

Feb. 2, 1954

G. W. GALLIHUGH
JET TORPEDO EXHAUST SILENCER OR MUFFLER
FOR INTERNAL-COMBUSTION ENGINES
Filed Oct. 18, 1951

2,667,940

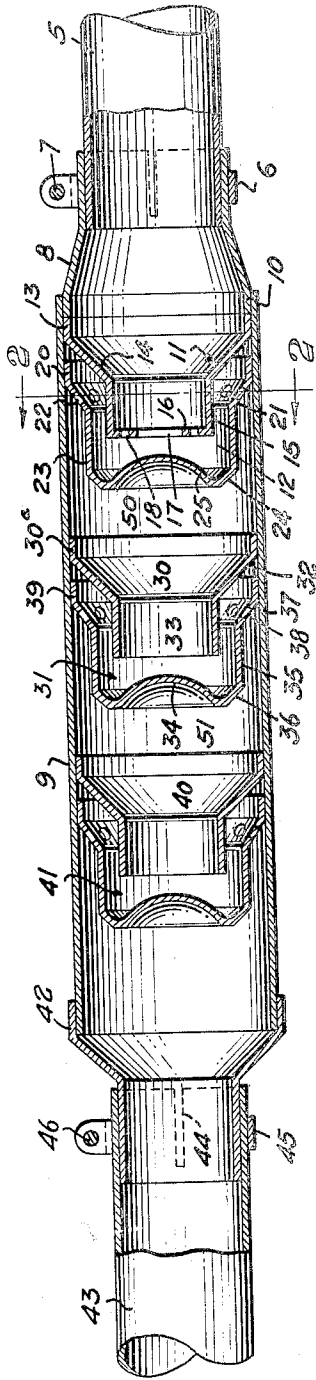


Fig. 1.

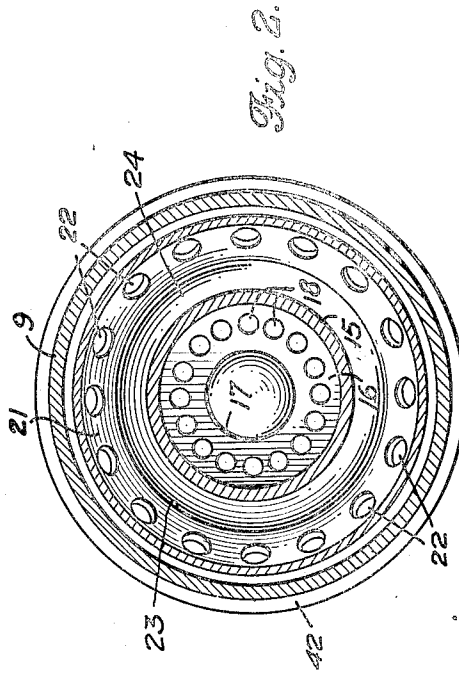


Fig. 2.

INVENTOR
Gordon W. Gallihugh
BY *Munson & Kane*
ATTORNEY

UNITED STATES PATENT OFFICE

2,667,940

JET TORPEDO EXHAUST SILENCER OR MUFFLER FOR INTERNAL-COMBUS- TION ENGINES

Gordon W. Gallihugh, Linden, Mich.

Application October 18, 1951, Serial No. 251,855

5 Claims. (Cl. 181-49)

1

This invention relates to jet torpedo exhaust silencers or mufflers for internal combustion engines.

Among other objects, the invention aims to provide a muffler which will obviate back pressure build-up such as might damage the muffler, only the necessary back pressure being created, thereby maintaining greater efficiency in motor operation.

The invention also provides an efficient silencer for a motor exhaust.

A further object is to provide silencing units which may be secured within a housing in any desired manner, spaced as preferred, to secure a maximum silencing effect for engines of different sizes and powers.

Other objects will be understood by those skilled in the art by referring to the following description and drawings accompanying and forming a part of this specification.

In the accompanying drawings a preferred embodiment of the invention—

Fig. 1 is a longitudinal sectional view of the muffler; and

Fig. 2 is a section on line 2-2 of Fig. 1 but on a larger scale.

Referring particularly to the drawings, my improved exhaust silencer or muffler is made of metal laminates or other suitable material and is designed to be clamped or otherwise secured on the end of an exhaust pipe 5 which carries the exhaust gases away from an internal combustion engine, not shown.

Secured by a clamping ring 6 and a bolt 7 to the outside of exhaust pipe 5 is an adapter 8 whose outer end is materially larger than the inner split, clamped end. Adapter 8 fits inside of a housing 9 which is preferably a straight tube having a diameter substantially larger than the diameter of the exhaust pipe, in some cases being about twice the size of the latter. Housing 9 may be secured by a suitable weld or in any other suitable manner to the enlarged end of the adapter, which is cylindrical, as indicated at 10, to give a suitably large contact area between the housing and the adapter.

Located between the outer end of the adapter 8 and the remote end of housing 9 are a plurality of muffling or silencing units. In the drawings, three of these units are shown, as in actual tests three units have been found to give good results without excessive back pressure. However, I do not wish to be limited to any particular number of units.

The first unit consists of a baffle funnel 11 and

2

a recoil cup 12 closely associated within the housing 9 near adapter 8. The baffle funnel 11 has a cylindrical portion 13 which snugly fits inside the housing and may be secured thereto by a suitable weld or any suitable manner so as to abut the end of adapter 8. Next to the cylindrical portion 13 is a frusto-conical well 14 which merges into a cylindrical wall 15 of reduced size, that is, cylindrical wall 15 is of less diameter than that of exhaust pipe 5 and may be only about two-thirds as large. The cylindrical wall 15 terminates in a perforate wall 16 whose plane is at right angles to the longitudinal axis of the housing. Wall 16 has a central round aperture 17 having a diameter about half that of the inside diameter of cylindrical wall 15; aperture 17 is in the center of the muffler housing so that it is concentric with the exhaust pipe 5. Surrounding aperture 17 are a circular series of perforations 18 of small size; however, the total area of these perforations exceeds the area of central aperture 17. Surrounding the cylindrical wall 15 and part of the frusto-conical wall 14 is the recoil cup 12, which also has a cylindrical portion 20 secured as by a suitable weld or any suitable manner to the interior of the muffler housing. Adjacent cylindrical portion 20 is a frusto-conical wall 21 having a circular series of perforations 22 whose total area equals or exceeds the total area of central aperture 17 plus perforations 18. Adjoining the frusto-conical wall 21 is a cylindrical wall 23 whose diameter is such that it lies about half way between the inner wall of the muffler housing and the outer wall of cylindrical wall 15. There is also a short frusto-conical wall 24 adjoining cylindrical wall 23, and a concavo-convex wall 25 is integral with frusto-conical wall 24 and presents a convex gas-deflecting surface to the central aperture 17, from which it is spaced a short distance.

The second unit is also secured within the muffler housing and is spaced a suitable distance from the first unit. In the drawings, the second unit is shown about half way between the ends of the housing, but other relative positions of the parts are possible. The second unit also consists of a baffle funnel, designated generally by the reference numeral 30, and a recoil cup 31 which preferably is identical with recoil cup 12. Baffle funnel 30 includes a short cylindrical portion 30^a by which it may be attached to the muffler housing by a suitable weld or any suitable manner, a frusto-conical wall 32 adjoining cylindrical portion 30^a, and a cylindrical wall

33 projecting from the smaller end of frusto-conical wall 32. Cylindrical wall 33 is preferably of the same dimensions as cylindrical wall 15 of the first unit, and its position relative to recoil cup 31 is substantially the same as the position of cylindrical wall 15 relative to recoil cup 12. However, cylindrical wall 33 does not merge into a perforate wall at right angles to the axis of the housing but instead is entirely open for free passage of the gases and their impingement against the convex wall 34 of recoil cup 31. A cylindrical wall 35, which is part of recoil cup 31, partly surrounds cylindrical wall 33 and merges into a suitable frusto-conical wall 36 which in turn merges into convex wall 34. Another suitable frusto-conical wall 37 having perforations 38 in a circular series adjoins cylindrical wall 35 and at its larger end merges into a short cylindrical wall 39 for attachment of the recoil cup 31 by a suitable weld or any suitable manner to the housing.

The third unit (and any additional units) are each like the described second unit, each including a baffle funnel 40 and a recoil cup 41. As shown, the third unit is spaced about two-thirds of the length of the housing tube from the adapter-supported end, but it may be otherwise located. The outer end of the housing supports another adapter 42, and an exhaust tube 43 is split as indicated at 44 and is clamped by a clamping ring 45 and bolt 46 to the reduced end of the adapter 42 secured to housing 9 by a suitable weld at the large end of adapter 42. Exhaust tube 43 is conventional and is only partly shown. It is preferably of any suitable diameter as exhaust pipe 5 and is axially aligned therewith.

When exhaust gases are discharged from exhaust pipe 5 they first expand in adapter 3 and the adjacent end of baffle funnel 11 and then are compressed somewhat and have their velocity raised as they pass through reduced cylindrical portion 15. Then, striking perforate wall 16, the gases are broken up into a plurality of swirling currents and flow out through the central aperture or orifice 17 and the circular series of perforations 18 as small jets. These jets all strike the convex wall 25 and are deflected and permitted to expand and lose velocity until they reach the circular series of perforations 22. The total area of these perforations and their position permit the gases to flow with lessened violence through the chamber or space 50 in the housing between the first and second units. When the gases reach the second unit they will flow through the cylinder presented by the wall 33 and out through the open end against convex wall 34 of recoil cup 31. Convex wall 34 reverses the flow of the gases and the recoil cup 31 permits the reversely flowing gases to expand and lose velocity. Then the gases flow quietly out through the circular series of perforations 38 and into chamber 51 between the second and third units. On reaching the third unit the flow is exactly the same as when reaching the second unit. Beyond the third unit the gases flow through the muffler housing, thence through the exhaust tube 43.

Applicant is not wedded to any particular theory of operation of the muffler described herein, but it is known from observation and experimentation that the muffler silences the exhaust of an engine to a remarkable degree without excessive back pressure.

All joints of adapters 10 and 42 and all units 13, 20, 30^a and 39 contacting housing tube 9 are

to be secured by a suitable weld or any suitable manner to housing tube 9.

Baffle funnel 11 is not to be confined to No. 1 unit but may be used on any and all units if desired, to accomplish the required results if needed.

Baffle funnel with reference numeral 30 and formerly described differs as having full opening and may not be confined to any one unit but may be used on any and all units such as the requirements may be, both baffle funnel 11 and baffle funnel 30 being used in conjunction with recoil cups as formerly described.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An exhaust silencer or muffler, comprising in combination, a housing, and a plurality of units within the housing secured to the walls thereof, each unit consisting of a baffle funnel and a recoil cup; each baffle funnel consisting of a hollow member having a gas receiving end which is about as large as the inside of the housing and a gas discharging end which is of reduced dimensions; each recoil cup being spaced from the baffle funnel lengthwise of the housing and also surrounding the part of the baffle funnel which is of reduced dimensions; each recoil cup having a wall which receives the gases discharged from the baffle funnel of the unit and deflects said gases outwardly; the aforementioned wall of each recoil cup being convex and directly in front of the gas discharging end of said hollow member and a circular series of openings provided in the said wall of the recoil cup near its portion of greatest lateral dimensions for discharge of said deflected gases.

2. An exhaust silencer or muffler comprising, in combination, a housing, and a plurality of units within the housing secured to the walls thereof, each unit consisting of a baffle funnel and a recoil cup; each baffle funnel consisting of a hollow member having a gas-receiving end which is about as large as the inside of the housing and a gas-discharging end which is of reduced dimensions; each recoil cup being spaced from the baffle funnel lengthwise of the housing and also surrounding the part of the baffle funnel which is of reduced dimensions; each recoil cup having a wall which receives the gases discharged from the baffle funnel of the unit and deflects said gases outwardly; each recoil cup having openings near its portion of greatest lateral dimensions for discharge of said deflected gases; said housing being tubular, each baffle funnel having a frusto-conical wall extending from the portion which is secured to the housing forwardly or in the direction of flow of the gases, with the smaller end of the frusto-conical wall located forwardly, the baffle funnel also having an opening of relatively large size provided by a cylindrical extension on the smaller end of the frusto-conical wall; the recoil cup having a convex wall directly in front of said opening of relatively large size, and also having a circular series of openings adjacent the area where said recoil cup is secured to the housing.

3. An exhaust silencer or muffler comprising, in combination, a housing; and a plurality of units within the housing and secured to the walls thereof; each unit consisting of a baffle funnel and a recoil cup; the baffle funnel nearest the engine having a frusto-conical wall adjoining the portion which is secured to said housing, with the smaller end of the frusto-conical wall located forwardly or in the direction of flow of the gases; a cylindrical wall joining the forward end of

5

said frusto-conical wall; said cylindrical wall terminating in a perforate wall whose plane is at right angles to the longitudinal axis of the housing; the recoil cup being located near said perforate wall and being so constructed and arranged as to receive gases discharged through said perforate wall and reverse the flow thereof; said recoil cup having perforations near its portion of largest lateral dimensions for discharge of the gases after such reverse flow; the second unit within the housing being spaced from the first unit and being in all respects similar to the first unit except that the baffle funnel of the second unit has a wide opening at the forward end of said cylindrical wall.

4. An exhaust silencer or muffler comprising, in combination, a housing; and a plurality of units within the housing and secured to the walls thereof; each unit consisting of a baffle funnel and a recoil cup; the baffle funnel nearest the engine having a frusto-conical wall adjoining the portion which is secured to said housing, with the smaller end of the frusto-conical wall located forwardly or in the direction of flow of the gases; a cylindrical wall joining the forward end of said frusto-conical wall; said cylindrical wall terminating in a perforate wall whose plane is at right angles to the longitudinal axis of the housing; the recoil cup being located near said perforate wall and being so constructed and arranged as to receive gases discharged through said perforate wall and reverse the flow thereof; said recoil cup having perforation near its portion of largest lateral dimensions for discharge of the gases after such reverse flow; the second unit within the housing being spaced from the first unit and being in all respects similar to the first unit except that the baffle funnel of the second unit has a wide opening at the forward end of said cylindrical wall; each aforementioned recoil cup having a centrally disposed convex wall axially aligned with and slightly spaced from the discharge opening in the baffle funnel, and each aforementioned recoil cup further having walls connecting said convex wall and the portion which is fixed to the housing; said last mentioned walls partly surrounding the cylindrical wall of the baffle funnel of the unit.

5. An exhaust silencer or muffler comprising,

6

in combination, a housing; and a plurality of units within the housing and secured to the walls thereof; each unit consisting of a baffle funnel and a recoil cup; the baffle funnel nearest the engine having a frusto-conical wall adjoining the portion which is secured to said housing, with the smaller end of the frusto-conical wall located forwardly or in the direction of flow of the gases; a cylindrical wall joining the forward end of said frusto-conical wall; said cylindrical wall terminating in a perforate wall whose plane is at right angles to the longitudinal axis of the housing; the recoil cup being located near said perforate wall and being so constructed and arranged as to receive gases discharged through said perforate wall and reverse the flow thereof; said recoil cup having perforations near its portion of largest lateral dimensions for discharge of the gases after such reverse flow; the second unit within the housing being spaced from the first unit and being in all respects similar to the first unit except that the baffle funnel of the second unit has a wide opening at the forward end of said cylindrical wall; each aforementioned recoil cup having a centrally disposed convex wall which is directly in line with the discharge opening in the baffle funnel of the unit, each aforementioned recoil cup further having a cylindrical wall partly surrounding the cylindrical wall of the baffle funnel of the unit and being spaced about half way between the inner walls of the housing and the cylindrical wall of said baffle funnel, the perforations in each aforementioned recoil cup being arranged in a circular series and being to the rear of the cylindrical wall of the aforementioned recoil cup.

GORDON W. GALLIHUGH.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
737,443	Mooers	Aug. 25, 1903
1,866,004	Beamer	Dec. 29, 1928

FOREIGN PATENTS

Number	Country	Date
58,655	Netherlands	Dec. 16, 1946
149,510	Great Britain	Aug. 19, 1920
379,458	Great Britain	Sept. 1, 1932