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Wagner

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[54] **CATALYTIC CONVERTER HOUSING**

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[52] **U.S. Cl.** ..... **23/288 F**; 60/299

[51] **Int. Cl.**[2] **B01J 8/02**; F01N 3/15

[58] **Field of Search** ..... 23/288 F; 60/299, 301; 423/212, 213.2

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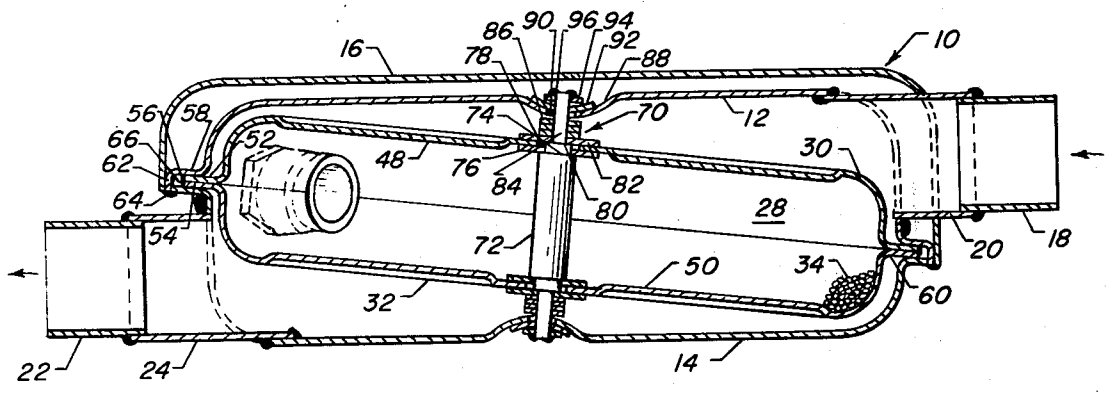
[57] **ABSTRACT**

Improved automotive catalytic converter capable of operating for long periods at inlet-outlet gas temperature differentials of 1,000°F or more contains a "floating" bed of particulate catalyst. An "anti-backfire" pin maintains the spacing between the bed and the inlet housing cover and prevents any deformation caused by a sudden increase in inlet gas pressure due to the presence of excess oxygen and unburned hydrocarbons downstream of the exhaust valves. The catalyst bed or chamber is defined by a pair of facing, dish-shaped members drawn from a perforated metal screen and welded to each other along circumferential radial flange portions. The welded radial flanges on the bed are free to slidably move in their common plane of contact relative to a pair of surrounding, spaced apart flanges on the housing which are welded together at points beyond the range of movement of the bed. The anti-backfire pin is centrally mounted for rocking movement relative to the housing under thermal exercising. The pin has spherically dished washers joined to its ends which are held in sliding engagement with embossed areas in the cover members which have a corresponding shape.

2 Claims, 3 Drawing Figures



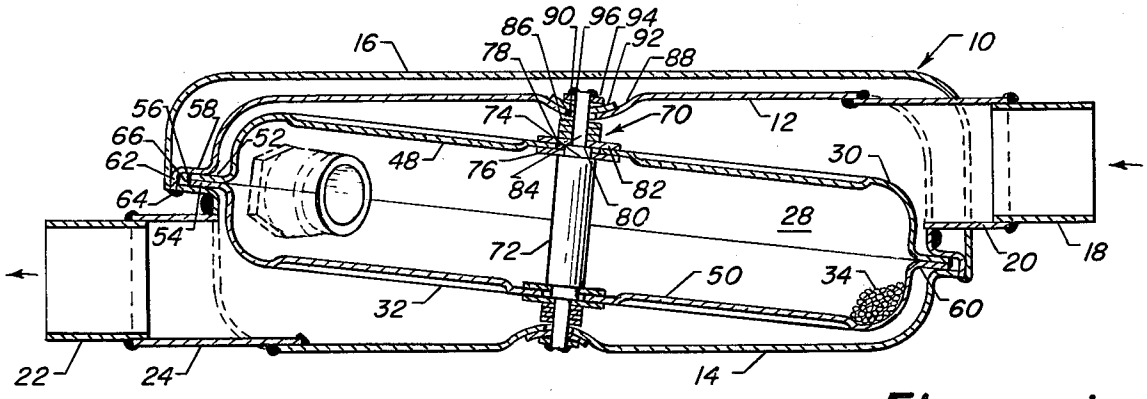


Figure 1

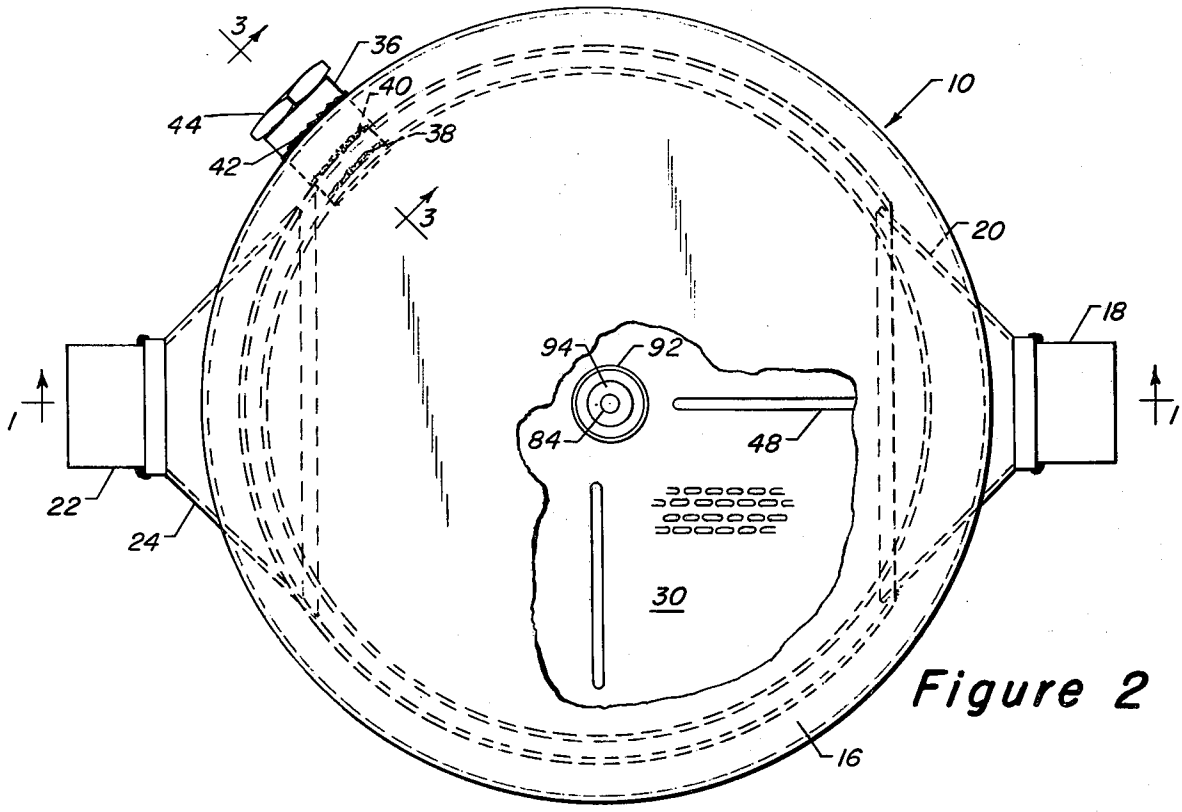
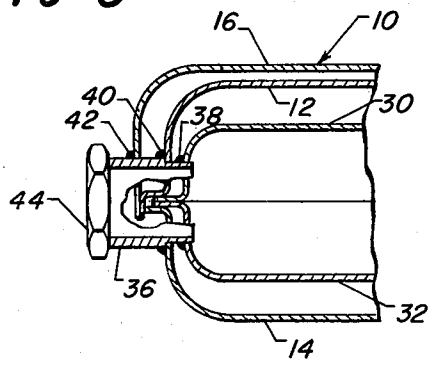


Figure 2

Figure 3



CATALYTIC CONVERTER HOUSING

BACKGROUND OF THE INVENTION

This invention relates to catalytic converters for automotive use and particularly to converters utilizing a particulate type catalyst. In such devices, the reaction which takes place between oxygen and unburned hydrocarbons and/or CO produces a large amount of heat. Where the catalyst bed is quite large compared to the volume of exhaust gases delivered to it, or where a relatively inefficient catalyst is used, the temperature differential between the outlet and inlet sides of the converter can usually be held to **500°F** or less. Such a relatively small temperature difference generally does not produce any significant thermal exercising of the catalytic converter housing relative to the catalyst bed mounted therein and it is possible to weld the bed and housing directly to each other without substantially reducing the expected life of the converter.

Where space requirements do not permit the use of a large catalyst bed it is of course necessary to make the bed smaller and thus use less catalyst. This can be done by using more efficient catalysts such as platinum. However, regardless of whether a more efficient catalyst is used, the mere reduction in size of the catalyst bed will cause the converter to run hotter. For example, temperature gradients of between **1200°–2000°F** are not at all uncommon in compact converters. U.S. Pat. No. **3,600,142** discusses various aspects of catalytic converter operation and design and is hereby incorporated by reference. The aforementioned patent is particularly concerned with problems presented by large temperature gradients and proposes reducing these problems by providing a mounting for a catalyst bed which permits the bed to slide relative to the housing. Although the provision for a sliding mounting for a bed eliminates certain of the problems created by a large temperature differential, other problems remain. For example, excess oxygen in the exhaust path can react with unburned hydrocarbons to produce backfires or explosions characterized by sudden and very large pressure pulses contacting the inlet screen and housing and tending to force these members away from each other and deform them. The conditions are often present when the engine is decelerating. In converters that operate at low temperatures it has been proposed that the bed and the housing be rigidly held together in the direction of gas flow by one or more anti-backfire pins that pass through the bed and the housing covers and are attached thereto. Such a mounting is quite satisfactory in a rigid housing operating at a low temperature gradient but would cause stresses which would probably result in converter failure if there was a large temperature gradient or if the catalyst bed were free to move relative to the housing.

SUMMARY

It is among the objects of the present invention to provide a catalytic converter of compact design which can operate at temperatures of **1,500°F** or higher without being damaged by internal temperature gradients of **1000°F** or more or by sudden gas pulses such as those produced by a backfire in the exhaust path.

These and other objects are obtained by the catalytic converter of the present invention which incorporates a floating catalyst bed. The floating catalyst bed consists of two symmetrical drawn screen components having a circumferential flange portion which is welded peripherally at the outer extent of the flange so as to comprise an enclosure for containment of the catalyst pellets. The catalyst bed assembly is held in the desired position within the converter body by means of an inlet cover and an outlet cover having flanged portions configured in such manner that the catalyst bed assembly can be placed within the inlet and outlet cover so that the flanged portion of the catalyst bed assembly rests upon the lower cover flange portion, and the inlet cover flanged portion can be placed upon the opposite side of the catalyst bed flanged portion. The inlet cover is additionally flanged in such a manner that the outer periphery of the flanged portion is formed downwardly for a distance equal to the thickness of the two flanges which extend from the catalyst bed assembly. The flanges permit the inlet and outlet cover members to be attached to each other by a conventional welded process with a circumferential weld joining the flanged portion of the outlet cover and the flanged portion of the inlet cover but leaving the flanged portion of the catalyst bed assembly free to move. The downwardly formed flange portion in the inlet cover is formed with a sufficient internal diameter to allow for radial thermal exercising of the catalyst bed. As a point of illustration, one can readily appreciate that if the catalyst bed were securely welded to the inlet and outlet body cover portions of the converter, and if the body cover portions of the converter were at a lower temperature than the components comprising the catalyst bed, the body covers would act as a restraint to thermal expansion of the catalyst bed components and would cause buckling or some form of deformation as a result of the differential of temperature.

The converter assembly also includes an anti-backfire pin. This pin is of such construction that when used in cooperation with a series of washers or spacers it provides a uniform desired spacing of the catalyst bed screen components and the inlet and outlet cover components and secures them together. The pin also provides resistance to the pressures of backfires in the exhaust path under all conditions of differential thermal growth between the internal screen components and the external cover components. The differential thermal growth is accommodated by providing a large pin receiving opening in the catalyst bed screen components. A pair of shouldered portions on each end of the anti-backfire pin support a pair of large circular washers which are axially spaced from each other by the thickness of the screen. The washers contact the inside portion of the screen component and the outside portion of the screen component and permit radial relative movement of the screen while sealing against passage of gases around the clearance hole in the screen. The ends of the anti-backfire pin extend outwardly from the bed assembly through an appropriate hole in the inlet and outlet cover. The areas immediately surrounding the holes in the inlet and outlet covers are spherically embossed inwardly in such manner as to accept formed washers of a complementary curved shape. The ends of the anti-backfire pin extend outwardly beyond the outward surface of each curved washer a sufficient distance to permit the pin to be welded to an additional washer which bears against the outward curved surface of the formed washers. This mounting method allows a small amount of rotational or rocking movement of the pin about any transverse axis through its center to ac-

commodate differential thermal growth between the inlet cover portion and the outlet cover portion.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side sectional view taken on line 1—1 of FIG. 2;

FIG. 2 is a top plan view of the improved catalytic converter with portions broken away for clarity; and

FIG. 3 is a fragmentary cross-sectional view taken on line 3—3 of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, the improved catalytic converter indicated generally at **10** includes an inlet cover **12** and an outlet cover **14.** An additional cover **16** forms a heat shield on the upper side of the converter to protect portions of the vehicle positioned above it. Engine exhaust gases are directed to the converter by an inlet tube **18** and inlet transition member **20** which are welded to the inlet cover **12.** Similarly, an outlet tube **22** and outlet transition member **24** are welded to the outlet cover **14.**

Positioned between the inlet and outlet covers **12, 14** is a catalyst bed assembly indicated generally at **28** and including a perforated inlet screen member **30** and a perforated outlet screen member **32.** The catalyst bed assembly **28** is filled with catalyst pellets **34** through a loading tube **36** which is welded at **38** to screens **30, 32.** The loading tube is also welded at **40** to cover members **12, 14** and at **42** to the heat shield **16.** The loading tube **36** is closed by means of a closure plug **44.**

To lend additional strength to the screen members **30, 32** the screens are embossed with ribs **48, 50** respectively. The peripheral edges of the screen members **30, 32** are provided with flanges **52, 54** respectively which are welded together at their peripheries by weld bead **56.** The screen flanges **52, 54** are adapted for radial movement between upper cover radial flange portion **58** and lower cover radial flange portion **60** in response to differential temperature gradients between the covers and the bed assembly **28.** The radial flanges **58, 60** are held in a predetermined spacing relative to each other by means of an axial flange **62** formed on the upper cover and a weld bead **64** which attaches it to flange **60.** The axial flange **62** has a greater internal diameter than the external diameter of the bed assembly **28** so as to provide a space **66** for expansion of the bed assembly **28.** Since the bed assembly covers **12, 14** and heat shield **16** are all welded to the loading tube **36,** it is obvious that no relative movement can take place between the bed assembly **28** and the covers **12, 14** in the vicinity of the loading tube **36.** Rather, movement takes place away from tube **36.**

Although the aforementioned mounting of the bed assembly **28** within the cover members **12, 14** permits the bed to move freely relative to the covers in response to temperature differentials it has been found that additional structure is desirable to support the covers **12, 14** and the screens **30, 32** in the center of the converter. For this purpose, an anti-backfire pin assembly **70** is provided. The assembly **70** comprises a pin **72** having an inner shoulder **74** which bears on an inner screen retaining washer **76.** The inlet screen **30** rests on the retaining washer **76** and is spaced from the pin **72** by a space **78** which accommodates thermal expansion of the screen. The pin **72** further includes an intermediate shoulder portion **80** upon which an outer screen retaining washer member **82** is positioned. The washers **76** and **82** provide some strength to the screen **30** in the vicinity of the space **78** while providing a guide for sliding movement. The pin **72** is further reduced in diameter along end portion **84** which is surrounded by flat spacer washers **86.** A concave, spherically curved portion **88** of the cover member **12,** having an aperture **90** larger than the diameter of the end portion **84** of the pin **72,** is pressed down against the stack of washers **86** by a spherically curved washer **92** which is in turn held by a flat washer **94** and a weld bead **96.**

Although only the upper end of the pin assembly **70** has been described it will be appreciated that the lower end is identical. Furthermore, while the converter **10** has been shown as having a generally circular configuration and right angled embossed ribs **48** for strengthening it will be appreciated that other shapes such as an oblong shape could be used and that the embossed ribs could be formed in other ways depending upon the strength required. For example, on an oblong shaped converter the ribs would preferably be arranged parallel to the longitudinal direction of the converter. Although a converter having 1 pin assembly **70** has been shown it will be appreciated that for larger converters strength requirements might dictate the presence of 2, 4 or more pin assemblies.

In operation, engine exhaust gases passing into the converter **10** through inlet tube **18** normally pass down through the catalyst **34** and out the outlet tube **22.** In doing so they increase in temperature depending upon the amount of combustibles present so that the converter outlet screen **32** could be at a temperature of **1500°F** or higher as compared to an inlet temperature of perhaps **550°F** at the inlet cover **12.** In order that the converter **10** will last for a long time, preferably **50,000** miles or more, it is constructed of material such as Type **409** stainless steel which will provide the necessary corrosion resistance and high temperature durability. Although differential temperature expansions during use of the converter are relatively small in magnitude, they are of great significance since the converter temperature is constantly rising and falling as the engine speed and load changes. Due to the presence of the spherically curved cover embossment **88** and the similarly curved washer **92** it is possible for the outlet covers **12, 14** to slide relative to the pin **72.** The sliding movement prevents the pin from flexing the covers as would happen if it were welded.

I claim as my invention:

1. A catalytic converter assembly comprising a metal housing including a inlet housing cover portion and a metal outlet housing cover portion; a particulate catalyst retaining bed portion including a chamber defined by a pair of facing, dished, perforated metal inlet and outlet members; said pair of dished members having peripheral, joined together, radially extending flange portions; each of said cover portions having peripheral flanges which extend radially beyond, and slidably engage, the flange portions on said dished members; at least one of said cover portions having an axially extending flange portion which is welded to the other cover portion at a location spaced radially outwardly of the flange portions of said dished members; said bed portion being free to slide in the plane of said flange portions in response to temperature differences between the metal housing and the bed portion; at least

one spacer pin passing through said housing cover portions and said perforated members; said spacer pin having shoulder portions spaced inwardly from its ends limiting movement of said perforated members toward each other; the end portions of said spacer pin projecting through apertures larger than said end portions which are formed in said housing cover portions; the cover portions being generally concavely shaped in the immediate area surrounding said pin ends; and retaining means on the ends of said at least one pin for preventing said cover portions from moving away from each other, a portion of said retaining means being shaped in a manner complementary to said concave shaped cover area so as to permit said retaining means to slide relative to said cover portion and said pin to pivot.

2. A catalytic converter assembly in accordance with claim **1** characterized in that a fitting for adding or removing catalyst particles passes through and is joined to said metal housing and bed portion.

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