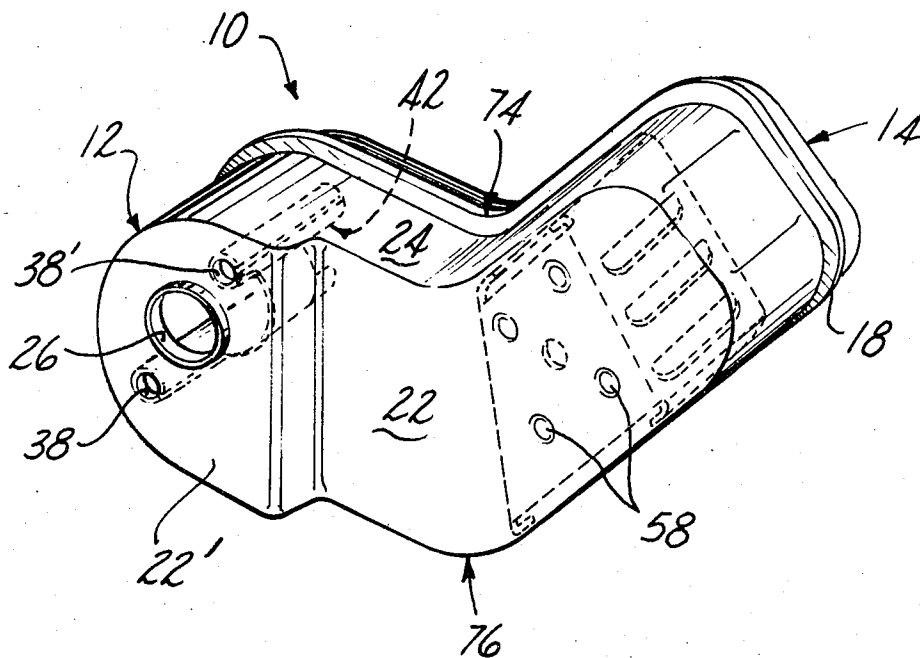
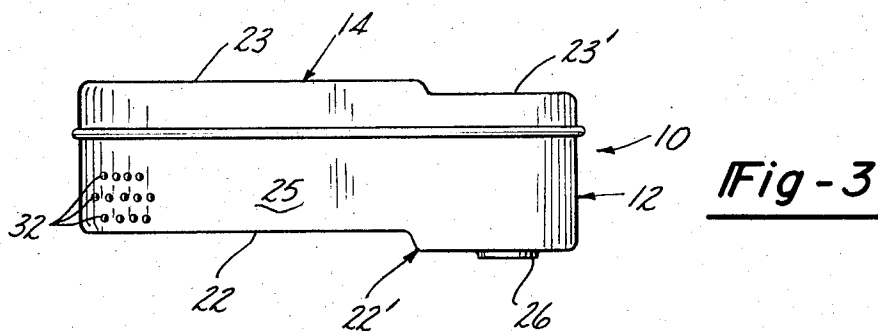
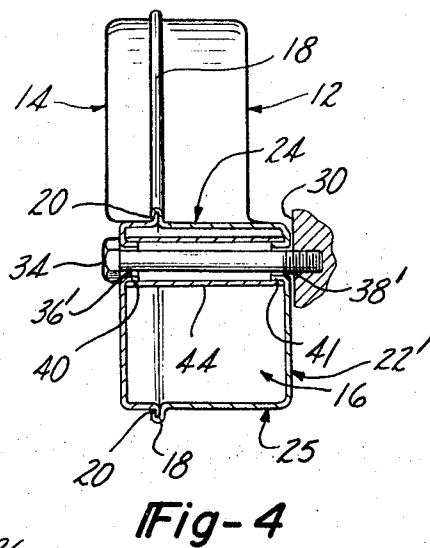
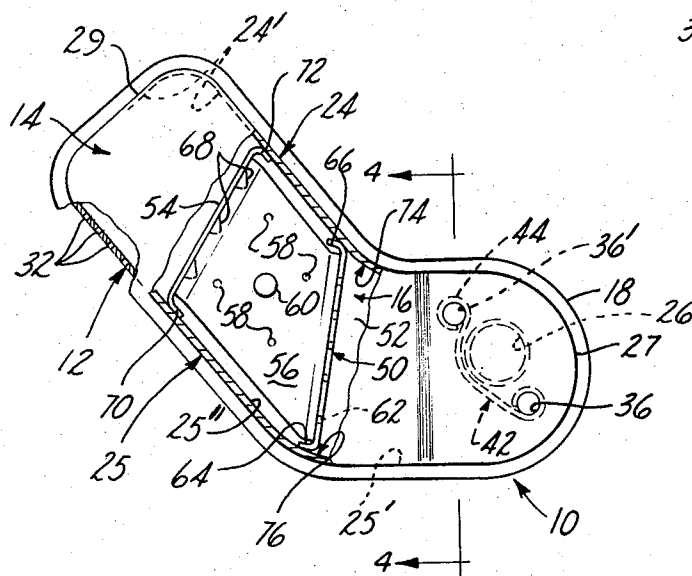
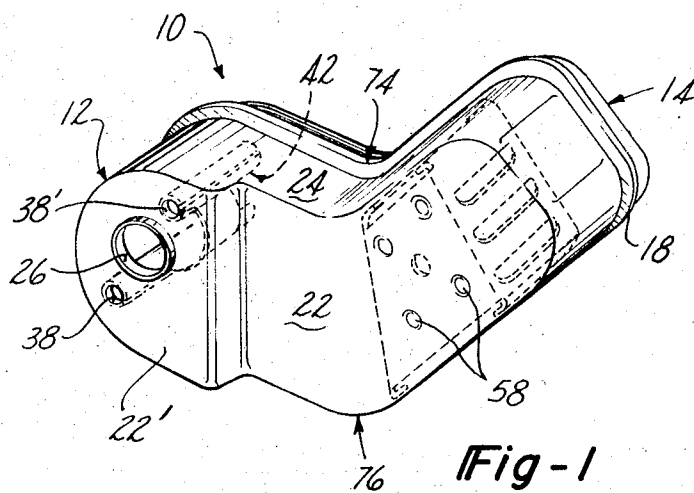
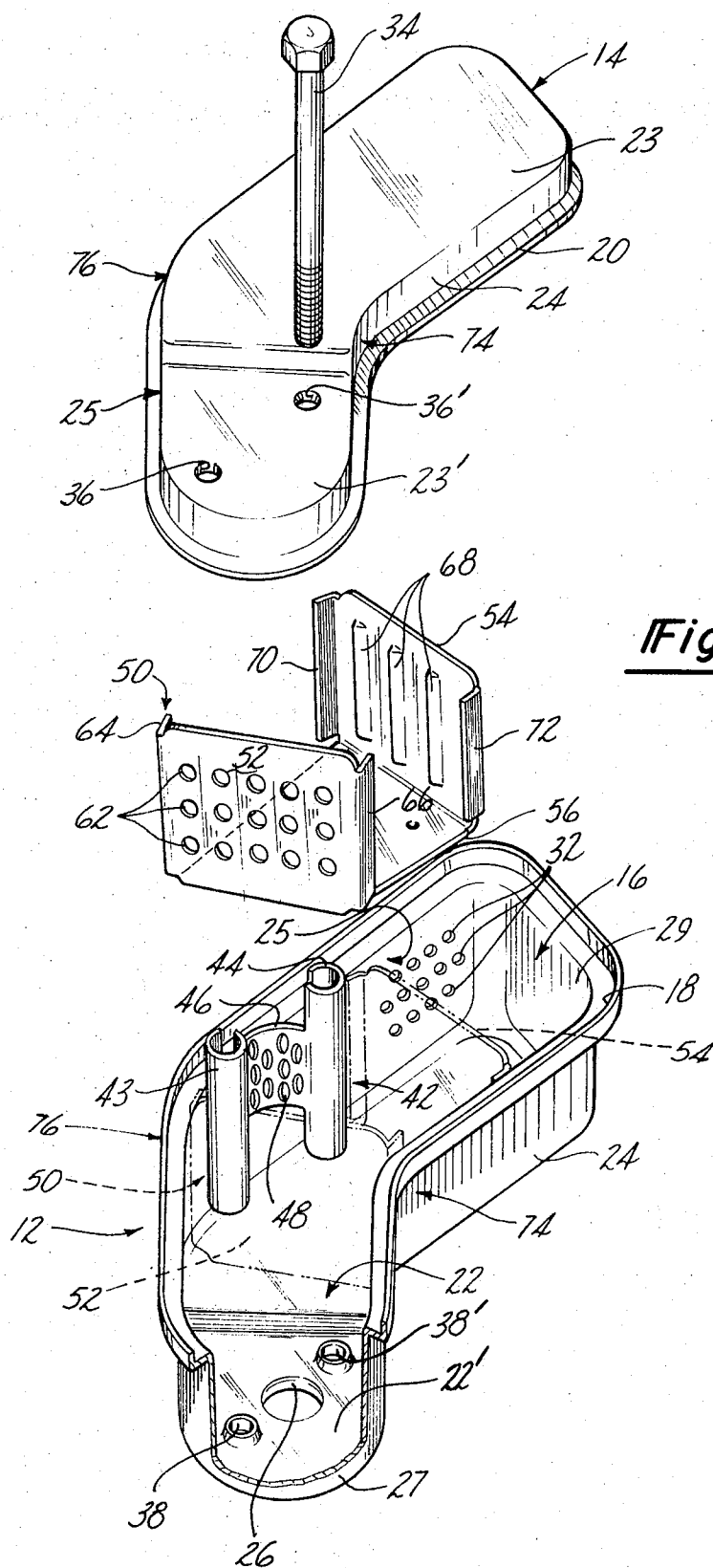








MUFFLER FOR INTERNAL COMBUSTION ENGINES

This is a continuation of application Ser. No. 300,842, filed Oct. 25, 1972 and entitled "Muffler".

DESCRIPTION

This invention relates to mufflers for internal combustion engines and more particularly to mufflers for small engines such as are commonly used on lawn mowers, snow blowers, garden tractors and the like.

Objects of this invention are to provide a muffler for small engines which has improved sound attenuating characteristics, reduced back pressure, simplicity of design with few component parts, and which is of economical manufacture and assembly.

These and other objects, features and advantages of this invention will become apparent from the following detailed description, appended claims and accompanying drawings in which:

FIG. 1 is an isometric view of a muffler embodying this invention.

FIG. 2 is a plan view of the muffler of FIG. 1, with portions broken away to illustrate the location of a baffle member in the muffler chamber.

FIG. 3 is a side elevational view of the muffler of FIG. 1.

FIG. 4 is a vertical sectional view on line 4—4 of FIG. 2 showing the muffler mounted on an engine (indicated only fragmentarily).

FIG. 5 is an exploded isometric view of the component parts of the muffler of FIG. 1 prior to assembly.

Referring to the drawings, FIGS. 1 through 4 illustrate an exemplary but preferred form of a muffler 10 embodying this invention having a body 12 with a matching cover 14 in the nature of two half shells sealed together to provide an enclosed muffler chamber 16. The marginal edges of body 12 and cover 14 extending around the mutually facing open ends thereof terminate in flanges 18 and 20 (FIG. 4) respectively which are crimped together to retain and seal the cover to the body. Body 12 and cover 14 are each preferably a one-piece stamping having a tub-like shape, body 12 defining a bottom wall 22, cover 14 a top wall 23 of muffler 10, the sides of body 12 and cover 14 mutually defining parallel side walls 24 and 25 of muffler 10 which extend longitudinally thereof and terminate in end walls 27 and 29. An exhaust inlet is provided adjacent the curved end wall 27 of chamber 16 by a flanged opening 26 located in an offset portion 22' of bottom wall 22. Offset portion 22' is adapted for sealing engagement with a mating surface on a block 30 (FIG. 4) of an internal combustion engine (not otherwise shown). An exhaust outlet is provided adjacent the other flat end wall 29 of chamber 16 by a plurality of perforations 32 which preferably extend through the body portion of side wall 25, but which can also be provided in end wall 29, top wall 23, or bottom wall 22.

As shown in FIG. 4, muffler 10 is mounted by two bolts 34 of the exhaust port flange of a block 30 of an internal combustion engine. Bolts 34 extend one through each pair of coaxial holes 36, 38 and 36', 38', holes 36 and 36' being located in a downwardly offset step portion 23' of the top wall 23 of cover 14 and holes 38, 38' in body 12. Holes 36, 36' and 38, 38' have inwardly extending flange portions 40 and 41 respectively. The compression stress exerted by the bolts 36

and 36' on top and bottom walls 23' and 22' of muffler 10 is resisted by a one-piece dual column spacer and screen 42 which has a pair of spaced tubes 43 and 44 with the opposite ends thereof telescopically received over flanges 40 and 41 and bearing on the associated walls 22' and 23'. As best shown in FIG. 5, tubular portions 43 and 44 are rigidly interconnected by a bowed bridging portion 46 having a plurality of perforations 48 therein providing a screen through which exhaust gases can pass. Preferably, bridging portion 46 is located immediately adjacent exhaust inlet 26 on the side thereof remote from end wall 27. Portion 46 is oriented so that its perforations direct exhaust gases passing therethrough onto a portion 25' (FIG. 2) of side wall 25.

Chamber 16 is divided into four compartments by three transverse partitions, one of which is formed by spacer 42 and the other two by a one-piece baffle member 50 received therein between spacer 42 and exhaust outlet 32. Baffle member 50 has a generally U-shaped cross section (FIG. 5) and is made up of a pair of spaced panels 52 and 54 interconnected by a generally flat bight portion 56, portion 56 having four welding projections 58 therein and a construction hole 60 therethrough. Panel 52 has a plurality of holes 62 therethrough and inwardly bent flanges 64 and 66 along its upright edges adapted to slidably engage the side walls of chamber 16 whereby panel 52 provides a baffle therein. Another baffle is provided in chamber 16 by panel 54 which has a plurality of louvers 68 therein and inwardly bent end flanges 70 and 72 adapted to slidably engage the side walls of the chamber. Panels 52 and 54 of baffle member 50 preferably extend between and are adapted to terminate closely adjacent or bear on the walls 22 and 23 of muffler 10 when assembled therein.

Chamber 16 has a dog leg configuration with bends 74 and 76 in its side walls 24 and 25 respectively which cooperate with baffle member 50 to assist in the assembly of muffler 10. After the four principal components 12, 14, 42 and 50 have been formed separately as shown in FIG. 5, muffler 10 is assembled as follows. First, baffle member 50 is loosely dropped in place in body 12 so that bight portion 56 rests on wall 22 with panel 52 closest to the bends 74 and 76 but spaced a slight distance therefrom toward wall 29. The baffle member 50 is then slid along wall 22 toward the bends until flanges 64 and 66 of panel 52 bind up against the associated bends 74 and 76, thereby positively locating baffle member 50 in body 12 and automatically fixturing it in the body for the next operation, which is to projection weld baffle member 50 to body 12 via the weld projections 58. Preferably, after baffle member 50 is thus securely fixed to body 12, the columns of spacer 42 are inserted over flanges 38 and 38' in body 12 and then cover 14 is positioned thereon with its flanges 36, 36' registered in the spacer columns. Flange 18 of body 12 is then crimped or folded over flange 20 of cover 14 to secure and seal the cover to the body.

When muffler 10 is in use, exhaust gases pass from the engine exhaust port into chamber 16 through inlet port 26 into the first chamber defined between spacer 42 and wall 27. A substantial portion of the gases are directed by the ports 48 of screen 46 toward transverse wall portion 25'. Much of the gases pass from the first chamber into the second chamber (between spacer 42 and panel 52) via the clearance spaces between col-

umns 44, 43, and the adjacent side walls 24 and 25, as well as between screen 46 and the adjacent walls 22' and 23'. All of the gases then pass from the second chamber through the baffle provided by perforated panel 52 of baffle member 50 into the third chamber 5 formed between panels 52 and 54. The orientation of panel 52 tends to direct the gases toward transverse wall portion 25'' (FIG. 2) from which the gases are deflected and then pass through a second baffle provided by panel 54 of baffle member 50. Louvers 68 in panel 54 direct the gases entering the fourth chamber (between panel 54 and wall 29) away from the exhaust outlet holes 32 and, hence, the exhaust gases tend to impinge on and be deflected by wall portion 24' (FIG. 2) before passing through holes 32. The screen of member 42 and the baffles of member 50 tend to direct the exhaust gases passing through muffler 10 at an oblique angle with respect to the side walls of chamber 16. The superior noise deadening characteristics of muffler 10 compared to conventional lawn mower mufflers and the elimination of resonance is believed to result from this arrangement of the screen and baffles. It is also to be noted that the transverse walls of the four sub-chambers making up chamber 16, i.e., walls 27, 42, 52, 54 and 29 are progressively inclined and oriented in non-parallel relationship with each other, the second, third and fourth chambers having a trapezoidal configuration as view in FIG. 2. This not only increases the turbulence of gas flow through chamber 16, but also assists in dispersion and diffusion of pressure wave trains in each of the successive sub-chambers to further decrease the tendency of the muffler to resonate.

Preferably, this muffler is made with only four component parts all of which can be sheet metal stampings and, hence, is a simplified design of economical manufacture and assembly. Assembly of the component parts is facilitated by uniting the two baffles 52 and 54 into a one-piece baffle member 50 so that the orientation of these baffles relative to one another is constant and not subject to variation in the assembly procedure. The dog leg muffler configuration also cooperates with member 52 to positively locate the baffle member in the body of the muffler in the correct position for being fixed to the body as by projection welding. Ease and economy of assembly of this muffler is further enhanced by providing the spacer and screen member in one piece to be telescopingly received over the flanges of the bolt mounting holes and retained in place between the cover and body by the crimping of mating flanges thereon which provide an adequate seal between and mechanical retention of the cover on the body without brazing the flanges together.

I claim:

1. A muffler comprising, a closed chamber having an exhaust inlet adjacent one end, an exhaust outlet adjacent the other end, a first outer wall portion with said exhaust inlet therein and at least two spaced mounting holes extending therethrough adjacent said exhaust inlet adapted to receive bolts for mounting said muffler on an engine, and a second outer wall portion axially spaced from and generally opposed to said first outer wall portion with second mounting holes therethrough coaxial with said first-mentioned mounting holes, a one-piece baffle member having two spaced perforate panel portions integrally interconnected by a bight portion, said baffle member being fixed in said chamber between said inlet and outlet and oriented therein with

said panel portions spaced apart in the direction of gas flow through said chamber to divide said chamber into at least three compartments through which exhaust gases pass, and a one-piece spacer member received in said chamber immediately adjacent said exhaust inlet such that at least a portion of the exhaust gases from the inlet pass therethrough before passing through said baffle member, said one-piece spacer member having spacer tubes extending between said coaxial first and second mounting holes and a perforate portion extending between and rigidly interconnecting said spacer tubes.

2. A muffler comprising, a closed chamber having an exhaust inlet adjacent one end, an exhaust outlet adjacent the other end and opposed side walls each having a bend between said exhaust inlet and outlet, and a one-piece baffle member having two spaced perforate panel portions integrally interconnected by a bight portion, said baffle member being closely received between said side walls during assembly of the muffler such that said baffle member can be slidably wedged into a positive location in said chamber adjacent said bends prior to being fixed in said chamber, said baffle member being fixed in said chamber between said inlet and outlet and oriented therein with said panel portions spaced apart in the direction of gas flow through said chamber to divide said chamber into at least three compartments through which exhaust gases pass.

3. The muffler of claim 2 wherein said chamber comprises a tub shaped body having a bottom wall and generally longitudinally extending side walls and a cover having a top wall parallel to said bottom wall and side walls adapted for sealing engagement with said side walls of said body.

4. The muffler of claim 2 wherein one of said panel portions of said baffle member has louver means tending to direct exhaust gases passing through said openings in said one panel member away from said exhaust outlet of said chamber.

5. The muffler of claim 2 wherein said two panel portions of said baffle member lie generally in two planes non-parallel with respect to each other with at least one of said planes being oriented at an oblique angle with respect to a side wall of said chamber.

6. The muffler of claim 2 further including a spacer member immediately adjacent said exhaust inlet through which at least a portion of the exhaust gases from the inlet pass before passing through said baffle member.

7. The muffler of claim 3 wherein said body and cover side walls have marginal mating flanges with said flanges being crimped into retaining and sealing engagement with each other.

8. A muffler for small internal combustion engines comprising a body with a bottom wall and generally longitudinally extending side walls, a matching cover sealed to said body and having side walls and a top wall in spaced relation to said bottom wall of said body to provide a closed chamber, an exhaust inlet adjacent one end of said chamber and an exhaust outlet adjacent the other end of said chamber, said side walls of said chamber being generally parallel and having oppositely disposed bends between said inlet and outlet, and a one-piece baffle member having a close fit between said side walls but obstructed from longitudinally sliding movement therealong by said bends to thereby positively locate said baffle member in said chamber adja-

cent said bends prior to being fixed in said chamber, said one-piece baffle member having first and second perforate panel portions disposed in said chamber at oblique angles to one another and to said side walls between said inlet and outlet and dividing said chamber into at least three compartments through which exhaust gases pass.

9. The muffler of claim 8 wherein said inlet is located in one of said top and bottom walls and said outlet is located in one of said side walls.

10. The muffler of claim 9 wherein a spacer is disposed between said inlet and said panels and has tubular portions each receiving a mounting bolt therethrough, said spacer being disposed at an oblique angle relative to said panels.

11. The muffler of claim 10 wherein said body and cover have an end wall adjacent said outlet transverse to the longitudinal axis of said chamber and said bends impart a dog-leg configuration to said chamber, said panels and spacer being oriented at progressively increasing oblique angles relative to said end wall.

12. The muffler of claim 11 wherein said body and cover each have two spaced mounting holes therethrough adjacent said exhaust inlet adapted to receive said mounting bolts therethrough, said spacer tubular portions extending between said holes in said cover and said body, said spacer having a perforate portion providing a screen extending between and rigidly interconnecting said spacer tubular portions, said spacer being positioned in said chamber such that at least a portion of the exhaust gases from the inlet pass through said perforate portion before passing through said baffle member.

13. The muffler of claim 12 wherein said mounting holes have flanged portions associated therewith adapted for telescoping engagement in assembly with said tubular portions of said spacer.

14. A muffler for small internal combustion engines comprising; an open body with a bottom wall and generally longitudinally extending side walls, a matching cover sealed to said open body in spaced relation to said bottom wall of said open body to provide a closed chamber, one of said side walls of said body having a portion thereof inclined relative to a portion of the other of said side walls of said open body, said portions of said side walls being in fixed relation to each other and said bottom wall of said open body, an exhaust inlet adjacent one end of said chamber and an exhaust outlet adjacent the other end of said chamber, a one-piece baffle member having two spaced perforate panel portions integrally interconnected by a bight portion, said one-piece baffle member having a close fit between said side walls of said open body and being obstructed from longitudinally sliding movement therealong in at least one direction by being wedged between said relatively inclined portions of said side walls of said open body to thereby positively locate said one-piece baffle member in said open body prior to being fixed in said open body and prior to sealing said cover to said open body, said bight portion of said one-piece baffle member bearing on one of said walls of said open body, and fastening means fixing said one-piece baffle member to said open body in said positive location wedged between said relatively inclined portions of said side walls of said open body, said one-piece baffle member being positioned in said chamber between said inlet and outlet and oriented therein with said panel

portions spaced apart in the direction of gas flow through said chamber to divide said chamber into at least three compartments through which exhaust gases pass.

15. The muffler of claim 14 wherein one of said panel portions of said baffle member has louver means tending to direct exhaust gases passing through said openings in said one panel member away from said exhaust outlet of said chamber.

16. The muffler of claim 14 wherein said exhaust inlet is located in a portion of said bottom wall of said body with at least two spaced mounting holes extending therethrough adjacent said exhaust inlet adapted to receive bolts for mounting said muffler on an engine, said cover has a top wall portion axially spaced from and generally opposed to said portion of said bottom wall and has second mounting holes therethrough coaxial with said first-mentioned mounting holes, and also comprises a one-piece spacer member received in said chamber having spacer tubes extending between said coaxial first and second mounting holes and a perforate portion extending between and rigidly interconnecting said spacer tubes.

17. The muffler of claim 14 wherein said fastening means fixing said one-piece baffle member to said open body comprises at least one weld.

18. A muffler for small internal combustion engines comprising, an open body with a bottom wall and side walls, a matching cover sealed to said open body in spaced relation to said bottom wall of said open body to provide a closed chamber, at least one of said side walls of said open body having a portion thereof inclined relative to a portion of the other of said side walls of said open body, said portions of said side walls being in fixed relation to each other and said bottom wall of said body, an exhaust inlet adjacent one end of said chamber and an exhaust outlet adjacent the other end of said chamber, a one-piece baffle member having two spaced perforate panel portions integrally interconnected by a bight portion, said one-piece baffle member having a close fit between said side walls of said open body and being obstructed from sliding movement therealong in at least one direction by being wedged between said relatively inclined portions of said side walls of said open body to thereby positively locate said one-piece baffle member in said open body prior to being fixed in said open body and also prior to sealing said cover to said open body, said bight portion of said one-piece baffle member bearing on said bottom wall of said open body, fastening means fixing said bight portion to said bottom wall in said positive location of said one-piece baffle member with said baffle member being wedged between said relatively inclined portions of said side walls of said open body, said baffle member being positioned in said chamber between said inlet and outlet and oriented therein with said panel portions spaced apart in the direction of gas flow through said chamber to divide said chamber into at least three compartments through which exhaust gases pass.

19. The muffler of claim 18 wherein said fastening means comprises at least one weld.

20. A muffler for small internal combustion engines comprising; an open body with a bottom wall and generally longitudinally extending side walls, a matching cover sealed to said open body in spaced relation to said bottom wall of said open body to provide a closed

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chamber, one of said side walls of said body having a portion thereof inclined relative to a portion of the other of said side walls of said open body, said portions of said side walls being in fixed relation to each other and said bottom wall of said open body, an exhaust inlet adjacent one end of said chamber and an exhaust outlet adjacent the other end of said chamber, a one-piece baffle member having a first perforate baffle portion and a second portion integral with and extending generally transverse to said first baffle portion, said second portion of said one-piece baffle member bearing on one of said walls of said open body, at least one of said first and second portions of said one-piece baffle member having a close fit between said side walls of said open body and being obstructed from longitudi-

nally sliding movement therealong in at least one direction by being wedged between said relatively inclined portions of said side walls of said open body to thereby positively locate said one-piece baffle member in said open body prior to being fixed in said open body and prior to sealing said cover to said open body, and fastening means fixing said one-piece baffle member to said open body in said positive location wedged between said relatively inclined portions of said side walls of said open body, said one-piece baffle member being positioned in said chamber between said inlet and outlet and oriented therein with said panel portion dividing said chamber into at least two compartments through which exhaust gases pass.

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