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⑤④ **Improved silencer with unwelded connection of the caps and the pipes.**

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⑤⑥ References cited:
FR-A-2 173 458
FR-A-2 457 969
GB-A-1 214 989
GB-A-2 022 697

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Description

The present invention relates to a silencer having a considerable utility and ease of use because of the unwelded connection of the caps and the pipes to the ends of said silencer.

The silencers presently available on the market have the considerable drawback of requiring weldings for joining the various components and it is known that welding is a time-consuming, troublesome, expensive and polluting process, requiring also skilled and qualified operators. The quality of the weld affects in a decisive way the performance and operative life of the silencer, and in view of the steadily increasing shortage of skilled qualified welders, it is more and more difficult to produce silencers of a good quality and long-lasting.

Furthermore, welding has the intrinsic drawback of altering the material of the workpiece and of its coating (aluminizing) so that it is necessary to carry out again plating of the metal at the welding area after the welding operation.

In the prior art some attempts to eliminate welding operations in the manufacture of silencers are disclosed, but the results were not entirely satisfactory for several reasons.

GB—A—2 022 697 (Armstrong) discloses a connection between inner tubes of a silencer and exhaust gas tubes by interposition of a stub tube. Thus each silencer requires two additional elements, with greater difficulties in manufacturing the silencer; higher costs of materials and working and above all a lower resistance to flexural and vibratory stress in the connection zone, with a dangerous weakened area in the unsupported portion of the stub tube wall between inner tube and exhaust tube, where a crack may soon appear.

FR—A—2 173 458 (Peugeot) discloses a connection of the exhaust tube effected by deformation of the wall at the point of contact with the silencer end plate. This single point connection has less resistance to mechanical stress and does not allow to interpose a connection tube between silencers, as the seaming tool cannot be inserted inside the tube.

FR—A—2 457 969 also shows a connection between an inner pipe and the silencer end plate. It does not shown how the inner tube is connected to the exhaust tube.

GB—A—1 214 989 also shows a connection between inner tubes and silencer, effected at the end walls or at the intermediate cross walls, likewise without any indication regarding the connection of the exhaust tubes.

Therefore, none of the four prior art patents discloses a double seaming connection of the inner pipe both to the end caps and to the exhaust pipe and/or tail pipe at the same time and without additional connecting pieces.

Moreover, all the four prior art patents teach that the diameter of the connecting portions of the tubes should be kept strictly constant, in order to allow a free flow of the exhaust gases.

The present invention provides for a strong and stable connection of the elements by fixing the end caps as well as the exhaust pipes to the inner tube but at points spaced along the inner tube in order not to create points of high stress or weakened areas of the tubes, without requiring any additional tube or sleeve.

Moreover, it has been surprisingly found that a slight conicity of the connection between exhaust pipes and inner tube is not harmful, on the contrary a slight widening of the inner tube toward the silencer interior causes an expansion of gases entering the silencer and an acceleration of the gases discharged from it, makes the seaming operation easier and strengthens the connection between tubes, the whole with clear beneficial effects on the silencer operation.

The improved silencer, in which an inner pipe (4) is fixed by seaming to the end caps (3) of the silencer, and the incoming exhaust pipe (8) and/or the outgoing tail pipe (8) are in turn fixed by seaming to the corresponding free ends of said inner pipe (4). The free ends of the inner pipe (4) are extending outwardly from the end caps (3) for a length adapted to accommodate said double seaming connection and have a slightly narrower diameter in comparison with the diameter of the part of the inner pipe (4) which is inside the silencer and the two diameters are connected by a slightly conical portion (11), causing an expansion of gases entering the silencer and an acceleration of gases discharged from said silencer.

The advantages obtained with this system are various and considerable, such as the great reduction of manufacturing cost due to welding elimination, without needing the specialized staff for it, which can now be replaced by unskilled labor, moreover doing a light job in a non polluting environment; manufacturing speed and uniform quality of the product, no more subject to the individual skill of the welders; elimination of thermal stresses and chemico-physical alterations of the material, which were caused by the welding process.

These and other advantages, objects and features of the present invention will be more apparent from the following detailed description, made with reference to the sole figure of the accompanying drawing, diagrammatically showing the area of connection of the inner pipe to an end cap of the silencer, as well as an exhaust pipe to the end of said inner pipe.

With reference now to said sole figure of the accompanying drawing, one can see partially the outer body 1 of the silencer to which the usual closure cap 3 is seamed by means of a double heading 2.

The silencer inner pipe 4 is fixed to the cap 3 by seaming, obtained by cold making with a suitable tool two waves or dimples 5 and 6 between which the edge 7 of the cap bore is clamped, so as to create the stable, safe and resistant connection of said elements, by means of pressure deformation of the two machining surfaces.

In the same way the exhaust line is fixed at the

end of inner pipe 4, protruding outside the silencer.

The pipe 8, which can be either the incoming exhaust pipe from the engine exhaust manifold or the outgoing tail pipe discharging to the atmosphere the exhaust gases, is inserted into or onto the end of said inner pipe 4 and then with an outer seaming operation for the two assembled pipes, two corresponding waves or dimples 9 and 10 are formed on them, so as to mutually clamp them in a stable and safe way.

The free ends of the inner pipe 4, extending outwardly from the ends caps 3 for a length adapted to accommodate said double seaming connection, have a slightly narrower diameter in comparison with the diameter of the part of the inner pipe 4 which is inside the silencer and the two diameters are connected by a slightly conical portion 11, causing an expansion of gases entering the silencer and an acceleration of gases discharged from said silencer.

It is to be understood that the materials used, the equipment and tools used to carry out the connection of the elements, the number and size of the pipes may be varied in the wider and greater manner, without departing however from the principles and the features illustrated and described hereinbefore.

Claims

1. Improved silencer, in which an inner pipe (4) is fixed by seaming to the end caps (3) of the silencer, characterized in that the incoming exhaust pipe (8) and/or the outgoing tail pipe (8) are in turn fixed by seaming directly to the corresponding free ends of said inner pipe (4), whereby the free ends of the inner pipe (4) are extending outwardly from the end caps (3) for a length adapted to accommodate said two seaming connections and have a slightly narrower diameter in comparison with the diameter of the part of the inner pipe (4) which is inside the silencer and the two diameters are connected by a slightly conical portion (11).

2. Improved silencer according to Claim 1, characterized by the fact that the inner pipe (4) get by cold deformation two waves or dimples (5, 6) between which the edge (7) of the silencer cap bore is clamped.

3. Improved silencer according to Claim 1, characterized by the fact that the incoming exhaust pipe (8) and/or the outgoing tail pipe (8) is inserted into or onto the free end of the silencer inner pipe (4) and then the two assembled pipes get by cold deformation two corresponding waves or dimples (9, 10) which are mutually clamping them together.

Patentansprüche

1. Verbesserter Schalldämpfer, bei dem ein Innenrohr (4) durch Verformen an den Abschlussdeckeln (3) des Schalldämpfers befestigt ist, da-

durch gekennzeichnet, dass das hineinführende Auspuffrohr (8) und/oder das hinausführende Endrohr (8) ihrerseits durch direkte Formverbindung an den entsprechenden freien Enden des genannten Innenrohrs (4) befestigt sind, wobei sich die freien Enden des Innenrohrs (4) von den Abschlussdeckeln (3) über eine Länge nach außen hin erstrecken, die geeignet ist zur Aufnahme der genannten beiden Formverbindungen und einen geringfügig engeren Durchmesser im Vergleich zu dem Durchmesser desjenigen Teils des Innenrohrs (4) aufweisen, das sich innerhalb des Schalldämpfers befindet und die beiden Durchmesser über einen leicht konischen Abschnitt (11) miteinander verbunden sind.

2. Verbesserter Schalldämpfer gemäß Anspruch 1, dadurch gekennzeichnet, dass das Innenrohr (4) durch Kaltverformung zwei Wellen von Eintiefungen (5, 6) erhält, zwischen denen der Rand (7) der Bohrung des Schalldämpferdeckels eingeklemmt ist.

3. Verbesserter Schalldämpfer gemäß Anspruch 1, dadurch gekennzeichnet, dass das hineinführende Auspuffrohr (8) und/oder das hinausführende Endrohr (8) in oder auf das freie Ende des Innenrohrs (4) des Schalldämpfers geschoben ist und die beiden zusammengeschobenen Rohre danach durch Kaltverformung zwei einander entsprechende Wellen von Eintiefungen (9, 10) erhalten, durch die diese gegenseitig miteinander verklemt werden.

Revendications

1. Silencieux perfectionné dans lequel un tuyau intérieur (4) est fixé par sertissage aux couvercles (3) du silencieux, caractérisé en ce que le tuyau d'échappement entrant (8) et/ou le tuyau de sortie (8) sont respectivement fixés par sertissage directement sur les extrémités libre correspondantes de ce tuyau intérieur (4), les extrémités libres du tuyau intérieur (4) s'étendant hors des couvercles (3) sur une longueur appropriée pour permettre les dites deux connexions par sertissage et ayant un diamètre légèrement inférieur, comparé au diamètre de la partie du tuyau intérieur (4) qui se trouve dans le silencieux, ces deux diamètres étant raccordés par une portion (11) légèrement conique.

2. Silencieux perfectionné selon la revendication 1, caractérisé en ce que le tuyau intérieur (4) comprend deux ondulations ou élargissements (5, 6) obtenus par déformation à froid entre lesquels est fixé le bord (7) de l'orifice du couvercle du silencieux.

3. Silencieux perfectionné selon la revendication 1, caractérisé en ce que le tuyau d'échappement entrant (8) et/ou le tuyau de sortie (8) est inséré dans ou sur l'extrémité libre du tuyau intérieur (4) du silencieux, après quoi les deux tuyaux assemblés sont soumis à une déformation à froid qui leur confère des ondulations ou élargissements (9, 10) correspondants les fixant l'un à l'autre.

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