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MUFFLER CONSTRUCTION

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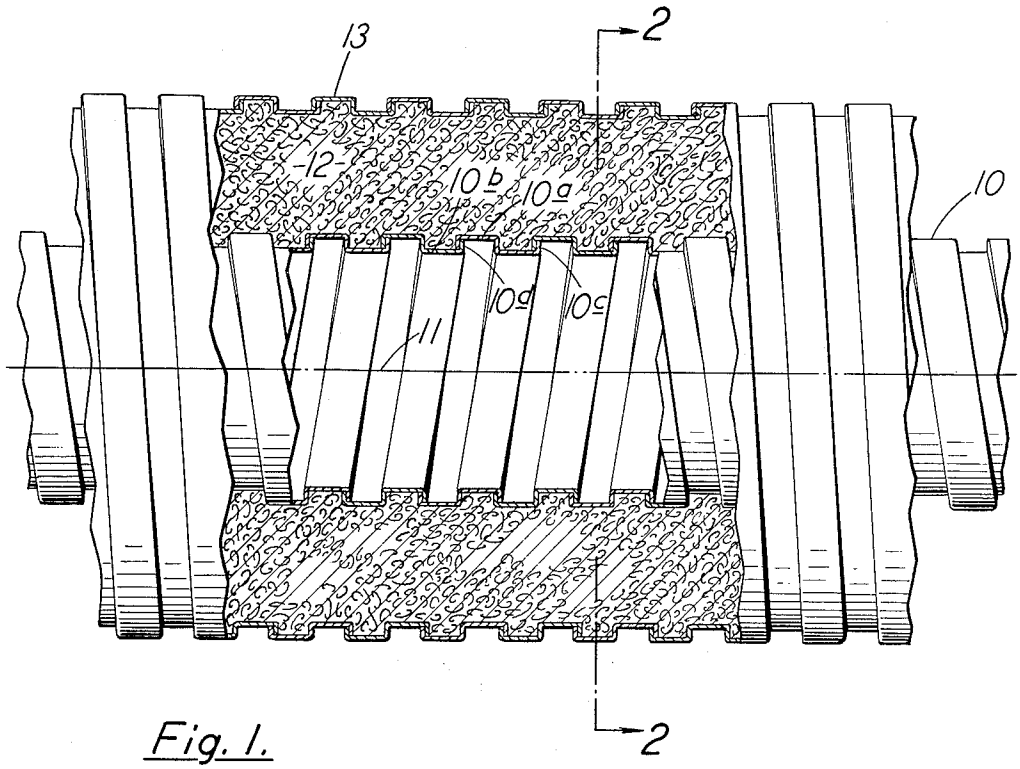


Fig. 1.

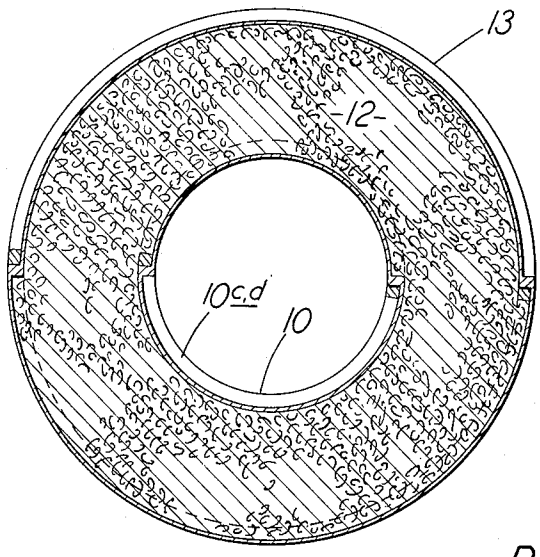


Fig. 2.

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MUFFLER CONSTRUCTION

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1 Claim. (Cl. 181—42)

The present invention relates to noise mufflers. It is the general function of these devices to progressively withdraw and transform the energy of sound waves passing through a conduit so as to decrease the amplitude of the sound emerging therefrom. These devices are standard equipment on the exhaust lines of internal combustion engines, and in similar installations.

In general, several ways have been devised for removing the energy of the sound wave as it passes through the conduit, and transforming it to heat or into some other form of energy. It is well known to provide a perforated tube in such a conduit, the function of the perforations being to permit the escape of minute quantities of air as each wave front passes along the tube. Progressive withdrawal of such minute quantities of air decreases the amplitude of the pressure gradient at each wave front, and thereby decreases the amplitude of the sound wave that emerges from the conduit. It is also well known that some of the energy of a sound wave may be converted into heat by directing the wave against a movable surface and damping the movement of the surface. The heat energy is dissipated through radiation, convection, or through some sort of cooling system.

The present invention makes use of both of the above principles. A conduit is provided in which a small amount of the gas within the conduit is permitted to escape through the walls thereof as each sound wave moves along. This escaping gas passes into suitable loosely packed insulating material. The preferred form of the conduit of the present invention is also provided with surfaces arranged generally in a transverse relationship with the axis of the conduit, and these surfaces provide abutments against which portions of the sound wave may be directed. The components forming the conduit walls are movable with respect to each other, and such movement is damped by the presence of the packed material surrounding the conduit. Oscillation of these conduit components under the restraint imposed by the packing serves to convert small amounts of the wave energy into heat, and to thereby reduce the amplitude of the emerging sound waves. The effects described above, when added together by the structure provided by the present invention, serve to produce a very effective muffler with a relatively simple construction.

This construction is capable of being manufactured by standard machines used for other products with but slight modification. The manufacture of armored flexible cable is similar in many respects to the production of mufflers embodying the present invention, and similar equipment will produce a muffler section in continuous lengths which may be cut to suit the particular installations. A flexible muffler has the notable advantage of being adapted to installation upon a variety of vehicles. The ability of this unit to be deflected from a straight axis to avoid the frame structure of the automobile, and the possibility of using make shift hanger arrangements rather than specially-manufactured components, makes this device highly desirable for replacement muffler units.

The several features of the present invention will be described in detail through an analysis of the particular embodiments illustrated in the accompanying drawings. In these drawings:

Figure 1 is a view in elevation of a muffler construction embodying the present invention, with a portion broken away to show an axial section.

Figure 2 is a section taken on the plane 2—2 of Figure 1.

Referring to Figure 1, a conduit **10** is shown which is adapted to form a part of an exhaust line of an internal combustion engine. This conduit is formed by the helically-formed strips **10***a* and **10***b*, which are substantially S-shaped in cross section, and which are loosely interengaged to form the conduit **10** as shown. It will be noted that the conduit thus formed is flexible, and that a considerable amount of relative movement between the components **10***a* and **10***b* is possible. The type of relatively loose engagement between the components is such as to permit a considerable amount of leakage of gas which may be momentarily under pressure within the conduit **10**, and thereby permit the escape of gases as each wave front passes such a junction point in its course along the conduit **10**. Since the strips **10***a* and **10***b* are helically wound, there will be a continuous withdrawal of small quantities of gas under pressure as the wave front moves along, resulting in diminishing the energy of that wave by the time it emerges.

It will also be noted that the configuration of the components **10***a* and **10***b* is such as to provide a series of helical surfaces **10***c* and **10***d*. These surfaces are substantially transversely arranged with respect to the axis **11** of the conduit, and present abutment surfaces against which portions of the sound waves collide. The action of the sound wave against these surfaces will tend to cause vibration in an axial direction of the components **10***a* and **10***b*, and the damping action of the packing material **12** establishes resistance to such movement. These conditions result in the transformation of a considerable amount of the energy of the sound wave into heat. The packing **12** also is useful in damping the sound caused by the emergence of small quantities of gas under pressure around through the juncture of the components **10***a* and **10***b*. The presence of a considerable quantity of the loose packing **12** as indicated also serves to control the temperature of the overall unit so that the outer housing **13** does not become overheated. Preferably, the housing **13** is constructed in a fashion similar to the inner conduit **10** so as to preserve the flexibility of the unit.

It is preferred that the packing **12** be asbestos, glass wool, or some other heat-resistant porous material. The housing **13** may take a variety of forms due to the fact that it does not primarily function in the same fashion as does the conduit **10**, and acts only to secure the packing in the illustrated form of the invention. In addition to the construction shown, it may also be formed of woven wire or some other similar material. The use of a porous material is only recommended for the simplicity of manufacture. The function of the device does not require porosity in the housing **13**; and in fact, the effectiveness of the device would even be increased if no leakage were permitted to go through the housing **13**. Due to the minute quantities of gas that would be passing through the packing **12**, however, this is not considered to be a necessity. In the event that a sealed housing is used, the volume occupied by the packing **12** forms an adequate reservoir to permit the flow of gas under pressure as the sound waves pass each point of junction between the conduit components. If a complete seal were effected at the housing, the pressure level within the packing **12** would remain at such a point that backflow would take place

into the conduit between the points of high pressure established by the sound waves.

The particular embodiments of the present invention which have been illustrated in the accompanying drawings and are discussed herein are for illustrative purposes only and are not to be considered as a limitation upon the scope of the appended claim. In the claim it is my intention to claim the entire invention disclosed herein except as I am limited by the prior art.

I claim:

A muffler for suppressing sound, comprising: conduit means having portions thereof provided with surfaces transverse to said conduit means and exposed in the interior thereof, and relatively movable axially with respect to each other; packing means surrounding said conduit means and isolated from the interior of said conduit means by said portions, and bearing against the peripheral surface of said conduit means; and housing means surrounding said conduit means and packing means, and holding said packing means in position against said conduit means.

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