United States Patent [19]

Keller

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[54] **DOUBLE WALL EXHAUST PIPE**

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[52] **U.S. Cl.** ..... **138/178,** 137/525.1, 181/36 B

[51] **Int. Cl.** **F16l 9/18**

[58] **Field of Search** ..... 138/178, 177, 140, 143; 137/525.1; 181/35 B, 36 B

[56] **References Cited**

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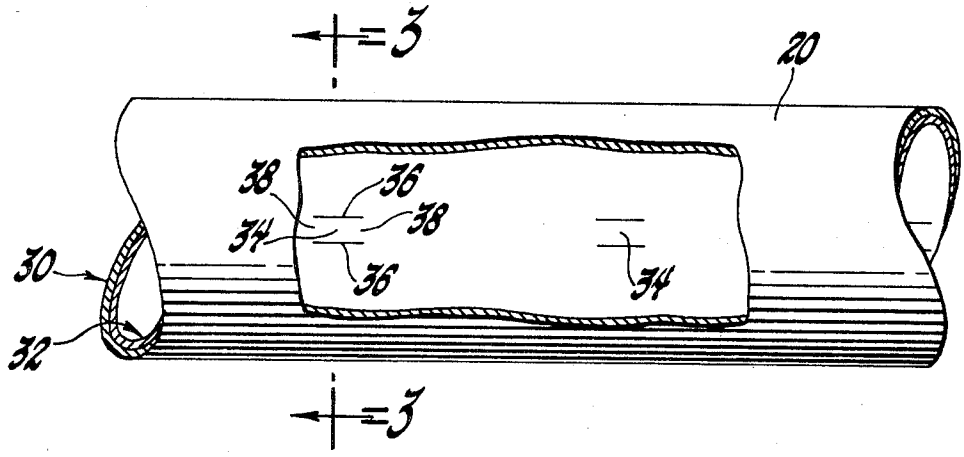
[57] **ABSTRACT**

A double wall exhaust pipe comprising inner and outer conduits includes a plurality of inwardly lanced strips on the inner conduit which are reformed to their original position. The lanced strips yield upon pressure buildup between the conduits to allow pressure venting while maintaining a double wall thickness resistance to corrosion.

2 Claims, 7 Drawing Figures



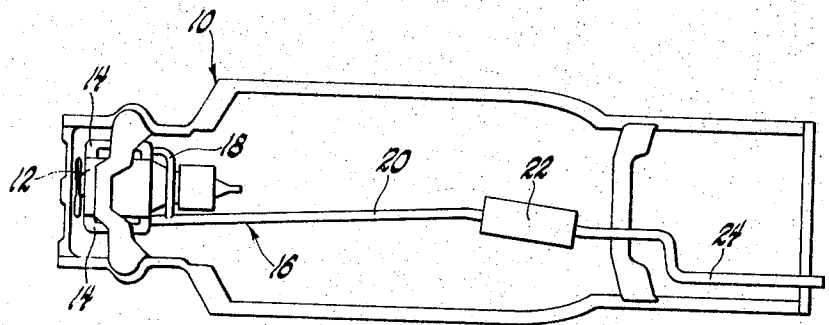


Fig. 1

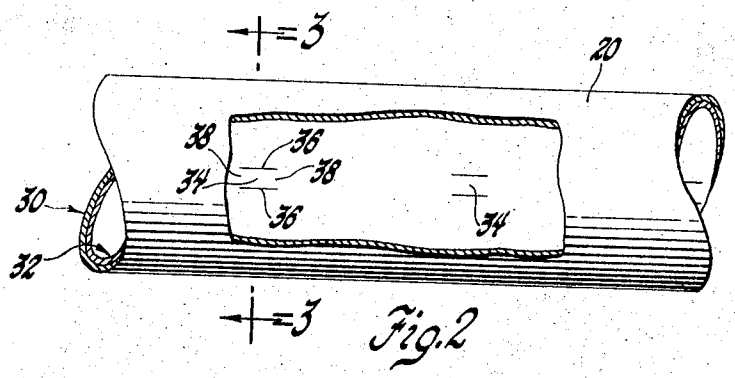


Fig. 2

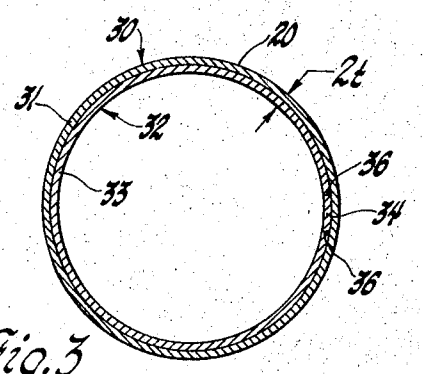


Fig. 3

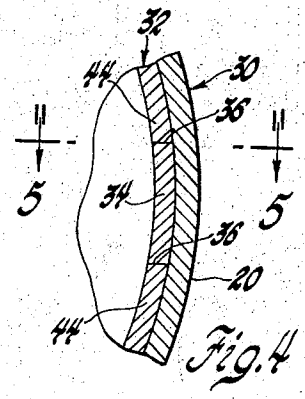


Fig. 4

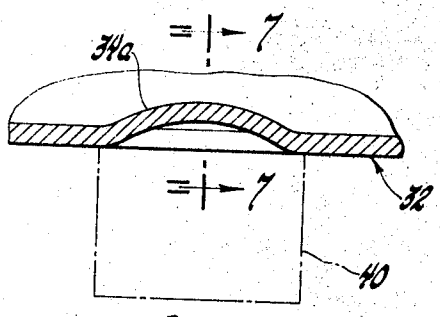


Fig. 6

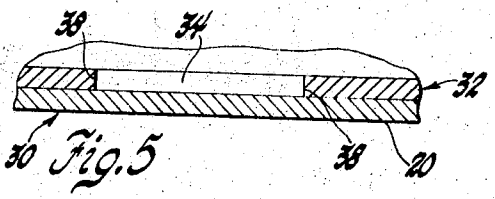


Fig. 5

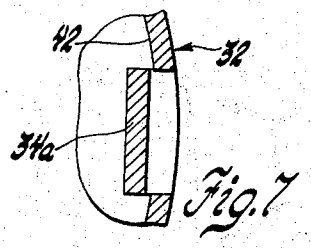


Fig. 7

DOUBLE WALL EXHAUST PIPE

The present invention relates to fluid flow conduits and, in particular, to a double wall exhaust pipe having integral pressure venting.

Current motor vehicles use a laminated or double wall construction for the exhaust pipe leading from the engine to the muffler. This construction prolongs the useful life of the pipe by providing an additional wall thickness for reducing corrosion. It also reduces acoustical transmission or "pipe noise" through the walls of the pipe. Under certain conditions, pressure can build up between the walls. This can cause the inner wall to collapse with a consequent reduction in engine performance. Various methods have been used for relieving this pressure buildup, usually a hole in either the inner or the outer wall. These holes leave only a single wall thickness between exhaust gas and atmosphere making the pipe locally susceptible to adverse effects from corrosion.

The present invention provides a double wall exhaust pipe construction having integral pressure relief means and a continuous double wall thickness resistance to corrosion. More particularly, these features are achieved by forming a series of axially aligned lanced strips at spaced axial locations along the inner wall. The strips are originally radially inwardly lanced and are thereafter reformed into their original position in continuity with the wall cross section. The reforming provides a continuous double wall between the exhaust gases and atmosphere to eliminate the localized corrosion problem above described. These lanced strips are defined by parallel axial slits to establish pressure relief sections which are limitedly supported only at the ends thereof. Upon a pressure buildup between the walls, the strips yield inwardly to allow venting of the entrapped gases thereby preventing a collapse of the inner wall.

Accordingly, an object of the present invention is to provide a double wall fluid flow conduit having integral pressure relief means and a continuous double wall resistance to corrosion.

Another object of the present invention is to provide a double wall exhaust pipe for an internal combustion engine having a plurality of in-place pressure relief sections which yield to a venting position upon pressure buildup between the walls.

A further object of the present invention is to provide a laminated exhaust pipe construction wherein a plurality of strips are lanced in the inner pipe and reformed to their original position to establish a continuous double wall resistance of corrosion, the strips being limitedly supported only at the ends thereof and yielding inwardly to relieve pressure buildup between the inner and outer pipes.

Yet another object of the present invention is to provide a method of making a double wall exhaust pipe with integral pressure relief means wherein a plurality of strips are lanced at spaced axial locations along the length of the inner pipe and are reformed into their original cross sectional position to provide a double wall resistance to corrosion while being limitedly supported so as to yield to a venting position upon a pressure buildup between the pipes.

These and other features of the present invention will be apparent to one skilled in the art upon reading the following detailed description, reference being made to

the accompanying drawings showing a preferred embodiment in which:

FIG. **1** is a plan view of a motor vehicle frame incorporating an exhaust system for an internal combustion engine having a double wall exhaust pipe made in accordance with the present invention;

FIG. **2** is an enlarged partially sectioned fragmentary view of the double wall exhaust pipe showing the lanced pressure relief strips;

FIG. **3** is a view taken along line **3—3** of FIG. **2** showing the disposition of the in-place pressure relief strip to the conduit walls;

FIG. **4** is an enlarged fragmentary view showing the in-place pressure relief strip with respect to the conduit walls;

FIG. **5** is a view taken along line **5—5** of FIG. **4**;

FIG. **6** is a fragmentary sectional view showing the lancing of the pressure relief strip on the inner wall; and

FIG. **7** is a view taken along line **7—7** of FIG. **6** showing the lanced position of the pressure relief strip with respect to the inner wall.

Referring to FIG. **1**, there is shown a motor vehicle frame **10** in which there is a mounted internal combustion engine **12.** For the V-type engine illustrated, exhaust manifolds **14** are provided on either side thereof. The engine exhaust gases are discharged from the exhaust manifolds **14** to an exhaust line **16** including a crossover pipe **18.** The exhaust line **16** includes a double wall exhaust pipe **20** serially connected to an attenuating device **22** and a tailpipe **24.**

To reduce acoustical transmission through the exhaust pipe, it is conventional to use a double wall or a laminated exhaust pipe construction. In such a construction, a seamless or welded outer conduit is disposed tightly around a welded or seamless inner conduit. Under certain circumstances, exhaust gases can effect a pressure buildup between the inner and outer conduits and cause a collapse of the inner pipe.

The present exhaust pipe includes means for preventing inner pipe collapse due to pressure buildup and maintaining a continuous double wall resistance to corrosion. As shown in FIGS. **2** and **3,** the exhaust pipe includes an outer conduit **30** defined by a cylindrical wall **31** and an inner conduit **32** defined by a cylindrical wall **33.** The outer conduit **30** has its inside diameter disposed tightly around the outside diameter of an inner conduit **32** in juxtaposed relationship therewith continuously circumferentially therearound along the axial length of the inner conduit **32.** This construction provides a double thickness corrosion resistant barrier having a width $2t$. To prevent pressure buildup between the pipes which can cause the aforementioned collapse, an axially spaced series of generally rectangular lanced pressure relief strips **34** are formed at spaced axial locations along the inner conduit **32.** Each pressure relief strip **34** is defined by a pair of parallel axially extending slits **36.** It has been found that a 6 inch spacing between strips having a width of 0.12 inch and a length of 0.25 inch provides effective pressure venting capabilities. The pressure relief strips **34** are supported only at bridge sections **38** adjacent the ends of the slits **36.** The strips, as shown in FIGS. **6** and **7,** are originally radially inwardly lanced on the inner pipe **32** by means of a suitable tool **40.** The lancing provides a preformed strip **34***a* having an undulating configuration along the length thereof. As shown in FIG. **7,** the apex of the pre-

formed strip **34***a* projects radially inwardly beyond the inner surface **42** of the pipe **32.** This lancing may take place before or after forming of the inner conduit **32.**

As shown in FIGS. **4** and **5,** the strips are thereafter reformed into cross sectional juxtaposed continuity with adjacent sections **44** of the inner pipe **32.** By reforming the pressure relief strips **34** to their original place in the conduit cross section, a double wall corrosion resistance barrier 2*t* is provided at the strip which establishes a continuous double wall corrosion resistance barrier along the entire axial length of the exhaust pipe **20.**

The slits **36** establish a circumferential structural discontinuity and the strips **34** are only limitedly supported at the bridge sections **38.** Therefore, when the pressure between the inner conduit **32** and the outer conduit **30** increases beyond a predetermined value, the strip **34** will yield inwardly to allow pressure venting of the entrapped gases.

Although the strips of the preferred embodiment are defined by pairs of lances or slits, it is also apparent that reformed tabs, louvers, or other limitedly supported reformed sections in either the inner or outer conduit will provide the dual function of a continuous double wall corrosion barrier and yielding pressure vents described above.

Although only one form of this invention has been shown and described, other forms will be readily apparent to those skilled in the art. Therefore, it is not intended to limit the scope of this invention by the embodiment selected for the purpose of this disclosure but only by the claims which follow.

What is claimed is:

1. A double wall exhaust pipe comprising: an inner conduit, an outer conduit surrounding said inner conduit having its inside diameter tightly disposed in juxtaposed relationship with the outside diameter of said inner conduit, a plurality of lanced strips on said inner conduit, each of said lanced strips including a pair of parallel circumferentially spaced axially extending slits, said lanced strips being reformed to the contour of the inside diameter of the inner conduit and being in juxtaposed relationship therewith to establish a continuous double wall thickness resistance to corrosion, bridge sections in said inner conduit structurally supporting each of said lanced strips adjacent the ends of said slits, said strips yielding inwardly of said bridge sections out of juxtaposed relationship with said inner conduit upon a predetermined buildup of gas pressure between the conduits to allow venting of the built-up gas pressure from between the conduits inwardly of said inner conduit thereby to prevent pressure collapse of said inner conduit.

2. A double wall exhaust pipe comprising: an inner conduit, an outer conduit surrrounding said inner conduit having the inside diameter tightly disposed in juxtaposed relationship with the outside diameter of said inner conduit continuously circumferentially thereabout to form a double thickness wall along the entire axial length of the exhaust pipe, means forming a plurality of pressure release strips at spaced apart points along the length of said inner conduit, each of said strips on said inner conduit being located in juxtaposed relationship with said outer conduit to form part of the double wall thickness, said strips being yieldable from their juxtaposed position upon a predetermined buildup of gas pressure between said inner and outer conduits, and means for securing each end of said strips to said inner conduit to control inwardly yielding movement of the strips to allow pressure venting of the entrapped gas and retention of the continuous double wall corrosion barrier.

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