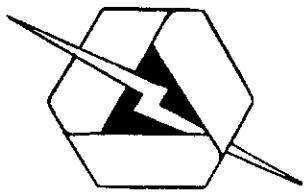

Rex Research ~ P.O. Box 19250 ~ Jean ~ NV 89019

InFolio # E9-ELS

Title ELECTRO-SLEEP

5C 18
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ELECTROSLEEP

1/18/70 NAT. ENQ.

Inventor Claims Electronic Device Gives Benefit of 8 Hours Sleep in 1 Hour

By SELIG ADLER

A new electronic device, when placed on the head, gives the wearer the benefit of 8 hours sleep in 1 hour, according to the inventor of the sleep machine, R.A. Williams.

Williams, president of Williams Instrument Co. of Fort Worth, Tex., said he and his wife, Dell, have tested the electro sleep-inducing device hundreds of times and both of them swear by it.

"Bands hold electrodes at the back of the head and under the eyes without discomfort," he told The ENQUIRER in a recent interview. "A mild, pulsating electrical current goes into the body."

Williams said this pulsating current is similar to a natural current which appears in the body during sleep.

SLEEPING CAP: Man is wearing sleep machine invented by R.A. Williams, who says that its mild, pulsating currents induce restful slumber more beneficial than normal sleep. Tests indicate that it does work.

But this natural current, which rests the body, is present only part of the time during natural sleep.

With the sleep machine, Williams says, the current is continuous and the body receives the amount of current needed to rest it as much in 1 hour as it would ordinarily be in 8 hours.

Electric power is supplied by a small battery, similar to those used in portable radios.

Williams said further testing is necessary before the U.S. Food and Drug Administration will approve the sale of the sleep machines to the general public.

Similar devices are already on the market in Europe and Japan and sleep machine experiments are also being conducted in Russia, Williams said.

The Texas inventor holds the U.S. patent on his sleep machine.

The most extensive tests of Williams' sleep machine were conducted at Woodlawn Hospital, Dallas, under the direction of Dr. Robert H. Glen, chief psychiatric consultant on the staff of the Southwestern Medical School of the University of Texas.

During a five-day test, 10 persons testing the sleep machine were allowed to sleep one hour out of every 12.

All of the persons in the test wore sleep machines when they slept, but only half of them had their machines turned on.

They were not told if their machine was on or off.

Then all 10 persons were awakened and given tests such as multiplication problems and finger tapping exercises.

"Those who had their sleep machines turned on while sleeping performed at a superior level when compared to those who did not use the machine," Dr. Glen said.

"Those who had had the machines turned on were more alert, they gave quicker responses and they also showed more steadiness with their hands."

Williams said now that he has tested it, he is trying to interest the Armed Forces in his sleep machine and he hopes to get the government to sponsor more extensive tests.

"The machine is compact and durable and does not obstruct the vision or hamper physical activity while being worn," Williams said.

"It could be worn by combat troops who often have to spend many hours without sleep."

Williams said he got the idea for the sleep machine after reading of the Russian research.

He said, "Our goal was to develop an electrical impulse to approximate the sensation experienced when a person is under an anesthesia such as ether.

"I spent four to six hours a day for 67 days trying out all possible electrical wave forms before finding the right one.

"The only side effects noticed during this time were occasional irritation of the eyelids and blurred vision from sustained pressure on the eyes.

"After this rough period I spent another 83 hours perfecting the pulse of the machine for maximum comfort and effectiveness.

"A number of people have tried out the sleep machine for periods ranging from 15 minutes to 2 hours.

"My wife has used it more than 100 times. We're still gathering experimental data.

"And I will continue to experiment with the sleep machine on myself."

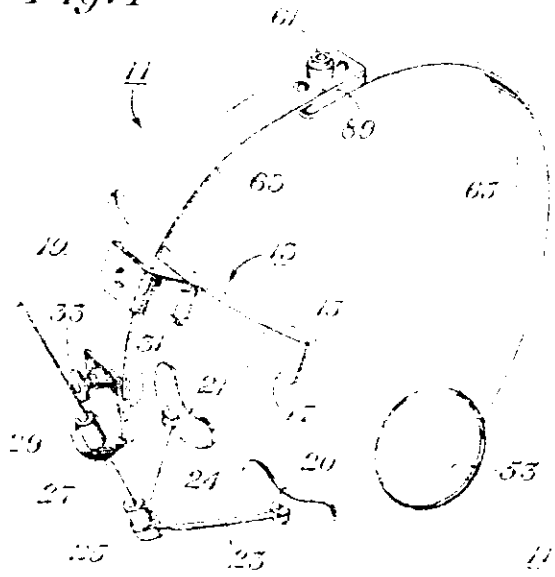
(2)

Sept. 2, 1969 R. A. WILLIAMS 3,464,416

SLEEP INDUCING METHOD AND HEADPIECE

Filed Aug. 25, 1967 3 Sheets-Sheet 1

Fig. 1



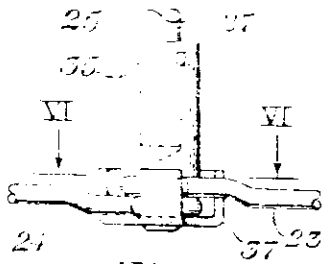


Fig. 5

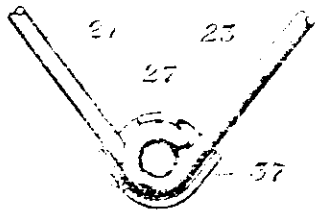


Fig. 6

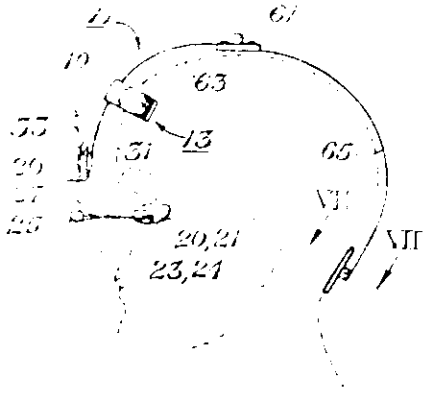


Fig. 2

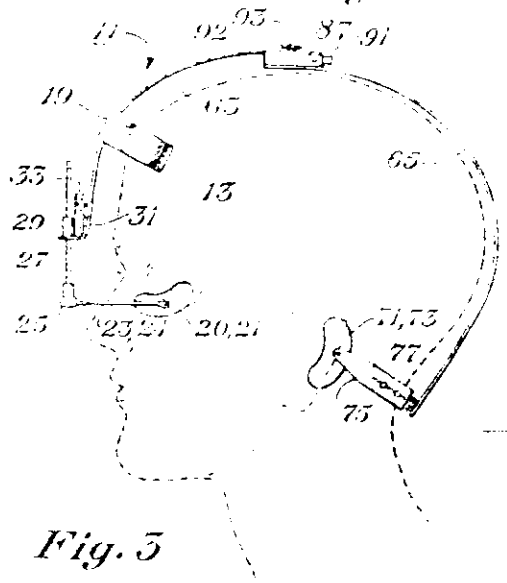


Fig. 3

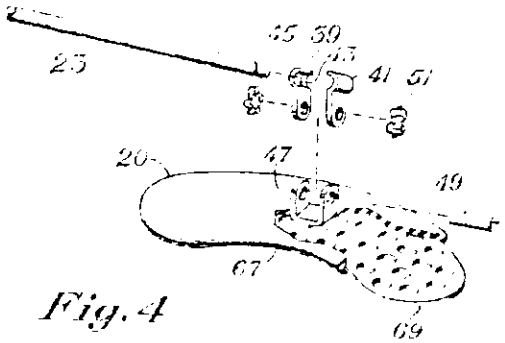


Fig. 4

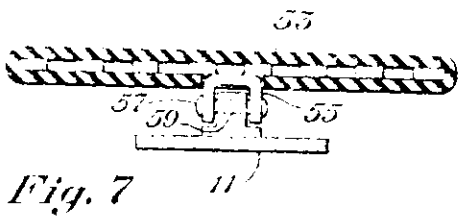


Fig. 7

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Sept. 2, 1969 R. A. WILLIAMS 3,464,416

SLEEP INDUCING METHOD AND HEADPIECE

Filed Aug. 25, 1967 3 Sheets-Sheet 3

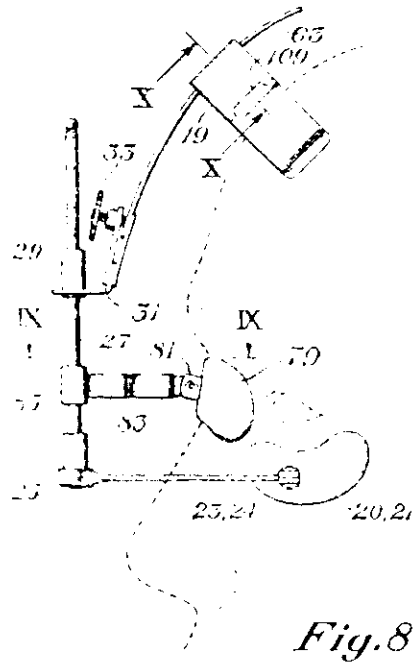

Fig. 8

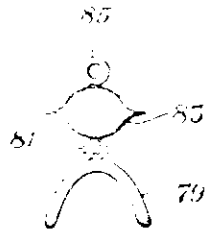

Fig. 9

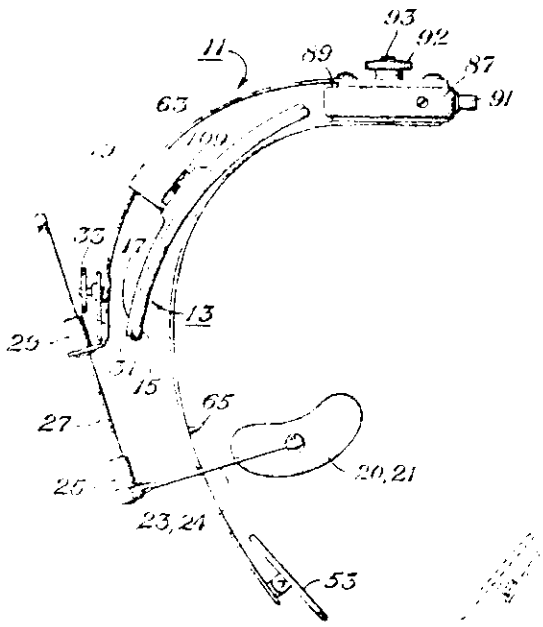

Fig. 11

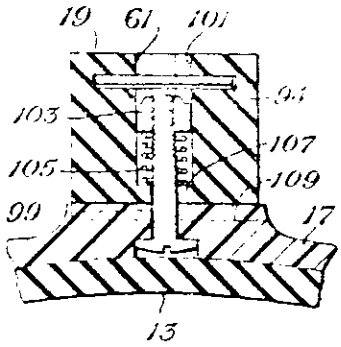

Fig. 10

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SLEEP INDUCING METHOD AND HEADPIECE

Filed Aug. 25, 1967 3 Sheets-Sheet 3

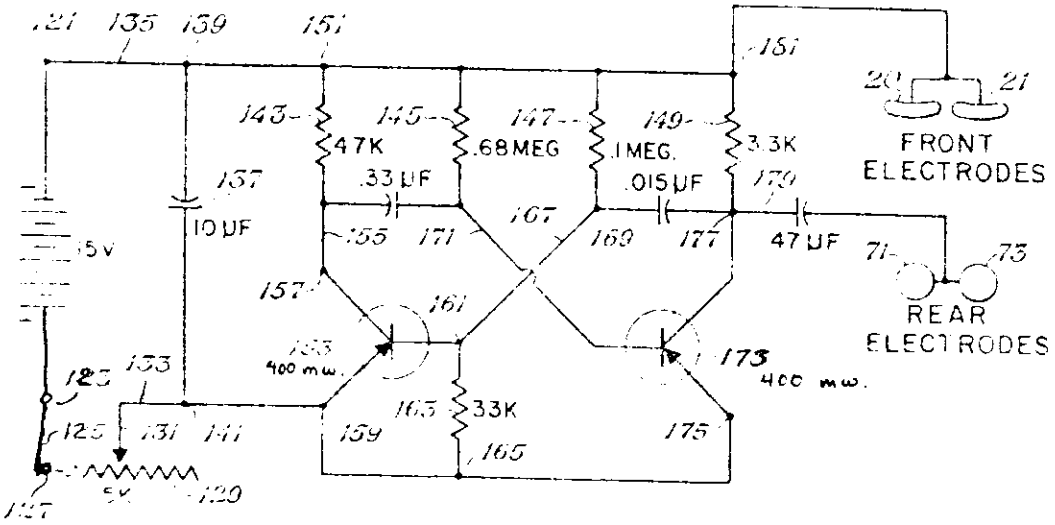

Fig. 12

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ATTORNEYS

(5) United States Patent Office 3,464,416
Patented Sept. 2, 1969

3,464,416

SLEEP INDUCING METHOD AND HEADPIECE

Robert A. Williams, Fort Worth, Tex., assignor to Williams Instruments, Inc., Fort Worth, Tex.

Continuation-in-part of application Ser. No. 408,895, Nov. 4, 1964. This application Aug. 25, 1967, Ser. No. 668,280

Int. Cl. A61m 21/00; A61n 1/02

U.S. Cl. 128—410 10 Claims

ABSTRACT OF THE DISCLOSURE

A method and apparatus whereby electrical energy is transmitted through the head to induce sleep by placing electrodes on the infraorbital ridges and on the rear region of the head. The apparatus disclosed for positioning the electrodes against the infraorbital ridges includes an arcuate band extending fore and aft over the head to support a rear electrode and a forehead clamp. A shaft is slidably and adjustably mounted to the band to extend downward along the nose region of the face and a pair of rods are radially and rotatably mounted to the shaft for pivotally supporting the infraorbital electrodes. The electrodes have a yieldable plate, preferably foraminous, core to assume an infraorbital ridge facial contour, being covered with electrically conductive nonmetallic materials such as silicone rubber. An electric circuit connected across the infraorbital and rear electrodes provides pulsating current and voltage selected from range subsequently defined.

This application is a continuation-in-part of a previously filed application, Ser. No. 408,895, filed Nov. 4, 1964, now abandoned

BACKGROUND AND GENERAL DISCUSSION

Previously, it has been discovered that the passage of certain types of electrical currents through the head is frequently beneficial in reducing fatigue. A deep sleep is often induced by this technique, and in many instances the apparent equivalent of eight hours sleep may be achieved in two hours or less. This general area of electrotherapy treatment is commonly known as the "electrosleep" technique.

Electrodes must be placed and immovably retained upon selected regions of the head during the use of the electrosleep technique, since shifting of the electrodes during treatment may awaken the user. Various of headpieces for securing the electrodes to the head have been previously proposed. One of the most common types of headpieces utilizes a pair of sponge electrodes that are moistened with a saline solution and retained over the eyes by a metallic cup. Another electrode is placed at the rear of the head, usually at the occipital region. Such devices have a number of disadvantages, the major one being perhaps the blurred vision which results from exerting a sustained pressure directly against the eye. The blurred vision may last for as long as thirty minutes after the termination of the treatment. In addition, some persons have eyes which are especially sensitive to and irritated by electrical currents. Moreover, one disadvantage found in all prior art electrosleep headpieces of which I am aware is that their construction will not allow the wearer to comfortably alter the position of his head. If the mechanical pressure which holds the electrodes against the head is changed, then the electrical resistance between each electrode and the head is also changed. Changing the electrical resistance and thus the current flow through the head is often irritating and may arouse the wearer of the headpieces. Moreover, the prior art headpieces do not permit adjustment of the electrode pressure exerted against

the head independently of the clamping pressure that secures the headpiece to the head. Maximum comfort can only be achieved by providing a headpiece wherein there are means for adjusting the electrode pressure exerted against the front parts of the head without tightening or loosening the headpiece.

It is the general object of my invention to provide an improved headpiece apparatus for use by those persons who are to undergo electrically induced sleep.

Another object of my invention is to provide an improved electrosleep headpiece apparatus wherein means are provided for adjusting the pressure the front electrodes exert against the head, without the necessity for tightening or loosening the headpiece itself.

Another object of my invention is to provide an improved headpiece apparatus for use in the electrosleep technique, said apparatus being capable of providing a constant pressure between the electrodes and the head even when the user changes position widely.

Another object of my invention is to provide an improved electrode for use in the electrosleep technique.

Another object of my invention is to provide an improved electrosleep headpiece apparatus wherein the front electrodes are improved and placed in an improved position on the head. Apparatus conforming to the above objects is utilized in practicing a method of inducing sleep electrically in which pulsating current is passed through the head in the vicinity of the infraorbital foramen and eyes so as not to interfere with normal vision. Moreover, the peak to peak current and voltage lie in selected ranges compatible with the nerve system impulse pattern.

It is accordingly another object of my invention to provide an improved electrosleep method.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a headpiece apparatus constructed in accordance with the principles of my invention.

FIG. 2 is a side elevational view showing the headpiece apparatus of FIG. 1 in position on the head.

FIG. 3 is a side elevational view of a modified form of my invention.

FIG. 4 is a fragmentary perspective view which shows a preferred construction of those electrodes shown in FIGS. 2 and 3 and hereinafter referred to as the "infraorbital" electrodes.

FIG. 5 is a fragmentary side elevational view of the swivel arrangement of FIGS. 1, 2, and 3 which helps support the infraorbital electrodes.

FIG. 6 is a fragmentary sectional view as seen looking along the lines VI—VI of FIG. 5.

FIG. 7 is a fragmentary sectional view as seen looking along the lines VII—VII of FIG. 2.

FIG. 8 is a fragmentary side elevational view showing a modified form of my invention.

FIG. 9 is a view as seen looking along the lines IX—IX of FIG. 8.

FIG. 10 is a fragmentary sectional view as seen looking along the lines X—X of FIG. 8.

FIG. 11 illustrates another modified form of my headpiece apparatus.

FIG. 12 is a schematic diagram of a suitable electric circuit that may be utilized in practicing my sleep inducing method.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawings and initially to FIGS. 1 and 2, the numeral 11 designates an arcuate band that extends from the forehead to approximately the occipital regions of the head. This band is preferably formed of stainless spring steel so that it is electrically conductive and mechanically biased so that its end portions are urged

toward the head. The primary purpose of the band is to support electrodes as will be explained in detail later. The band 11 need not be formed of stainless steel, however, or even of metal so long as there is provided means for conducting electricity to the electrodes and means for urging the band end portions toward the forehead and occipital regions of the head. At a forward portion of the band 11 is a head clamp 13 that is transversely mounted on the band. This head clamp has a padding of foam rubber 15 or equivalent that is mounted on the back of an arcuate member 17 which is formed of a rigid material, preferably of a plastic such as polycarbonate. Attachment means are provided in a housing 19 to secure the arcuate member 17 to the band 11.

Depending from the forward end of the band 11 are infraorbital electrodes 20, 21 which are pivotally secured to horizontal adjustment rods 23, 24 that extend from a swivel 25. The swivel in turn is connected to a vertical adjustment shaft 27 that in turn is connected to a friction slide 29. The friction slide 29 is securely mounted to a housing 31 that is secured to the band 11. The angle of the housing 31 may be changed with respect to the band 11 by turning a pressure adjustment wheel 33. Thus, the pressure exerted by the electrodes 20, 21 against the face may be conveniently adjusted.

As may be seen more clearly by referring to FIGS. 5 and 6, the swivel 25 is rotatably mounted to the vertical adjustment rod 27 and is secured thereto by means of a snap ring 35, which engages suitable grooves (see FIG. 5) in the swivel 25 and rod 27. The horizontal adjustment rods 23, 24 are wrapped around the rod 27 and protrude from a covering 37. There is preferably some degree of interference between the rod 27 and the wrapped portion of each rod 23, 24 so that the rods are securely held in selected positions. Thus it is apparent that the infraorbital electrodes may be spaced apart a distance that suits the person using the headpiece.

Referring now to FIG. 4, it may be seen that the horizontal adjustment rods 23, 24 are preferably universally secured to the infraorbital electrodes 20, 21. This helps provide a uniformly distributed pressure at all times between the infraorbital electrode and the infraorbital region of the face. As is shown in FIG. 4, the horizontal adjustment rod 23 extends between a pair of clamps 39, 41 and ridges 43 on the clamps engage a groove 45 in the rod. This enables the clamp to rotate with respect to the rod but prevents the rod from slipping from the clamps. The clamps 39, 41 are secured to the bracket 47 on electrode 20 by means of a spring pin 49 which extends through bracket 47, through the undulated spring washers 51, and through the clamps 41, 43. Thus, the similarly constructed electrodes 20, 21 may be adjusted radially by moving the horizontal adjustment rods 23, 24, with respect to the vertical rod 27; they may be adjusted vertically by moving the vertical adjustment rod 27 with respect to the friction slide 29; and they may be angularly oriented by both rotating and pivoting them with respect to the horizontal adjustment rods 23, 24.

As stated previously, the arcuate band 11 extends rearwardly to the occipital region of the head and electrode 53 is pivotally mounted to the end portion of the band 11. The construction of the occipital electrode 53 of FIGS. 1 and 2 is shown more clearly in the fragmentary sectional view of FIG. 7. There it may be seen that the electrode 53 is secured to a bracket 55 which is pivotally mounted by means of a pivot pin 57 to the protrusion 59 that extends from the band 11. Thus, the occipital electrode 53 is capable of adapting to the particular contour of the head of its user. A suitable electrical circuit (not shown) is connected to the input jack 61 on the arcuate band as may be seen clearly in FIGS. 1 and 2. The band 11 is actually formed in two pieces, having a forward section 63 and a rearward section 65 which are insulated from each other. The electrical circuit is arranged so that the occipital electrode 53 is the negative electrode while the infraorbital electrodes 20 and 21 are the positive electrodes.

The construction of the electrodes is such that the need for saline solution filled sponge electrodes is eliminated. As may be seen clearly in FIG. 4, the exterior 67 of each electrode is formed of a nonmetallic conductive material such as silicone rubber while the interior of each electrode is formed of a foraminous metallic conductor such as perforated sheet metal or screened metal sheet. The metal and nonmetallic materials are molded together and thus intimate contact is maintained between the rubber and the metal, a feature which eliminates any adhesion factor and maintains equal distribution of the current over the entire area of the electrode even during the most adverse conditions. In use, the exterior 67 of each electrode is initially moistened but afterwards, no further care is needed since skin moisture has been found sufficient to maintain a constant resistance between the electrode and the skin tissue. A successfully used nonconductive material was silicone rubber having a volume resistivity of approximately 15 ohm-centimeter and a durometer Shore scale hardness of 40 to 80. Silicone was selected because of its inert characteristics but conductive rubber proper and conductive plastic may also be used. The above construction of the electrodes maintains equal distribution of current, as stated previously, and allows the electrodes to be bent, formed or reformed to conform to individual facial configurations.

I have discovered that the shape of the infraorbital electrodes 20, 21 can be helpful in achieving maximum effectiveness. The use of electrodes that engage the infraorbital region of the head is of itself a significant improvement, but if the infraorbital electrodes are properly shaped, even greater advantages are achieved. One purpose in providing infraorbital electrodes is to eliminate the necessity for placing electrodes over the eyes, since over-the-eye electrodes have the heretofore mentioned disadvantages. And yet it has been found advantageous to have the electrical current pass into the head in the region of the eyes. My infraorbital electrodes rest on the infraorbital bone structure of the head and thus do not exert a direct pressure on the eyes. This is more comfortable than using electrodes that cover the eyes and exert pressure thereon. The upper edge of each infraorbital electrode 20, 21 is curved to the approximate contour of the infraorbital edge of the bone structure. Consequently, my electrodes enable the current to pass into the head in the region of the eyes and yet do not cover or exert a direct pressure on the eyes. The lower edges of the electrodes are preferably curved also so that the electrodes have a kidney shape, since this shape conforms to the facial contour of most persons. But this is not essential since the construction of the electrodes enables them to be bent to match the contour of the face. Thus, many shapes may be used along the lower edges of the infraorbital electrodes.

In FIGS. 1 and 2 the rear electrode is of a type that is adapted to engage the occipital region of the head. In FIG. 3, however, the rear electrodes 71, 73 are kidney-shaped (like the infraorbital electrodes) and are adapted to engage the mastoidal region of the head. In this instance an arcuate cross member 75 is rotatably mounted to the rear portion 65 of band 11. The extremities of the arcuate band 75 are formed of separate pieces and are adjustably and slidably mounted to a central piece 77. When I intend to refer to either the occipital or mastoidal regions of the head, I specify the "rear" portions of the head.

I have discovered that in some instances, the nose bridge electrode 79 of FIG. 8 is quite effective, especially when those persons using the apparatus have a high degree of sensitivity in their upper tooth region. In such instances the nose bridge electrode 79 is used singly or in combination with the infraorbital electrodes 20 and 21.

The electrode is pivotally mounted at 81 to the spring 83 as is perhaps shown more clearly in FIG. 9. The spring 83 is attached to a housing 85 which is slidably mounted on the vertical adjustment rod 27. The use of the nose bridge electrode 79 is beneficial since it diffuses the flow of electrical energy over a wider region of the head and thus eliminates the discomfort which sometimes arises in sensitive persons by concentrating the flow of electrical energy.

In the apparatus of FIGS. 1 and 2, an external electric circuit is used and is attached to the head band 11 by means of the input jack 61. However, my headpiece apparatus is capable of adaptation as a completely portable unit by the inclusion of a miniaturized electrical circuit of a suitable type within the headpiece itself. In this instance the housing 87 of FIG. 11 is interposed between the rear portion 65 and the front portion 63 of the band 11. Bands 63 and 65 are electrically insulated by the pad of insulation 89 that separates the forward band 63 and the housing 87. (The bands 63, 65 of the FIG. 1 headpiece are also insulated by a suitable pad 89.) The housing 87 has an input jack 91 for connection to a source (not shown) of electrical energy. In order to make the headpiece more compact during transportation, the rear band 65 is pivotally mounted in housing 87. The thumb screw 92 is connected to a shaft 93 that extends through the housing and joins the rear band 65. Thus, when the thumb screw is loosened the band 65 may be rotated from the operational position shown in phantom in FIG. 11 to the position shown in heavy lines. Also, the infraorbital electrodes 20, 21 and their horizontal adjustment rods 23, 24 may be swung together since they are pivotally mounted to the vertical adjustment rod 27. In addition, the head clamp 13 may be rotated from the transverse position shown in FIG. 3 to the FIG. 11 position. As a consequence, the headpiece occupies very little space and may thus be transported very easily.

The construction of the head clamp 13 may be seen quite clearly in FIGS. 8, 10, and 11. The housing 19 has a slot 94 therein, and the front portion 63 of band 11 interferingly engages this slot so that the head band may be moved and retained in a desired position on the band. The arcuate and rigid backing 17 is pivotally secured to the housing 19 by means of the screw 97 which extends through a hole 99 in the rigid backing 17 and into an aperture 101 in the housing 19. A nut 103 is secured to the screw 73 and a spring 105 is interposed between the bottom nut 103 and an annular ledge 107 in the housing 19. Thus, the rigid backing of the head clamp is urged against the housing 19, and elongated slot 109 (see particularly FIG. 11) is included in housing 19 so that when the head clamp is moved to its operational position, a portion of the rigid member 17 engages the slot to prevent rotation of the head clamp.

Illustrated in FIG. 12 is a circuit suitable for transmitting sleep inducing electrical energy through the head. In this instance a fifteen volt power source is connected across terminals 121, 123, the latter being connected with a single pole, single throw switch 125 having a terminal 127 connected with a five kilohm, two terminal rheostat 129, the variable contact terminal 131 of which is connected to a conductor 133. Terminal 121 communicates with a conductor 135 and a ten microfarad capacitor 137 is connected in series with the battery to the conductors 133, 135. Connected in parallel with the battery and the capacitor 137 across the conductors 133, 135 are four resistors, 143, 145, 147, and 149, preferably having ratings of respectively 4.7 kilohms, .68 megohm, .1 megohm and 3.3 kilohms. Resistor 143 communicates with conductor 135 through terminal 151 and is connected in series with a 400 milliwatt transistor 153 through a conductor 155 and the collector 157. The emitter 159 of the transistor communicates with conductor 133 while its base 161 is connected in series with a 33.0 kilohm resistor 163 that is connected with the conductor 133 through terminal 165. Terminal 161 is connected through a conductor 167 with a terminal 169 which in addition is one terminal of resistor 147. Connected in series with the resistor 145 through its base 171 is a 400 milliwatt transistor 173 having its emitter 175 connected with the conductor 133 and its collector 177 connected with a conductor 179 that extends between terminal 169 and the rear electrodes 71, 73, such conductor having inserted therein a .015 microfarad capacitor between terminal 169 and collector 177, and also a forty-seven microfarad capacitor between the collector 177 and the rear electrodes 71, 73. Conductor 135 extends to the front electrodes 20, 21 from the terminal 181 connected with the resistor 149.

The above circuit provides a selected voltage across the front and rear electrodes. The measured value for the resistance to electric current in the head of an average person is about 3000 ohms. The current flow through the head when using twelve volts is four milliamps. The frequency of the pulse variations has been established to be preferably thirty-six cycles per second, which appears to be satisfactory for most persons. It has been determined from the alpha patterns as shown on electroencephalograms that the frequency of the pulsations in the average nerve system varies between nine and twelve cycles per second. Possibly, best results are obtained by using a multiple of a particular person's alpha pattern frequency, which may explain why thirty-six cycles per second works well on most persons whose nerve system registers about twelve cycles per second on an electroencephalogram. This has not been demonstrated, however, with certainty and seemingly there is considerable variation in the frequency that may be successfully utilized. Even on a single patient the frequencies that may be used with comfort to satisfactorily induce sleep may vary.

Voltages that may be satisfactorily utilized vary since persons demonstrate varying ability to tolerate comfortably electric current. For most persons, however, voltage selected from a range from two to eighteen volts and a current in a range from 0.67 to 6.0 milliamps is satisfactory, with the preferred current and voltage being respectively four milliamps and twelve volts. The above ranges of current and voltage may be used to satisfactorily perform my method of electrically inducing sleep wherein the electrodes are placed on the infraorbital ridge. Current and voltage values referred to herein are peak values and not average values unless so specified.

In operation the band 11 is placed over the head so that occipital 53 or mastoidal electrodes 71, 73 engage rear portions of the head while the head clamp 13 engages the forehead. Head clamp 13 is slipped along the front portion 63 of the band 11 to a comfortable position. The horizontal adjustment rods 20, 21 are moved radially and the vertical adjustment rod 27 is moved vertically along friction slide 29 until the infraorbital electrodes 20, 21 are placed on the infraorbital regions of the head. The above adjustment means allow the electrodes 20, 21 to be adapted to essentially any facial configuration. The upper curved surface of the electrodes is positioned to match the edge of the infraorbital base structure and are close to the eyes and yet do not exert an uncomfortable pressure thereon. The pressure adjustment means, which consist of the pivotable housing 31 and its adjustment wheel 33 (both of which are mounted on the end portion of front band 63), is adjusted so that the pressure exerted by the infraorbital electrodes against the face suits the person using the headpiece. Then input jack 61 or 91 is connected to a suitable source of electrical energy while the person is in a sitting or prone position.

When using a circuit like that shown in FIG. 12, a supply voltage of fifteen volts is utilized, with the voltage supplied to the electrodes being regulated through the five kilohm rheostat 129. The setting of this resistor is established initially such that voltage across the electrodes is minimized. If the user demonstrates that he is suffering

no irritation, the voltage across the electrodes is increased until preferably four milliamps of current is reached. The voltage across the electrodes may be increased to the desired degree until irritation develops. When such irritation develops, the electrode voltage is decreased to a non-irritating level. Experience indicates that twelve volts and therefore about four milliamps is not irritating to a majority of users and will satisfactorily induce sleep. It is therefore common to establish the voltage at about the twelve level without need for testing for the irritation level of the current flow. Using the above method, sleep may be induced for thirty minutes to one hour and the effect in most instances on the user is like receiving a full seven to eight hours of sleep.

It should be apparent from the foregoing that I have provided electrotherapy treatment headpiece apparatus having significant advantages. The provision of electrode adjustment means for those electrodes that engage sensitive regions of the head, such as the regions around the nose and eyes, is a significant advantage, especially since the adjustment means functions independently of the clamping means used to secure the headpiece to the head. Thus, there is no need to loosen or tighten the headpiece when adjustments (such as pressure adjustments) need to be made. The use of a band that extends fore-and-aft over the head with the need for only two pressure points (head clamp 11 and occipital electrode 53, for example) permits the person using the headpiece to vary his position widely. He may lie with either side or the back of his head down without interfering with the positioning of the headpiece. He may not, of course, lie with his face down since the electrode and pressure adjustment means extend forwardly from the headpiece, but people rarely try to sleep with their faces down. The improved electrodes are particularly advantageous since their construction eliminates the need for assistance from such things as saline solutions and since their construction permits them to be bent to conform to individual facial configurations without disrupting the even distribution of current flowing through the electrodes. In addition, the contour of the infraorbital electrodes (with their curved upper edges that conform to the approximate contour of the infraorbital edges of the bone structure) permits the passage of electrical current into the head in the region of the eyes without the necessity for covering the eyes with electrodes. As was explained previously, covering the eyes with electrodes leads to a number of disadvantages. Moreover, the use of an electrode that engages the nose bridge enables a wider diffusion of electrical current through the head and eliminates the discomfort that accompanies the concentration of electrical currents in small regions of the heads of sensitive persons. Also, the use of electrodes that engage the infraorbital region of the head is a significant improvement of itself since good results are obtained and yet the disadvantages which accompany the use of eye engaging electrodes are eliminated.

The above described method of electrically inducing sleep is effected in a manner avoiding eye irritation. It is seemingly possible to utilize current and voltage levels over a wide range in most persons but the preferred levels described appear to work satisfactory for the average person. There are a variety of circuits which may be utilized to produce frequency, current and voltage in the above ranges and it is seemingly possible to utilize alternating currents in those ranges in addition to using pulsating direct current, although it appears pulsating direct current is the most satisfactory.

The foregoing disclosure and the showings made in the drawings are merely illustrative of the principles of this invention and are not to be interpreted in a limiting sense.

I claim:

1. An apparatus for holding electrodes in selected positions on the head of a person who is to undergo electrically induced sleep, said apparatus comprising:

an arcuate band having a length sufficient to extend from the forehead region to the rear of the head, said band being biased to urge its end regions toward the head;

at least one electrode mounted on one end of said band to engage the rear region of the head;

an arcuate, insulated clamp mounted toward an opposite end of said band to engage the forehead region of the head;

a shaft slidably and adjustably mounted to said band beneath said arcuate clamp to extend downward a selected distance along the nose region of the face;

a pair of rods mounted radially to said shaft and being radially adjustable relative to said shaft;

an electrode pivotally mounted to each rod to engage the infraorbital ridge of the face adjacent but not upon the eye and above those regions of the face overlying the mouth cavity;

means electrically connecting said electrodes across an electrical energy power source;

said electrodes having a yieldable plate core capable of being selectively and repetitively bent and shaped to assume an infraorbital ridge facial contour, and having a covering of electrically conductive non-metallic material such as silicone rubber.

2. The apparatus defined by claim 1 wherein said infraorbital electrodes have arcuate upper peripheral edges that conform to the shape of the eye to facilitate the passage of current into the eye.

3. The apparatus defined by claim 1 wherein another electrode extends from said band to engage the nose bridge.

4. An apparatus for holding electrodes in selected positions on the head of a person who is to undergo electrically induced sleep said apparatus comprising:

an arcuate band having a length sufficient to extend from the forehead region to the rear of the head;

at least one electrode mounted on one end of said band to engage the rear region of the head;

clamping means mounted toward an opposite end of the band to engage the forehead region of the head;

support means mounted to said band beneath said clamp means to extend downward a selected distance along the nose region of the face;

a pair of rods pivotally mounted to said support means;

an electrode pivotally mounted to each rod to engage the infraorbital ridge of the face adjacent but not upon the eye;

means for supplying current to said electrodes in a range varying from two to eighteen volts and at a current level from 0.6 to 6.0 milliamps.

5. The apparatus defined in claim 4 in which said voltage is approximately twelve volts and the current is approximately four milliamps.

6. The method for inducing sleep electrically, said method comprising the steps of:

securing electrodes against the infraorbital ridge of the face adjacent but not upon the eyes and above those regions of the face overlying the mouth cavity;

securing at least one additional electrode of opposite polarity against a rear region of the head;

passing an electric current between said electrodes of current sufficient to induce sleep;

said current having a voltage in a range from two to eighteen volts and at a current level from 0.6 to 6.0 milliamps.

7. The method defined by claim 6 wherein said voltage is about twelve volts and the current is about four milliamps.

8. The method for inducing sleep electrically, said method comprising the steps of:

securing electrodes against the infraorbital ridge of the face adjacent but not upon the eyes and above those regions of the face overlying the mouth cavity;

securing at least one additional electrode of opposite polarity against a rear region of the head;

passing an electric current between said electrodes of a character sufficient to induce sleep.

9. An apparatus for holding electrodes in selected positions on the head of a person who is to undergo electrically induced sleep said apparatus comprising:

an arcuate band having a length sufficient to extend from the forehead region to the rear of the head;

at least one electrode mounted on one end of said band to engage the rear region of the head;

clamping means mounted toward an opposite end of the band to engage the forehead region of the head;

support means adjustably mounted to said band beneath said clamp means to extend downward a selected distance along the nose region of the face;

a pair of rods radially and pivotally mounted to said support means;

an electrode pivotally mounted to each rod to engage the infraorbital ridge of the face adjacent but not upon the eye;

means connecting said electrodes with a source of current of a character sufficient to induce sleep.

10. The method for inducing sleep electrically, said method comprising the steps of:

securing electrodes against the infraorbital ridge of the face adjacent but not upon the eyes;

securing at least one additional electrode of opposite polarity against a rear region of the head;

passing an electric current between said electrodes of a character sufficient to induce sleep.

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RICHARD A. GAUDET, Primary Examiner

K. L. HOWELL, Assistant Examiner

U.S. Cl. X.R.

128—416, 418

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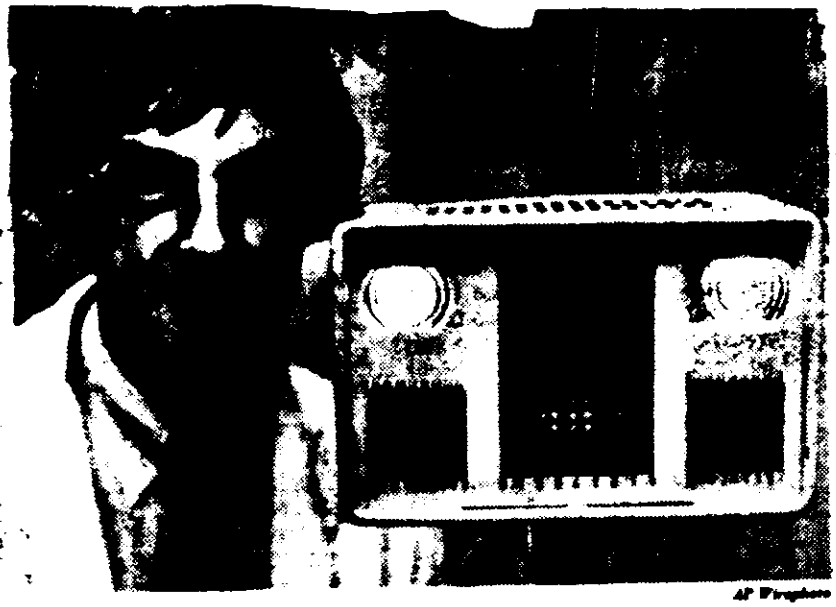


AP Wirephoto

DR. ROSS ADEY AND THE LIDA MACHINE
It bombards the brain with low-frequency radio waves

Russian Machine That Tranquilizes People

Loma Linda,
San Bernardino County

A Soviet device that bombards brains with low-frequency radio waves may be a replacement for tranquilizers and their unwanted side effects, says a researcher, but its use on humans poses ethical and political questions.

The machine, known as the Lida, is on loan to the Jerry L. Pettis Memorial Veterans Hospital through a medical exchange program between the Soviet Union and the United States.

Hospital researchers have found it changes behavior in animals.

"It looks as though instead of taking a Valium when you want to relax yourself it would be possible to achieve a similar result, probably in a safer way, by the use of a radio field that will relax you," said Dr. Ross Adey, chief of research at the hospital.

The Lida's Russian-language manual shows it being used on a human in a clinical setting, Adey said. The manual says it is a "distant pulse treatment apparatus" for psychological problems, including sleeplessness, hypertension and neurotic disturbances.

The device has not been approved for use with humans in this country, although the Russians have done so since at least 1960, Adey said.

Low-frequency radio waves simulate the brain's own electromagnetic current and produce a trance-like state.

Adey said he put a cat in the box and turned on the Lida.

"Within a matter of two or three minutes, it is sitting there very quietly ... it stays almost as though it were transfixed," he said.

The hospital's experiment with the machine has been under way for three months and should be completed within a year, Adey said.

Associated Press

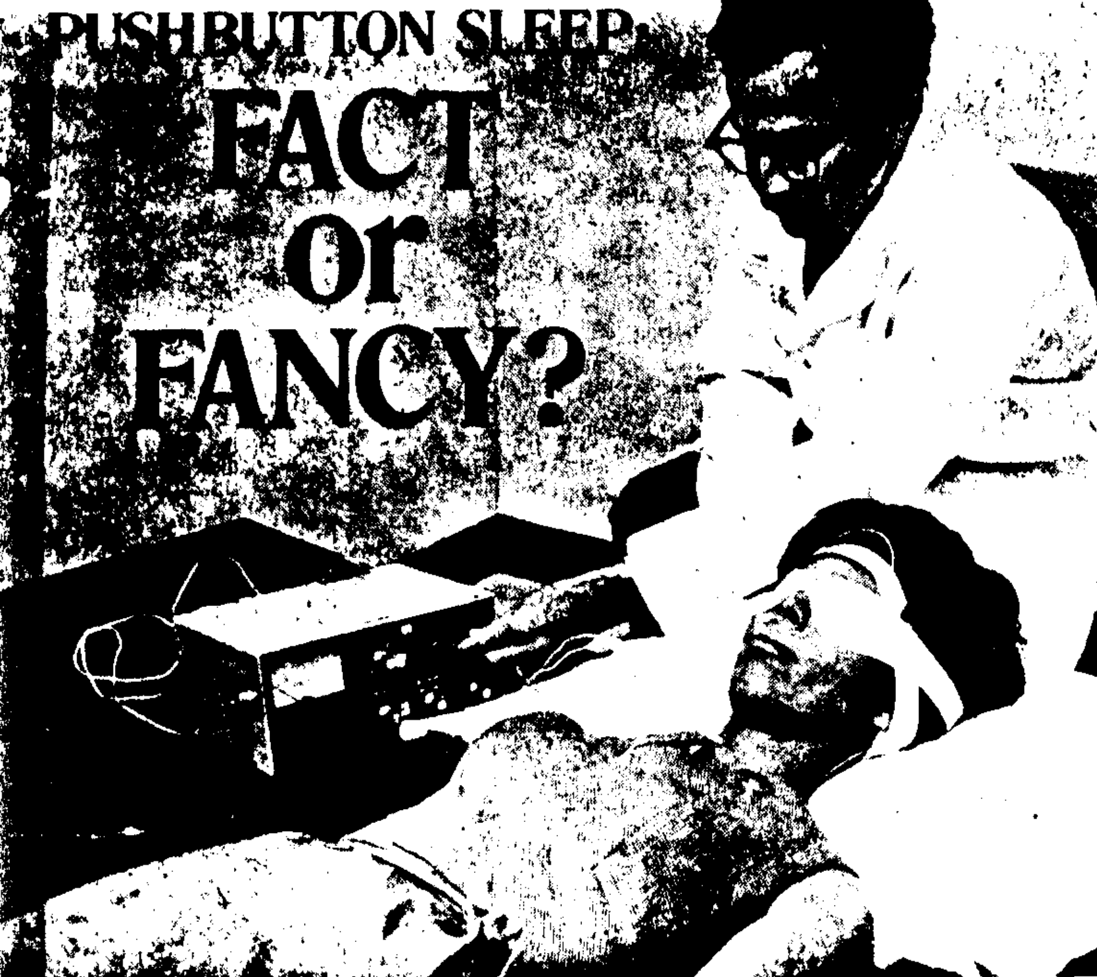
Pop Sci Aug '37

Electric Currents Keep People Asleep

ELECTRICITY may be used as a cure for sleeplessness, as well as a substitute for drugs in producing local anesthesia, it is indicated in reports of research studies being carried on by Prof. G. Kalendarov, Russian biologist. The method is an extension of the system, known to scientists for several years, of applying certain kinds of electric current to living nerves to deaden them against pain. To determine whether electricity could produce complete and harmless anesthesia, or sleep, Professor Kalendarov first experimented with frogs. An electrode was connected to the frog's head, and another to the base of its spinal column. When the current was switched on, the frog fell asleep immediately, waking, apparently unharmed, only when the electricity was turned off. After extensive tests on other animals, the professor finally tried the experiment on himself. Awakening promptly after the current flow ceased, he declared that he had felt only a slight discomfort before losing consciousness. No bad after-effects developed, and "electric sleep" is now being carefully tested in Russian hospitals as a treatment in cases involving insomnia and for patients who would benefit from a long and drugless sleep after a major surgical operation.

AUGUST 19[illegible]

PUSHBUTTON SLEEP: FACT or FANCY?



Does an electrosleep machine actually put you to sleep, or does it work simply because you believe it does? /By Webb Garrison

Ten years ago no U. S. research worker who valued his reputation would have admitted interest in using electrical devices to induce sleep.

Today this special application of a still-mysterious force is one of the hottest areas of medical research. Ranks of Americans who were considered to be hopelessly addicted to bedtime pill-popping have already been thinned a little. Some of the nation's leading clinics are eagerly testing, or planning to test, solid-state electrosleep machines.

Sophisticated new variants of methods long linked with quackery are yielding positive results that can't be ignored. Debate still flourishes, though, on the unresolved question of whether results stem from pulsating current entering the brains of patients—or from subjective reactions to techniques and gadgets.

A Willing Guinea Pig. Take the case of Harold Y. A successful junior executive whose performance during the next two or three years will determine whether or not he makes it to the top, Harold has always been rated as exceptionally competent.

He sometimes suffers from periods of depression, though. Since 1959 he has been plagued with insomnia that didn't respond to any conventional treatment. Harold's physician prescribed Elavil and later Librium.

N A. ZULLO NAT. ENQ.

ELECTROSLEEP: New Way to Treat Ulcers, Insomnia, High Blood Pressure & Anxiety

Tiny Electrical Current Sent Through Brain Relaxes Entire Body, Claim Specialists

...eds of thousands of suffering from insomers, high blood pres... d anxiety can be suc... treated by electrical... ed relaxation, say two specialists. 7/29/73

...eatment, which was in Russia, is called ...ep.

...es patients by sooth... brain with a tingling current.

...osleep could enhance ...ment of hundreds of ... of Americans suf... m insomnia and anx... id Dr. David Pino... uses electrosleep at ...n Resource Institute ... Fla., where he is ...irector.

...l Rosenthal, asso... essor of psychiatry ...niversity of Texas ...hool, also uses elec... patients.

"As a substitute ...tion, electrosleep is ...tive, has no side ...l also prevents the ...f suicidal or acci... dental overdoses from medication."

An electrosleep patient lies down in a semi-darkened room where electrodes are placed over his brow and behind his ears. A portable machine provides a tiny amount of electrical current, about one thousandth of an ampere.

"It relaxes the entire body," said Dr. Pinosky.

Dr. Rosenthal said electrosleep sessions last about a half hour and are carried on five days a week, sometimes for several months. Almost all sessions are combined with a period of psychotherapy.

Said Dr. Pinosky: "Patients plagued by sleeplessness are soothed to rest during the session. When they return home, they find they can sleep naturally. However, the treatment doesn't cure insomnia for the elderly or people with emotional problems."

Ulcers which occur in people troubled by anxiety can be controlled by electrosleep which decreases high blood pressure as well as the amount of stomach acids, he said.

He added: "Electrosleep has been used for 20 years in Russia for psychiatric purposes. Recently, it's been used quite a bit in the U.S."

ELECTROSLEEP TREATMENT: Therapist Bil... ministers electrosleep to patient of a Miami...

e/e PUSHBUTTON SLEEP

Neither drug helped him. Valium, another standard pharmaceutical weapon against sleepless nights, was totally ineffective. So was chloral hydrate.

Though he showed some symptoms of anxiety, nothing in his personality profile indicated that intensive psychiatric treatment was needed. There was nothing left—or so it seemed.

As a desperate last resort, Harold's family doctor referred him to an electrosleep clinic where he registered as an outpatient. Neither he nor his physician had any real hope of positive results, but every other alternative had been tried.

He took a battery of tests. Finally the day came for his first treatment.

At the clinic, the specialist working with him had already explained that he would be treated with the Electrosone 50. This machine is based on the circuitry of the Electrosom "sleep machine" widely used in Russia, but differs from the Iron Curtain device in several important respects.

Electrosone. Manufactured and sold by Tri-Tronics Laboratory, Inc., near Dallas' Love Field in Euless, Texas, the Electrosone 50 is the only electrosleep machine that has won F.D.A. approval. Currently, such approval isn't absolutely necessary. Unless electronic medical devices can be considered "drugs" under recent court interpretations, they don't have to prove either efficiency or safety.

This situation may change any time, however. Once such devices are promoted for sale to the public, the F.D.A. is likely to initiate regulatory action. Two major brand-name electrosleep machines, made in Russia and Germany, are readily available in Europe and other parts of the world. So are half a dozen competing products.

Even without specific laws governing manufacture and sale in the U. S., F.D.A. pressure is strong enough to limit distribution to "qualified scientific investigators" wishing to use electrosleep machines for research purposes. This meant that in subjecting himself to treatment by means of the Electrosone 50, Harold Y. was a willing guinea pig. The result of his experience could affect the future of the electronic device as well as his own health and career.

From his doctor's instructions, Harold already knew that he didn't have to strip and don a hospital gown to receive his first treatment. So he walked into the clinic wearing an ordinary business suit. He elected to lie down—not because this is considered necessary, but because it is more comfortable than sitting.

Sleep Treatment. A sleep mask was placed over his eyes in such away that the built-in negative electrode was positioned over his eyelids and the positive over his mastoid areas. It took only seconds for connection of the positive wire to the mastoid electrode and the negative wire to the eyelid electrode.

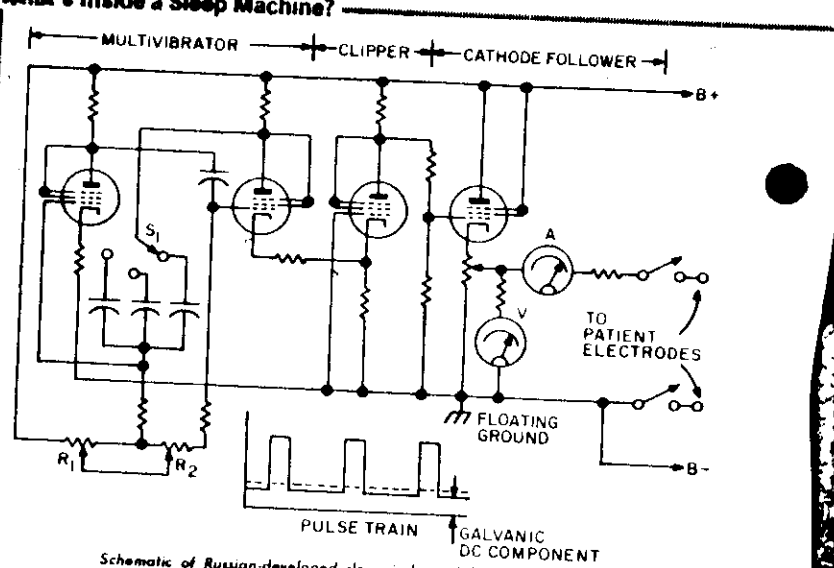
Electrical contact, Harold already knew, would be made by means of throw-away plastic pads moistened in a saline solution to improve electrical conductivity. Manipulating dials of the Electrosone 50, his physician set the machine for a frequency of 100 positive pulses per second and a pulse duration of 1 millisecond. By turning a third dial, the timer control was set for a thirty-minute treatment with automatic cutoff.

Harold felt a slight "prickling" or "flashing" sensation over the eyes. Then the same sensation was felt in the mastoid area. He was in no way uncomfortable—simply aware of the reaction he had been told most patients experience. He knew enough about electronics to realize that the squarewave pulse yielded by the Electrosone 50 closely approximates the brain's alpha wave.

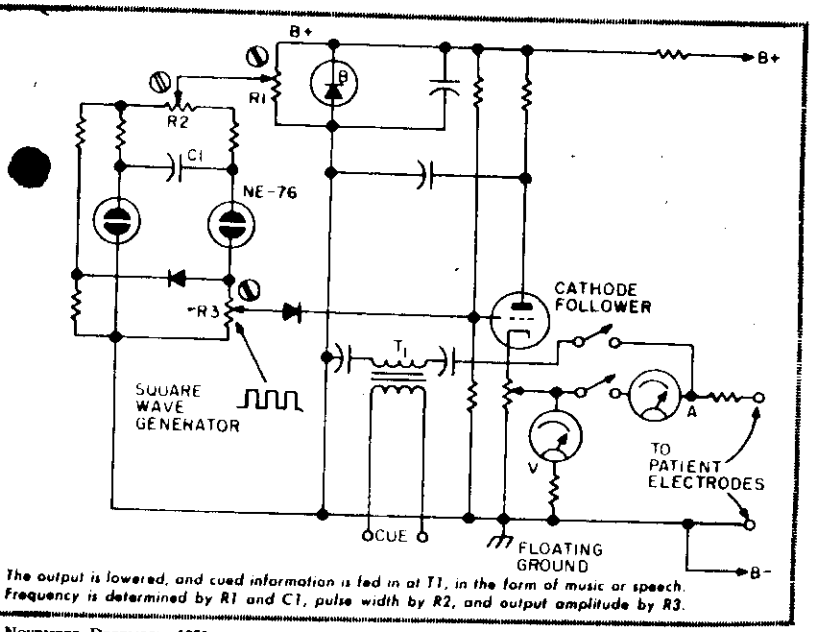
Tense for a few minutes but never actually apprehensive, the patient soon relaxed. Though he didn't fall asleep, he found himself in that never-never land where there are no conscious thoughts or dreams. His pulse rate and breathing assumed such patterns that though fully conscious, he was, for clinical purposes, asleep.

At the outset, Harold had agreed to a course of ten half-hour treatments. Largely as a courtesy to his physician he completed the entire series. After the third treatment he found himself drifting off to sleep more easily and sleeping more restfully than in years. He voluntarily gave up all medication.

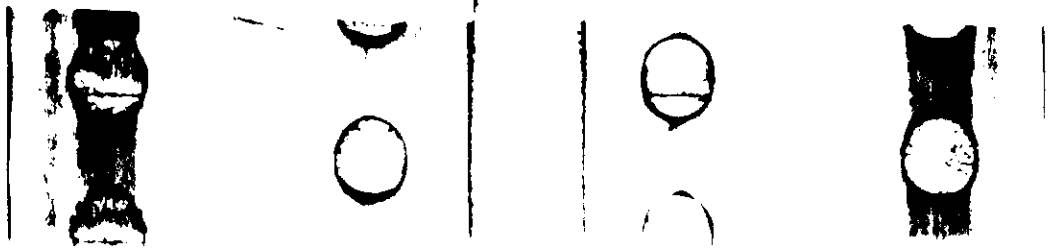
What's Inside a Sleep Machine?



Schematic of Russian-developed sleep inducer (above). The machine's output resembles the brain's alpha rhythm. The sleep inducer on the opposite page will modulate dreams.



The output is lowered, and cued information is fed in at T1, in the form of music or speech. Frequency is determined by R1 and C1, pulse width by R2, and output amplitude by R3.



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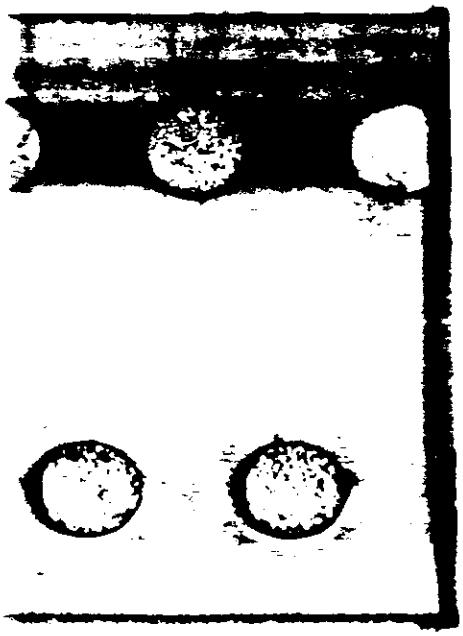
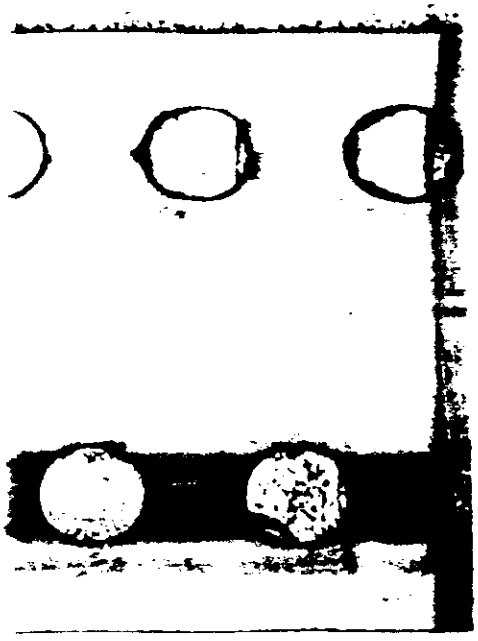




e/e PUSHBUTTON SLEEP

Still waiting to see whether or not he'll get the promotion that will determine the course of his career, Harold Y. threw away his bottles of pills after his seventh electrosleep treatment. In the nearly eighteen months that have elapsed since he received treatment #10, he has had only a few sleepless nights.

Though the name is fictitious and details have been changed to prevent identification, the story of Harold Y. is no fairy tale. It represents one fruit of very recent American willingness to give European electrosleep techniques a genuine clinical try.

Pioneer. One of the pioneers in this country is Saul H. Rosenthal, M.D. Associate professor in the department of psychiatry, University of Texas Medical School at San Antonio, Rosenthal himself was highly skeptical of electrosleep. But he felt that low-intensity electrostimulation of the brain as a psychiatric treatment was too important to be ignored. Pioneer work began in Europe more than fifty years ago. The *Foreign Science Bulletin*, published by the Library of Congress, lists hundreds of technical papers reporting results of tests and treatments involving tens of thousands of persons.

European Activity. Practically all European nations have encouraged experimentation. In Russia, electrosleep machines are in daily use in more than three hundred "sleep centers." Scientists from all over the world converged on Graz, Austria, in 1965 and again in 1969 for international conferences on electrosleep and electroanesthesia. The international society whose headquarters are located there (Chirurgische Universitaetsklinik, 8036 Graz, Austria) has a big and growing library, and publishes extensive literature on current work.

During the past decade, Moscow has been host for four symposia on electrosleep and electroanesthesia, involving participants from the Union of Soviet Socialist Republics.

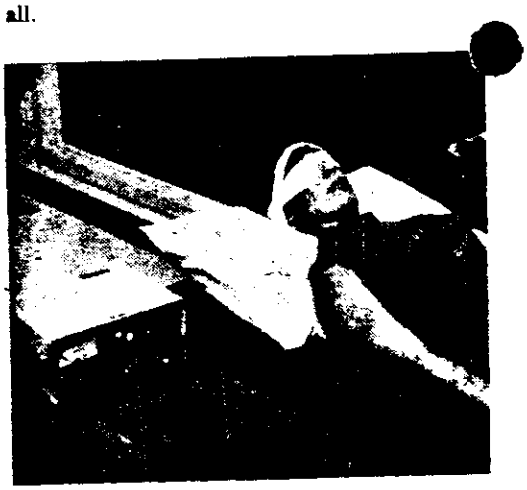
Russia's "All Union" symposia have concentrated entirely upon electrosleep and electroanesthesia. In the U. S., a much broader approach has been followed. Milwaukee was host to the nation's first "neuroelectric conference" in 1968; others followed in San Francisco the following year and in Las Vegas in 1970.

"One would think that with all this activity," Dr. Rosenthal said at the American Psychiatric Association annual meeting in May, 1970, "electrosleep would be a flourishing area of investigation in the U. S. Amazingly, this is not so. There is a very small amount of clinical work published on electrosleep in the U.S. and almost nothing at all in the psychiatric literature."

Rosenthal himself got into the field quite by accident and was at first skeptical about positive results reported by European research workers. He now confesses that he "had the university trained psychiatrist's traditional distrust of anything electrical in the treatment of patients as being at least vaguely disreputable."

Some Tests. With Normal L. Wulfsohn, M.D., associate professor in the department of anesthesiology in the medical school where he teaches, Rosenthal set out to make some tests of the way precisely-regulated electrical pulses affect the brain and behavior patterns. Results of their clinical studies were communicated to the American Psychiatric Association and summarized in the *Journal of the American Medical Association*.

Rosenthal's personal skepticism notwithstanding, nine of the twelve patients in his first series of tests gained "relatively total remission of symptoms" through electrosleep. Partial improvement was noted in one, while two showed no improvement at all.



Controls for the battery-operated portable Electrosone 50 were adjusted so that the patient felt no sensation except a slight tingling. Relaxed but not actually asleep, the patient will virtually "float" until electrosleep is ended by a preset timer.

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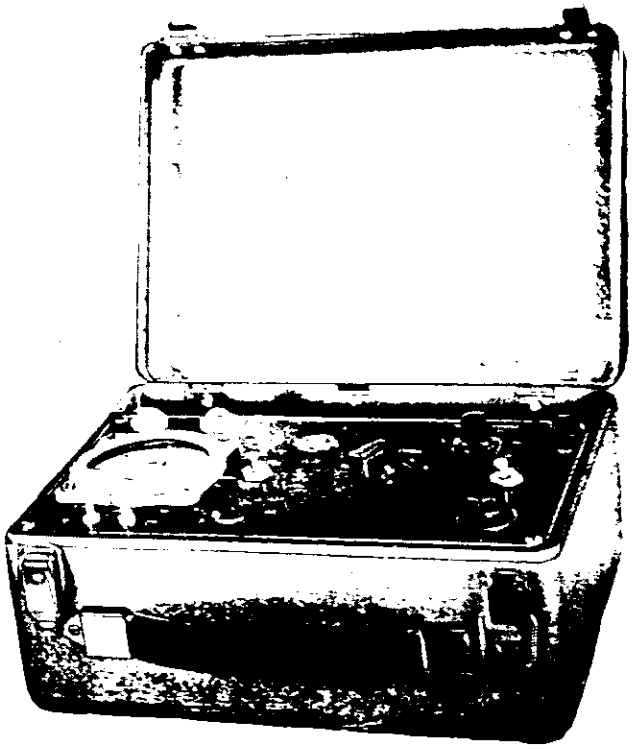

АППАРАТ ДЛЯ ЛЕЧЕНИЯ ЭЛЕКТРОСНОМ ПОРТАТИВНЫЙ ЭС-1П

PORTABLE ELECTRIC SLEEP APPARATUS
TYPE ЭС-1П

USSR V/O MOSCOW

ВСЕСОЮЗНОЕ ОБЪЕДИНЕНИЕ

СССР МОСКВА

АППАРАТ ДЛЯ ЛЕЧЕНИЯ ЭЛЕКТРОСНОМ ПОРТАТИВНЫЙ ЭС-1П

Аппарат служит для лечения электросном ряда заболеваний и может быть использован во всех случаях, когда показано лечение сном. Он применяется в хирургии (в предоперационном и послеоперационном периодах), терапии (для лечения гипертонической болезни, головных болей, бессонницы и др.), в психиатрии (для лечения некоторых форм шизофрении, циклофрении, эпилепсии, психоневрозов после контузии и др.).

Аппарат прост в управлении, удобен в эксплуатации и транспортировке, широко используется как в условиях лечебных учреждений, так и для лечения больных на дому.

Принцип действия аппарата основан на воздействии импульсного тока определенной формы, частоты и длительности на кору головного мозга. Создающиеся импульсы с крутым фронтом волны тока вызывают торможение нервных клеток коры головного мозга, переходящее в дремотное состояние и сон, продолжающийся в большинстве случаев и после выключения тока.

Электросон по своей физиологической характеристике близок к естественному сну и не вызывает у больного никаких отрицательных явлений.

Аппарат представляет собой генератор импульсного тока низкой частоты, работающий на двухпальчиковых лампах типа 6Н1П.

Генератор импульсов собран по мультивибраторной схеме самовозбуждения и работает в диапазоне от 2 до 130 гц. С генератора импульсы поступают на ограничитель, а затем на катодный повторитель. В катоде лампы установлен потенциометр, с помощью которого подается напряжение на пациента.

Электрический ток от аппарата подводится через электроды (рис. 1), накладываемые на область затылка и глаз. Затылочные электроды закрепляют в области ушной раковины, вблизи сосцевидных отростков.

Конструкция электродов обеспечивает непрерывное самоувлажнение поверхности контакта физиологическим раствором в течение большого промежутка времени (свыше четырех часов работы).

Электроды (четыре на каждого пациента) смонтированы на резиновой манжете, предназначенной для их фиксации и закрепления на голове больного (рис. 2).

Для защиты от попадания высокого напряжения на больного при неисправности аппарат снабжен электромеханической и электронной блокировками. Электромеханическое защитное устройство выполнено на реле РСМ-2, электронное — на неоновой лампе МН-3.

Время срабатывания всей блокировки защитного устройства не превышает 6 м/сек.

Рис. 1

Рис. 2

Переключение аппарата для работы с другим напряжением осуществляется переключателем-предохранителем.

Стабилизатор напряжения обеспечивает нормальную работу аппарата при колебаниях напряжения питающей сети от —15% до +5% номинального значения.

В аппарате предусмотрены фиксированная и плавная регулировка частоты; плавная регулировка напряжения, поданного на пациента; контроль дозы тока, протекающего через пациента; возможность определения сопротивления пациента в период лечения.

Аппарат смонтирован в портативном чемодане. Расположенные на панели управления переключатели и тумблеры имеют надписи, указывающие их положение и назначение.

Основные данные

Питание от сети переменного тока напряжением 127 или 220 в.

Потребляемая мощность 40 вт.

Максимальное выходное напряжение при нагрузке 5000 ом по амплитудному значению прямоугольного одностороннего импульса — 20 в ± 25%.

Пределы постоянной составляющей — 1,4 в ± 25%.

Диапазон рабочих частот от 2 до 130 гц.

Длительность импульсов для диапазона частот 2 ÷ 25 гц равна 1 ÷ 2 мсек, для 25 ÷ 130 гц — 0,4 ÷ 1 мсек.

Величина фронта импульсов не превышает 100 мксек.

Габариты аппарата 285×206×135 мм.

Вес не более 6 кг.

В комплект аппарата входят косынка с электродами и шнуром пациента, провод, струбцина, запасной комплект радиоламп, а также техническое описание с инструкцией по эксплуатации.

PORTABLE ELECTRIC SLEEP APPARATUS TYPE ЭС-1П

The apparatus is designed for treatment with electric sleep of a number of diseases, and can be used in all cases when electric sleep treatment is indicated. It is used in surgery (in the pre-operational and post-operational periods), therapy (for treatment of hypertonic disease, headaches, insomnia, etc.), in psychiatry (for treatment of some forms of schizophrenia, cyclophrenia, epilepsy, psychoneurosis after contusion, etc.).

The apparatus is simple to operate, convenient in use and transportation; it is widely used both in therapeutic institutions and at the patient's home.

The operating principle of the apparatus is based on the action of pulse currecnt of definite shape, frequency and duration on the cerebral cortex. The produced pulses with a steep wave shape cause inhibition of the nerve cells of the cerebral cortex which results in drowsiness passing into sleep, which lasts in most cases after current is switched off.

Physiologically electric sleep is very close to natural sleep and does not produce any negative phenoniena in patients.

The apparatus is a pulse current generator of low frequency employing two 6НП bantam valves.

The pulse generator employs a self-excitation multivibrator circuit and operates within the range of 2 to 130 c/s. The pulses from the generator are fed to a limiter and then to a cathode follower. The cathode circuit of the valve includes a potentiometer, by means of which voltage is applied to the patient.

Electric current is applied from the apparatus to the patient via electrodes (Fig. 1) which are applied to regions of the occiput and the eyes. The occipital electrodes are secured to the helix near the mastoid process.

The design of electrodes provides continuous selfmoistening of the contacting surface with saline solution during a long period of time (over four hours).

The electrodes (four per patient) are mounted on a rubber mask which is secured on the patient's head (Fig. 2).

To protect the patient from high voltage in case of a fault, the apparatus includes both electromechanical and electronic interlocking devices. The electromechanic protection device employs a relay, type РСМ-2, the electronic device — a neon lamp, type МН-3.

The clearing time of all the interlocks does not exceed 6 milliseconds.

The apparatus is switched for operation from mains of another voltage by means of a fuse-switch.

The voltage stabilizer ensures normal operation of the apparatus with fluctuations of the supply mains voltage of —15% to +5% of the nominal value.

Fixed and continuous frequency control, continuous adjustment of the voltage, applied to the patient, control of the dose of current passing through the patient, and means of determining the patient's resistance during treatment are provided for in the apparatus.

The apparatus is mounted in a portable case. All the switches and tumblers arranged on the control panel have inscriptions, indicating their positions and functions.

Specifications

The aparatus operates from a.c. mains of 127 or 220 V.

Power consumption — 40 watts.

The maximum output voltage across a load of 5000 ohms does not exceed 20 volts ±25%, in terms of the amplitude of a single-polarity square pulse.

The limits of the d.c. component are 1.4 v± ±25%.

The working frequency range is from 2 to 130 c/s.

The pulse duration for the frequency range of 2÷ 25 c/s: 1÷ 2 millisec; for 25÷ 130 c/s: 0.4÷ 1 millisec.

The pulse edges do not exceed 100 milliseconds.

The overall dimensions of the apparatus are 285×206× 135 mm.

The weight of the apparatus does not exceed 6 kg.

The apparatus set includes: mask with electrodes and the patient's cord, a wire, a C-clamp, a spare set of radio valves and the Technical Description and Instructions for Use.

United States Patent [19]

Monroe

[11] **3,884,218**

[45] **May 20, 1975**

[54] **METHOD OF INDUCING AND MAINTAINING VARIOUS STAGES OF SLEEP IN THE HUMAN BEING**

[75] Inventor: **Robert A. Monroe**, Charlottesville, Va.

[73] Assignee: **Monroe Industries, Inc.**, Charlottesville, Va.

[22] Filed: **Sept. 30, 1970**

[21] Appl. No.: **76,923**

[52] U.S. Cl. ..... 128/1 C

[51] Int. Cl. A61b 19/00

[58] Field of Search ..... 128/1 C, 2.1 B, 422

[56] **References Cited**

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2,304,095	12/1942	Hull	128/1 C
3,032,029	5/1962	Cunningham	128/2.1 B
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1,183,607	12/1964	Germany	128/1 C

Primary Examiner—William E. Kamm

Attorney, Agent, or Firm—Sughrue, Rothwell, Mion, Zinn & Macpeak

[57] **ABSTRACT**

A method of inducing sleep in a human being wherein an audio signal is generated comprising a familiar pleasing repetitive sound modulated by an EEG sleep pattern. The volume of the audio signal is adjusted to overcome the ambient noise and a subject can select a familiar repetitive sound most pleasing to himself.

6 Claims, 8 Drawing Figures

"HEMI-SYNCH"

What is claimed is:

1. A method of inducing sleep in a human being, comprising the steps of:

a. generating an audio signal representing a familiar, repetitive, pleasing sound;

b. generating a signal approximating a human EEG signal waveshape characteristic of a state of sleep;

c. amplitude modulating the audio signal with the EEG signal to produce an output signal; and

d. producing an audible sound signal from the output signal for listening by a human being.

2. The method of claim 1 further comprising the step of setting the level of the audible sound signal above the ambient noise level.

3. A method of inducing sleep comprising:

a. generating an EEG sleep pattern signal;

b. generating one of a plurality of signals;

c. modulating the one of a plurality of signals with the EEG sleep pattern signal;

d. generating an audio signal from the modulated signal;

e. raising the audible level of the signal above the ambient noise level of the environment; and

f. setting a timing device to automatically turn off the audio signal after a predetermined time.

4. The method of claim 3 wherein the plurality of signals is predetermined based upon the environment to which an individual is accustomed.

5. The method of claim 4 wherein the EEG sleep pattern signals are predetermined signals which have the same waveshape as the EEG patterns generated by sleeping individuals.

6. The method of claim 3 wherein the step of selecting one of the plurality of audio signals comprises an individual listening to seven signals and deciding which signal is the most pleasing to him.

* * * * *

SLEEP

FIG. 1

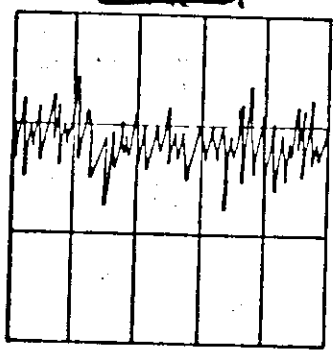


FIG. 2

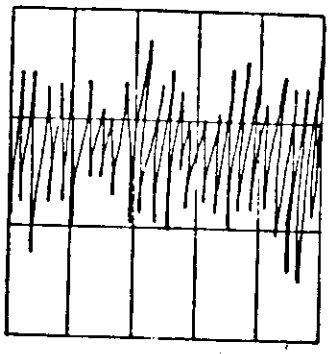


FIG. 3

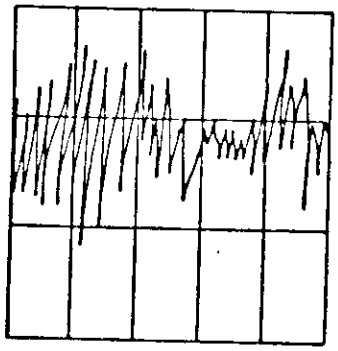
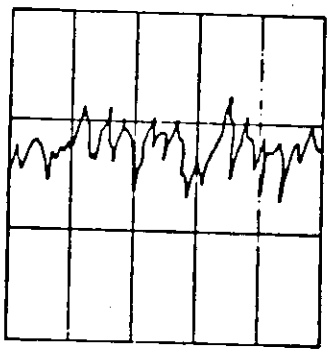


FIG. 4



STAGE 1 SLEEP

FIG. 5

STAGE 2 SLEEP

30-40 μV

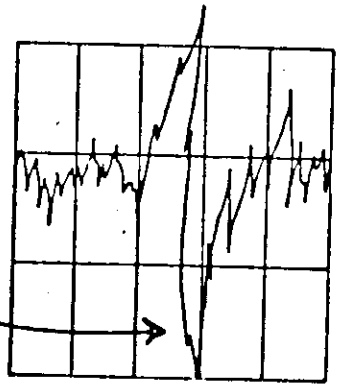
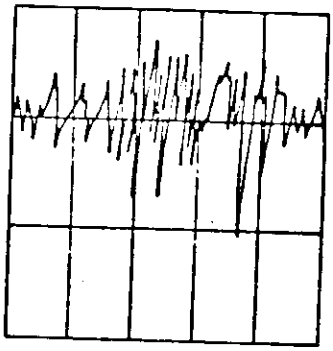


FIG. 6



100 μV

FIG. 7

STAGE 3 SLEEP

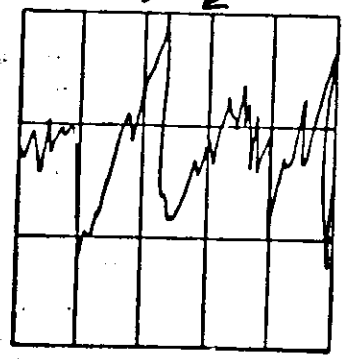
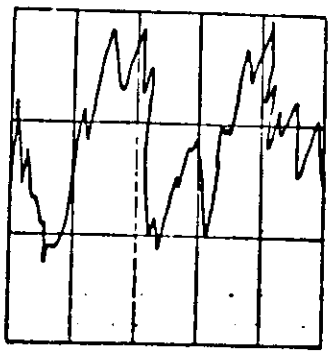


FIG. 8



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ATTORNEYS

METHOD OF INDUCING AND MAINTAINING VARIOUS STAGES OF SLEEP IN THE HUMAN BEING

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a method of inducing sleep in a human being, and more particularly, to a method of inducing sleep by the generation of audio signals which are produced by the modulation of familiar repetitive noises with electroencephalographic (EEG) sleep patterns.

2. Description of the Prior Art

The use of audio generators to induce sleep is well known in the prior art, as exemplified by U.S. Pat. Nos. 2,711,165 and 3,384,074. The audio signals used include pleasing and harmonious steady sounds or vibrations, fixed frequency signals which are cyclicly varied as to amplitude, and repetitive sounds such as the falling of rain on a roof and the sighing wind through the trees.

The prior art also discloses, in U.S. Pat. No. 3,304,095, a method for inducing sleep by the generation of an audible or tactual signal which is related to the physiological processes of heartbeat and respiration. In this method, the pitch and amplitude of a pleasing audio signal are varied at a rate somewhat slower than either the rate of heartbeat or respiration. The heartbeat and respiration will tend to synchronize with the audio signal thereby lowering the heartbeat and respiration rate and inducing sleep.

SUMMARY OF THE INVENTION

The present invention comprises a method for inducing sleep wherein familiar, repetitive, pleasing sounds are modulated by predetermined EEG sleep signals to produce an audio signal which induces various stages of sleep.

It has been found through the use of an EEG that various patterns of electrical activity are associated with different states of consciousness. There are two primary states, waking and sleeping. Within the waking state, there are various degrees of alertness ranging from frantichyperalertness through relaxed attentiveness to drowsiness. There are also several stages of sleep ranging from a light to deep. All of the various states of alertness and sleep have EEG patterns which are characteristic of the state. These patterns tend to be basically similar for all normal human beings. It is well known in the prior art, as set forth above, that familiar, repetitive, pleasing sounds tend to produce drowsiness and sleep in an individual. In the method of this invention, however, the pleasing sounds are combined with the EEG sleep patterns by modulating the former with the latter. The audio signal thereby produced has been found to be a quick and efficient sleep inducing signal. In the method of this invention, the individual has the opportunity of selecting a signal most pleasing to himself for inducing sleep, and furthermore, he may determine the level of the sleep inducing signal in order to overcome ambient noise conditions.

In addition, the subject may time the sleep inducing signal such that upon completion of a predetermined time period the signal will stop and, he will drift back to wakefulness.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a typical human EEG pattern of awakeness with eyes open.

FIG. 2 is an EEG pattern of awakeness with eyes closed.

FIG. 3 is an EEG pattern of drowsiness.

FIG. 4 is an EEG pattern of descending stage 1 sleep.

FIG. 5 is an EEG pattern of stage 2 sleep.

FIG. 6 is an EEG pattern of stage 2 sleep with sleep spindles.

FIG. 7 is an EEG sleep pattern of stage 3 sleep.

FIG. 8 is an EEG sleep pattern of stage 4 sleep.

DESCRIPTION OF THE PREFERRED METHOD

An electroencephalogram (EEG) is a device for measuring the fluctuation of electrical potentials due to the electrical activity of the brain. It has been found, through the use of the EEG, that various patterns are generated during different states of consciousness of the human being. This is the subject of the book *Electroencephalography: A Symposium In Its Various Aspects*, by Hill and Park. There are two primary states of consciousness, waking and sleeping. Within the waking state, there are various degrees of alertness ranging from frantic hyperalertness to drowsiness. Extreme alertness is associated with a low voltage, generally fast and irregular, of 10 to 20 microvolts amplitude and frequencies ranging from 10 to 40 cycles per second. Relaxed alertness is accompanied by an alpha rhythm, which is a regular sinusoidal rhythm with a frequency between 8 to 13 cps. As the state of consciousness changes from relaxed alertness to drowsiness, the alpha rhythm breaks up and tends to become less and less frequent.

The first stage of sleep or state 1 has an EEG pattern, as shown in FIG. 4, which consists of an irregular mixture of theta waves which are low in amplitude with a frequency of 4 to 8 cps, occasional alpha waves, and irregularly occurring alphoid waves which are similar to alpha waves but have a frequency of 1 to 2 cps lower than the alpha wave.

An individual progresses from stage 1 sleep to stage 2 sleep, the EEG pattern of which is shown in FIG. 5. The stage 2 pattern is similar to stage 1 except that sleep spindles begin to appear. The spindles are short bursts of waves at a frequency of about 14 cps. They start at low amplitude and build up very rapidly to an amplitude of 20 or 40 microvolts and then quickly taper off.

The individual then passes into stage 3 sleep, the EEG pattern of which is shown in FIG. 7. Stage 3 sleep is characterized by the appearance of delta waves which are waves of an amplitude of approximately 100 microvolts or more and a frequency of 1 cps. Stage 4 sleep which follows stage 3 sleep is characterized by a preponderance of delta waves as opposed to the occasional delta waves of stage 3 sleep. In sleep stages 3 and 4, the spindles and irregular theta waves appearing in stage 2 sleep still appear.

Stages 1 through 4 were initially conceived of as comprising a continuum from "light" to "deep" sleep, but many other measures of the depth of sleep contradict this ordering. Stage 1 sleep occurring later in the night seems to have very distinct characteristics which make it a distinct kind of sleep, while stages 2, 3 and

do seem to comprise a depth continuum in a second kind of sleep.

Stage 1 EEG sleep periods later in the night are accompanied by binocularly synchronous rapid eye movements (REMs), highly variable heart rate and breathing, and an inhibition of nerve transmission to the muscles.

If subjects are awakened from the two types of sleep and asked to report what they have been experiencing, the reports may be classified into two rather distinct types. One type – awakenings from stage 1 sleep or shortly (within, roughly 10–15 minutes) after stage 1 sleep has changed to nonstage 1 sleep – possesses the characteristics traditionally associated with the experience of dreaming. Reports from nonstage-1 sleep seem more like "thinking" and are generally called thinking by the subjects (these same subjects generally refer to their stage 1 experiences as dreams). The psychological differences reported so far are quantitative, rather than being completely dichotomous, but generally give the impression of distinct types of experiences.

Stage 1 sleep is almost always accompanied by REMs, and the evidence is very convincing that these are closely associated with the content of the dream, if not actual scanning movements of the dream imagery. Such REMs have not been reported in non-stage 1 sleep, although there are some slow, rolling movements of the eyes.

For a normal subject, stage 1 dreaming and non-stage 1 sleep alternate in a regular, cyclic fashion, the sleep-dream cycle. As a subject falls asleep, there is generally a brief period (a few seconds to a minute or two) of stage 1, without REMs, but subjects' reports indicate that this is a period of hypnagogic imagery rather than typical dreaming. At approximately 90 minute intervals throughout the night there are periods of stage 1 dreaming, each dream period generally being longer than the preceding one. The first stage 1 period may last for 10 minutes; the fourth or fifth may last as long as 50 minutes. Altogether, stage 1 dreaming occupies between 20 and 30% of the total sleep time of most young adults, spread over 3 to 6 stage 1 periods. While the exact percentage of dream time and the number of cycles vary from subject to subject, for a given subject the sleep-dream cycle is generally quite stable from night to night.

It is well known that the human body will respond to several sensory perceptions to induce sleep. However, the aural sense organ is the only one which continues to function not only during relaxation and drowsiness but also into the first three stages of sleep as well. Therefore, the induction of sleep by aural means is the most practical method of inducing controlled sleep.

It has been found that familiar repetitive sounds tend to produce drowsiness and sleep. Conversely, the lack of these sounds tends to produce alertness and wakefulness. The sounds which effect a particular individual, because they must be familiar sounds, are dependent upon the environment of that individual. In other words, a city dweller may sleep with the steady rumble of traffic but he might find the sound of crickets to be so noisy that he cannot sleep. Investigation has shown that each individual is receptive to a specific sound pattern and these patterns are the product of his environmental conditioning. Some of the more common familiar repetitive sounds which tend to induce sleep are rain on a roof, machinery hum, gentle wind, ocean surf, breathing, heartbeat, the human voice when noncommunicative or a steady 500 cycle hum. Wakefulness is produced by such warning signals as auto horns, alarms, baby cries, etc. Each individual, therefore, has a pattern of response to various sounds. This pattern has been labeled his sound condition index (SCI).

The cultural environment of humans has tended to standardize the SCI to some degree for the various environments which groups of people live in. For instance, the SCI for people living in a large city would tend to be approximately the same as would the SCI for people living out in the country.

In the preferred method of this invention, an audio generator is placed near the bedside of an individual desiring to have sleep induced. The generator has a capability of providing at least seven basic sound patterns. These patterns are in accordance with the SCI of the individual. Typically, the seven basic sounds for a person living in an urban environment would be sounds of rain on a roof, gentle wind, waves upon a beach, slow breathing, machinery hum, the sound of a noncommunicative human voice and a steady 500 cycle hum. An individual, by listening to each of the seven sounds picks the sound which would be most pleasing to him in order to induce the sleep.

The sound generated by the audio generator is the pleasing repetitive sound, as set forth above, amplitude modulated by the stage 3 and 4 EEG sleep pattern. The amplitude of the pleasing sound is confined to an envelope of the EEG sleep pattern. In other words, the familiar repetitive sound is modulated by a wave of theta sleep spindles and delta rhythms which are found in the EEG pattern during stage 3 and 4 sleep. It should be noted that EEG sleep pattern is not an EEG signal but a signal having the same wave shape as an EEG signal. This sound rapidly produces stage 1 sleep followed by stage 2, 3 and 4 sleep in most individuals. It has been found through experimentation that the results achieved by inducing sleep with a signal synthesized by modulating a pleasant signal with an EEG sleep pattern are several magnitudes higher than induction of sleep by use of a pleasant sound only.

The apparatus for generating the familiar repetitive signal and the EEG sleep pattern signal, as well as the apparatus for modulating the former with the latter, may be any standard signal generators and modulators which are well known in the signal generating art.

One of the primary requirements of this method is that the sound produced by the audio generator be sufficient to mask all of the ambient noise in the environment of the individual. This is effected by the individual raising the volume of the audio generator until it is at a level above the ambient noise level of the surroundings.

It has been found that sleep can be maintained by maintaining the presence of the audio signal and that awakeness may be induced by stopping the audio generator. Therefore, an individual may determine the time which he sleeps by setting a timer which will automatically turn off the sound generator and thereby return him to a state of consciousness.

While the invention has been particularly shown and described with reference to the preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and the scope of the invention.

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APPARATUS "ELECTROSLEEP ЭС-11"

CLINICAL DATA

MOSCOW V/O "MEDEXPORT" USSR

Introduction

The method of electric sleep therapy is gaining ever wider application year to year both in the Soviet Union and abroad.

The success in the treatment of a number of diseases of corticovisceral pathology attracts the physicians' attention to this comparatively new method of neurotropic therapy.

Electric sleep used originally in psychoneurological clinics has penetrated within recent years into the surgical, therapeutic, obstetric, dermatological and pediatric practice.

Within the last decade many communications concerning this method of therapy have been published in various periodicals.

As is known, the electric sleep therapy is based at present not only on the use of pure, low-frequency (1 to 25 i.p.s.) impulse current (Gbilarovsky, Idventsev and others), but there exist methods providing for the use of higher frequences (30 to 135 impulses per second). In particular, the method for the use of the apparatus "Electrosleep" ЭС-III developed by the Research Institute for Experimental Surgical Apparatus and Appliances, the USSR Ministry of Health, provides for the use of a rectangular impulse current with a frequency of mainly 100 i.p.s. combined with a galvanic component.

The paper submitted for your consideration expounds the main methods of electric sleep therapy, brief physiological characteristics of the method and practical recommen-

dat.ons for the use of electric sleep in clinics. The results of using electric sleep for treating mental and somatic patients are described as well.

Apart from the author's (Dr.S.R.Roitenburd's) own clinical experi nce (obtained on more than I,000 patients) this paper also includes the material of the latest publications.

We believe, that this paper will be of value for both physicians and assistant personnel who begin to make use of electric sleep therapy.

I. CONCERNING PHYSIOLOGICAL MECHANISM OF ELECTRIC SLEEP

Modern conceptions of pathogenesis, therapy and prophylaxis of a disease are based on the theory of the integrity of organism, its interaction with the environment, neurism and parabiosis, developed by I.Sechenov, N.Vvedensky, F.Botkin and I.Pavlov.

In accordance with K.Bykov's theory of corticoviscaral pathology, as well as in accordance with the studies of N.Anokhin and other Soviet and foreign authors concerning reticular formations of the brain (based on I.P.Pavlov's theory) any disease should be regarded not as a local pathological condition, but as a pathological condition of the organism as a whole, with inevitable disturbance of the C.N.S. functions, normal functional correlations between the cortex and subcortex and functional intercommunications between all organs.

The recognition of the leading role of the C.N.S. in pathological processes, which take place in the organism, has opened new prospects for medical practice. The methods of controlling the regulation of the cerebral cortex functions and its functional interrelations with lower sections of the brain have occupied an important place in the complex of therapeutic measures.

A great merit of I.P.Pavlov is his teaching about natural and artificial sleep which he considers to be a process of therapeutically protective checking of the nervous

cells of the cerebral cortex. This process protects the nervous cells from further emaciation.

I.P.Pavlov's conception of sleep as protective checking has appeared to be the base for sleep therapy which has gained a wide application among the therapeutic measures used by practical medicine. While employing pharmacological sleep therapy one has to take into account the toxicity of hypnotics, their cumulative effect, impossibility to interrupt the sleep when necessary. These disadvantages of pharmacological sleep made the investigators seek for new ways of inducing sleep as protective checking.

Electric sleep differs advantageously from pharmacological sleep. Its main advantage consists in the absence of toxic effects on the organism. The possibility of changing current intensity, maintaining an exact dose and controlling the time of switching on and switching out the current is also an important advantage of electric sleep.

'Electric sleep is a protective checking induced by a weak impulse current passed through the brain.

The induction of a diffuse protective checking by passing a weak impulse current through the brain is termed "electric sleep".

Electric sleep is induced by an impulse current of a definite form, frequency and duration which acts upon the central and the peripheric nervous system. This causes a protective checking of the nervous cells which turns to drowsiness and sleep continuing in most cases even after the current is switched out.

The Soviet method of electric sleep therapy was developed in the 40's owing to the studies carried out by a large group of scientists at various research institutes of the Soviet Union (V.A.Ghilarevsky, I.Liventsev, Yu.Segal, Z.Kirillova, L.Shostak, G.Kalemdarov, N.Lebedinskaya, Yu.Khudy and others).

It should be noted that various foreign methods sometimes incorrectly termed as "electric sleep", are actually electronic narcosis or electric shock, which have nothing in

(15)

common with electric sleep (as Soviet authors regard it) both in its physiological effect and the patient's state.

The apparatus ЭС-III developed by Yu.Khudy, V.Bulba-Popkov and V.Kutinov, as well as the method for its operation have been successfully tested at surgical clinics headed by Professors A.A.Vishnevsky, A.N.Bakulev, I.Zhorov and other clinics.

According to some data (which, however, are far from being complete) the electric sleep therapy is used in the Soviet Union in more than 200 large medical institutions and has been tested on more than 20,000 patients.

In the latest years the electric sleep therapy is gaining ever wider use in foreign countries (Bulgaria, Czechoslovakia, Rumania, the German Federal Republic, the German Democratic Republic, Italy, Finland, Austria, the USA, Japan, China, Australia, Chile, Argentina, Bolivia, Columbia, etc.).

The physiological mechanism of electric sleep is rather complicated. At the present stage the physiological mechanism of electric sleep may be interpreted as follows: the irritant (impulse current) with a rhythm more frequent than that of the functional lability of the brain cells causes both stimulation and checking of the C.N.S. cells, i.e. increases the lability of some and diminishes the lability of other nervous cells.

This leads to normalisation of the formerly disturbed connections between the cortex and the lower sections of the brain, as well as to normalisation of the receptor and interoceptor connections. A rather essential role in the mechanism of electric sleep belongs to the very fact of current passage through the tissues of the organism. The electric current causes a number of biophysical and physicochemical changes in the composition of cells and intercellular spaces. These changes are undoubtedly of importance in the complex of biological reactions taking place during electric sleep. The effect of impulse current on the C.N.S. is direct and reflectory.

Impulse current should be regarded as an irritant of

parabiotic nature which simultaneously renders a stimulating and a protective checking effects on the central and peripheric nervous system. In this case the therapeutic effect is achieved due to normalisation of interrelations between the cortex and lower brain sections disturbed by the pathological process. This, in turn, change the physicochemical composition in the nervous cells and improves the trophic functions of the organism.

The electric sleep therapy is carried out at present by two principal methods.

According to V.A.Gilarovsky's method one uses pure rectangular impulse current with an impulse duration of 0.2 to 0.3 milliseconds and frequency of 5 to 25 impulses per second; the electrodes are applied to an eye orbit and the occiput.

The USSR Research Institute for Experimental Surgical Apparatus and Appliances has developed a more effective method of electric sleep therapy according to which the procedures are carried out with the use of combined impulse current with frequencies of 30 to 135 i.p.s. and impulse duration of 0.5 to 1.2 msec to which 20 to 30 per cent of a galvanic component are added. The electrodes are applied to the eye and the occiput.

The use of a galvanic component in combination with rectangular impulse current of 30 to 135 i.p.s. frequency and 0.5 to 1.2 msec impulse duration permits one to increase the threshold current intensity permissible for the patient more than 4-fold, i.e. to bring it to 1.0-1.5 mA. Due to this deeper phases of checking and wider irradiation of the checking process may be obtained. It enables one to render a deeper action upon the organism and enhances the therapeutic effect. The optimal dose of the average current intensity sufficient for inducing a deep sleep with the help of "Electrosleep" ЭС-III apparatus and with the use of the combined form of the impulse current is 0.8 mA, with impulse duration of 0.8 to 1.0 msec and frequency of 100 i.p.s.

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It is not recommended to use the current of the above characteristics in doses of more than I.5 mA because of possible development of moderate and transient unpleasant sensations after prolonged current application.

When electric sleep is used in combination with local anaesthesia during an operation it is desirable to increase the current dosage up to I.5 to I.8 mA, bearing in mind that with such dosages the anaesthetic effect of novocaine may be enhanced.

Many authors point out in their communications that the sleep during electric sleep procedures sets in only 70-75 per cent of the patients. They, however, also indicate to the therapeutic effect (though somewhat less marked) in patients who do not sleep during procedures.

In the lights of the latest physiological conceptions of sleep these communications seem inexact. As is known, the protective checking - sleep - may be manifest ("a man is sleeping", as we say in everyday life) and may take its course without outward manifestations. This depends on the depth and the irradiation of the checking process.

The sleep induced by the impulse current shows all the outward manifestations of physiological sleep, but differs from the latter in a deeper therapeutic action as well as in electrophysiological and biological changes in the organism.

The suggestive factor is of no greater significance for the mechanism of electric sleep than for other methods of therapy.

The observations carried out by E.Popov, G.Serghеyev, S.Moitemburd and others with the use of "blank" electric sleep procedures confirm that the suggestive factor is not a leading one in the mode of electric sleep action.

SOME PROBLEMS CONCERNING PHYSIOLOGICAL CHARACTERISTICS OF ELECTRIC SLEEP

Electric sleep has definite physiological characteristics which distinguish it from pharmacological sleep and electric narcosis.

If the technique of the procedure performance is correct the electric sleep causes no unpleasant sensations. With frequencies of 60 to I35 i.p.s. the patient feels tender vibration or a slight sensation of mustard plaster in the site of electrode application (the orbital and the mastoid areas); with lower frequences the patient feels rough vibration and single unpleasant rhythmic jerks. If the current intensity is not increased after appearance of these sensations, the latter rapidly subside (due to adaptation) and 5 to I5 min later the patient begins to feel heaviness in his eyelids, his thoughts get confused, a mild languor appears and the patient becomes drowsy; in most cases this state soon turns to a deep sleep.

The outward manifestations of electric sleep are similar to those of physiological sleep. The patient is lying quietly, in an easy attitude customary to him. As the sleep becomes deeper the respiration gets more and more rare, rhythmic and deep, the pulse rate decelerates by 5-7 beats per minute.

The impulse current with parameters characteristic for electric sleep induces, as a rule, diffuse protective checking (one of its effects). Exceptions are persons with pathologically perverted reaction of the nervous system against various stimulants. As is known, some medicines (e.g. Phenamine) sometimes produce checking of the nervous system in such patients instead of stimulation.

The checking process induced by electric sleep may be of various depth and irradiation. An electric sleep procedure may generally cause 4 types of the checking process, such as: a) protective checking: the sleep is developing without notable outward manifestations. The patient is lying quietly, responds to a slight touch and whispering speech, answers questions, changes his position in bed, but his respiration gets more rhythmic, more and deep, the pulse rate is diminished, the muscles are relaxed. The electroencephalographic curve changes its character under the action of in-

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pulse current. These patients show a therapeutic effect, but somewhat less pronounced. Usually these patients are included into the category of "non-sleeping" at electric sleep procedures. We think it more correctly to regard this group of patients as persons in whom the impulse current causes a slight sleep-like checking without outward manifestations. In some patients of this group the checking process becomes deeper and more widespread after switching off the current; these patients fell asleep showing all outward manifestations of deep sleep.

b) Protective checking: the sleep reaches a deeper degree with outward manifestations of drowsiness from the very beginning and during the whole course of the procedure. At the end of the procedure and after switching out the current these patients subside into a deep sleep with its typical physiological characteristics.

c) Protective checking: the degree and irradiation of the sleep during the procedure are unstable. These patients show sudden change of drowsiness by deep sleep.

d) Protective checking: the sleep reaches a great depth and irradiation from the very beginning of an electric sleep procedure. The sleep usually sets in 8 to 20 min after switching on the current and lasts during the whole course of the procedure often continuing 1 to 2 hrs after its end. These patients show the full picture of the outward manifestations of profound physiological sleep. This group includes about 70 per cent of all patients (when apparatus ЭС-III is used).

As we have already shown above in insignificant percentage of patients with perverted reactions to irritants do not respond to electric sleep therapy at all: instead of checking they sometimes develop excitation.

The observations made by us as well as by other authors show that persons with a very weak checking process or exceedingly irritable poorly respond to electric sleep therapy. Such patients often develop an inverted reaction and in-

stead of checking the impulse current causes a sharp excitation in them.

The effect of the impulse current upon the nervous system manifests itself not only while the patient is under current and immediately after this, but for a long period of time after the treatment course has been finished. The sleep induced at electric sleep procedures does not interfere with night sleep; on the contrary, it prolongs, normalises and deepens the latter.

The patients' state after electric sleep procedures is characterised in most cases by a marked improvement of self-feeling, general sedation, the feeling of cheerfulness and freshness. The patients become more active and optimistic. At first these positive shifts in the patients' neuropsychic sphere last for a relatively short period of time, but after several electric sleep procedures they become prolonged and stable.

The checking process in the C.N.S. induced by electric sleep may be characterised objectively with the help of various physiological experimental methods.

The principal objective characteristics of electric sleep determined on the basis of observations made by Soviet authors are presented below.

When the results of electric sleep therapy are positive a plethysmogram shows normalisation of the curve, the respiration becomes deeper and rhythmic, the pulse oscillations get more intense, waves of the third order appear. Even patients with pronounced respiratory disturbances show an improvement of the respiratory rhythm. The normalisation of respiration in the course of the treatment becomes more and more stable and remains as such after discontinuation of the treatment course.

Electric sleep also normalises vascular functions. The pulse becomes stronger and is slowed down by 5 to 7 beats per minute. A plethysmographic curve shows a gradual dilatation of the peripheric vessels. During an electric sleep procedure the arterial pressure falls down in most patients

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by 10 to 15 mm Hg (systolic) and by 5 to 10 mm Hg (diastolic). In patients with hypotension prior to the treatment the arterial pressure increases to normal value.

Some authors (G.Sergheyev, S.Roitenburg and others) point out to subsidence of substernal pains and disappearence of stasis due to electric sleep. Electric sleep procedures cause no changes in the E.C.G.

Thus the impulse current renders a normalising effect upon the C.N.S.

These studies point out at the same time to the absence of any harmful effects produced by impulse current.

In contrast to all other kinds of therapeutic sleep, the pharmacological sleep including, the electric sleep causes no diminution in the saturation of blood with oxygen. On the contrary, the oxygen saturation of blood remains on the upper figures of the norm.

According to Dr. E.Shuin's observations the changes in the carbohydrate and protein turnover in patients treated with electric sleep remain within physiologically normal limits with a tendency to normalisation during the whole course and after discontinuation of the therapy.

An E.E.G. of electric sleep differs from that of physiological and other kinds of sleep. In the course of electric sleep the E.E.G. first shows a depression of the α rhythm oscillations, then slow oscillations appear. With prolonged action of the current a certain intensification of the quick (high-frequency) oscillations is observed chiefly in the front lobes of the brain.

II. INSTRUCTIONS FOR CLINICAL USE OF ELECTRIC SLEEP

If prescribed and carried out correctly the electric sleep therapy is a powerful neurotropic curative factor, which is at the same time absolutely harmless.

The achievement of maximal effect of electric sleep therapy depends on many factors, such as correct choice of patients, their psychoprophylactic preparation, situation and technique of procedure performance, etc.

While choosing the patients the physician who just begins to work in this field encounters a number of difficulties. We do not yet know exactly all nosological units in which electric sleep therapy should be used.

Naturally, it is impossible to suggest any exact recommendations for choosing the patients in all possible cases; nor is it possible to achieve 100-per cent success using any method of therapy. However, if the etiology of the disease, the peculiarities of its clinical course, concomitant diseases and the state of the patient's higher nervous activity are estimated correctly, it is quite possible to achieve the maximum success in choosing the patients.

While choosing patients for electric sleep therapy one must also take into consideration the state of the organism reactivity.

To estimate correctly the dynamic changes in the patient's state in the course of the treatment and to decide whether the treatment course should be repeated one must bear in mind the following characteristic feature of electric sleep: the impulse current of equal parameters may produce opposite effects depending on the initial physiological state of the organism and the state of the pathological dominant.

When the pathological dominant is in the stage of active development the impulse current acting on the C.N.S. weakens and checks it.

When, however, this dominant is in the stage of fading, i.e. is being checked, the effect of the impulse current results in its excitation and activisation. In the course of many- year work with electric sleep we developed certain criteria for choosing patients.

Our experience has shown that electric sleep therapy may be used for treating all diseases in the etiopathogenesis of which the main role belongs to corticovisceral disturbances. The radical therapeutic effect from electric sleep therapy cannot be expected in cases of irreversible morphological processes, such as gangrene due to obliterat-

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ing endarteritis, callose gastric or duodenal ulcers, etc. What is to be done with such patients? These patients should not be ruled out, but while administering electric sleep procedures to them one should clearly realise what we can expect in such cases from this method and to plan the treatment correspondingly. In such cases electric sleep may promote normalization of the neurotrophic functions of the organism and may arrest to this or that degree the further development of the process, creating thereby a background for complex therapy (surgical intervention including). In this respect the electric sleep may be of use in such cases, too. Indeed, while performing, for example, resection of the stomach for gastric ulcer we confine ourselves to the removal of a part of the organ changed anatomically because of the disease. Thereby we eliminate the stream of the pathological impulses of the former ulcer. But this is not enough for normalisation of the disturbed functional interrelations between the cortex and the lower sections of the brain. The persistent foci of excitation continue to receive pathological impulses from other organs which had been also affected by the disease. The electric sleep therapy will help to normalise the disturbed functional interrelations between the cortex and the lower sections of the brain. In combination with operative intervention this not only secures a success in the treatment of the organ but will promote a favourable reconstruction of the organism as a whole. In other words this will secure the treatment of the disease proper, but not only its local manifestation.

Quite different is the case when we have a patient with the same gastric or duodenal ulcer, but the latter is not callose (i.e. when the pathological anatomic manifestations of the disease are still reversible). In such cases we can rely upon electric sleep as a self-sufficient method of therapy (in the "pure" form) which can secure the patient's recovery.

Thus, in some cases we select patients with the view of curing them completely with electric sleep alone, whereas

in other cases the electric sleep is used as a component part of a complex of therapeutic measures.

At present there is some experience in using electric sleep both in the "pure form" and as a part of complex therapy.

Electric sleep has been successfully used in combination with paranephral novocaine blockade at the Vishnevsky's Institute of Surgery, the USSR Academy of Medical Sciences, for treating gastric and duodenal ulcers. In cases of gastric and duodenal ulcers and gastritides electric sleep brings good results when combined with diet therapy, mineral waters, physiotherapy, intraarterial or intravenous injections of novocaine.

Some authors recommend to use electric sleep for treating hypertensive vascular disease in combination with physiotherapy and therapeutic gymnastics.

Good results are obtained in the treatment of patients suffering from encephalitis of various etiology and residual signs of vernal (tick-borne) encephalitis with electric sleep combined in various ways with X-ray therapy, medicinal and therapy, massages and therapeutic gymnastics. Good results are also obtained in patients with remote sequelae of closed cranial trauma in the stage of decompensation: the electric sleep therapy is combined in these cases with physiotherapy and drug therapy.

When combined with apomorphine therapy and hypnotic suggestion electric sleep may bring favourable results in the treatment of chronic alcoholism.

Observations made by us at the surgical clinic, as well as observations made by other authors have shown that when patients had concomitant diseases the latter also responded to electric sleep therapy. For example, some of our patients treated with electric sleep for the main disease also showed disappearance of myopia, chronic and acute rhinitides. An improvement of the general state of patients suffering from Meniere's disease was also observed.

Of course, more detailed and versatile studies of the

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therapeutic efficacy of electric sleep will increase the number of diseases in which this method of therapy may prove to be effective.

One should bear in mind that elderly patients with pronounced sclerotic changes and signs of involution accompanied with emotional disturbances poorly respond to electric sleep therapy. Nor is electric sleep effective in patients with pronounced excitation processes.

Summing up the said above it is possible to conclude that electric sleep therapy is indicated to patients suffering from diseases of corticovisceral etiology who do not yet show irreversible morphological changes and pronounced involutional signs, as well as to patients without predomination of excitation processes. Besides that electric sleep may be used in combination with other methods of therapy for treating patients with irreversible morphological change so as to normalise the neurotrophic sphere of the patient and his general somatic functions.

Electric sleep appears to be especially valuable for pre-operational preparation of patients with pronounced signs of functional neurosis. In cases of painful wound re-dressings electric sleep may eliminate or relieve pains.

Though we do not consider the suggestive factor to be the leading one in the mode of electric sleep action, we still attach some importance to the psychoprophylactic preparation of the patient, i.e. to his positive attitude to this method.

INDICATIONS AND CONTRAINDICATIONS

Indications. Electric sleep is indicated for treating all diseases with corticovisceral disturbances in the etiopathogenesis.

Taking into consideration that this method is relatively new, it is difficult to give an exhaustive list of diseases and conditions in which the electric sleep may be used in "pure form" and as a component part of complex therapy.

On the basis of the existing experience, however, electric sleep may be recommended for treating the following diseases: thromboangiitis obliterans (obliterating endarteritis), gastric and duodenal ulcers, hypertensive vascular disease, gastritides, trophic ulcers of extremities, cranial traumas and their sequelae, burns, insomnia (not due to organic diseases), early toxemias of pregnancy, a number of neuropsychic disturbances, neurodermatoses, neuroeczemas, nocturnal urine irretention, stuttering, acute and chronic rhinitides, visceral forms of rheumatism, auditory neuritides with hearing damages, tick-borne encephalitis, hyperthyroidism and many other diseases.

Electric sleep is indicated in the pre- and post-operational period as well as during operation in combination with local anaesthesia.

There exists an experiance in using electric sleep with positive results for treating patients with bronchial asthma and compensated coronary insufficiency.

Contraindications

Hypertensive vascular disease in the period of predomination of excitation processes. Malignant hypertension.

Grave coronary insufficiency with pronounced decompensation, myocardial infarction states in the acute stage.

Cerebral hemorrhages of non-traumatic origin.

Active forms of tuberculosis.

Pronounced involutional states.

Leukemias.

The author does not share the widespread opinion that electric sleep in contraindicated to patients with malignant newgrowths. It may be used instead of narcotics.

In conclusion, we would like to draw the practitioner's attention to the prospects of using the electric sleep method for prophylaxis of neurovascular, neuropsychic and other diseases.

It is advisable to use electric sleep in prophylactic institutions as well as to establish prophylactic courses

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of electric sleep at medical-and-sanitary wards of large plants for treating patients without suspending them from their regular occupation.

We believe, that such a measure will be especially useful at industrial enterprises with harmful working conditions.

III. CLINICAL USE OF ELECTRIC SLEEP

1. ELECTRIC SLEEP THERAPY IN PSYCHIATRIC AND NEUROLOGICAL PRACTICE

Soviet psychiatry more than any other bases its therapeutic methods on the principles of protective checking and stimulation of the C.N.S., and therefore it is not a mere chance that the merit of the development of electric sleep therapy and its use in clinical practice belongs to Prof. V.A.Ghilarovsky (and his disciples), the head of one of the leading Soviet psychiatric schools.

More than two thirds of communications presented at the Conference on Electric Sleep held in December 1957 were reported by psychiatrists and neuropathologists, and only one-third of the reports concerned the use of electric sleep therapy in other clinics. In the latest years, however, this proportion changed greatly due to much wider use of the electric sleep method in surgical and therapeutic practice.

Electric sleep therapy is the most effective in the treatment of the following mental and nervous diseases: insomnia, neuroses, reactive and asthenic conditions, schizophrenia, etc. (V.A.Ghilarovsky, Z.A.Kirillova, A.V.Dobrzhanskaya, V.I.Rusakov and others).

In the treatment of neuroses, asthenic and reactive conditions electric sleep produces a relief or disappearance of the morbid symptoms and improvement in the patient's self-feeling; the patient becomes even-tempered and then gradually recovers. In other patients the symptoms of the depressive state are first changed to excitation with subsequent complete recovery.

The data obtained by V.A.Ghilarovsky and others have

shown, that in such cases the electric sleep therapy results in twice as quicker a recovery of patients than pharmacological sleep. Electric sleep is less effective in cases of psychosthenic and neurotic conditions, involution, persistent neuroses with endocrine disturbances.

According to the observations made by V.A.Ghilarovsky and others the electric sleep therapy yields better results in cases of hallucinatory-delusional syndromes with predomination of neurotic conditions in the clinical picture of the psychosis, especially, when the latter is provoked by a mental trauma. Electric sleep is less effective in patients with catatonic stupor or hypochondriacal form of schizophrenia. In cases of pre-senile psychoses the results of electric sleep therapy are negative. Following is an example of the treatment from V.A.Ghilarovsky's observations[x/].

Patient N., a 44-year-old female. Treated in the Clinic of the Institute of Psychiatry.

Descended from a healthy family. Developed normally. Finished 4 classes of elementary school. Has no definite profession. Last time worked as a corrector at a printing-house. Had had smallpox in childhood. During an air attack in 1942 was wounded with aerial bomb splinters to the soft tissues of the upper extremities and to the chest. Had been trice operated for intestinal obstruction. In 1949 had sustained a head trauma with symptoms of cerebral concussion. Has been regularly treated since that time. Married, had had 7 pregnancies which ended in normal births, but only two children are alive. The patient's nature is asthenic, sociable, frank. Since 1950 the patient's temper has changed; she has become irritable, excitable; when excited she would fall down on the floor, cry and beat with her arms and legs against the floor. Often suffered from headaches. In summer 1951 the headaches became especially intense, the sleep got disturbed and anxiety appeared. Was hospitalized at the

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x/ V.A.Ghilarovsky et.al. "Electric Sleep", Medgiz, Moscow 1958, p. 95

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Kashchenko Mental Hospital where she was treated for about 3 months. Recovered and returned to work. The patient's state deteriorated again in December 1952 in connection with a grave disease and death of her mother, whom the patient nursed for several months. Remembers her mother's funeral and all subsequent episodes vaguely, and says that she was "as in a mist". Remembers that she fell down, shouted, could not eat, was haunted by nightmares. An idea occured to her that she would fall ill with cancer like her mother. Was afraid of death.

Objective examination: the patient is of low nutrition. Hard respiration and dry rales in the lungs. On percussion: pulmonary tone clear. The left border of the relative cardiac dullness is passing along the mediclavicular line, the right border - along the right margin of the sternum. Heart tones clear, pulse rhythmic, of satisfactory intensity. Arterial pressure 70/40 mm Hg. The liver and spleen are not enlarged. The abdomen soft, and painless on palpation. Post-operational cicatrices along the middle line of the abdomen and in the right iliac area.

X-ray of the chest: pulmonary roots fibrous, with hardened lymphatic nodes, pulmonary fields transparent, the sinuses free, the diaphragm motility not limited.

Heart: the size not enlarged, pulsation of the medium intensity. The aorta normal.

Blood findings: Hb 65 per cent; R.B.C. 4,200,000; W.B.C. 4,000; basophils I per cent; eosinophils I per cent; rod-nuclear neutrophils 3 per cent; segment-nuclear neutrophils 31 per cent; lymphocytes 60 per cent; monocytes 4 per cent; ESR 12 mm per hr. Wassermann reaction negative. Urine findings without abnormalities.

Nervous system: the eye slits uneven, pupils normal, their reaction to light and convergence satisfactory, eye movements not disturbed; other cranial nerves without abnormalities. Tendon reflexes regular and vivid. Tremor of the eyelids and fingers of stretched arms.

Before treatment the patient is anxious and depressed;

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she is either lying in bed with her face closed with the hands or is walking about the room moaning and weeping: "I don't know what to do with myself", "anguish oppresses the heart". The voice is dull, without modulations, the expression of the face tense and alarmed. Sees everything "as if in a mist", but nevertheless estimates the surrounding situation and her state correctly. Seeks the physician's sympathy and help, but asks not to question her until she tells everything herself. Hypochondriacal, listens to herself, is afraid of falling ill with cancer and die "without bringing up the children". Suffers from hallucinations: hears her mother's voice. Critical to hallucinatory feelings, but avoids remaining alone in the room and is afraid of falling asleep, because she sees "terrible things". Sees her mother lying in the grave and next to it - another "empty grave" prepared for her. The mother is going behind her, calls her to come, "snatches her at the dress". Delusional ideas absent. The appetite is poor, the food seems tasteless.

Electric sleep therapy was instituted. A sufficiently deep checking (sleep) was observed beginning from the 2nd procedure; the patient fell asleep 7 to 10 min after switching on the current. The sleep often continued even after the current was switched out. The patient evaluated the therapy positively and said that after each procedure she got "stronger", "more cheerful", "the fear is leaving her", "everything is getting clearer". Thoughts about the misfortune sustained without former acuity and distress.

After 7-8 electric sleep procedures the hallucinations disappeared, the patient fell asleep at night without hypnotics, but nightmares sometimes recurred. Later the patient became more and more active and lively, her outlook changed. She began to do needlework and to help hospital personnel. Says to everybody that "electric sleep has returned life to her". By the end of the treatment course the night sleep restored completely and the patient got better physically. Because of some instability of temper she was

transferred to the sanatorium department, from which she was dismissed and returned to her regular occupation.

Diagnosis: reactive condition.

2. USE OF ELECTRIC SLEEP IN SURGICAL CLINIC

The theoretical foundations of electric sleep therapy and positive results obtained with its use in psychiatric, neurological and other clinics attracted the attention of surgeons to this method of neurotropic therapy.

Electric sleep is indicated in surgical clinic in the treatment of diseases and conditions, in the etiopathogenesis of which the main role belongs to corticovisceral disturbances. Electric sleep therapy is particularly effective as a method for preparing patients to operation, during an operation in combination with local anaesthesia and in the first days of the post-operational period. Positive results are obtained when electric sleep therapy is used for treating patients with obliterating endarteritis, acute cranial trauma, gastric and duodenal ulcer, local and phantom pains in the amputated extremities, trophic ulcers of the extremities, etc.

a) USE OF ELECTRIC SLEEP IN THE PRE- AND POST-OPERATIONAL PERIOD AS WELL AS DURING OPERATION IN COMBINATION WITH LOCAL ANAESTHESIA

During pre-operational period a condition is often observed which greatly resembles a breakdown of the higher nervous activity, or a prolonged mental trauma. This condition is especially pronounced in persons with the week type of the nervous activity (according to I.P.Pavlov) suffering from neuroses. Pending the operation such patients often experience an exaggerated fear. They develop a number of neuropsychic disturbances which tell unfavourably upon the patient's state during the operation. In the course of the operation these patients are excited, complain of pain thought its probability is excluded if local anaesthesia is correctly performed. Sometimes such patients even develop operational shock.

After the operation the patients suffer from pain in the operational wound, forced position in bed, difficult respiration, disturbances of urine and feces evacuation, etc. In such cases a vicious circle seems to be formed: the irritations from the post-operational trauma disturb the coordinated activity of the cortex and subcortex, the fact, which in its turn disturbs the functions of the affected organs and influences negatively on the process of wound healing. Even after such usually light operations as appendectomy or excision of hernial ring the patients are insomnious. In such cases it is imperative to take measures which may eliminate the overstress of the nervous system and normalize the tone of the somatic sphere.

This problem was solved by us, as well as by other authors, by way of using electric sleep. 3 to 4 days before the operation the patients are transferred to a room specially equipped for electric sleep. Every day and at one and the same time the patients receive (in parallel with conventional pre-operational preparation) two electric sleep procedures according to the above described method (from about 10 to 12 a.m. and from 15 to 17 p.m.).

Under the effect of electric sleep administered in the pre-operational period a rapid and notable normalisation of the patient's neuropsychic and general somatic state is usually observed. The fear of operation and nervousness associated to it disappear, the general self-feeling gets better, the sensations of cheerfulness and freshness appear; the patients become more active and optimistic. The blood pressure, pulse and respiration are normalized, and even in the pre-operation room (i.e. immediately before the operation) remain unchanged or show insignificant fluctuations which are of no practical importance.

When laid upon the operation table the patients prepared for the operation with the use of electric sleep show no negative emotional reactions. When given an ordinary electric sleep procedure during the operation (the dose should be increased up to 1.0 - 1.5 mA) the patients succumb to vari-

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ous degrees of checking. In these cases they do not react at all or react but weakly even to the most painful stages of the operation performed under local anaesthesia(such as pulling up of the mesentery, treatment of the stump of the duodenum, etc.). The blood pressure, pulse and respiration rates at various stages of operations performed even in cavities show no pronounced variations. For example, during a stomach resection (performed under local anaesthesia combined with electric sleep) the blood pressure varies only within 8 to I0 mm Hg in the course of the whole operation. Similar insignificant variations are observed on the part of pulse and respiration.

When the same operations are performed without electric sleep preparation of the patient, the blood pressure shows rather pronounced variations at different stages of the operation (within 25 to 35 mm Hg.). Similar variations are observed on the part of pulse and respiration. Local anaesthesia performed against a background of electric sleep reduces the amount of novocaine used for anaesthesia by about 40

finement to bed associated with the operative intervention and their daily balance of sleep averages I2 to I6 hrs.

The variations of blood pressure, pulse and respiration are insignificant and their practical importance are nil. Any pathological shifts in blood and urine due to electric sleep are not observed. Patients who had received electric sleep develop much less operational and post-operational complications than patients not subjected to electric sleep therapy. Administration of narcotics to these patients in the pre- and post-operational period is unnecessary.

The use of electric sleep in the pre- and post-operational period, as well as during operation in combination with local novocaine anaesthesia was tested on I26 patients. A positive effect was obtained in II8 patients. In other patients any notable changes due to the use of electric sleep were not observed. The combination of electric sleep with local anaesthesia during operations was used in other clinics as well.

To illustrate the effect of electric sleep in the pre-

these patients the post-operational pain sensations in the operational wound subside and often disappear completely; pains associated with the tension of muscles participating in respiration subside too. The respiration gets deeper and the sputum excretion more free, the fact, which plays a positive role in preventing the development of congestive phenomena in the respiration ducts. In patients operated for gastrointestinal conditions with the use of electric sleep the disturbances of the functioning of pelvic organs and gastrointestinal tract are less marked and get rapidly normal. These patients suffer much less from the forced con-

last 5 years an operation was recommended to the patient several times, but he stubbornly refused it because of fear of the operation, and during the last year the disease rapidly progressed. On admission the patient showed marked disturbances on the part of his neuropsychic sphere. The patient is irritable, winding, hardly accessible, preoccupied with his disease, fears the operation. All the time questions the personnel and other patients about the course of operation and possible complications. Insomnious. X-ray findings: niches in the epigastral and the minor curvature areas. The second day after admission the patient fainted when

the nurse took blood from his finger for analysis. That day (after fainting) the patient was unusually depressed. Arterial pressure and pulse showed pronounced variations. Next day the patient was transferred to the electric sleep room, where he received two electric sleep procedures daily for five days. Already on the second day the patient's general self-feeling markedly improved after electric sleep. The patient became more quiet and began to sleep 8 - 10 hrs daily. The fear of the operation disappeared. Arterial pressure and pulse without marked variations. The evening before the operation the patient was cheerful, played domino. Took the announcement about the coming operation calmly, with smile. Slept at night for 8 hrs. In the operation room the patient lay quietly on the operation table. Arterial pressure 145/80 mm Hg; pulse 72 beats per minute, respiration 18 breaths per minute. The patient was given electric sleep with a current of 0.7 mA and frequency of 100 i.p.s. At the same time local anaesthesia of the abdominal wall was performed. Resection of the stomach was performed after Meningen. Novocaine consumption 500 ml of 0.25 per cent solution (usually 800 to 1000 ml are spent). The operation lasted for 1 hr 10 min. In the course of the whole operation the patient remained drowsy. Reacted to the treatment of the duodenum stump with a weak moan and an attempt to move his hands. Did not answer the assistant's question of what had happened to him. Variations of the arterial pressure, pulse and respiration were insignificant.

The operation having been over, the electrodes were removed. The patient remained in a state of shallow sleep and after transportation to the post-operational room subsided into a deep sleep which lasted for one hour. Later on, in answer to the question about his sensations during the operation the patient told that he had felt nothing except some pricking in the abdomen. During the post-operational period the patient received electric sleep procedures for 4 days. In the evening of the operation day and next morning the patient vomited once each time. The pain in the wound in-

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significant. Urinated in the evening of the operation day. Unassisted stool three days after the operation. No post-operational complications. Blood pressure, pulse and respiration in the post-operational period within normal values. The sutures were removed on the 8th day; the wound healed as sterile. The patient was dismissed from the clinic on the 11th day after the operation. The daily sleep balance in the post-operational period is 10 to 12 hrs. No narcotics were administered. The patient showed a stable normalisation of his neurotrophic sphere.

Patient A., a 42-year-old male. Admitted to the clinic with a diagnosis of acute appendicitis. The patient is pronouncingly excited and anxious both because of severe pain and the coming operation.

An electric sleep procedure was given to the patient in the operation room. The patient was laid on the operation table in the spinal position. Local anaesthesia was performed with 100 ml of 0.25 per cent novocaine solution.

The patient fell asleep 20 min after switching on the current of 0.2 mA intensity. The patient did not react to the treatment of the operational field, novocaine injections and the beginning of the operation (before manipulations with the peritoneum). Pulling up of the peritoneum and its opening was accompanied with weak movements of the arms and moaning in sleep (the current intensity was 0.75 mA). At the moment of taking out the caecum the patient woke up, but then lapsed into drowsiness in which he remained up to the end of the operation.

After waking up completely the patient noted that he had been asleep all the time, but felt twice some insignificant pains.

Patient B., a 20-year-old male. Admitted to the clinic with hernia of the abdominal linea alba. The electric sleep procedure was given to the patient in the operation room, with the use of the ЭС-III apparatus; the electrodes were applied to an eye orbit and to the occiput. Local anaesthesia was performed with 30 ml of novocaine solution. The

sleep set in 18 min after switching on the current of 0.9 mA. The patient did not react to the treatment of the operational field, novocaine injections and skin incision, but reacted with moaning to the incision of the aponeurosis and suturing of the hernial bag. The current intensity during the operation varied within I to I.3 mA.

On waking up the patient said that he remembered only some moments of the operation and felt almost no pains.

With any type of systemic narcosis the use of electric sleep may prevent possible operational and post-operational complications and facilitate the patient's coming out of the state of narcosis.

b) ELECTRIC SLEEP THERAPY OF PATIENTS WITH OBLITERATING ENDARTERITIS

The term "obliterating endarteritis" ("thromboangii-

(central and peripheric) so as to bring it to the functionally normal state.

Our observations show that it is advisable to use electric sleep for treating patients with the Ist and the 2nd stages of obliterating endarteritis (according to N.N.Klansky's classification) in out-patient conditions and without suspending the patients from their regular occupation, except patients who work in hard working conditions. Naturally, these patients can also be treated in hospital conditions.

The out-patient electric sleep treatment is carried out in specially equipped rooms. The patients receive electric sleep procedures daily (preferably at one and the same time of the day); each procedure lasts for 1.5 to 2 hrs and is performed according to the above described method. A [illegible] course consisting of 24 to 26 [illegible]

The theory of etiopathogenesis of obliterating endarteritis suggested by N.N.Klansky and A.A.Bogolmann best of all corresponds to the level of modern knowledge. According to the corticoorganic theory of N.N.Yelansky and A.A.Bogolmann obliterating endarteritis should be regarded as a systemic neurovascular disease caused by functional changes in the nervous system up to the development of foci of persistent excitation in the cerebral cortex. Morphological, endocrine and other changes are, probably, of secondary importance.

In accordance of the abovementioned corticoorganic theory it follows, that the use of neurotropic electric sleep therapy for treating patients with obliterating endarteritis is quite reasonable. Using this method of therapy we act with impulse current upon the nervous system

sleep therapy.

After the first procedures all the patients show a marked improvement in their general state and prolongation of their night sleep. The positive changes in the patients' neuropsychic sphere induced by the electric sleep gradually become stable and permanent.

Subsidence or disappearance of the signs of obliterating endarteritis in the course of the therapy takes place from the first procedures (3d - 5th) and mainly in one of the following successions:

a) in one group of patients the changes begin from diminution or disappearance of intermittent claudication, nocturnal pains, sensations of heaviness, numbness and cramps; the warming of the extremities is also observed. The sensa-

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tions of chilliness, fatigue and pains at walk are the last to disappear (mainly, when the treatment is carried out in out-patient conditions).

b) in other patients warming of the extremities, diminution or disappearance of chilliness are first observed; then nocturnal pains, sensation of heaviness, numbness and cramps subside or disappear. Last to subside or disappear are intermittent claudication, fatigue and pains at walk (most often in hospital conditions). About 20 per cent of patients show transient (for 2 - 4 days) aggravation of pains, beginning from 5 to 10 procedures. If patients have concomitant metabolic disorders (deforming arthroses, deforming spondyloses, etc.) transient aggravation of the latter is observed as well. If these patients had suffered from headaches prior to the treatment, the headaches usually disappear. The above changes characteristic for electric sleep therapy are observed in the dynamics of blood and urine findings. Blood cholesterol level sometimes diminishes but in some cases, on the contrary, increases, especially in patients with the atherosclerotic form of the disease, (probably due to degradation of the lesions and getting of great amounts of cholesterol to the blood because of the treatment). Blood prothrombin level decreases in about 50 per cent of all cases.

Restoration of pulsation in the main vessels of the feet due to electric sleep treatment is observed in about 10 to 15 per cent of patients.

At the end of a course of electric sleep treatment of patients with obliterating endarteritis in dispensary conditions an increase of the oscillographic index was observed in 52 per cent of the cases. In 13 per cent of the cases the index remained unchanged and in 35 per cent the index insignificantly decreased (for 100 per cent the number of examinations was taken). Capillaroscopic examinations of the above group of patients have shown that in 70 per cent of them an evident improvement of the capillaroscopic picture took place: the background turned pink, the visibility

got clearer, the number of capillaries increased, the edema and degenarative changes desappeared, the circulation restored in places where it had been absent before.

Summing up the clinical and the functional-diagnostic data one should point out that a positive clinical effect is observed in the overwhelming majority of patients with the 1st and the 2nd stages of the disease of all forms, but the degree of this effect is different. Immediately after the treatment a good effect was observed in 56 per cent of the patients, a satisfactory one in 33 per cent and no effect in 11 per cent of the patients. Aggravations and amputations after a course of electric sleep treatment have been never observed.

The spastic and the atherosclerotic forms of the disease in the 1st and the 2nd stages respond especially readily to electric sleep therapy (the latter form responds to the treatment even in elderly patients of up to 70 years of the age). The thrombangiotic form responds to the therapy with greater difficulty.

The catamnestic observations of patients with obliterating endarteritis carried out for 3 years since the end of the electric sleep treatment course show the following: in most patients the therapeutic effect was in progress for 1 to 8 months after discontinuation of the treatment course. Further improvement of functional diagnostic findings was observed. The positive effect persisted without deterioration for more than 5 years in 51 per cent of the patients, for more than 3 years in 19 per cent; for more than 2 years in 15 per cent; for more than 1 year in 10 per cent, from 6 months to 1 year in 5 per cent of the patients. The treatment course had to be repeated 6 to 12 months after discontinuation of the first electric sleep treatment course in 4 per cent of the patients. Patients in whom the treatment course had to be repeated were in most cases elderly persons or persons with pronounced signs of reactive neurosis (prior to the treatment), in whom a breakdown of the higher nervous activity took place after the treatment because of a

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grave mental trauma, or who got into very unfavourable environmental conditions (cold, dampness, etc.).

The electric sleep treatment of patients with obliterating endarteritis in hospital conditions has brought less favourable results. Good results were obtained in 31 per cent of the cases, satisfactory - in 48 per cent; no changes - in 17 per cent; amputations - in 4 per cent of the cases. The difference between the clinical and functional diagnostic data for hospital treatment was much greater than for out-patient treatment. As mentioned above, the dynamics of the subsidence or disappearance of the clinical symptomatology of obliterating endarteritis in the course of electric sleep treatment in hospitals follows in another sequence than in cases of dispensary treatment (warming of the feet takes place first while intermittent claudication disappears last).

The dynamics of functional diagnostic findings also somewhat differs in this instance from that observed in patients treated in dispensaries.

If the percentage of the oscillometric index rise in dispensary and hospital patients is equal and constitutes 52 per cent, the invariability of the index was observed in 30 per cent of hospital and 13 per cent of dispensary patients; an insignificant diminution of the index was observed in 17 per cent of hospital and in 35 per cent of dispensary patients; a pronounced improvement of the capillaroscopic picture was manifest in 63 per cent of hospital patients and in 71 per cent of dispensary patients.

This is most probably due to the presence of patients with the IIId stage of the disease (gangrene), as well as to the negative emotions caused by separation of the patient from his habitual environment and a certain forced inertness associated with the restriction of movements.

It is advisable (especially in hospitals) to combine electric sleep with therapeutic gymnastics. Apart from using electric sleep in the "pure form" it is advisable to combine it in some cases with other methods of therapy, i.e. to

use it as a component part of complex therapy, so as to increase its therapeutic effect.

Electric sleep is also indicated (in combination with surgical treatment) in the 3d stage of the disease with irreversible changes in the extremities (gangrene) already present. In such cases electric sleep serves as a background for operation and promotes a more rapid convalescence in the post-operational period.

As our observations show electric sleep (just like other methods of treatment) is of little effect in cases of obliterating endarteritis relapses after previous ganglioectomies.

Following is an example presented for illustrating the results of treatment of obliterating endarteritis with electric sleep.

Patient P., a 63-year-old male. On May 16, 1957 consulted his physician for pains in the right foot at rest and at walk, which got more intense at fast walk and at ascending stairs; intermittent claudication (halts after each 20 to 30 steps), chilliness in the right foot. Considers himself to have been ill since May 1956. Had received some treatment before. Diseases in the past: pulmonary tuberculosis with hemoptysis in 1924. Received antituberculous therapy and in 1930 was crossed off the register of the tuberculous dispensary. Since 1956 has been suffering from hypertension. From time to time received some injections. Had had measles and dysentery (in childhood). At present is suffering from calculous bursitis of the right humeral joint. Had had no injuries, contusions or frostbites. Has been smoking since the age of 20, now smokes 25 to 30 cigarettes daily. Drinks alcoholic beverages from time to time, in small quantities. An employee of the aircraft industry by profession; since December 1956 a pensioner. Living and working conditions satisfactory.

Examination: all organs normal corresponding to the age; arterial pressure 160/100 mm Hg, pulse 80 beats per minute, of satisfactory force, rhythmic. Local findings:

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the right shin is somewhat thinner than the left one, with single varicose distentions; the skin is marble-like, the distal parts of the feet cyanotic. The right shin and foot are cold to the touch. The left lower extremity shows the same signs but less pronounced. Pulsation on both femoral and popliteal arteries satisfactory. Peripheric pulsation absent on the right foot and weak on the left. Functional diagnostic findings: capillaroscopy of the nail bed of the fourth finger of the right hand shows signs of insignificant congestion and moderate spasm. The nail bed of the first toe of the right foot shows a picture of pronounced congestion and degeneration; capillaries numbering 10 to 14 in the field of vision. A pronounced spastic and atonic picture with signs of congestion and degeneration to the left. Oscillogramme on the femoral arteries: pronouncingly reduced to the right (4 to the right and 9 to the left). Pulsation on the right shin arteries absent, on the left shin arteries very weak. Blood and urine findings without notable abnormalities. Blood cholesterol 178 mg/100; blood prothrombin 86 per cent, prothrombin time 24.

Diagnosis: obliterating endarteritis, the atherosclerotic form, IInd stage with predominating involvement of the lower extremities (more of the right one).

Treatment: From May 20, 1957 to June 20, 1957 the patient received 24 daily procedures of electric sleep in the dispensary. Each procedure lasted for 1 hr 30 min. Current intensity 0.7 to 0.9 mA. The patient began to fall asleep from the first procedure 17 min after switching on the current. The patient's sleep lasted for 1 hr 20 min to 1 hr 40 min at all procedures.

The clinical symptoms began to subside and disappear from the 3d procedure, in the sequence characteristic for out-patient treatment.

The course of electric sleep treatment having been over, the patient's general state improved, the arterial pressure dropped from 160/100 mm Hg down to 140/80 mm Hg, pains at rest disappeared and diminished at walk, intermittent

claudication disappeared, chilliness, marble-like character of the skin and cyanosis of the distal sections of the feet diminished, the shins and the feet got warm to the touch. Peripheric pulsation on the feet remained unchanged. Capillaroscopic findings of the upper extremities were within normal values, those of the lower extremities still showed a spastic atonic picture. Signs of congestion and degeneration subsided. The oscillogram showed an insignificant diminution of the index on both things and the left shin; a weak pulsation appeared on the right shin. By the end of the treatment the patient could walk 1.5 to 2 km without halts and unpleasant sensations.

Blood cholesterol 167 mg/100; blood prothrombin 78 per cent, prothrombin time 24.

The patient was examined catamnestically 10 months, 1 year 6 months and 2 years 3 months after treatment.

Examination on April 17, 1958 (after 10 months): the patient feels well, has no complaints and goes for long walks. Both shins are equal in size. The skin coloration of the lower extremities is normal except distal sections of both feet which are slightly cyanotic. The feet and the shins are warm to the touch, pulsation on both femoral and popliteal arteries good, on the arteries of the left foot weak, on the arteries of the right foot absent. Capillaroscopy of the upper extremities shows insignificant atony. An insignificant atony is also observed in the feet; the number of capillaries is 20 in the field of vision (it was 14 at the end of the treatment). Oscillography showed an increase of the index on the right thigh and an intensification of pulsation on the right shin.

Examination on December 25, 1959 (1 year 6 months after the end of the treatment): anamnestic and objective findings are the same as on the previous examination, but cyanosis of the feet disappeared and a weak pulsation on the right foot arteries appeared. Capillaroscopy of the lower extremities shows insignificant congestion; the number of capillaries is 22 in the field of vision. Oscillography

again shows a small increase of the index on the right shin.

Examination on September 20, 1959 (after 2 years 3 months). The patient's state is good; no aggravations both in anamnesis and on examination. Capillaroscopic and oscillometric findings are somewhat better than on the previous examination, and show a new increase of the oscillographic index.

In spite of warning the patient continued to smoke all the time. During the whole period after the end of the treatment the arterial pressure remained at normal figures. The patient did not address for medical aid.

Electric sleep therapy was also used in surgical clinics for treating other diseases. For example, positive results were obtained in the treatment of patients with cerebral traumas and commotion-contusion syndrome due to acute cerebral trauma. Electric sleep in such cases was used both in the "pure form" and in combination with drug therapy.

In such patients electric sleep produces a stable therapeutic effect. In addition to the improvement of the patient's general state, normalization of night sleep, disappearance of headaches, increase or restoration of the patient's capacity for work, etc. are observed.

Examination of the electric activity and motoric chronaxymetry points out to normalization of the C.N.S. functions.

In patients with amputated extremities electric sleep produces an improvement of the general state and stable disappearance of local and phantom pains in 70 per cent of cases (A.S.Berkhon, S.R.Roitenburd and others).

Electric sleep is somewhat less effective in the treatment of non-healing ulcers of the extremities. A better effect in the treatment of such patients is achieved when electric sleep is used in combination with other methods of therapy.

As the electric sleep therapy is used in surgical practice more and more widely the range of its application will undoubtedly grow up.

3. ELECTRIC SLEEP THERAPY OF INTERNAL DISEASES

Electric sleep treatment of patients may find a wide application in therapeutic clinics. This method is first of all indicated in the treatment of pathological conditions associated with corticovisceral disturbances. When electric sleep alone cannot change the pathological symptomocomplex its combination with other methods of therapy may prove to be useful.

In the clinic of internal diseases electric sleep is used at present mainly in the treatment of hypertensive vascular disease, gastric and duodenal ulcers, gastritides and bronchial asthma.

a) Electric Sleep Therapy of Hypertensive Vascular Disease

The hypertensive vascular disease has corticovisceral pathology and occurs due to a disturbance of the functional activity of the C.N.S. and particularly, due to a disturbance of the interrelations between the processes of excitation and checking. In such cases there appear foci of persistent excitation in the brain cortex and the functional interrelations between the cortex and the lower sections of the brain got disturbed. This disturbs the functioning of the vegetative-humoral system, the fact, which is a causative of hypertension. Later on atherosclerotic impairments are joined.

On the basis of the above conception of the etiopathogenesis of the hypertensive vascular disease its therapy should consist in normalization of the principal nervous processes. This, in particular, is achieved by using electric sleep.

There are many observations concerning the efficacy of electric sleep in the treatment of hypertensive vascular disease (G.V.Sergheyev, L.A.Studnitsina, S.R.Roitenburd and others).

The treatment of hypertensive patients with electric sleep can be performed in hospitals and dispensaries without

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suspending the patients from their regular occupation.

A treatment course consists of about 15 - 25 daily procedures of 1.5 - 2 - hours duration.

In the course of treating hypertensive patients with electric sleep the improvement of their general state is observed from the very first procedures; headaches subside and later disappear completely, the arterial pressure falls down after each procedure.

In the course of the first 4 to 7 procedures the abovementioned changes hold on for several hours but later they become more and more stable and at the end of the first half of the treatment course these changes become permanent.

The observations carried out by us have confirmed the therapeutic value of electric sleep for the treatment of hypertensive vascular disease, especially, of its Ib, IIa, and IIb stages.

The therapeutic effect was manifested in 80 per cent of the patients. In the course of the treatment the arterial pressure is reduced to normal figures or even lower (systolic pressure by more than 20 to 30 mm, diastolic by more than 10 to 12 mm). Various unpleasant and morbid sensations, such as headache, dizziness, cardiac pain, dyspnea disappear. The patients' general neuropsychic state improves, their night sleep becomes normal.

Oscillographic examinations show a diminution of the asymmetry of the arterial tone and reduction of arterial pressure. An EEG shows restoration or improvement of the α - rhythm and diminution of the number and the amplitude of the quick oscillations. The results of electric sleep therapy of hypertensive vascular disease are rather stable.

In patients with a pronouncingly weakened checking process (a highly excitable type) electric sleep therapy is of no effect.

Following is a clinical example of electric sleep treatment of hypertensive vascular disease:

I. Patient B., a 42-year-old female, an engine fitter by profession. Was treated in out-patient conditions (with-

out discontinuing her work) at Moscow City Hospital No. 25 from November 20, 1958 till December 21, 1958. Complaints of headache, dizziness, tinnitus, nausea, pricking cardiac pains, dyspnea, insomnia. Considers herself to have been ill from the beginning of 1956. The arterial pressure in 1956 was 180/100 mm Hg, but the patient refused treatment for family reasons. Associates the disease with a mental trauma and overexertion. Did not take medical advice. Revealed and sent for treatment after a regular medical examination of workers.

The patient was born and grew up in a peasant family. Married at the age of 25. Had had 3 pregnancies 2 of which ended in births and one in abortion. Has two healthy children. Menstruation from the age of 14: the menstrual cycle without abnormalities all the time.

Of diseases sustained in the past points out to measles, scarlet fever, pneumonia, typhus fever, frequent tonsillitides and influenza.

Neuropsychic sphere up to the present disease without abnormalities. The sleep is deep and long. Since 1956, after mental trauma (of family character) has become irritable, rapidly fatiguable, exceedingly emotional, insomnious.

Examination: the patient is a medium height, regularly built, satisfactorily nouriahed female. Skin and visible mucosa somewhat pale. Musculoskeletal system without abnormalities. Heart: borders within the norm, tones somewhat dull. Arterial pressure 195/110 mm Hg. Lungs: borders within the norm, respiration vesicular.

Abdomen: symmetrical, soft, painless, participates in the respiratory act regularly. The liver and the spleen unpalpable. The stool and diuresis normal. Blood and urine findings (general) show no abnormalities. Blood cholesterol 205 mg/100. X-ray of the chest: no abnormalities. Eye fundus without pathological changes.

Diagnosis: hypertensive vascular disease, stage II b.

The patient received 24 electric sleep procedures of

I.5- hour duration each. She fell asleep for the first time on the 4th procedure 20 min after switching on the current and slept for 20 min. Subsequently the duration of the sleep during procedures increased and from the 9th procedure on, the patient showed outside manifestations of deep sleep during all procedures. From the 3d procedure on, normalization of the patient's night sleep set in (she began to sleep for 6 instead of 3 hrs) and from the 5th procedure on, the duration of the night sleep settled at 8 - 9 hrs. The character of the sleep also changed: it has become deep, quiet, dreamless, refreshing. Headaches, tinnitus, nausea, dizziness, cardiac pain and dyspnea began to subside from the 3d procedure and disappeared after the 8th procedure. The arterial pressure diminished after each procedure by I5-20 mm Hg. A stable reduction of the arterial pressure was observed after the 7th procedure (I60/90 mm Hg) and after the I2th procedure the pressure settled at the values of I45-85 to I40/80 mm Hg and has been remaining at this figures already for a year. The patient's general state also improved considerably, the patient has become cheerful and good-humoured, the neurotic symptoms disappeared.

(From Dr. S.R.Roitenburd's observations).

b) Electric Sleep Therapy of Patients with Gastric and Duodenal Ulcers

Electric sleep treatment may be performed both in dispensary and hospital conditions (depending on the patient's state). The treatment is carried out by the above described method, in combination with diet therapy. The efficacy of electric sleep therapy in the treatment of patients with gastric and duodenal ulcers is confirmed by the observations carried out by many medical institutions, such as, by A.V.Vishnevsky's Institute of Surgery, the USSR Academy of Medical Sciences, Moscow, and the Institute for Therapeutic Nutrition, the USSR Academy of Medical Sciences, Moscow.

A positive therapeutic effect in the treatment of these patients with electric sleep was achieved in about 70 per cent of all cases.

The positive effect of electric sleep therapy + diet (but without drugs or other kinds of therapy) manifests itself in an improvement of the patient's neuropsychic state and subsidence of the vegetative disturbances from the very first procedures (3d or 4th). If sleep is disturbed, it becomes normal rapidly. The pain syndrome begins to subside gradually, and by the middle of the treatment course usually disappears. Pains at palpation disappear somewhat later. In the first half of the treatment course a normalisation of the secretory, motoric and evacuatory function is also observed. The disappearance of the niche is observed roentgenologically by the end of the treatment course (but only in 60 - 80 per cent of patients in whom the effect of the therapy is positive).

Non-callose ulcers diminish or cicatrize under the effect of electric sleep therapy. Patients with callose ulcers should be operated.

Electric sleep therapy of patients with callose ulcers is also used in the pre - and post-operational period, as well as during the operation in combination with anaesthesia.

When electric sleep in the "pure form" or some other method of therapy fail to produce expected results, the use of electric sleep in combination with other methods of treatment yields a positive therapeutic effect.

Following is an example illustrating the results of treating a gastroduodenal ulcer with electric sleep:

Patient Z., a 59-year-old male. Admitted to the surgical division with the diagnosis of gastroduodenal ulcer.

The patient has been suffering from that disease for I0 years. During the last 5 years the patient was treated several times in hospitals and dispensaries. Received diet therapy, histamin therapy, aloe therapy, Rumyantsev's im-

plantations, paranephral novocaine blockades after Vishnevsky, etc. Has been twice at health resort. Noted temporary improvements.

On admission the patient is complaining of epigastric pains - I-2 hours after meals and on empty stomach, eructation, poor appetite (or, more exactly, fear of taking food because of pains), pronounced emaciation, heightened nervousness, reduced capacity for work.

Examination: the patient is of medium height, regularly built, lowered nutrition. The skin and visible mucosa are paler than normally. Skin turgor lowered. Vesicular respiration and pulmonary tone in the lungs. Heart borders within the age norm, heart tones somewhat dull. Pulse rate 80 beats per minute, of satisfactory force, rhythmic. Arterial pressure 145/90 mm Hg. The tongue humid, covered with a slight white coating. The abdomen is of normal configuration, symmetrical, somewhat sunken, participates in the respiratory act regularly; soft and tender at palpation in the epigastral area. The liver and the spleen unpalpable. Peripheric lymph nodes are of normal size and painless. Musculoskeletal system without abnormalities. Signs of functional neurosis on the part of neuropsychic sphere. Blood and urine findings without abnormalities. Gastric juice: total acidity 94, free hydrochloric acid 54, combined hydrochloric acid 24. X-ray examination reveals a niche in the area of the stomach minor curvature.

Treatment: The patient received two electric sleep procedures daily; each procedure lasted for 2 hrs (current intensity 0.3 to 0.5 mA).
In addition to electric sleep and diet therapy no other methods of treatment were given to the patient.

The patient began to fall asleep from the 3d procedure and slept during all subsequent ones. On the second day of the treatment normalization of the patient's neuropsychic sphere began: the patient has become more quiet and gay. The pains began to subside, appetite returned. The pains disappeared completely on the I2th day and tenderness at palpation on the I8th day of the treatment.

The patient began to gain weight from the 6th day of the treatment. By the end of the treatment he had gained 2.5 kg. The treatment having been over, the patient showed no compliants. At X-ray examination the niche could not be seen. Gastric juice: total acidity 48, free hydrochloric acid 26, combined hydrochloric acid I6. Blood and urine findings within normal values.

The patient was observed for 2 years after the end of the treatment. During this period he showed no complaints. X-ray examination a year after the treatment did not reveal the niche.

4. ELECTRIC SLEEP THERAPY OF EARLY TOXEMIAS OF PREGNANCY

From the very beginning and during the whole course of pregnancy complicated physiological changes take place in the woman's organism. This reconstruction involves to this or that degree all somatic and vegetative functions of the organism. The functional interrelations of the C.N.S. undergo changes too.

If the woman's organism is unable to cope with the new physiological situation created by pregnancy a pathological condition termed as "early toxemia of pregnancy" develops. This condition requires corresponding therapy.

Corticovisceral pathology plays an important role in the pathogenesis of early toxemias of pregnancy.

Electric sleep treatment is one of the most effective methods for pathogenetic therapy of early toxemias of pregnancy.

The observations carried out by Dr. N.M.Liventsev and others indicate to a favourable effect of electric sleep in the treatment of early toxemias of pregnancy.

Electric sleep therapy in the "pure form" (even without administration of narcotics) produces an improvement of the patients' neuropsychic state, arrests vomiting, nausea and

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salivation. This method of treatment reduces the period of the patient's confinement to bed down to IO - I5 days.

Following are some clinical examples presented for illustration:

Patient Z., aged 30. Admitted to the Institute for Obstetrics and Gynecology. Diagnosis: 6-week pregnancy, vomiting gravidarum.

Second pregnancy. On admission: vomiting I2 times daily, weakness, anorexia, nausea. Acetone in the urine. The patient is depressed and anxious. Weeps all the time, cannot concentrate upon anything and read; says that she cannot understand what she reads. During the first 4 days after admission the patient received enemas with bromides but her state did not improve.

Electric sleep therapy was started.

At the moment of switching on the current the patient complained of pricking sensations in the nose bridge. Soon a state of pleasant drowsiness set in which then turned into deep sleep. The patient slept at all subsequent procedures. During the treatment the current intensity was established at I.4 mA. The patient's state got gradually better and after the 6th procedure the patient vomited not more than 5 times daily. After the 8th procedure she vomited only once a day. The patient noted that after an electric sleep procedure she feels well and cheerful. After I7 procedures the patient was dismissed in a good state with IO-week pregnancy.

Patient S., aged 25, admitted to the Institute for Obstetrics and Gynecology.

Diagnosis: 5-6 week pregnancy, vomiting gravidarum.

Admitted with compliants of persistent nausea, vomiting 4-5 times a day, loss of weight, poor appetite, general weakness, dizziness, irritability, tearfulness, touchiness. The patient cries on every trifle, does not want to move and to think, experiences a vague fear all the time. During the first IO days of the treatment the patient received enemas with bromides, but her state continued to deteriorate;

the vomiting still remained persistent, the patient continued to lose weight, acetone appeared in the urine.

Electric sleep therapy was instituted.

Current intensity was within 8 - IO mA (impulse value)[X]; frequency I.5 i.p.s. During the procedures the patient noted mild pricking in the area of the eyebrow arches, then a slight drowsiness set in, which remained during the whole procedure. After the 4th procedure the patient noted that she had become much more active, the nausea and vomiting troubled her much less, the temper had become more quiet. During a procedure she experienced a sensation of pleasant comform which turned into drowsiness. Slept even after switching out the current. After the 6th procedure the nausea and vomiting had become less frequent and after the 8th procedure almost disappeared. Sometimes she felt nausea, but much less intense. An interest to reading appeared: the patient said that she began to miss her home, whereas before this she had been indifferent to everything. The patient received I5 electric sleep procedures: during subsequent procedures the current intensity was increased up to I5 mA (impulse value)[X]. The patient's general state is good; the patient is cheerful, her temper is calm and optimistic. Dismissed in a good state.

Patient V., aged 3I, admitted to the Institute for Obstetrics and Gynecology.

Diagnosis: 8-week pregnancy, vomiting gravidarum, salivation. Second pregnancy. The course of this pregnancy has been complicated since the 5th week with nausea to which salivation later joined. During a month the patient lost 4 kg weight. Albumin in the urine has appeared. Salivation up to 700 ml daily. The patient's temper is exceedingly depressed. She weeps all the time, does not believe in the possibility of recovery and in treatment. The food and even its outlook cause aversion and repugnance for eating. Last time the sleep is very bad; the patient dreams that she is eating a "foul food".

X/ Note of the author.

The patient was proposed to have electric sleep treatment. The dosage of the impulse current applied to the brain was determined. The current intensity was established within 5 mA (impulse value)[x/], with a frequency of I.5 i.p.s. At the moment of switching on the current the patient got excited and anxious, saying that "she is being pricked everywhere". Then she calmed gradually and by the end of the procedure showed no compliants.

During the electric sleep procedure the patient felt well and experienced no nausea. The salivation decreased too; that day 500 ml of saliva were excreted. After the third procedure the salivation decreased still more, there was no nausea, the appetite got better. After the 5th procedure the patient noted that salivation had ceased completely and the appetite had restored. During electric sleep procedures the patient felt drowsiness and a sensation of pleasant comfort. After the 8th procedure the patient noted that her state was good and cheerful; the felt quite healthy and wanted to go home. She received I5 electric sleep procedures and was dismissed in a good state on the I2th week of pregnancy.

CONCLUSION

Electric sleep is a method of neurotropic therapy, the essence of which consists in acting upon the central and peripheric nervous system with impulse current of a definite form and frequency.

Electric sleep differs from other methods of sleep therapy (medicinal, hypnotic, etc.) in its physiological mechanism, more profound and stable therapeutic effect, absence of toxic effects and unpleasant sensations, possibility of maintaining exact dosage of the current and controlling the duration and depth of the sleep. The method is harmless and convenient for use in hospitals, dispensaries and army surgeries, as well for treating patients at home. Electric sleep may be also of value as a part of the general complex

x/ Note of the author.

of prophylactic measures against cardiovascular, neuropsychic and other diseases.

The existing experience makes it clear that the mode of electric sleep action cannot be regarded as the effect of a rhythmic irritant only. Its mode of action is much more complicated and involves the action of impulse current as a specific irritant for nervous cells which causes a broad complex of electric, inductive and biophysico-chemical changes. These changes lead to reconstruction of the functions of the cortical and subcortical systems, which, in its turn, manifests itself in stimulation of the vegetative processes and the general activity of the organism as a whole. Proceeding from this it is clear that the term "electric sleep" is purely conventional, since the mode of its action and therapeutic effect are not conditioned by sleep only. It has a wider spectrum of therapeutic action, the fact, which is confirmed, in particular, by the therapeutic effect in patients who do not sleep during the procedures, and by a more rapid (about 2 times) therapeutic effect as compared to that of medicinal sleep. The suggestive factor is not a leading one in the mode of electric sleep action, the fact, which is, in particular, is confirmed by experiments with "blank" procedures (without switching on the current).

Physiological studies carried out by scientists of different schools, attach a great importance to the frequency of impulses acting upon the nervous system. High-frequency impulses as agents producing a checking effect are preferred.

Our clinical observations of somatic patients as well as observations made by other authors have also shown that a frequency of 80 to I20 i.p.s. is more effective than a frequency of I to 25 i.p.s.

Of great importance for electric sleep is current intensity and exposition. An increase of the intensity of the pure impulse current up to over 0.3 mA (average value) produces an unpleasant sensation in the patient. Since 3C-IM apparatus has an additional galvanic component, it permits one to increase the average current intensity up to I.0 to

I.8 mA without causing unpleasant sensations to the patient.

The importance of electric sleep therapy in somatic clinics has become greater in the last year. Electric sleep therapy is especially promising in the conditions of dispensaries, polyclinics and prophylactic stations where patients are treated without discontinuing their work. Electric sleep may be also used in combinations with other methods of treatment. One should differentiate the notions "electric sleep" which is induced by a current of an average intensity of 0.2 to 0.8 mA applied for a long time; "electric narcosis" induced by a current of an average intensity of 8 to I2 mA applied for a long time, and "electric shock" achieved by a short-time application of current of about I.5 to 2 A.

In the first case one deals with a therapeutic effect with outside manifestations similar to those of physiological sleep without any unpleasant sensations for the patient and any negative physiological and morphological changes in the organism. In cases of electronarcosis a greater effect on the C.N.S. is rendered; due to this effect a state of narcosis with all phases characteristic to it is achieved.

Electric shock, used in some psychiatric clinics, especially in foreign ones, is a vulgar way of short-time acting upon the organism with electric current, which may cause irreversible morphological changes in the C.N.S.
It is necessary to point out that the problems pertaining to the physiological mechanism and the characteristics of electric sleep, as well as the questions concerning its indications and contraindications require further studies.

The main purpose of the present prospect is popularization of the valuable and promising neurotropic method of therapy-electric sleep, as well as of the modern apparatus "Electrosleep" 3C-IH developed in the USSR and exported by V/O "Medexport".

For all information and terms of delivery, please write to
Vsesojuznoje Exportno-Importnoje Objedinenije "Medexport",
Moscow G-200, USSR
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Telephone: 38-09-20
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The Russians' New Sleep Machine

Photo, Marvin Lichtner, Electrosone, courtesy of National Patent Development Corp.

Soviet scientists have come up with a

Machine

Soviet scientists have come up with a device they claim will crowd a full night's sleep into two hours — and help treat emotional disturbances too. Here is an American doctor's report from Moscow

By DR. CYRIL SOLOMON

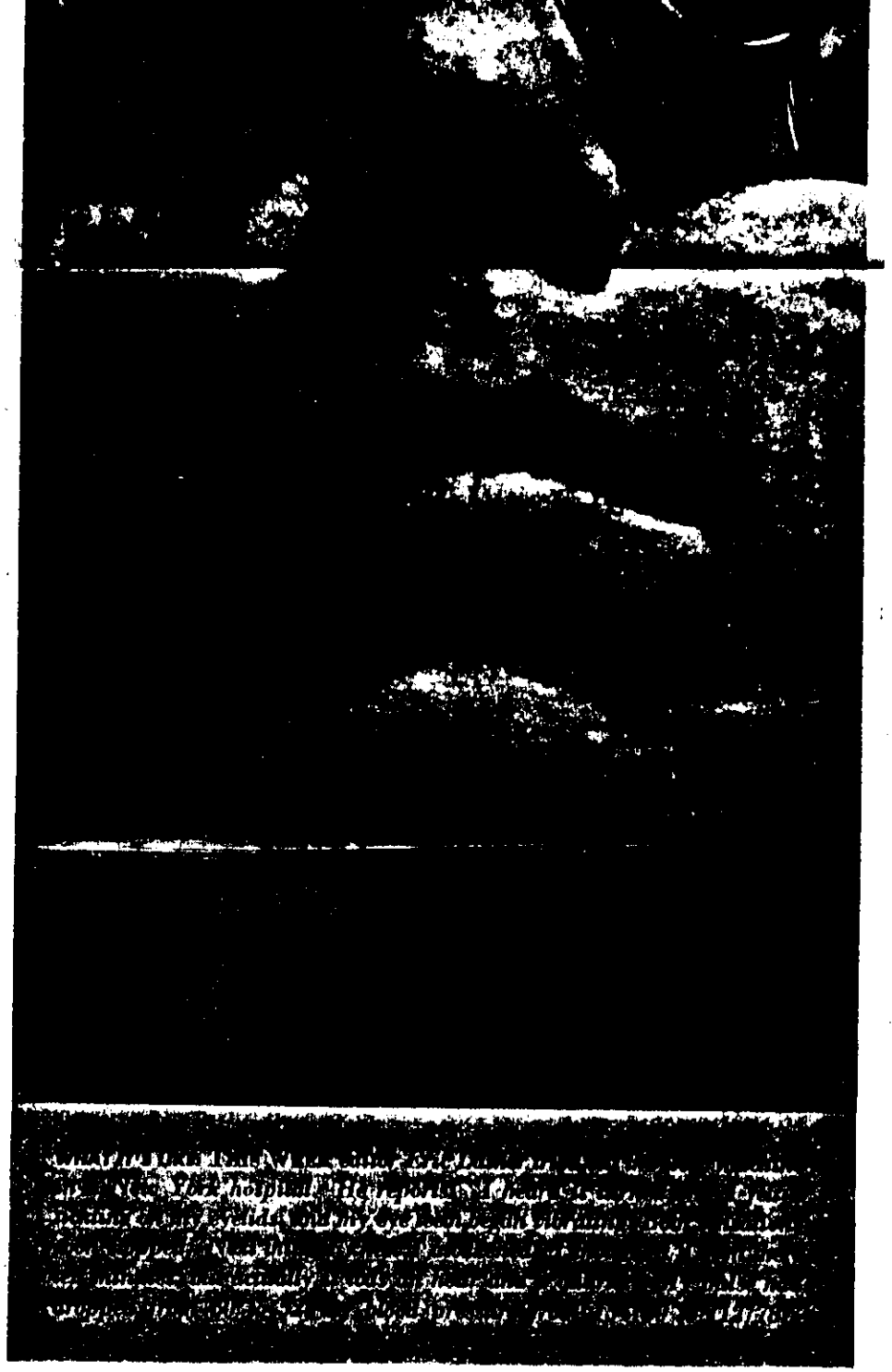
This Week's Medical Consultant

MOSCOW

SCIENTISTS IN THE SOVIET UNION are rapidly developing a machine which may have a profound effect on what we call "a good night's sleep." I saw the Russians test this device, called the electrosone, which they claim packs eight hours of deep, restful sleep into two hours or less. Russian physicians say the electrosone will have an even more important role as a dramatic new weapon in medicine's fight to conquer disease.

The electrosone I observed looks like a ham radio operator's receiving set, complete with dials and gauges. But, in place of the earphones there is a mask-like leather and cloth apparatus. The machine itself is 20 inches long, 12 inches high and ten inches deep. It's portable and weighs just 26 pounds, about the same as an office typewriter.

Here's how the Soviet doctors explain the machine's principle: by transmitting harmless electrical impulses through the brain, it quickly and painlessly brings about complete cessation of consciousness. The electrosone produces conditions exactly duplicating deep, natural sleep: muscles relax, pulse and respiration slow down, blood pressure drops and diaphragmatic, abdominal breathing — *continued on next page*



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Continued from preceding page

How to make two hours' sleep equal eight

takes over from thoracic (lung) breathing.

If what they say is true, the implications for everyday living are obviously tremendous. We would all have several extra hours a day to use either for productive work or for leisure time activity. In a way, it would be like adding a couple of extra days to every week.

Physicians in the United States are now making initial tests with the electrosome. At a recent meeting of the American Congress of Physical Medicine and Rehabilitation, Dr. Bernard S. Post, Dr. Sigmund Forster and Dr. Joseph G. Benton, all of the State University of New York's Downstate Medical Center, New York City, confirmed many of the Russian findings. Using an apparatus patterned after the Russian electrosome, they found that even one hour's treatment apparently leaves the effect of a full night's rest. They also confirm that their sleep machine allows spastics to relax their muscles and can help some victims of multiple sclerosis, cerebral palsy and paraplegia. Other researchers hope to use the electrosome to correct various psychiatric disorders.

The word got around

brain waves register on an electro-encephalogram.

The principle behind the Russian sleep machine is simple. A weak, rhythmic electrical impulse is sent to the part of the brain which controls sleep and metabolism, lulling you into a deep, natural sleep. Soviet doctors say the electrosome puts a patient to sleep the same way a rocking cradle puts a baby to sleep. But, in this case, the sleep is so deep, and achieved so fast, that the patient wakes up fully refreshed and invigorated in fewer hours.

Dr. Alexandre N. Obrosow is Russia's leading expert on electric sleep. He told me:

"The generator is easy to operate and may be connected to a simple electric outlet. It should be turned on for a minute so the tubes develop an operating temperature. While the tubes are warming up, the patient is placed on a comfortable couch. The low-frequency current is turned on, sending electrical impulses to the base of the brain, the

ELECTRODE SLEEP: *Editor Lauber napped 75 min.*

blood pressure, schizophrenia, insomnia and other psychiatric disorders. They also say the electrosome will ease the pain of many other dread diseases.

Dr. Obrosow continued: "Electrosleep was first used for patients at the Institute of Psychiatry of the Department of Health of the Soviet Union and soon became regular. It brought good results in schizophrenia — a disease many investigators believe results from over-exhaustion of the nervous system. Sleep therapy affords the brain cells the best opportunity for complete rest and restoration. Artificial sleep for 20 to 30 days can improve the function of the brain cells to the point at which the pa-

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The word got around

I first heard of the electrosone from colleagues who studied in Moscow on a medical-exchange program. I decided I would look into the electrosone when I came here to attend the recent International Cancer Congress.

Sasha, my attractive Intourist guide, found it easy to arrange a visit with Dr. I. Lipsky and Dr. Henry Puttun at the Institute of Therapy. I watched Dr. Puttun demonstrate the apparatus on an assistant. He placed oval patches over each eye, and long thin straps behind her ears, giving a Halloween mask effect. Electrode pads of absorbent material were soaked in salt water to help conduct current.

The electrodes over the eyes are connected to the negative pole and the electrodes which fit behind the ears are attached to the positive pole of the generator. Current running through the electrodes and into the patient is five to 15 milli-amperes. (An ordinary household lamp uses 1,250 milli-amperes.) The impulses are sent through the electrode at approximately the same rate the electrosone puts a patient to sleep the same way a rocking cradle puts a baby to sleep. But, in this case, the sleep is so deep, and achieved so fast, that the patient wakes up fully refreshed and invigorated in fewer hours.

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"The generator is easy to operate and may be connected to a simple electric outlet. It should be turned on for a minute so the tubes develop an operating temperature. While the tubes are warming up, the patient is placed on a comfortable couch. The low-frequency current is turned on, sending electrical impulses to the base of the brain, the cerebellum and the medulla. The pulsations lead to an inhibitory process.

"The patient should not experience any discomfort. Gradually, he senses an increasingly heavy feeling of the eyelids and a slight feeling of dizziness. Finally, the patient falls into a deep, restful sleep."


Dr. Obrosow

It generally takes less than ten minutes for the patient to fall asleep once the treatment begins, Dr. Obrosow says. All his findings indicate electrosone sleep is superior to sleep induced by drugs or anaesthesia, and is more restful and produces no ill effects.

Physicians using the electrosone say their patients have pleasant dreams, when they happen to remember them at all. And a two-hour treatment with the electrosone leaves the user fully refreshed and invigorated, just as he would be after a full night of natural sleep!

Russian physicians report using the automatic sleep machine to treat high blood pressure, schizophrenia, insomnia and other psychiatric disorders. They also say the electrosone will ease the pain of many other dread diseases.

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Sleep treatment

The late Ivan P. Pavlov, Russia's Nobel Prize-winning physiologist, first theorized that it was possible to obtain sleep with a weak external stimulus that would be rhythmic, monotonous and of long duration. A pulsating current was one such stimulus. Pavlov's work provided the basis for the wide use of sleep treatment in recent years in the Soviet Union. In 1935, he reported successfully treating a case of catatonic schizophrenia with non-electric sleep therapy. This initiated more experimentation. The electrosone now being used all over Russia was invented in 1951 by the late Dr. V. A. Gilyarovski, first to use machine-induced sleep on mental patients.

Russian physicians reported encouraging results treating other nervous diseases. Spastics, they say, often improve after a series of about 12 to 16 treatments with the sleep machine.

Dr. N. M. Liventzev gave me more details of the elec- —continued on page 8

trosone. He said patients must be in a relatively calm state and, when treating nervous disorders, organically healthy. Dr. Liventzev told me that after several electrosone treatments some patients often are able to fall into the same deep, restful sleep without the current being turned on.

Dr. Liventzev

This, Dr. Obrosow pointed out, proves Pavlov's conditioned-reflex theories. In the Soviet Union all nervous disorders are treated on the basis of Pavlov's work. In the United States, Sigmund Freud's work is usually basic.

Obrosow and Liventzev have had noteworthy success using the electrosone to treat hypertension — high blood pressure. In one clinic a third of the beds were devoted to treating hypertensives. One sleep machine can administer to four patients simultaneously. Six were used in all.

Hope for hypertensives

They recorded the results of electro-sleep on 300 hypertensives. With labile hypertensives, patients whose blood pressure varies from normal to high, the electrosone was an unbelievable 100 per cent effective. In stabile diastolic hypertensives, patients whose blood pressure remains consistently high (too much peripheral resistance of the blood vessels in the kidneys and extremities,) the machine was said to be 70 to 80 per cent effective. It did not work at all with organically ill hypertensives.

I discussed with Dr. Liventzev the electrosone's effect on one hypertensive, a 29-year-old male. The patient's blood pressure registered 170/110. Normal blood pressure for a man that age is about 135-110/90-70. After four months of electrosone treatment his reading improved to 140/86.

Electro-sleep treatment to hypertensives is given six days a week for 20 minutes. After two weeks, treatment is increased to 40 minutes. Many hypertensives are treated for several weeks in hospitals and later shifted to out-patient status. Then treatment is every third or fourth day.

World-wide electrosone use

The Soviet doctors told me they are also experimenting with the electrosone to treat insomnia, hallucinations, ulcers, bronchial asthma and encephalitis. Russian medical journals show they also are trying to treat pancreatitis, rheumatism, eczema, burns, tuberculosis and toxemia of pregnancy.

Personally, I think the Soviets are overenthusiastic. But use of the electrosone is spreading. Japanese manufacturers have a transistorized model, which, claim the Russians, "isn't very good." Physicians in France, Italy, Czechoslovakia and Germany are experimenting with the electrosone.

As we learn more about how the machine affects the mind and the body, we may expect to find further applications for it. When tests now underway in the U.S. and all over the world are completed, we will know just how accurate and important the Russians' claims are.

—THE END

Dr. Nakamats' Amazing Chair

Gives 8 hours sleep in 60 minutes

Text by Joe Cempa

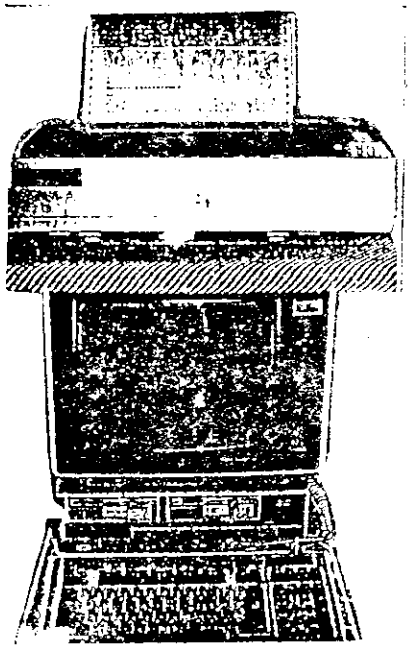
Japanese inventor Dr. Yoshiro Nakamats has designed an astounding computerized chair that's sure to bring a smile to any traveller whose been a victim of jet-lag. Using a series of programmed software images and ultra-high frequency electronic pulses that activate alpha brain waves — which increase blood flow to the head — the chair can give a full nights rest in one hour.

"We have found that by using the chair if a man or woman needs eight hours of sleep to recover from fatigue, they will recover in only one hour. One hour of its use equals eight full normal sleep hours!" says the inventor of the computer-age chair.

Dr. Nakamats invented the "human performance enhancing robot" because he needed a way to relax and refresh his body and mind to keep in top condition. "Therefore, for my own purposes I invented the Cere-brex robot chair after 18 years of research and development," adds Dr. Nakamats.

The name "Cere-brex" is derived from Cerebral and Excellent. "Excellent cerebral conditioning! My chair was tested in a variety of ways with over 600 people of all age groups. It's effectiveness was confirmed."

The chair's computer centre constantly adjusts to suit the users requirements.



Dr. Nakamats incredible career as an inventor began when he was five-years-old. His first patent for a "Non-Fuel Heating" device was awarded when he was in eighth grade. Since then he's come up with a total of 2,360 patented inventions. American inventor Thomas Edison had but 1,093.

Dr. Nakamats has won the prestigeous grand prize at the Worldwide Inventors Exposition in New York City five years in a row. In 1986 he won again with the Cerebrex chair.

The Cerebrex robot chair will eliminate fatigue, improve eyesight, increase performance, improve memory, improve the senses and relieve the problem of jet-lag, says Dr. Nakamats.

"The Cerebrex is the first application of human and robot combined in one body. In the past robots have been used for such things as welding or painting in factories; replacing manual labor. My invention is not an old-fashioned robot, it is a third-generation robot. It is for people who must use their brains alot. It will increase performance in all the

senses. Taste, eyesight, hearing and so on.

Dr. Nakamats worked for years in his Tokyo laboratory until he came up with the calculated combination of computer images, ultra-high frequency electronic pulses which flow through the chair's head and foot rests, and a supply of oxygen and nitrogen fed to the user as they sit in the chair.

Dr. Nakamats explains how this miraculous transformation occurs saying; "The equipment is basically two components: a computer part and a human activating part. A person sits inside the chair and there is equipment to improve his or her performance. Then, the robot will ask the person to select a 20 minute or 60 minute sleep mode. After the testing period the person will sleep in the human activating position for the time selected.

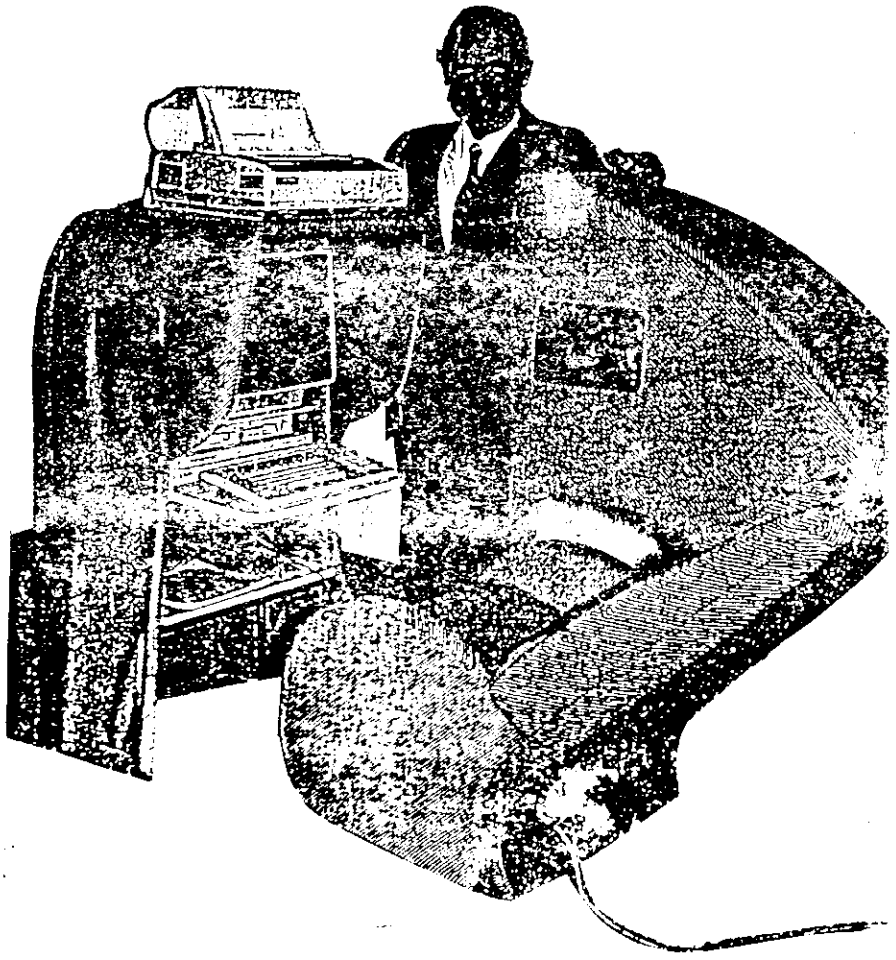
"After the 20 or 60 minutes the robot will ask the person to 'wake up!' Then the robot will give the person another testing program. The robot chair then calculates the answers before the sleep period, and the second group of solutions after the sleep period. The robot can now confirm how the performance has increased. Our past experiments with people using the Cerebrex confirm human performance increased more than an average of 40 percent! In a very short time. As little as 20 minutes.

"There are many, many applications of the robot chair. Such as: when one feels jet-lag after long plane flights it usually takes two or three days to fully recover. I use the Cerebrex to recover from such jet-lag! It is very effective, and there are no problems."

Bruce Williams, a New York electro-static engineer and owner of Trek Inc., a manufacturer and research and design company has experienced the futuristic device. Also an inventor, Williams met Dr. Nakamats at a Japanese convention and admits he originally questioned the validity of the "robot chair".

"I had the opportunity to meet Dr. Nakamats in Japan and at the time he described the chair to me. My first reaction was one of skepticism! It just didn't sound possible!" Williams declared.

"It really works! I tried the Cerebrex and found there was in fact increased brain activity. Part of the chair is a complete testing of memory. I found on all the tests, that through the use of the chair I improved 180 percent! In memory and speed of calculation. I was very impressed. At that time I knew it worked!" said Williams.



An independent testing lab showed there is a definite affect on blood gases and chemicals the brain produces, that's what seems to make the instrument work. I'd take advantage of it. It does work! Williams adds.

Dr. Nakamats feels that businesses using his chair could outperform and advance above their competition by generating a more productive employee.

"If a corporation has a group of 10 executives who have the ability to perform with an out put of say three — on a scale of one through ten — if they expand their capability by the use of the chair to six, they have an increase of 100 percent!

Then the company will be paying ten people to produce the equivalent working power of twenty people. The company can use the chair as a 'secret weapon' to expand and strengthen their productivity. Thereby outpacing the competition!" said Dr. Nakamats.

"Mental fatigue is very difficult to remove," he adds. "The Cerebrex robot is the only machine in the world to remove such fatigue and stress. I have established an area in Tokyo called Oyasumizokoro. Several Cerebrex chairs have been installed. It's a place of rest for busy executives, designers and engineers where-they may visit for a short time and remove all fatigue, headache, eliminate eyestrain and totally refresh themselves! It is not unlike a health club; only it's a 'health club' for the brain!"

The doctor's rejuvinating throne can be leased in Japan for 14,800 yen (US 94,00) a month. It is soon to be available in the United States.