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(71) Applicant: **Delphi Technologies, Inc.**
Troy, MI 48007 (US)

(72) Inventors:
- **Bouraad, Georges**
  4907 Bascharage (LU)
- **Laurent, Denis**
  54260 Longuyon (FR)

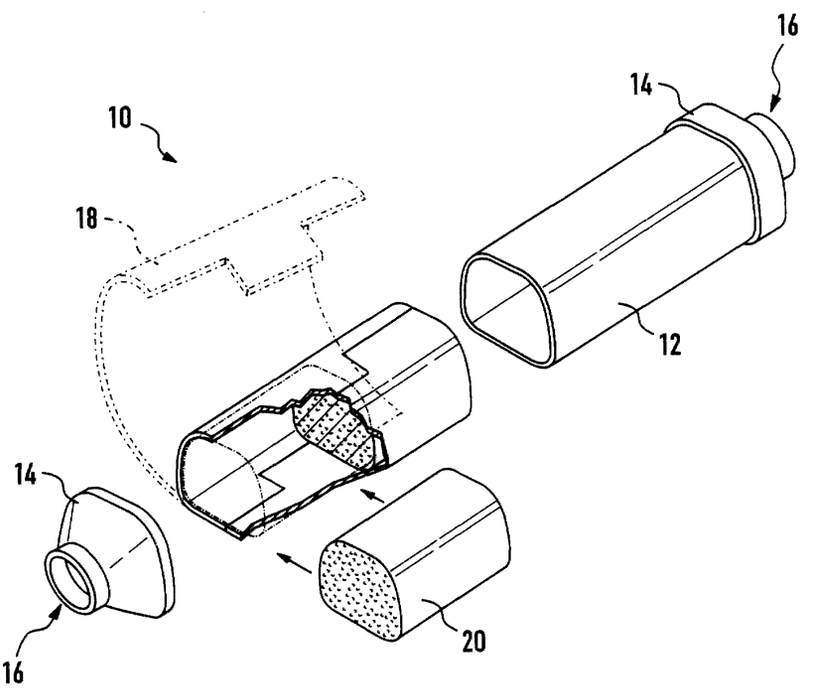
(74) Representative: **Kihn, Pierre Emile Joseph et al**
Office Ernest T. Freylinger S.A. 234, route d'Arlon B.P. 48
8001 Strassen (LU)

(54) Method for assembling a catalytic converter

(57) Method for assembling a catalytic converter, the catalytic converter obtained according to the method and the use of said catalytic converters in diesel engine exhaust lines. The method comprises the following steps:

- wrapping a mat around a catalyst monolith,
- stuffing said catalyst monolith together with the mat into a tubular shell,
- mounting an end cone to each side of the tubular shell,
- welding said end cones to the shell.

The catalyst monolith is positioned inside said shell in such a way that the mat and the weldings of the end cones to the tubular shell overlap and that the mat is heated during welding to a temperature which causes the mat to expand in the overlapping region.



EP 1 164 267 A1

Description

Introduction

[0001] The present invention relates to a method for assembling a catalytic converter, to the catalytic converter obtained according to the method and to the use of said catalytic converters in diesel engine exhaust lines.

[0002] It is known in the art relating to vehicle engine exhaust catalytic converters for controlling exhaust emissions to provide a housing including an insulated tubular shell to which tapered end cone assemblies comprising a flange are welded for connecting the converter to associated exhaust pipes or components. A catalyst monolith or catalytic element is assembled into the tubular shell prior to installing and welding the end cone assemblies onto each side of the shell. The tubular shell may have a circular cross section or be of any suitable non-circular configuration.

[0003] During operation of the engine, the internal combustion engine exhaust gases pass through the converter, so that the converter is heated to high temperatures. In order to reduce the heat radiation emanating from the shell of the catalytic converter, the metallic or ceramic monolith is mounted within the tubular shell by an intumescent (expanding) ceramic, heat-insulating blanket called mat, which comprises refractory ceramic fibers.

[0004] This mat assures basically three functions: it seals the perimeter of the catalytic converter to prevent exhaust gas bypass, it provides thermal insulation and holds the catalyst monolith firmly in place within the tubular shell.

[0005] To assure these functions properly, it is necessary that the mat extends or swells up after it has been introduced into the shell. This is achieved when the mat has been heated for the first time above a critical temperature depending on the mat, usually around 300°C.

[0006] However, in diesel engine applications, the mat does not reach the required temperatures because of the low temperatures of the diesel exhaust gases (650°C) and does not extend or swell up to the required volume. The catalyst monolith is not maintained properly inside the shell and will eventually be damaged because of the vibrations in the exhaust lines.

Object of the invention

[0007] The object of the present invention is to provide a catalytic converter in which the catalyst monolith is maintained in place more firmly.

General description of the invention

[0008] In order to overcome the abovementioned problems, the present invention provides a method for assembling a catalytic converter, comprising the following steps:

- wrapping a mat around a catalyst monolith,
- stuffing said catalyst monolith together with the mat into a tubular shell,
- mounting an end cone to each side of the tubular shell,
- welding said end cones to the shell,

wherein the catalyst monolith is positioned inside said shell in such a way that the mat and the weldings of the end cones to the tubular shell overlap so that the mat is heated during welding to a temperature which causes the mat to expand in the overlapping region.

[0009] During the welding of the end cones to the tubular shell, the mat is heated to a sufficiently high temperature (about 300°C) in the overlapping region so that the mat is caused to swell to such an extend that the catalyst monolith is maintained firmly in place. In other words, the heat provided during welding will heat up the part of the mat lying underneath the welding to such a temperature that it expands. Basically, the catalyst monolith is safely maintained inside the shell by to rings of expanded mat, one at each side of the shell beneath the weldings. These rings of expanded mat prevent the exhaust gas to bypass the catalyst monolith.

[0010] The life expectancy (durability) of the catalytic converters is enhanced since the catalyst monolith is held tight inside the tubular shell and is less subject to deterioration through vibrations. Life expectancies of more than 160.000 km can be expected.

[0011] The term "overlapping region" defines the part of the mat, the end cones and the tubular shell that overlap in the finished catalytic converter.

[0012] In a preferred embodiment, the overlapping region extends between 0.5 cm and 5 cm, preferably between 1 cm and 3 cm on each side of the shell.

[0013] According to a further embodiment, the invention comprises catalytic converters produced according to the method described above, and also the use of such catalytic converters in diesel engine exhaust lines.

[0014] If an improved heat insulation is required due to the mounting of the catalytic converter at a critical location, the tapered end cone piece can comprise a double wall cone assembly with an outer cone and an inner cone, said inner cone being arranged coaxially within said outer cone. Furthermore an insulation material is preferably arranged within a gap between said inner cone and said outer cone of said tapered end piece. Although this embodiment increases the production costs due to the double cone assembly, it nevertheless provides unequalled heat insulation.

Detailed description with respect to the figures

[0015] The present invention will be more apparent from the following description of a not limiting embodiment with reference to the attached drawings, wherein Fig.1: shows an exploded view of a catalytic converter; Fig. 1 shows an exploded view of a catalytic converter 10. It comprises a tubular shell 12 with a tapered end cone 14 welded at each side of the tubular shell 12. The tapered end cones comprise each a flange 16 for connecting the converter 10 to associated exhaust pipes or components. An intumescent ceramic, heat-insulating blanket a so called mat 18 is wrapped around a catalyst monolith 20, which is then stuffed into the tubular shell 12 together with the mat 18. After the stuffing, the end cones 14 are welded on each end of the tubular shell 12.

[0016] In order to reduce the heat radiation emanating from the tubular shell 12 of the catalytic converter 10, to seal the perimeter of the catalyst monolith 20 so as to prevent exhaust gas bypass and to hold the catalyst monolith 20 firmly in place within the tubular shell 12, the catalyst monolith 20 is mounted within the tubular shell by the mat 18.

[0017] The end cones 14 are designed in such a way that the tubular shell 12 penetrates inside the end cones 14 and that the tubular shell 12 and the end cones 14 overlap in an overlapping region. The mat 18 and the catalyst monolith 20 are positioned inside the tubular shell in such a way that the mat 18 is in the overlapping region. During the welding of the end cones 14 to the tubular shell 12, the mat 18 is heated to a sufficiently high temperature (about 300°C) for a sufficient time in the overlapping region so that the mat is caused to swell.

[0018] The measurements done on more than a hundred parts show that the force necessary to extract the catalytic monolith form its shell after manufacture improved from 2000-3500 N in the conventional method to 4000 to 10000 N with catalytic converters produced according to the method of the invention.

[0019] It is to be noted that the extraction forces remain at a very high level even after the catalytic converter manufactured according to the invention has been subjected to vibrations of about 40g for 40 hours whereas the extraction forces of state of the art catalytic converts decreased significantly.

[0020] In these tests, a mat available form MINNESOTA MINING AND MANUFACTURING COMPANY also known as 3M under the tradename INTERAM 100 Series 10 was used.

Reference signs

[0021]

10 catalytic converter

12 tubular shell

14 end cones

16 flange

18 mat

20 catalyst monolith

Claims

1. Method for assembling a catalytic converter, comprising the following steps:

   - wrapping a mat around a catalyst monolith,
   - stuffing said catalyst monolith together with the mat into a tubular shell,
   - mounting an end cone to each side of the tubular shell,
   - welding said end cones to the shell,

   wherein the catalyst monolith is positioned inside said shell in such a way that the mat and the weldings of the end cones to the tubular shell overlap so that the mat is heated during welding to a temperature which causes the mat to expand in the overlapping region.

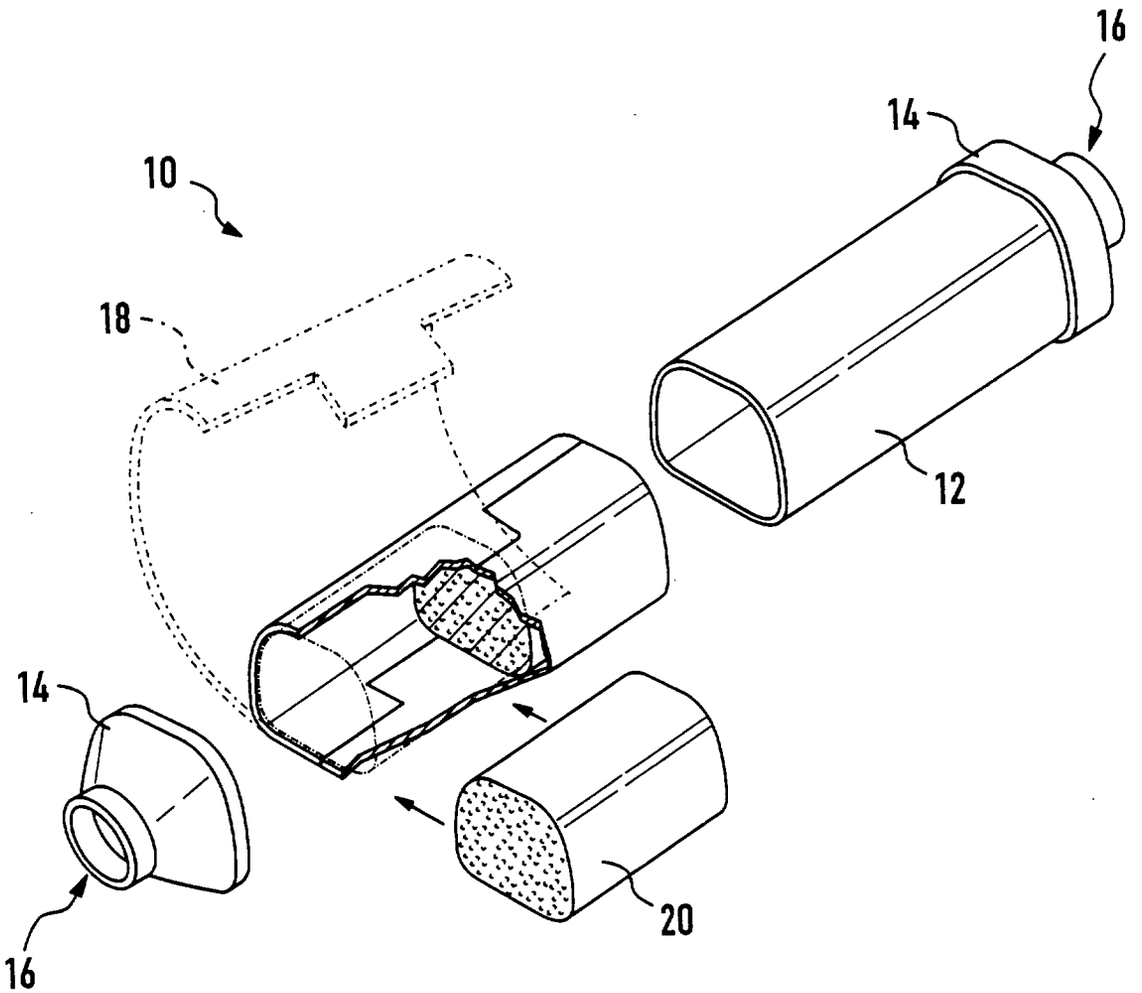
2. Method according to claim 1, wherein said overlapping region is comprised between 0.5 cm and 5 cm, preferably between 1 cm and 3 cm.

3. Catalytic converter obtained according to the method of any one of claims 1 to 2.

4. Catalytic converter obtained according to claim 3, wherein said tapered end piece comprises a double wall end cone assembly with an outer end cone and an inner end cone, said inner end cone being arranged coaxially within said end outer cone.

5. Catalytic converter according to claim 4, comprising an insulation material arranged within a gap between said inner cone and said outer cone of said tapered end piece.

6. Use of the catalytic converter according to any one of claims 3 to 5 in diesel engine exhaust lines.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EUROPEAN SEARCH REPORT

Application Number
EP 01 11 2299

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 October 2001	Friden, C

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