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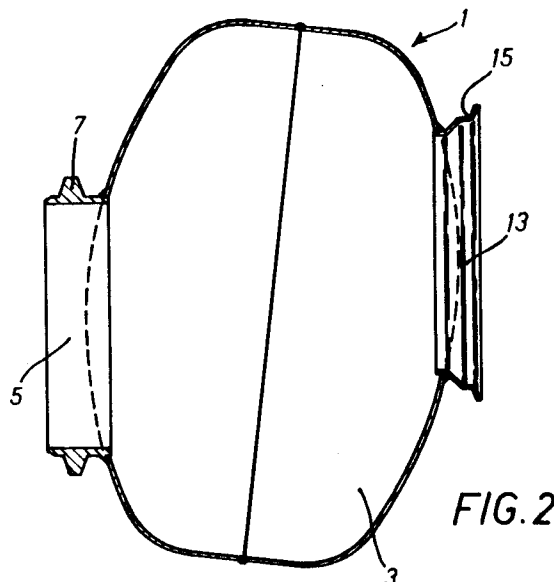
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**Studio "INTERPATENT" via Caboto 35**  
**I-10129 Turin (IT)**(54) **Silencer device for internal combustion engines.**

(57) Silencer device (1) for internal combustion engines equipped with exhaust brake, composed by a hollow body (3) whose shape is substantially spheroidal and whose section is approximately ovoidal, assembled downstream of the exhaust manifold of the engine and upstream of the muffler, connected to them through inlet openings (5, 13) and ducts (7, 15), and operating on exhaust gases going out of the engine, so that they expand and reflect inside it, losing kinetic energy, and damping the sound waves before making them entering the muffler.

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The present invention relates to a silencer device to reduce noises and sounds generated by exhaust gases in otto- or diesel-cycle engines, when an exhaust brake is applied to said engines.

Various exhaust-brake devices are currently being used on internal combustion engines, suitable to increase the braking effect of the engine, transforming the engine itself into an air compressor.

The fuel supply is eliminated:

- in injection engines through a direct control ("engine stop" control already existing), that zeroes the flow-rate of the injection pump;
- in carburation engines, opening an air intake of the atmosphere to the induction manifold (lateral passage to the carburettor): with this, the fuel induction stops and there occurs, like in diesel engines, a free intake of fresh air.

The inconvenience with said exhaust brakes is the noise generated by the expansion, in exhaust ducts, of the air compressed by the pistons, that cannot be dampened by the exhaust muffler, since it is designed to absorb the sound waves produced by the combustion burst.

In fact, the gases burnt in internal combustion engines, that cyclically flow into the exhaust manifold through the exhaust valves, produce, when the valves are being opened, a deafening noise with free exhaust; therefore, to reduce this free exhaust noise, an exhaust muffler is applied to the exhaust pipe end. This muffler, built for that purpose, has no effect when the fuel supply is stopped when it is time to operate on the exhaust brake: the combustion noise is then replaced by the noise of the compressed air going out of the exhaust manifolds and expanding; this noise, being of a different nature and frequency from the one typical of the combustion, will not be able to be absorbed by the traditional exhaust muffler.

Purpose of the present invention is eliminating or substantially reducing the noise generated by the air compressed by the pistons of an internal combustion engine, when this is subjected to the exhaust brake action, operating upstream of the muffler and in series with it, exploiting the principle of sound energy (and therefore noise) reduction, through the wave reflection on the conducting pipe walls, following diameter variations of the pipes themselves (it is in fact known that the increase of a pipe section generates the decrease of low-frequency noises).

Another purpose of the device is being suitable to any diameter of exhaust manifolds and mufflers connected to it, and therefore being able to be used for any engine displacement.

A further purpose of the device is being easily manufactured at low costs, due to assembling rationality and linearity.

The above purposes of the invention are reached by a silencer device operating on the compressed air that expands in exhaust ducts of internal combustion engines (otto or diesel ones) equipped with exhaust brake, characterized in that it is composed of a hollow body whose shape is substantially spheroidal and whose section is approximately ovoidal, assembled downstream of the exhaust manifold of the engine and upstream of the muffler, and equipped with an inlet opening and an outlet opening connected, through adequate ducts, to exhaust manifold and muffler, respectively.

According to another characteristic of the invention, the inlet and outlet openings of the silencer can lay not on the same axis.

According to a further characteristic of the invention, the silencer axis can be not perpendicular to the exhaust manifold and the muffler ones, and can be raking with respect to them.

A preferred embodiment of the invention will now be described, as a non-limiting example, with reference to the enclosed drawings, in which:

- fig. 1 is a diagrammatic front view of the device;
- fig. 2 is a diagrammatic view along the section II-II of the device in fig. 1;
- fig. 3 is a diagrammatic side view of the device in fig. 1 in its preferred operating assembly on a vehicle.

Referring to fig. 2 and 3, the device 1 is composed of a hollow body 3, usually made of steel, whose shape is substantially spheroidal and whose section is approximately ovoidal, equipped with an inlet opening 5 connected, through a duct 7, to the exhaust manifold 9 of the turbo 10 of the engine 11 equipped with an exhaust brake 12, and with an outlet opening 13 connected, through a duct 15, to the muffler 17. The compressed air going out of the manifold enters into the device 1 from the inlet opening 5 and, since the section of the device 1 is greater than that of the exhaust manifold 9 and of the muffler 17, and since said opening 5 does not lay on the same axis as that of the outlet one 13, and since the axis of the device 1 is raking with respect to those of the two openings 5 and 13, said air reflects expanding inside the hollow body 3, losing kinetic energy, and the sound waves related to it are damped; the compressed air that expands in the exhaust ducts, afterwards, goes out through the outlet opening 13 towards the muffler 17.

## Claims

1. Silencer device (1) operating on the exhaust gases of internal combustion engines (otto or diesel ones) (11) equipped with exhaust brake (12), characterized in that it is composed of a

hollow body (3) whose shape is substantially spheroidal and whose section is approximately ovoidal, assembled downstream of the exhaust manifold (9) of the engine (11) and upstream of the muffler (17), and equipped with an inlet opening (5) and an outlet opening (13) connected, through adequate ducts (7, 15), to exhaust manifold (9) and muffler (17), respectively.

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2. Silencer device according to claim 1, characterized in that the inlet opening (5) and the outlet opening (13) do not lay on the same axis.

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3. Silencer device according to claim 1 or 2, characterized in that the axis of the silencer device (1) is not perpendicular to the exhaust manifold (9) and the muffler (17) ones, but is raking with respect to them.

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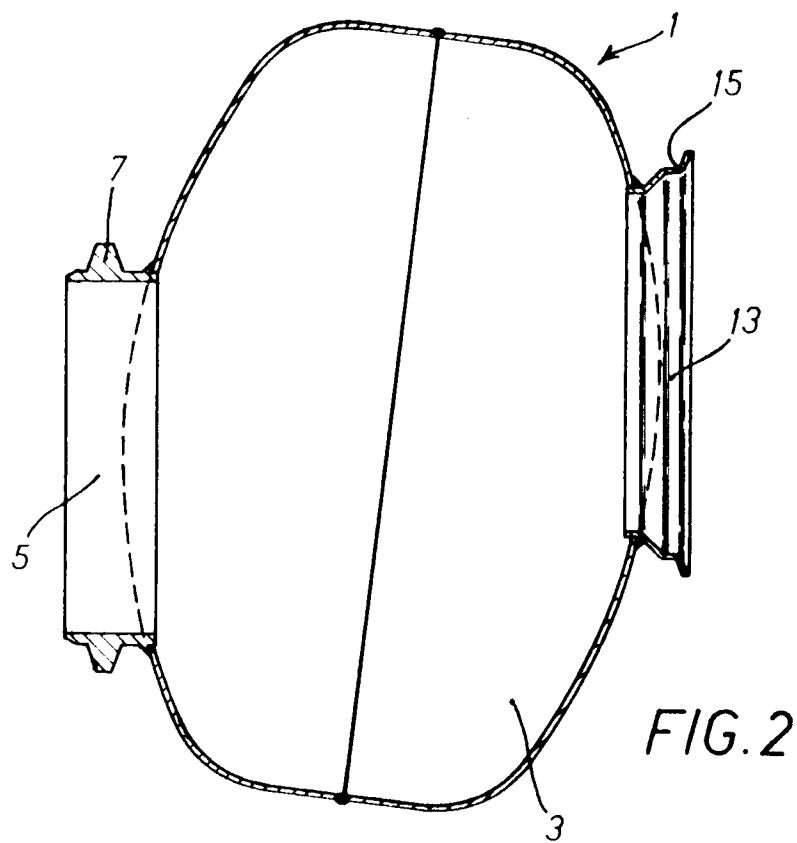
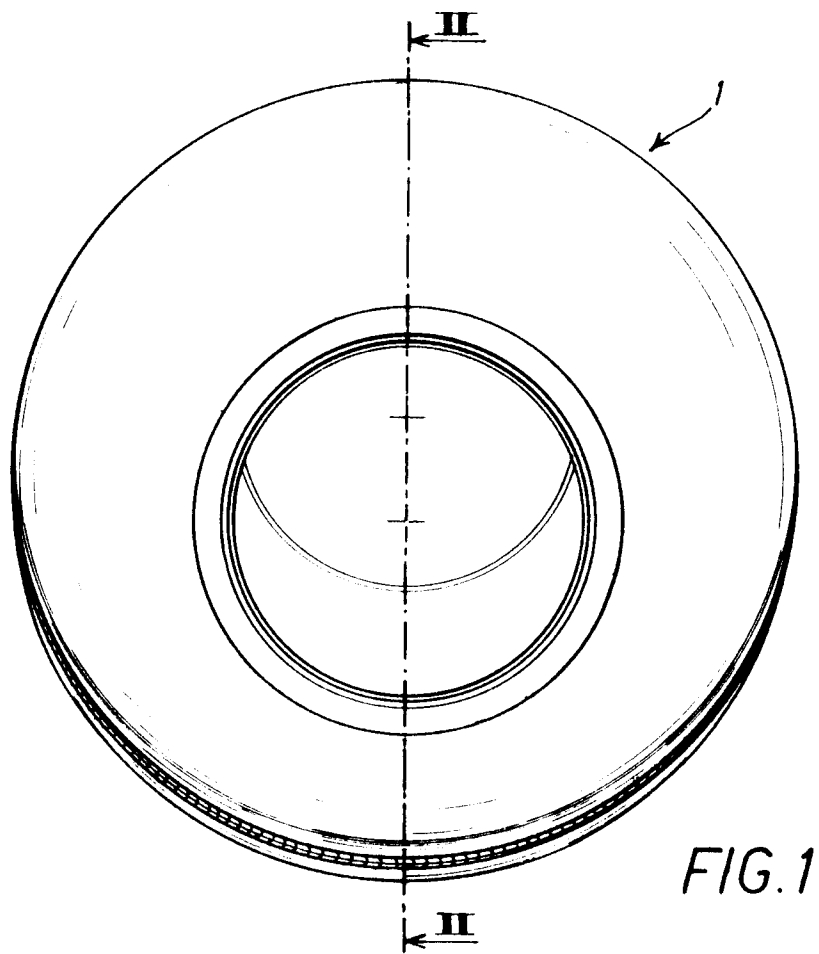
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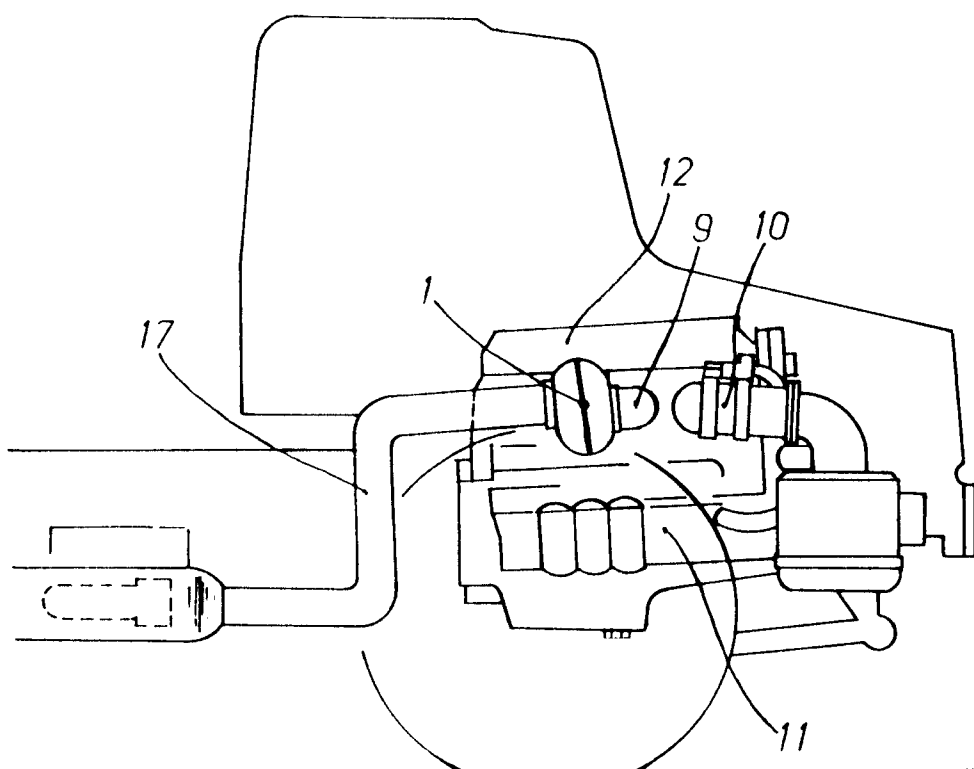


FIG. 3