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2,435,697

METHOD OF ASSEMBLING SHEET METAL PARTS

Original Filed March 24, 1941

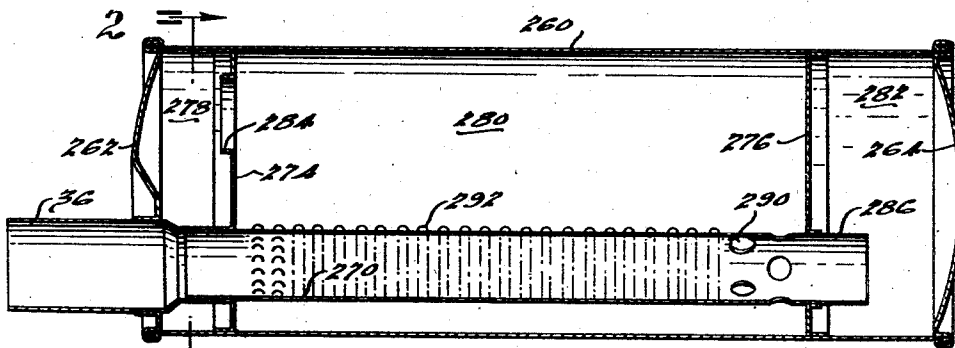


FIG. 1.

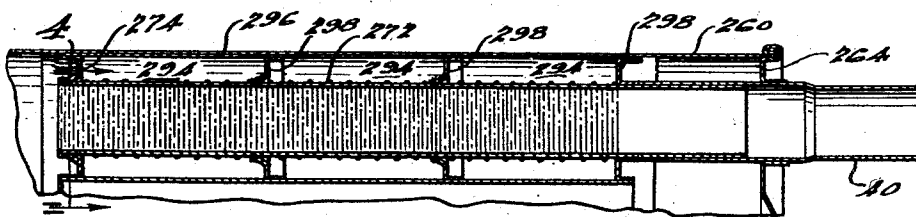


FIG. 3.

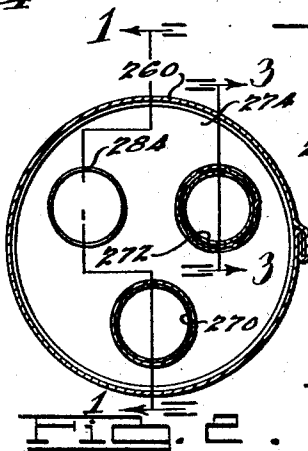


FIG. 2.

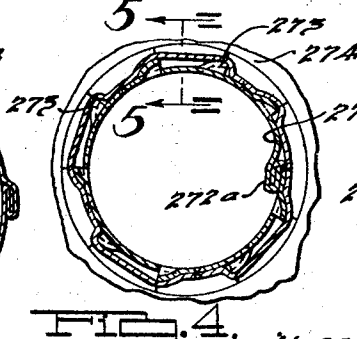


FIG. 4.

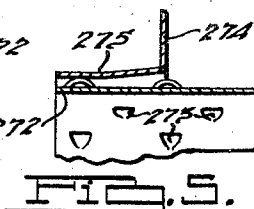


FIG. 5.

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UNITED STATES PATENT OFFICE

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METHOD OF ASSEMBLING SHEET
METAL PARTS

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Original application March 24, 1941, Serial No.
384,791, now Patent No. 2,357,791, dated Sep-
tember 5, 1944. Divided and this application
November 6, 1943, Serial No. 509,263

4 Claims. (Cl. 29—157)

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The present invention relates to silencers, and in particular, provides improved methods of assembling sheet metal parts.

The present application is a division of applicant's copending application, Serial No. 384,791, filed March 24, 1941, now Patent No. 2,357,791, granted September 5, 1944.

The principal object of the present invention is to provide an improved method for forming a connection between a tubular member and a partition, the tubular member being provided with radially outwardly extending projections, which method is principally characterized by providing the partition member with a conical neck which, in assembly, is ironed by the projections, thereby giving it a shape which adapts it for final connection to the tubular member.

With the above as well as other objects in view, which appear in the following description and in the appended claims, a preferred but illustrative embodiment of the invention is shown in the accompanying drawing, throughout the several views of which corresponding reference characters are used to designate corresponding parts and in which:

Fig. 1 is a view in longitudinal section of an automotive silencer constructed in accordance with the invention, and taken along the line 1—1 of Fig. 2;

Fig. 2 is a view in transverse section taken along the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary view, illustrating the third gas passage of the structure of Figs. 1 and 2, and taken along the line 3—3 of Fig. 2;

Fig. 4 is an enlarged view taken along the line 4—4 of Fig. 3; and

Fig. 5 is a fragmentary view taken along the line 5—5 of Fig. 4.

It will be appreciated from a complete understanding of the invention that the improvements hereof may be utilized in the manufacture of many different structures, intended for widely differing purposes. By way of illustration of preferred embodiments, the present improvements are herein illustrated in connection with the manufacture of silencers specifically designed for automotive service.

The general construction of the illustrative automotive silencer shown in the drawings, is described in detail, and claimed, in the aforesaid Patent No. 2,357,791.

For purposes of the present application, it is noted that the silencer comprises generally a cylindrical outer shell 260, which is provided with end heads 262 and 264. Head 262 is apertured

to receive the silencer inlet 36, which may be arranged for connection to the exhaust pipe of the associated automobile engine. Within the shell 260, the inlet 36 is connected to a tubular conduit 270. Conduit 270 and the inlet 36 are additionally supported by transverse partitions 274 and 276. These partitions and the other head 264 also support a second gas conducting conduit 272, the end whereof is connected to the outlet 40. Outlet 40 in turn is adapted for connection to the tail pipe of the associated automobile.

The space between partition 276 and 264 constitutes a resonator chamber, access to which is afforded only through the tuning neck 286 defined by the inwardly projecting end of conduit 270. The space between partitions 274 and 276 constitutes an intermediate expansion chamber, which receives gases through the two series of openings 290 and 292 in conduit 270, and which discharges gases through opening 284 into the crossover 278. The crossover 278, defined between head 262 and partition 274, communicates directly with the end of the outlet conduit 272. Outlet conduit 272 is provided with a series of small resonator chambers which are defined by an intermediate shell 296, through which conduit 272 passes, and a series of partitions 274 and 298. These small chambers are designated 294, and access thereto is afforded by the series of small louver openings 273 in conduit 272.

The invention is primarily concerned, in the illustrated embodiment, with the assembly of partitions such as 274, on the conduit 272, and before proceeding to a description of this improved method, the operation of the illustrated silencer may briefly be described as follows.

The gas stream enters through the inlet 36, and passes out through the outlet 40. In traversing the silencer, the stream is acted upon by the main resonator 282, the expansion chamber 280, and the small resonator chambers 294 which, in large part, eliminate the pressure peaks in the pulsating exhaust stream, and, consequently, in large part, silences the stream.

As most clearly appears in Figure 3, the louvers 273 in the conduit 272 are of the tangential form described and claimed in Gunn Patent No. 1,949,074. These louvers are arranged in axially spaced and circumferentially offset ring-like rows, the individual louvers in alternate rows being aligned with each other axially of the conduit. As aforesaid, these small louver openings afford the acoustic coupling between the interior of the conduit 272 and the small chambers 294.

The partition 274, and similar comments ap-

ply to the partitions 298, is provided with a neck 275 of conical form, the portion of largest diameter thereof being adjacent the junction between the neck and the body of the partition. The diameter of this largest portion is preferably substantially equal to the diameter of the imaginary surface including the crests of the louvers 273. With this relation, a relatively snug slip fit is provided between each portion of largest diameter and the tube 272, which enables the partition in question to be fitted over the louver tube without deforming the individual louvers. This fitting operation, however, causes the individual louvers to deform each neck portion of minimum diameter from its initial circular shape into a polygonal shape, the number of sides of which is equal to the number of louvers in two successive rings of such louvers. The difference between the minimum and maximum diameters is such that this deforming or ironing effect brings the surface of the neck in the region of the small end thereof more nearly into contact with or immediately adjacent the body of the tube than would otherwise be the case, and materially facilitates the completion of the connection between each neck and the tube.

It will be noticed that the length of each neck is preferably approximately equal to the spacing, axially of the louver tube, between two aligned rings of louvers. The final positioning of the partition is preferably such that the neck portion of largest diameter rests upon the louvers in one of such rings, thus bringing the portion of smallest diameter into registry with the other such ring.

The connection between each partition and the louver tube is preferably made by effecting a series of welds between the tube and the neck portion. Preferably, also, such welds are made adjacent the small end of each neck, and one such weld is made in the space between successive louvers in the corresponding louver ring. Manufacturing variations may be expected to cause some variation in the exact point at which each such weld is made. In a general sense it has been found that the connection is satisfactory if the welds are made anywhere between the crest of one such engaged louver and the crest of the next successive louver in the same ring. Preferably, and as illustrated in Fig. 3, however, the welds are made approximately midway between the crest of one such engaged louver and the crest of a louver in the next successive ring of louvers. An additional weld is also preferably made in the region of the rolled seam 272a.

The individual welds form a positive connection between each partition and the tube which secures the two together as a unit, and also serves to minimize any leakage space between the surface of each tube and the neck. Any such leakage spaces which are not eliminated by the welding operations are found to have only a negligible effect, if any, upon the performance of the silencer.

As will be understood, the described arrangement is particularly advantageous because it enables a given louver tube construction to be utilized in building up a silencer having differing numbers and differing sizes of chambers 294. This is because the individual partitions, such as 298, can be secured to the louver tube at any of a plurality of points along the body thereof.

What is claimed is:

1. The method of forming a connection between a conduit having a series of axially and

circumferentially distributed openings in the wall thereof, each opening being defined by a louver portion, the crest whereof projects radially outwardly from the surface of the conduit, and a partition or like member which comprises providing the partition with a neck of conical form, the diameter of the larger portion whereof is approximately equal to the diameter of the imaginary surface which includes said crests and the diameter of the smaller portion whereof is in excess of the diameter of said conduit, telescoping said neck and conduit together so that the ironing effect of the louvers deforms the portion of smaller diameter into a polygonal shape, and forming one or more connections between the conduit and the neck, each said connection being made in the region of the portion of smaller diameter.

2. The method of forming a connection between a conduit having a series of axially and circumferentially distributed openings in the wall thereof, each opening being defined by a louver portion, the crest whereof projects radially outwardly from the surface of the conduit, and a partition or like member which comprises providing the partition with a neck of conical form, the diameter of the larger portion whereof is approximately equal to the diameter of the imaginary surface which includes said crests and the diameter of the smaller portion whereof is in excess of the diameter of said conduit, telescoping said neck and conduit together so that the ironing effect of the louvers deforms the portion of smaller diameter into a polygonal shape with at least certain of the polygonal sides engaging the surface of the conduit, and forming one or more connections between the conduit and the neck, each said connection being made in the region of the portion of smaller diameter.

3. The method of forming a connection between a conduit having a series of axially and circumferentially distributed openings in the wall thereof, each opening being defined by a louver portion, the crest whereof projects radially outwardly from the surface of the conduit, and a partition or like member which comprises providing the partition with a neck of conical form, the diameter of the larger portion whereof is approximately equal to the diameter of the imaginary surface which includes said crests and the diameter of the smaller portion whereof is in excess of the diameter of said conduit, telescoping said neck and conduit together so that the ironing effect of the louvers deforms the portion of smaller diameter into a polygonal shape with at least certain of the polygonal sides engaging the surface of the conduit, and forming one or more connections between the neck and the surface of the conduit.

4. The method of forming a connection between a conduit having a series of axially and circumferentially distributed openings in the wall thereof, each opening being defined by a louver portion, the crest whereof projects radially outwardly from the surface of the conduit, and a partition or like member which comprises providing the partition with a neck of conical form, the diameter of the larger portion whereof is approximately equal to the diameter of the imaginary surface which includes said crests and the diameter of the smaller portion whereof is in excess of the diameter of said conduit, telescoping said neck and conduit together so that the ironing effect of the louvers deforms the portion of smaller diameter into a polygonal shape, and forming

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one or more connections between the neck and the surface of the conduit.

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The following references are of record in the file of this patent:

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Name	Date
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Van Dorn	July 16, 1918
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Sandiford	Mar. 24, 1914