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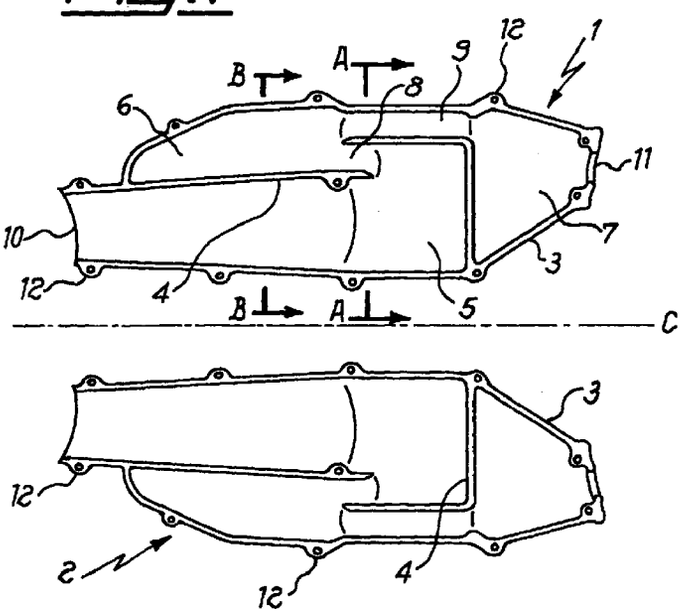
(54) Muffler for internal combustion engine

(57) Exhaust muffler for internal combustion engines comprising at least two portions of external shell (1,2) reciprocally joined along perimeter edges (3) and internal separators (4) in one-piece with at least one of the portions of external shell to form chambers (5,6,7) and/or connecting pipes (8,9) fit to allow the passage of the exhaust gases from an entry section, or opening (10), to an exit section, or opening (11), for the exhaust gases.

Fig.1



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Description

[0001] The present invention relates to an exhaust muffler, or silencer for the discharging of exhaust-derived gases from an internal combustion engine.

[0002] The reduction of the noise caused by the discharge of exhaust gas is achieved in a known way in the mufflers by exploiting different methods, among which are friction and reflection of acoustic waves.

[0003] In particular, mufflers that exploit reflection of acoustic waves comprise a plurality of expansion chambers and connecting pipes, fit to define an outflow course for the exhaust gases that presents significant variations in section.

[0004] The reflection of acoustic waves occurs corresponding to duct discontinuities constituted by abrupt changes of section and the acoustic waves thus reflected are subsequently transformed into heat in contact with the boundary layer in contact with the walls, thus causing the desired attenuation of the sound.

[0005] The number and geometry of the expansion chambers, the dimensions of the throats of the connecting pipes and the material used are parameters determining the noise reduction characteristics of the muffler.

[0006] Embodiments of mufflers of the acoustic-wave reflection type, comprising both external shell elements and internal dividing elements, also assembled by welding, are well known.

[0007] Among these last, in particular, are known mufflers that in order to be easily assembled, comprise two single external shell elements, or half-shells, joined together within which are lodged one or more dividing elements of the same muffler which, suitably shaped, define the expansion chambers and the connecting pipes which serve to reduce the noise.

[0008] However, embodiments of the type above described present the drawbacks of requiring a high number of molds for the production of the various parts, accurate machining and finishing of the dividing elements, which must fit into the external shell without any clearance, as well as a complex assembly of parts that makes the method of manufacturing such mufflers onerous.

[0009] It is an objective of the present invention to furnish an exhaust muffler for internal combustion engines that is easily manufactured and economical to produce.

[0010] It is a further purpose of the invention to produce a muffler for internal combustion engines that is corrosion resistant and of reduced weight.

[0011] Such purposes are achieved by the present invention, which relates to an exhaust muffler for internal combustion engines and a method for the production of the same.

[0012] The muffler according to the invention comprises at least two portions of external shell reciprocally joined and internal separators in one-piece with at least one of the said portions of external shell to form a passage for the exhaust-derived gases from the exhaust manifold of the engine.

[0013] In particular, such course could present expansion chambers and connecting pipes which serve to reduce the noise by reflection of the acoustic waves.

[0014] According to a preferential embodiment of the invention, this muffler is produced by means of two half-shells specular with respect to a longitudinal axis, reciprocally joined, within which are obtained in one-piece the same internal dividing pieces.

[0015] According to another embodiment of the muffler, the joining of such portions of external shell is effected by means of removable fasteners, such as bolts or similar.

[0016] A further aspect of the present invention provides that the exhaust muffler be produced in aluminum or in thermo-resistant light alloy, such as for instance an aluminum-based or a magnesium-based alloy, preferably by die-casting.

[0017] A preferential embodiment of the invention will be shown by way of example and not of limitation, in the attached figures, in which:

- Figure 1 is a side view of the two half-shells which, reciprocally joined, form the muffler;
- Figure 2 is a side view of the complete muffler, also endowed with a pipe for discharging the exhaust gases into the atmosphere;
- Figure 3 is a section through the muffler with view drawn according to the A-A line of figure 1;
- Figure 4 is a section through the muffler with view drawn according to the B-B line of figure 1;
- Figure 5 is a view in section of perimeter edges of the muffler according to the invention, comprising a hollow for lodging a means of sealing.

[0018] With reference to the figures taken together, the muffler according to the invention, indicated as a whole by 100, comprises two half-shells 1 and 2, specular with respect to the axis C in figure 1, that present a perimeter mating edge 3 and internal separators 4 produced in one-piece with the two half-shells 1 and 2.

[0019] The half-shells 1 and 2, and in particular the perimeter mating edge 3 and the internal separators 4, are shaped to produce, when joined up together, an outflow course for the exhaust-derived gases from the exhaust manifold of the engine.

[0020] The course thus defined allows the reduction of the noise by reflection of the acoustic waves.

[0021] In particular, as illustrated in figure 1, such outflow course of the gases comprises the entry section, or opening, 10, the expansion chambers 5, 6, 7, the connecting pipes 8 and 9, and the exit section, or opening, 11.

[0022] Preferentially, the half-shells 1 and 2 are advantageously produced in aluminum, or in an aluminum-based light alloy, or in other thermo-resistant light alloys, such as, for instance, magnesium- or titanium-based alloys, by die-casting process.

[0023] The use of light alloys, in particular aluminum- or magnesium-based, to produce the exhaust muffler entirely, allows the latter to acquire characteristics of high resistance to corrosion and efficiency in noise reduction, while maintaining the weight low.

[0024] Furthermore, the die-casting process allows castings with very precise contours and low tolerances to be got, which reduces the need for further working after the same casting.

[0025] The die-casting molding of the muffler also allows external details to be produced easily, such as the cooling fins 15 shown in Figure 2.

[0026] The mating of the two half-shells 1 and 2 is achieved preferentially by means of removable means of fastening, such as bolts or similar, that engage in flanges 12 set in the perimeter mating edge 3 of each external half-shell 1 and 2.

[0027] It is possible similarly to join the half-shells 1 and 2 by means of sealing elastic belts or, although less suitably, by means of irremovable means of fastening.

[0028] To guarantee an optimal impermeableness to the gases of the same muffler, there could be means of sealing 13, such as, for instance, gaskets in synthetic material, set between the half-shells 1 and 2 at least along the perimeter edges 3a and 3b.

[0029] As illustrated in figure 5, such means of sealing 13 are preferably lodged in a hollow 14 produced along the perimeter edge 3a of the external half-shell 1; in other embodiments, not shown in the figures, such means of sealing could be set both between the perimeter edges 3 and between the separators 4 of the two joined half-shells 1 and 2.

[0030] Means of removable joining (not shown) are provided between the muffler 100 and the exhaust manifold of the engine, placed in proximity to the entry opening 10.

[0031] Equally, in proximity to the exit opening 11, removable means of joining are provided between the muffler 100 and the terminal duct 17 for the dispersion of the gases.

Claims

1. Exhaust muffler for internal combustion engines, of the type comprising at least two portions of external shells joined reciprocally along their perimeter edges, characterized by comprising internal separators in one-piece with at least one of said portions of external shell to form chambers and/or connecting pipe fit to allow the passage of the exhaust gases from an entry section to an exit section of the exhaust gases.

2. Muffler according to Claim 1, characterized by comprising two portions of external shells specular with respect to a longitudinal axis.

3. Muffler according to any of the preceding Claims, characterized by said portions of external shell being joined reciprocally by means of removable means of fastening.

4. Muffler according to any of the preceding Claims, characterized by said portions of external shell being produced in thermo-resistant material.

5. Muffler according to Claim 4, characterized by said material being aluminum or an aluminum- based alloy.

6. Muffler according to Claim 4, characterized by said material being a magnesium-based alloy.

7. Muffler according to any of the preceding Claims, characterized by said perimeter edge comprising a flange for the joining of said portions of external shell.

8. Muffler according to any of the preceding Claims, characterized by comprising means of sealing between the said portions of external shell.

9. Muffler according to Claim 8, characterized by at least said perimeter edges of at least one of the said portions of external shell presenting a hollow fit to receive the said means of sealing.

10. Muffler according to any of the preceding Claims, characterized by said entry section of the exhaust gases comprising means for joining with the exhaust manifold of the engine.

11. Method for the production of exhaust mufflers for alternative internal combustion engines, of the type comprising the embodiment of at least two portions of external shell and their joining along perimeter edges, characterized by internal separator being in one-piece with at least one of said portions of external shell.

12. Method for the production of mufflers according to Claim 10, characterized by being formed of two portions of external shell specular with respect to a longitudinal axis.

13. Method for the production of mufflers according to any of Claims 11 or 12, characterized by said portions of external shell being produced in thermo-resistant material.

14. Method for the production of mufflers according to Claim 13, characterized by said material being aluminum or an aluminum-based alloy.

15. Method for the production of mufflers according to Claim 13, characterized by said material being a

magnesium-based alloy.

16. Method for the production of mufflers according to any of Claims from 11 to 15, characterized by said portions of external shell equipped with said separators being produced by die-casting.

Fig.1

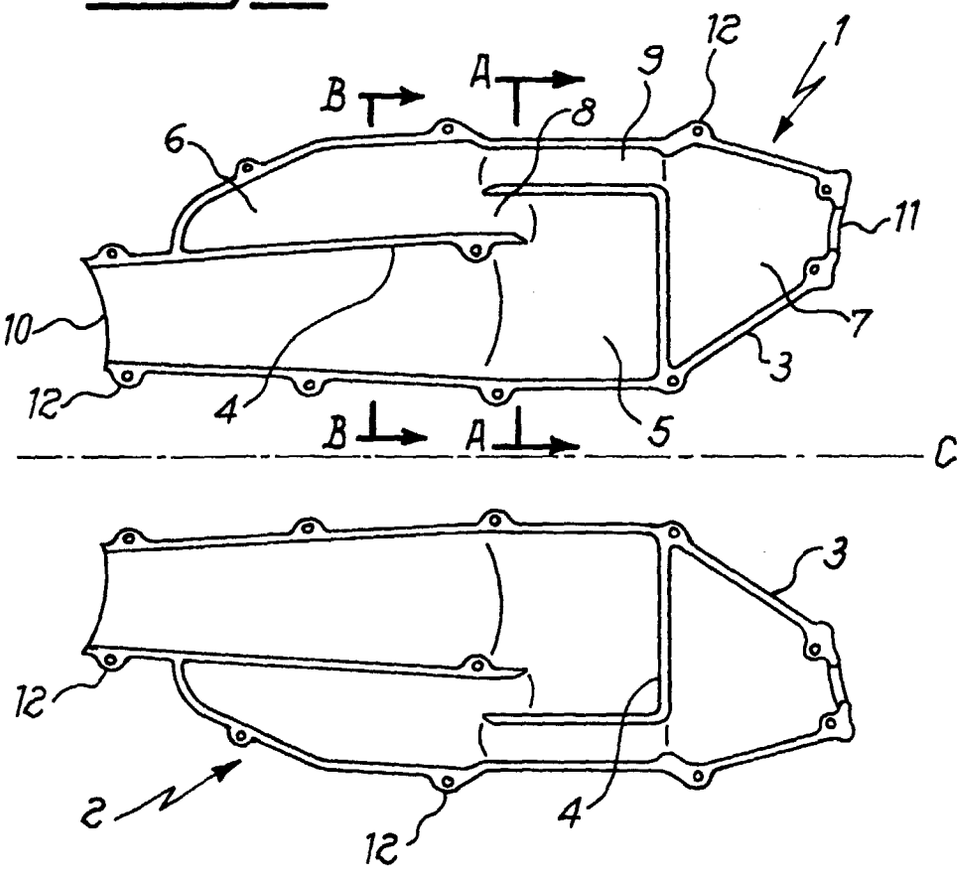

Fig.2

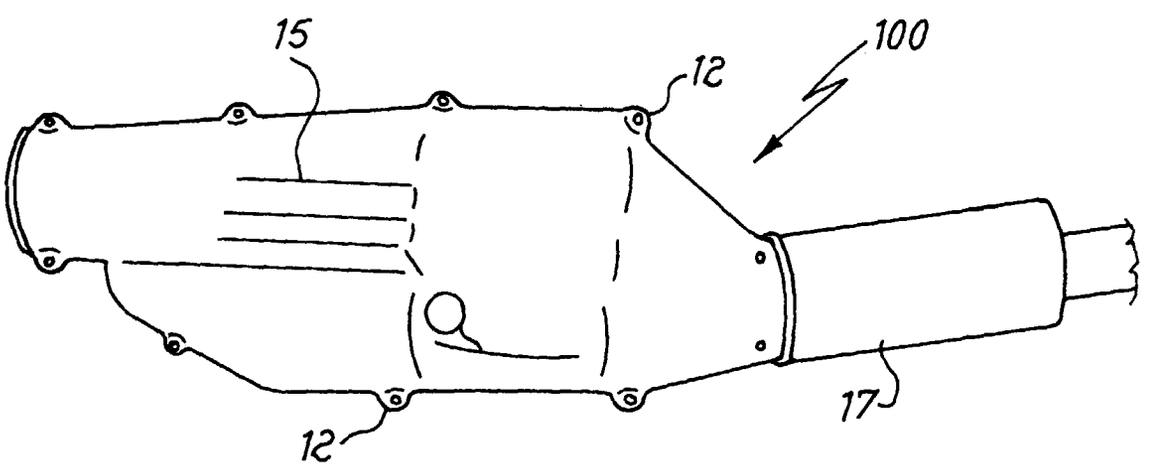

Fig.3

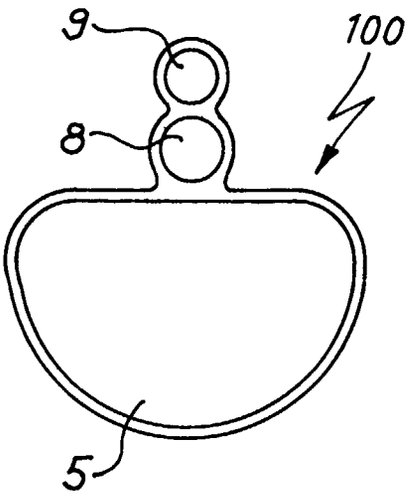

Fig.4

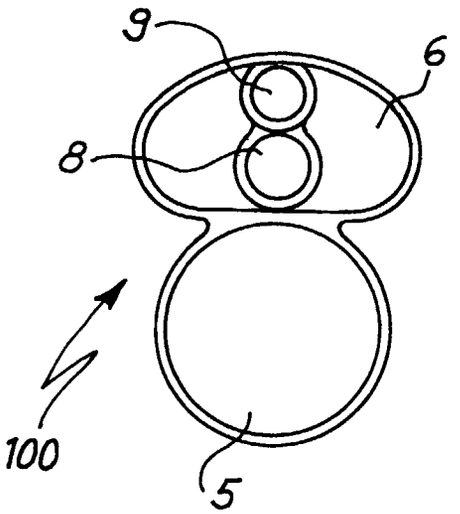

Fig.5