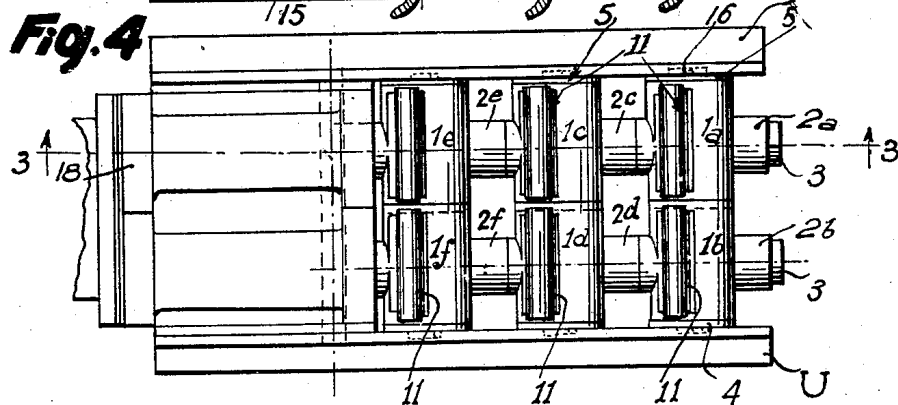
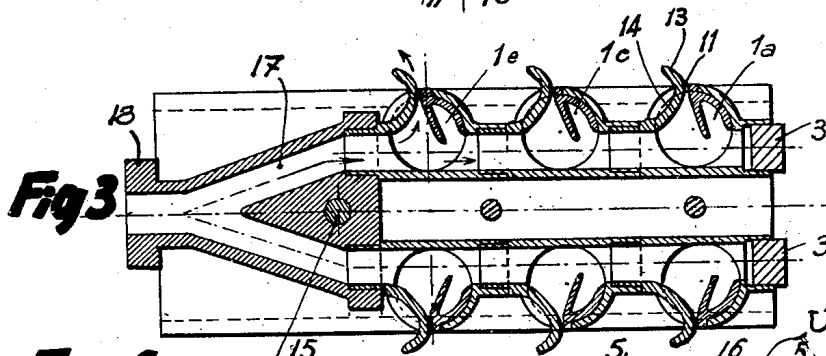
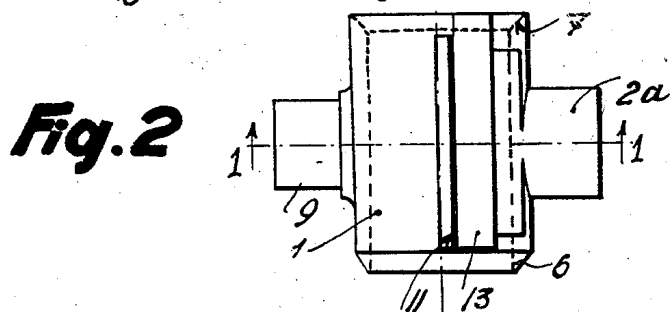
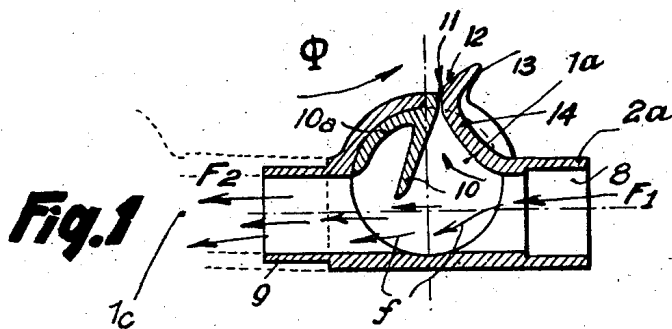


Sept. 19, 1939.

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SILENCER FOR ENGINES

2,173,549

Filed May 1, 1937



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2,173,549

SILENCER FOR ENGINES

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Application May 1, 1937, Serial No. 140,116
In France June 12, 1936

10 Claims. (Cl. 181-60)

It is known, in particular from my prior Patent No. 2,052,869, dated September 1, 1936, that a stream of fluid under pressure escaping into the atmosphere through a narrow slot only one lip of which prolonged in such manner as to deviate gradually from the axis of said slot flows along said prolonged lip and consequently creates a suction in the direction thereof.

The present invention relates to silencers or mufflers based upon this principle, that is to say of the type including at least one partial expansion chamber opening into the atmosphere through at least one slot made as above described.

The object of the present invention is to provide a silencer of this type which is better adapted to meet the requirements of practice than similar silencers made up to this time, both from the point of view of its operation and from that of its construction and assembly.

According to an essential feature of the present invention, each partial expansion chamber is provided with a deflector along the outlet slot thereof, this deflector being arranged in such manner that the exhaust gases fed to the first partial expansion chamber, and which have not escaped directly through the outlet slot or slots of said chamber, flow on to the next partial expansion chamber, where they escape at least partly to the atmosphere through the slot or slots of said chamber, and so on, until, practically, in the last chamber, there is no flow of exhaust gases, the respective deflectors of the various chambers preventing backward flow of any portion of the gases which would interfere with the smooth running of the gases through the silencer.

A particular object of the invention is to provide an arrangement of these deflectors which does not unduly restrict the section of flow of the mass of gases through the silencer.

For this purpose, according to another feature of the invention, whereas the exhaust gases are fed to the partial expansion chambers through conduits extending in the general direction of flow of said gases, the partial expansion chambers are in the form of cylindrical elements extending at right angles to this direction and of a diameter substantially greater than that of said conduits (advantageously twice this diameter). As the deflectors extend from the periphery of said expansion chambers toward the inside thereof but only to a limited distance, the part of the system opposed to the deflectors remains unobstructed and affords a sufficient passage for the smooth flowing of the gases.

According to another feature of the present in-

vention, the silencer is constituted by a series of elements, all of the same shape, adapted to be juxtaposed together, and each of these elements consists of a main cylindrical part, corresponding to the partial expansion chamber, carrying two cylindrical extensions, integral therewith, corresponding to the feed conduit, these extensions being part of a cylindrical surface at right angles to the cylinder forming the expansion chamber and tangential thereto on the side opposed to the exhaust slot.

Each of the large diameter cylinders, corresponding to a partial expansion chamber, is provided with a narrow slot, connecting the inside thereof with the atmosphere, advantageously disposed along the generatrix of the cylinder, the deflector being located along the inner lip of said slot.

As a consequence of the cylindrical shape of the expansion chambers, there is left, between the deflector of each of them and the outer wall of the expansion chamber, an empty space in which accumulate the exhaust gases which, for some reason, after having failed to escape through the slot, would tend to flow backward toward said slot, so that these gases do not interfere with the flow of the remainder of the exhaust gases.

According to still another feature of the present invention, the prolonged lip of the exhaust slot of each expansion chamber is integral with a curved piece forming a portion of the cylindrical wall of the expansion chamber.

According to still another feature of the present invention, the deflector provided in each expansion chamber consists of a piece, of V-shaped longitudinal section, fitting inside the cylindrical expansion chamber in question, so that, one of the branches of the V is the section of a portion of said piece applied against the inner wall of the expansion chamber, whereas the other branch corresponds to the deflector proper.

According to still another feature of the present invention, each silencer element is provided with faces adapted to fit in, or on, corresponding faces of another silencer element, whereby all these silencer elements can be fitted together accurately and without special difficulty.

Other features of the present invention will result from the following detailed description of some specific embodiments thereof.

Preferred embodiments of the present invention will be hereinafter described, with reference to the accompanying drawing, given merely by way of example, and in which:

Fig. 1 is a longitudinal section through one

element of the silencer, taken on line I—I in Fig. 2, and

Fig. 2 a top view of the same element, and

Fig. 3 is a longitudinal section taken on line III—III in Fig. 4, through a complete silencer comprising a certain number of elements such as shown in Figs. 1 and 2, while

Fig. 4 is a top view of the same complete silencer.

Throughout the views the same references indicate the same or corresponding parts.

As shown by Figs. 3 and 4, the silencer elements are preferably assembled between two channel irons U, by means of which the assembled unit can be mounted upon the body of a vehicle. A series of cylinders 1a, 1b, 1c, 1d, 1e, 1f, etc. fitting in each other are assembled between said channel irons in such manner that cylinder 1a fits into cylinder 1b, cylinder 1c into cylinder 1d, and so forth. Cylinders 2a, 2b, 2c, 2d, 2e, 2f, etc. also fit in each other so as to form two series extending in a direction parallel to the flow of the gases. The last cylinder of each series 2a, 2c, 2e, etc., and 2b, 2d, 2f, etc. is closed by a plug 3, and each of the lateral openings of cylinders 1a, 1b, etc. is likewise closed by a washer or plug 4 or 5 respectively so that the exhaust gases will be caused to flow through narrow slots 11 provided in the walls of the cylinders 1a, 1b, 1c, etc., said slots being preferably arranged along a generatrix either at the top or at the bottom according to the disposition of said cylinders with respect to the silencer unit. Figs. 1 and 2 show the details of an element cast in one piece including one cylinder 1a and one cylinder 2a. Cylinder 1 is provided with a truncated portion 6 adapted to fit in a corresponding portion 7 provided in the adjoining cylinder. Cylinder 2a comprises a recess or female portion 8, into which fits the corresponding male portion 9 of the adjoining cylindrical element. Cylinder 1a forms a partial expansion chamber into which the gases from cylinder 2a penetrate, flowing in the direction of arrow F₁. The wall of cylinder 1a includes a part 14 and a deflector 10 leaving between these parts a very narrow slot 11 lip 12 of which extends outwardly at 13. The deflector 10 is preferably of V-shaped longitudinal section having one circular branch 10a extending tangentially to cylinder 1a along one fourth of the circumference thereof, and one branch penetrating into said cylinder and extending beyond the outer generatrix of cylinder 2a.

The gases arriving in the direction of arrow F₁ flow partly along the path indicated by arrow f and, instead of remaining within the chamber formed by cylinder 1a, keep flowing toward chamber 1c formed by the next cylinder and so forth, thereby expanding more and more. The top layer of the gases arriving through tube 2a into cylinder 1a passes along part 14 and, flowing along lip 12 of embossment 13, escapes into the atmosphere through slot 11 according to the principle described in Patent No. 2,052,869 of September 1st, 1936, for Device for deflecting a stream of elastic fluid projected into an elastic fluid.

The surrounding air arriving in the direction of arrow ϕ is thus drawn into the zone along part 13 and increases the suction effect created by the expansion of the layer escaping in increased volume through slot 11.

The gases which have flown in the direction indicated by f, i. e. those which have not escaped through slot 11 and which, due to the resistance

offered by the layers of air contained in tube 2, would have a tendency to flow back rearwardly, will, upon such rearward movement, strike said reflector so that they are deflected in the direction indicated by arrow F₂ under the suction effort exerted by the layers of gases flowing in this direction.

The various tubes formed by the assembly of several cylinders 2 are rigidly secured in place by means of nipples or fingers 16 carried by washers 4 and 5. The exhaust gases arrive into the first small cylinder 2 through a suitably shaped socket 17 arranged to fit upon the ends thereof; the outer end of socket 17 is provided with a flange 18 by means of which the silencer unit can be connected to the exhaust of the motor; as already stated slot 11 preferably extends in a parallel direction to the generatrix of cylinders 1.

It should be understood that the preferred embodiment of the invention as shown and described could undergo many modifications without departing from the spirit or scope of said invention, this more particularly as regards the means for interconnecting the respective silencer elements, the means for closing up the free ends of the cylinders, as well as the means for connecting elements 1a, 2a, to the adjoining elements 1b, 2b such as by means of flanges recesses, of any desired type, wedges or the like.

What is regarded as new and desired to secure by Letters Patent is:

1. In a silencer for the exhaust from a motor into the atmosphere, a series of adjacent elements of identical shape, such element forming two cylinders of different diameters disposed tangentially and perpendicularly to each other, means feeding the burnt gases to said elements, and an exhaust opening provided in the wall of one of said cylinders.

2. In a silencer for the exhaust from a motor, a series of identically shaped adjacent interconnected elements each element forming a whole comprising two cylinders disposed tangentially and perpendicularly to each other, the diameter of one of said cylinders being substantially greater than of the other cylinder, a socket connecting the assembled unit of said elements to the exhaust port of the engine, a narrow slot provided in the wall of the larger cylinder and a flap protruding outside the cylinder wall and extending rearwardly in regard of the direction of flow in the smaller cylinder.

3. In a silencer for the exhaust from a motor, a series of identically shaped adjacent interconnected elements each element forming a whole comprising two cylinders disposed tangentially and perpendicularly to each other, the diameter of one of said cylinders being substantially greater than of the other cylinder, a socket connecting the assembled unit of said elements to the exhaust port of the engine, an embossment provided upon the inner wall of the larger cylinder, a narrow slot in the wall of the larger cylinder adjoining said embossment, and a flap protruding outside the cylinder wall and extending rearwardly in regard of the direction of flow, in the smaller cylinder.

4. In a silencer for the exhaust from a motor, the combination of a series of identically shaped adjacent interconnected elements each element forming a whole comprising two cylinders disposed tangentially and perpendicularly to each other, the diameter of one of said cylinders being substantially greater than of the other cylinder, a socket connecting the assembled unit of said

elements, to the exhaust port of the engine, an embossment provided upon the inner wall of the larger cylinder, a narrow slot in the wall of the larger cylinder adjoining said embossment, and a flap protruding outside the cylinder wall and extending rearwardly in regard of the direction of flow, in the smaller cylinder, with means directing the burnt gases arriving from the smaller cylinder partly towards said narrow slots and partly towards the other end of the smaller cylinder.

5. In a silencer for the exhaust from a motor the combination of a series of identically shaped adjacent interconnected elements each element forming a whole comprising two cylinders disposed tangentially and perpendicularly to each other, the diameter of one of said cylinders being substantially greater than of the other cylinder, a socket connecting the assembled unit of said elements, to the exhaust port of the engine, an embossment provided upon the inner wall of the larger cylinder, a narrow slot in the wall of the larger cylinder adjoining said embossment, and a flap protruding outside the cylinder wall and extending rearwardly in regard of the direction of flow, in the smaller cylinder, with means directing the burnt gases arriving from the smaller cylinder partly towards said narrow slots and partly towards the other end of the smaller cylinder, and means preventing the return of the burnt gases from one expansion chamber into the preceding one.

6. In a silencer for the exhaust from a motor, a series of identically shaped adjacent interconnected elements each element forming a whole comprising two cylinders disposed tangentially and perpendicularly to each other, the diameter of one of said cylinders being substantially greater than of the other cylinder, a socket connecting the assembled unit of said elements to the exhaust port of the engine, an embossment provided upon the inner wall of the larger cylinder, a narrow slot in the wall of the larger cylinder adjoining said embossment, and a flap protruding outside the cylinder wall and extending rearwardly in regard of the direction of flow, in the smaller cylinder, and a deflector mounted within the larger cylinder partially confining the aforesaid exhaust slot.

7. A silencer for the exhaust of an engine which comprises, in combination, a series of partial expansion chambers extending behind one another, a feed conduit for the exhaust gases extending throughout said series of chambers, each of said chambers being provided with an exhaust slot opening into the atmosphere, an extension lying in an outward and rearward direction with respect to the path of the gases carried by the

outer rear lip of said slot, and a deflector carried by the inner front lip of each slot extending inwardly and frontwardly in said chamber.

8. A silencer for the exhaust of an engine which comprises, in combination, a series of partial expansion chambers extending behind one another, a feed conduit for the exhaust gases extending throughout said series of chambers, each of said chambers being of the shape of a cylinder of a diameter substantially greater than that of said conduit having its axis at right angles to said conduit, each of said chambers being provided with an exhaust slot opening into the atmosphere, an extension lying in an outward and rearward direction with respect to the direction of travel of the gases through said conduit carried by the outer rear lip of said slot, and a deflector lying in an inward and rear direction in each of said chambers carried by the inner front lip of each of said chambers.

9. A silencer for the exhaust of an engine which comprises, in combination, a series of partial expansion chambers extending behind one another, a feed conduit for the exhaust gases extending throughout said series of chambers, each of said chambers being of the shape of a cylinder of a diameter substantially greater than that of said conduit, having its axis at right angles to said conduit, each of said chambers being provided with an exhaust slot opening into the atmosphere, and parallel to the generatrices of said cylinder, an extension lying in an outward and rearward direction with respect to the direction of travel of the gases through said conduit carried by the rear outer lip of said slot, and a deflector lying in the inward and frontward direction in said chamber, carried by the inner front lip of each of said slots.

10. A silencer for the exhaust of an engine which comprises, in combination, a series of partial explosion chambers extending behind one another, a cylindrical feed conduit for the exhaust gases extending throughout said series of chambers, each of said chambers being of the shape of a cylinder of a diameter equal to twice that of said conduit, having its axis at right angles to said conduit, each of said chambers being provided with an exhaust slot opening into the atmosphere, and parallel to the generatrices of said chamber, an extension lying in an outward and rearward direction with respect to the direction of travel of the exhaust gases through said silencer carried by the external rear lip of said slot, and a deflector lying in the inward and frontward direction in said chamber, carried by the inner front lip of each of said slots.

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