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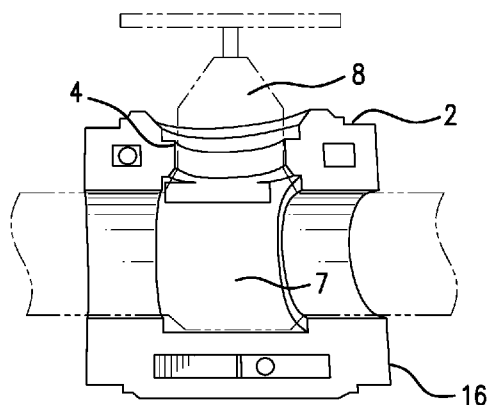


FIG. 6

(57) Abstract: An insulating conduit fitting cover system, each section of which comprises a plurality of cover sections. The plurality of cover sections, when connected together, form a cavity for accommodating a conduit or conduit fitting therein and provide at least one opening for the conduit or conduit fitting to extend therefrom. Each of the cover sections is made of a single deformable insulating material which is capable of adapting the cavity and the at least one opening to the conduit or conduit fitting. The cover sections when connected together form a connecting structure surrounding the at least one opening and the connecting structure is adapted for being connected to a respective cover of the conduit. The conduit cover system comprises a plurality of insulated conduit fitting covers, and the insulated conduit fitting covers are adapted for insulating different types of conduits or fittings.



CONDUIT COVER SYSTEM AND METHOD

FIELD OF THE INVENTION:

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The present invention relates to heat insulation of conduit assemblies, and more particularly to a modular conduit insulation system for insulating the conduit assembly comprising different conduit fittings, and a method of installing the same.

10

BACKGROUND:

Standardized inexpensive and easy to install insulating covers are commercially available for insulating straight sections of cylindrical piping – this is a typical application for the insulation of conduit assemblies used in the transmission of liquids or gases at temperatures above or below ambient temperature. However, conduit fittings such as for example valves, elbow sections, T sections, reducers and flanges and the like are provided in many varied shapes and sizes, making it difficult, time-consuming and expensive to insulate the same.

For example, valves are commercially available in several thousand different shapes and sizes in a single conduit assembly may comprise many different valve configurations even when the same size of piping or conduit is employed throughout. Furthermore, some conduit fittings may be custom-made to accommodate specific conditions of the material being transmitted through the pipe, or to perform specific functions.

In most conduit assemblies, insulation is applied to the conduit fittings using time-consuming and expensive installation methods such as, for example, insulating a rigid shell around the conduit fitting and then injecting spray foam insulation into the space between the conduit fitting and the rigid shell. Not only is this type of a spray foam insulation method and other similar approaches time-consuming to install, it also cannot be removed without destroying the same when access to the conduit fitting for maintenance or repair is required, for example.

It would be desirable to provide a modular conduit insulation system for insulating conduits and conduit fittings that would be simple to manufacture and easy to install, and which had conduit fitting covers that were adaptable to accommodate conduit fittings having different shapes and sizes therein.

SUMMARY OF THE INVENTION:

One object of the present invention is to provide a modular conduit insulation or conduit cover system for the insulation of conduit fittings that is simple to manufacture and easy to install.

Another object of the present invention is to provide a modular conduit insulation system for the insulation of conduit fittings which have conduit fitting covers that are adaptable to accommodate conduit fittings of different shapes and sizes therein.

Another object of the present invention is to provide a method for the installation of a modular conduit cover system for the insulation of conduit fittings that is easy and time efficient to install.

According to one aspect of the invention there is provided a conduit fitting cover for the covering of the conduit segment, which conduit fitting cover comprises a plurality of cover sections which when connected together form a cavity for accommodating the conduit segment therein and define at least one opening through which the conduit segment can exit the assembled conduit fitting cover. Each cover section is made of a single insulating material which is sufficiently deformable for adapting the cavity and the at least one opening to the conduit segment. In many cases it is contemplated that two cover sections would be used, which would effectively engage each side of the conduit segment and could be attached in position as halves comprising the whole of the conduit cover when completed. In other embodiments however, where more interchangeability was required or larger conduit segments were being covered and the like, more than two cover sections might be used to assemble a single conduit fitting cover without departing from the scope and intended coverage of the claims in the present invention outlined herein.

When the plurality of cover sections comprising the conduit fitting cover are assembled together to form a completed conduit fitting cover, those plurality of cover sections might also form a connecting structure surrounding the at least one opening defined therein which is adapted to be connected to an adjacent conduit fitting cover. For example a plurality of conduit fitting covers could be used in a larger installation where the connecting structure of each conduit fitting cover was adapted to engage or be attached to a similar connecting structure on an adjacent conduit fitting cover. In other cases the connecting structure to connect to an adjacent conduit fitting cover might be such that the adjacent conduit fitting cover may not be a conduit fitting cover in accordance with the present invention.

The conduit fitting cover which includes a connecting structure adapted for connection to an adjacent conduit fitting cover might further comprise a clamping element for holding the plurality of cover sections connected together, as well as for holding the conduit fitting cover in connection to the adjacent conduit fitting cover. Many types of clamping elements could be used including a collar designed to surround the connecting structures of adjacent conduit fitting covers. Even in other embodiments of the conduit fitting cover in accordance with the present invention that were not adapted with a connecting structure for connection to an adjacent conduit fitting cover, a clamping element might be used to hold the first cover section and subsequent cover sections connected together.

The conduit fitting cover might also be assembled using engaging elements on the cover sections – for example a first cover section might comprise a first engaging element with a second cover section comprising a second engaging element, wherein the first engaging element was adapted from being mated with a respective second engaging element to assemble the conduit fitting cover over the conduit. Adapting the cover sections to engage each other using engaging elements could be done in embodiments of the conduit fitting cover comprising two cover sections, or more.

The outer surface of one or more of the cover sections may also include a UV protective coating or other similar protective coatings to provide additional protection to the material of the cover sections as well as to protect the integrity of the conduit segment insulated therein.

The conduit fitting cover of the present invention may comprise a plurality of cover sections which were of different shapes and sizes, effectively allowing for a modular conduit cover system to cover multiple types of conduit segments and allow for the modular assembly of a single material deformable insulating conduit cover over a conduit that has a plurality of exterior profiles and sizes.

A modular conduit fitting cover system comprising a plurality of conduit fitting covers in accordance with the present invention is explicitly contemplated to be covered by the subject matter of the present application as well.

5 Another aspect of the present invention is a method of covering the conduit segment with the conduit fitting cover. The method comprises in a first step providing a plurality of cover sections which when connected together will form a cavity for accommodating the conduit segment therein and will define at least one opening through which the conduit segment can exit the conduit fitting cover. Each cover section is made of a single insulating material which is sufficiently deformable for
10 adapting the cavity and the at least one opening to the conduit segment included therein.

The first cover section is placed into position on the conduit segment, with remaining cover sections then being placed into position in relation to the first cover section and around the conduit segment, to define the cavity and the at least one opening. The plurality of cover sections are then connected
15 together, yielding a completed conduit fitting cover.

The method might also include the step of applying pressure to deform the interior cavity of the conduit fitting cover or to adapt the cavity of the at least one opening to the conduit segment. The pressure might be applied until the plurality of cover sections were engaged on their adjacent
20 surfaces and could be connected to yield the completed conduit fitting cover.

The method might also include the step of connecting a plurality of cover sections together by providing a clamping element and clamping the cover sections together, or applying adhesive to adjacent surfaces of adjacent cover sections, to adhesively attach the plurality of cover sections
25 together and yield the completed cover.

The further advantage of the present invention is that it provides a method for the installation of a modular conduit cover or insulation system for the insulation of conduit fittings that is easy and time efficient to install.

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DESCRIPTION OF THE DRAWINGS:

Several illustrative embodiments of the present invention are described below with reference to the accompanying drawings, in which:

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Figure 1 is a perspective view of two covers (an elbow cover and a T cover) of a conduit cover system in accordance with a preferred embodiment of the present invention;

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Figure 2 is a cutaway view of the interior of the elbow cover of Figure 1;

Figure 3 is a cutaway view of the interior of the T cover of Figure 1;

Figure 4 is a top perspective view of the T- cover of the embodiment of Figure 1;

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Figure 5 is a cutaway side view of the interior of the system of Figure 1, demonstrating the attachment surface details between the covers;

Figure 6 shows the view of Figure 3 with a conduit and valve in place therein;

25

Figure 7 is a perspective view of six covers in accordance with the present invention, in a system for use on a larger piping installation;

Figure 8 is an end view of a cover as shown in Figure 2, wherein the cover comprises two
5 cover sections;

Figure 9 is an end view of a cover as shown in Figure 2, wherein the cover comprises three cover sections;

Figure 10 is a close-up view of the connection of two covers in one embodiment of the
10 system of the present invention;

Figure 11 is a close up line drawing demonstrating the use of a spiked clamp connector to connect adjacent covers;

Figure 12 is a perspective view of an alternate embodiment of the system of the present invention wherein the clamping means connecting adjacent covers comprises a lockable
15 band;

Figure 13 is a line view of the lockable band of Figure 12 is shown;
20

Figure 14 is a detail view of area A of Figure 13, showing the lockable band in open position;
and

Figure 15 is a detail view of area A of Figure 13, showing the lockable band in clamped position.

DETAILED DESCRIPTION OF ILLUSTRATED EMBODIMENTS:

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Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the invention belongs. Although any methods and materials similar or equivalent to those described herein can be used in the practice or testing of the invention, the preferred methods and materials are now described.

10

Referring to the Figures, there is shown a modular conduit cover system 1 for the insulation of conduit fittings. The system 1 is comprised of a plurality of insulating conduit fitting covers 2 which are adapted for the insulation of various types of conduit fittings such as, for example, a straight section of piping, and elbow section, a valve, or a T section. Cover sections 2 could be fabricated in a virtually endless number of sizes and interior cavity configurations to allow for adaptation and use of the system of the present invention with virtually any type of a conduit requiring insulation. The following information describes the invention in further detail.

15

Referring first to Figure 1 there is shown one embodiment of a modular conduit cover system 1 in accordance with the present invention, comprising two insulating conduit fitting covers 2. In this particular case the covers 2 which are shown are a 90° elbow, and a T-cover which would be used to insulate a T-junction and a pipe or conduit. Multiple types, sizes and numbers of covers 2 could be used in the assembly of a particular system 1 in accordance with the present invention and any combination of those parts is contemplated within the scope hereof.

20

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Each cover 2 is comprised of at least two cover sections which are assembled together around the conduit or conduit section it is desired to protect. The conduit fitting covers 2 shown in Figure 1 each comprise two cover sections 16 - one of the cover sections 16 for each of the two covers 2 is shown in each of Figure 2 and Figure 3 respectively. Each of these cover sections 16, in the case of these covers 2, comprises a cover section 16 which would effectively cover half of the outer circumference of the conduit to be insulated. In certain cases, such as the cross-sectional view of an alternate cover 2 which is shown in Figure 9, more than two cover sections 16 could be used, either to increase the modularity of the system or to allow for enhanced or simplified assembly of a very large conduit fitting cover 2 over a large conduit where it was desired to assemble more than two of the cover sections 16 around the exterior of the conduit. An insulated conduit cover tube comprising any number, from two to more than two, of cover sections 16 as otherwise outlined herein is contemplated within the scope of the present invention.

The conduit cover sections 16 are adapted for being connected at respective contact surfaces 3 in plane 6, as shown in Figure 4. The first cover section 16 and subsequent cover sections when connected together, form a cavity 7 within the cover 2 which will accommodate the respective conduit or conduit segment fitting therein. For example, referring to Figure 6, there is shown a valve 20 shown in dashed lines which is accommodated in the cover section 16.

Each insulated conduit fitting cover 2 also comprises at least one opening 9 through which the conduit or a conduit fitting can extend, and in the case of joinder of adjacent covers 2 which will define the plane for attachment to the adjacent cover 2. When connected together, the first cover section 16 and subsequent cover sections 16 of each insulated conduit fitting cover 2 form a connecting structure 10 which surrounds the at least one opening 9. Each connecting structure 10 is adapted for being connected to an adjacent cover 2 - preferably the connecting structures 10

comprise substantially flat connecting surfaces 11 which are oriented substantially perpendicular to the axis 17 is illustrated in Figure 5, and at the same outer shape and size in order to facilitate their connection together.

- 5 Each cover section is made of a single heat insulating material with the insulating material being sufficiently deformable to allow the cavity inside of the cover section to deform, along with at least one opening in the cover section, to the shape and size of the conduit fitting or section therein, enabling the modification or use of a similar cover section for somewhat differently shaped or sized conduit fittings. For example, the cover sections are made of flexible elastomeric foams such as
- 10 polyurethane foam or polystyrene using a standard moulding process. The type of flexible elastomeric phone which might be chosen as the material is manufactured for example could be chosen based upon a number of factors including the thermal resistance (R-value) desired; the dimensions of the cover sections desired, as well as the ability to enable the formation and for accommodating differently shaped and sized conduit fittings while at the same time substantially
- 15 preserving the outer shape and size of the cover and cover sections.

Figure 8 provides one demonstration of flexibility and deform ability of an elastomeric phone product used in the manufacture of the cover sections 16 – for example it can be seen that the cover section 16 is made of a flexible elastomeric phone which has dimensions D=20 cm and W=5 cm,

20 enabling deformation of Σ of at least 0.5 cm. these dimensions are provided merely for demonstrative purposes and it will be understood that the size and shape of the individual cover sections 16 could be as varied as the number of types of conduit segments are fittings that it was desired to insulate or adapt in accordance with the remainder of the system and method of the present invention. These dimensions should not be considered as limiting in any way. Any dimension or deform ability factor

is contemplated within the scope of the present invention so long as it does not depart from the remainder of the intentions outlined herein.

Each of the cover sections 16 would include engaging elements 12, as shown in Figures 2 and
5 elsewhere, to facilitate proper alignment and engagement of the respective first and subsequent cover sections 16 when the cover 2 is assembled around the conduit. For example the engaging elements 12 are provided as protrusions extending from end indentations disposed in the contact surface 3 such that when the first cover section 16 and another cover section 16 are properly connected, each protrusion is mated with a corresponding in respect of indentation. Preferably the cover sections 16
10 and the placement of the engaging elements 12 are designed such that the first cover section 16 and the subsequent cover sections 16 of the same, thus requiring only one mould for producing multiple cover sections 16 in a cover 2, substantially easing the method of manufacture.

The insulating conduit fitting covers 2 of the present invention would be manufactured for the
15 accommodation of different sizes and types of conduit and conduit fittings such as for example straight conduit sections, elbows, valves, tea sections and others, as illustrated herein. It will be understood that any type of conduit section or conduit fitting is contemplated within the scope of the present invention as such this listing and the illustrated embodiments should not be considered exhaustive in this fashion. For example, to accommodate a valve 8, the first cover section 16 and a
20 second or subsequent cover sections 16 when connected together would form an opening 4 which would enable a portion of the conduit fitting with a handle or the like to protrude therethrough or for enabling access to the conduit fitting, as shown in Figure 6.

Preferably each insulated conduit fitting cover 2 would be provided as a module of the conduit
25 insulation system 1, with each modular cover tubing designed for cover and type of a conduit fitting

for a given pipe diameter or range of pipe a with each cover module 2 being adaptable to varying shapes and sizes of different conduit fittings of the same type. These different insulating conduit covers 2 are then connected to each other and/or to the pipes themselves for the installation of a conduit assembly as outlined in Figure 7. Figure 7 demonstrates a larger embodiment of a conduit insulation system 1 in accordance with the present invention, in which six insulating conduit covers 2 are shown – there are three straight conduit cover sections 2, one 90° elbow section 2, one T section 2, and one valve cover 2. Again as outlined in detail elsewhere herein, the modularity of the system of the present invention is intended to allow for simplified and quick installation of conduit installation in the field where required, using a simply assembled cover system 1 comprise the components made of a single deformable insulated material.

The connected cover sections 16 of each insulated conduit cover 2, as well as the connection to another adjacent cover 2 or other hardware is secured using clamping elements or the like. Many different types of connecting means for the connection of the cover sections 16 together to form the covers 2 or of the covers 2 to adjacent covers 2, will be understood to those skilled in the art and are all contemplated within the scope of the present invention – any type of a connecting means which would allow for the appropriate holding in place of these components to each other or attachment to the hardware installation are contemplated within the scope of the present invention.

Referring to Figure 10 and Figure 11, clamping elements 13 are shown. In the embodiment illustrated these comprise a plurality of substantially flat plates with spikes 13A extending therefrom. The clamping elements 13 are placed on the connecting structures 10 where the contact surfaces 11 and the connecting surfaces 3 are aligned and are to be connected when pressure is applied to the clamping elements 13, the spikes 13A penetrate the connecting structures 10 until the plate of the clamping element 13 contact the outer surface of the cover section 16. The clamping allowance 13

are made of, for example, suitable sheet materials such as steel or aluminum or the like using standard cutting or stabbing technology or even suitable plastic material such as nylon using standard moulding technology. Any type of clamping element 13 which can be used to hold the cover sections 16 in alignment with each other as required to form a cover 2, or to attach covers 2 to adjacent covers 2 or to the hardware installation are contemplated within the scope of the present invention.

Figures 12 through 15 illustrates an alternate clamping element 13, in the form of a collar. The clamping collar 13 is placed around the connecting structures 10 where the connecting surfaces 11 are connected. The clamping collar 13 could comprise a strip of sufficiently flexible material for enabling opening of same while disposing it around the connecting structures 10, having a securing mechanism for securing the clamping collar 13 into place. The clamping collar in terms of a securing mechanism might comprise for example only, bent end portions 14 and 15 of the strip 13 for engaging each other as illustrated in detail A in Figures 14 and 15. The clamping collar element 13 could be made of, for example, suitable sheet materials such as steel or aluminum, or a suitable plastic material.

Alternatively, suitable adhesive tape such as for example duct tape or the like could even be used as the clamping element 13 for securing connected sections together into covers, or securing covers to each other or to the hardware installation.

The covers 2 of the system 1 are easily installed in a time efficient manner by placing the first cover section 16 of the first portion of the conduit in question, followed by placing additional cover sections 16 onto related second portions of the conduit. The first cover section 16 and the second or additional cover sections 16 are connected together and secured in place using at least one clamping

element. When necessary, pressure is applied to adapt the cavity and opening of the cover 2 to the conduit fitting or conduit extending into her therethrough, until the first and subsequent cover sections 16 are connected. Additional covers 2 can be constructed adjacent to the first, all of which when connected together yields a unitary conduit cover system 2 which is quickly assembled, easily maintained and quickly manufactured. The modularity of the system 1 is accomplished by carefully designing different cover sections 16 in a way that they can be used to assemble one or more different types of conduit covers 2, for use in the insulation assembly and method of the present invention.

It will be apparent to those of skill in the art that by routine modification the present invention can be optimized for use in a wide range of conditions and application. It will also be obvious to those of skill in the art that there are various ways and designs with which to produce the apparatus and methods of the present invention. The illustrated embodiments are therefore not intended to limit the scope of the invention, but to provide examples of the apparatus and method to enable those of skill in the art to appreciate the inventive concept.

Those skilled in the art will recognize that many more modifications besides those already described are possible without departing from the inventive concepts herein. The inventive subject matter, therefore, is not to be restricted except in the scope of the appended claims. Moreover, in interpreting both the specification and the claims, all terms should be interpreted in the broadest possible manner consistent with the context. In particular, the terms "comprises" and "comprising" should be interpreted as referring to elements, components, or steps in a non-exclusive manner, indicating that the referenced elements, components, or steps may be present, or utilized, or combined with other elements, components, or steps that are not expressly referenced.

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CLAIMS:

What is claimed is:

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1. A conduit fitting cover for covering a conduit segment, said conduit fitting cover comprising a plurality of cover sections which when connected together form a cavity for accommodating the conduit segment therein and define at least one opening through which the conduit segment can exit the assembled conduit fitting cover; each cover
10 section being made of a single insulating material with the insulating material being sufficiently deformable for adapting the cavity and the at least one opening to the conduit segment.

15

2. The conduit fitting cover of claim 1 wherein the plurality of cover sections when connected together form a connecting structure surrounding the at least one opening, and wherein the connecting structure is adapted for being connected to an adjacent conduit fitting cover.

20

3. The conduit fitting cover of claim 2 wherein the adjacent conduit fitting cover is a conduit fitting cover in accordance with claim 2.

5 4. The conduit fitting cover of claim 2 comprising a clamping element for holding the plurality of cover sections connected together and for holding the conduit fitting cover connected to an adjacent conduit fitting cover.

10 5. The conduit fitting cover according to claim 4 wherein the clamping element is adapted to form a collar surrounding the connecting structure.

15 6. The conduit fitting cover of claim 1 wherein the number of cover sections is two, being a first cover section and a second cover section.

7. The conduit fitting cover according to claim 1 comprising at least a clamping element for holding the first cover section and the second cover section connected together.

8. The conduit fitting cover of claim 6 wherein the first cover section comprises a first engaging element and the second cover section comprises a second engaging element,
5 and wherein each first engaging element is adapted for being mated with a respective second engaging element.
9. The conduit fitting cover of claim 1 wherein the number of cover sections is more than
10 two.
10. The conduit fitting cover of claim 1 wherein each cover section comprises an engaging element and said engaging elements of adjacent cover sections engage each other.
15
11. The conduit fitting cover of claim 1 further comprising UV protective coating on the outer surface of the plurality of cover sections.

12. A modular conduit fitting cover system comprising a plurality of conduit fitting covers according to claim 1.

5

13. The conduit fitting cover system of claim 12 wherein the plurality of conduit fitting covers are adapted for covering multiple types of conduit segments.

10

14. A method for covering a conduit segment with a conduit fitting cover, said method comprising:

15

a. providing a plurality of cover sections which when connected together will form a cavity for accommodating the conduit segment therein and will define at least one opening through which the conduit segment can exit the conduit fitting cover, each cover section being made of a single insulating material with the insulating material being sufficiently deformable for adapting the cavity and the at least one opening to the conduit segment;

20

b. placing a first cover section onto the conduit segment;

c. placing the remaining cover sections around the conduit segment, to define the cavity and the at least one opening; and

5 d. connecting the plurality of cover sections together.

15. The method according to claim 14 comprising applying pressure to adapt the cavity and the at least one opening to the conduit segment.

10

16. The method according to claim 15 wherein the pressure is applied until the plurality of cover sections are engaged on their adjacent surfaces and can be connected.

15

17. The method according to claim 14 wherein the step of connecting the plurality of cover sections together comprises providing a clamping element and clamping the cover sections together.

20

18. The method according to claim 14 wherein the step of connecting the plurality of cover sections together comprises applying adhesive to the adjacent surfaces to adhesively attach the plurality of cover sections together.

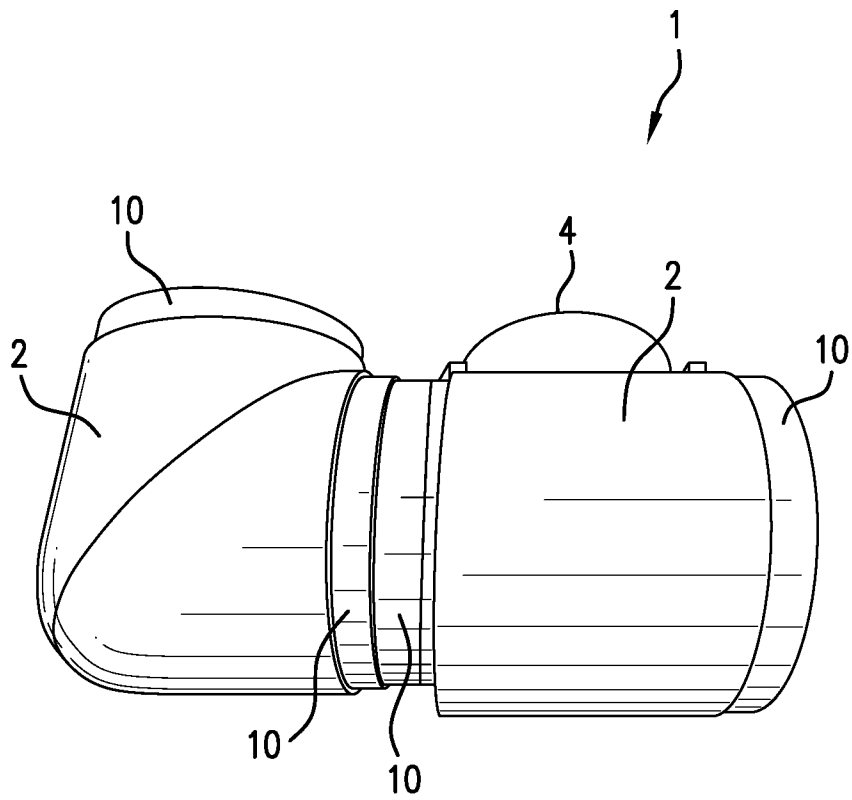


FIG. 1

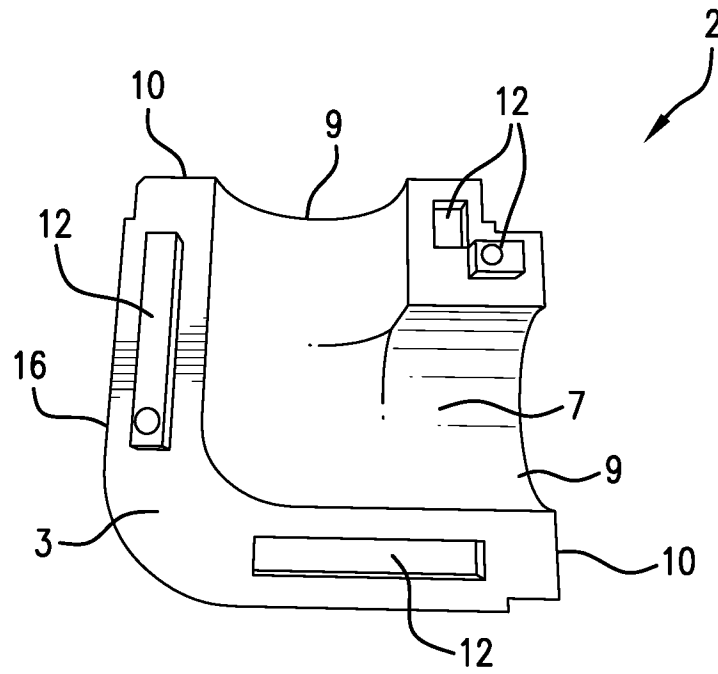


FIG. 2

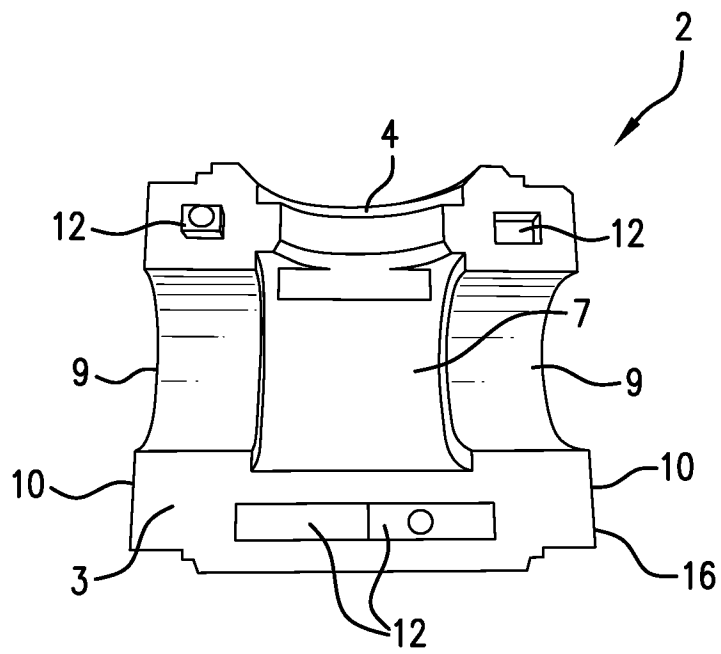


FIG. 3

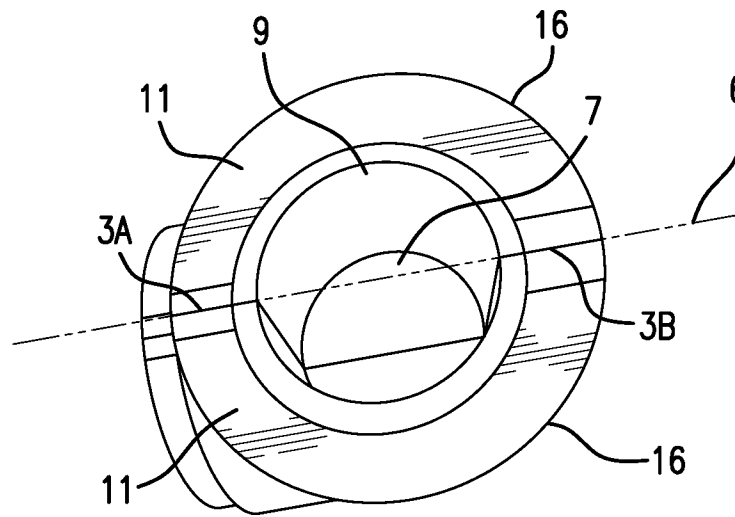


FIG. 4

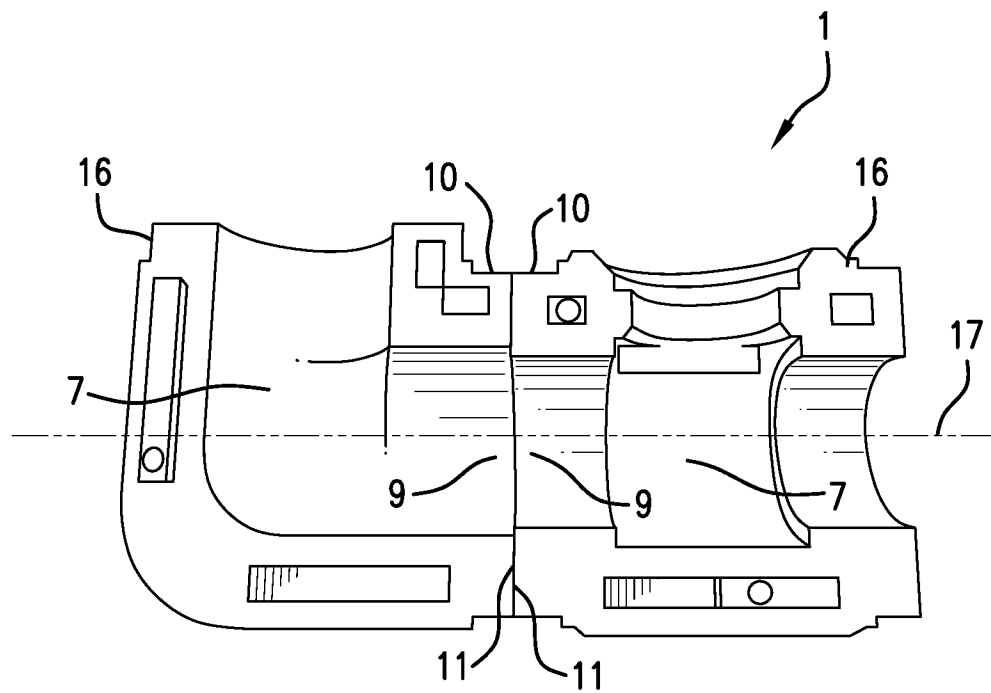


FIG. 5

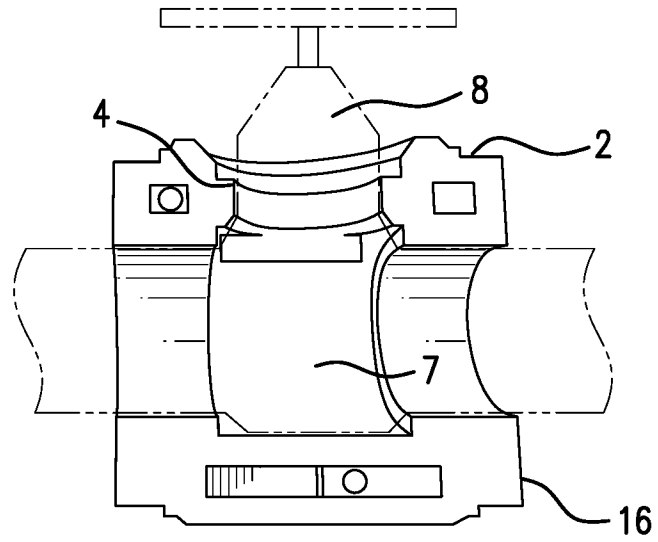


FIG. 6

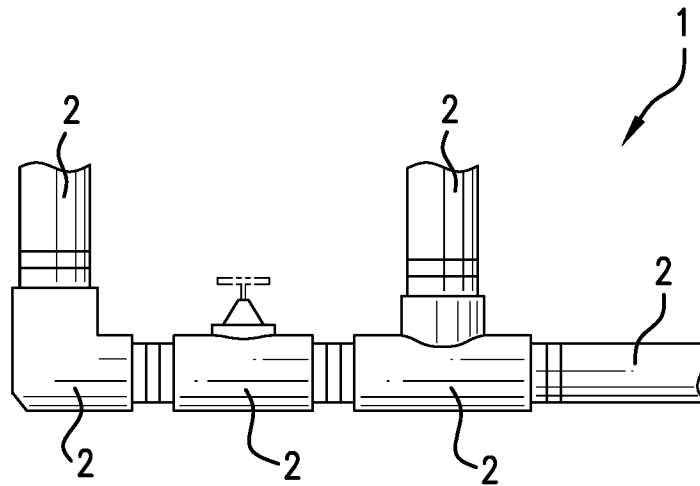


FIG. 7

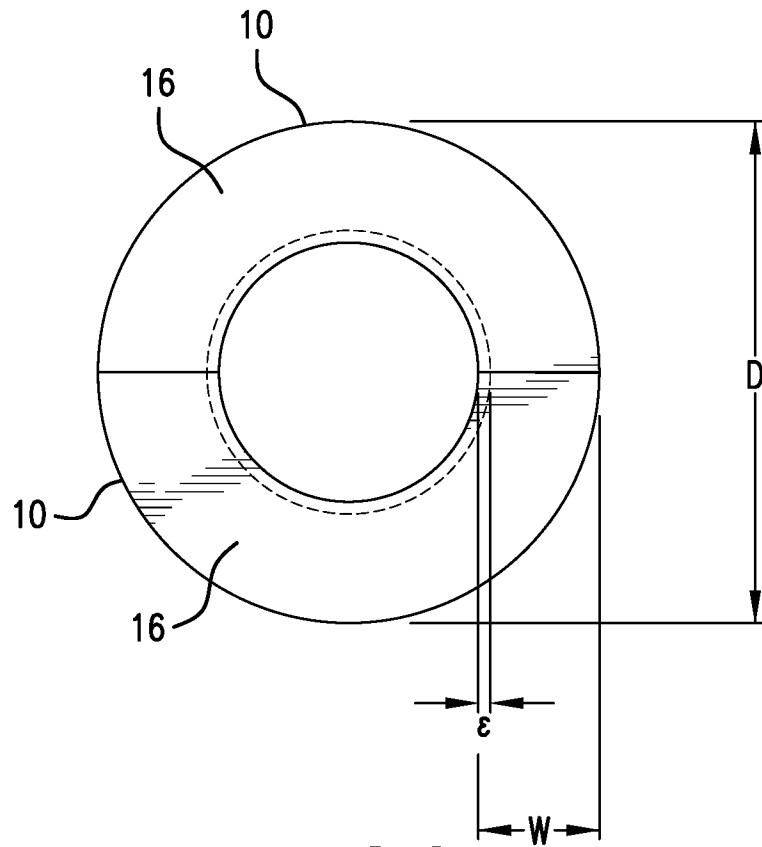


FIG. 8

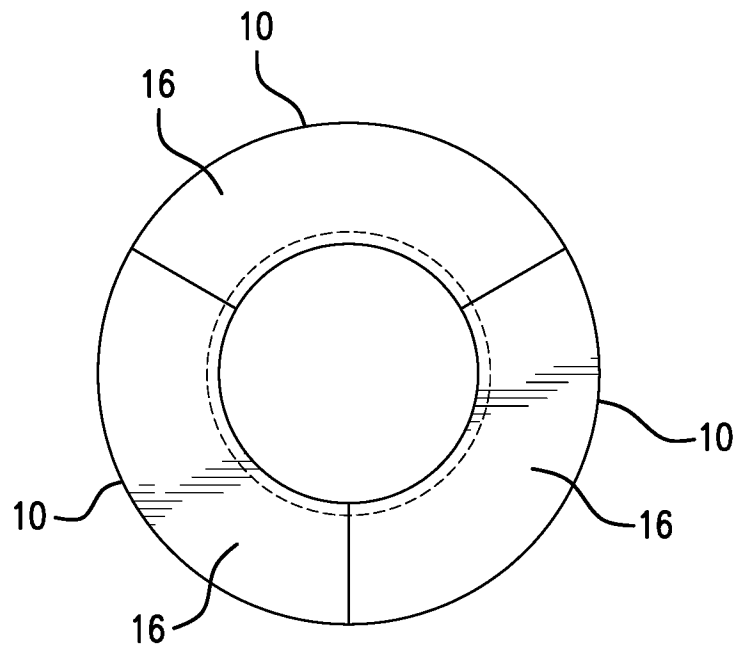


FIG. 9

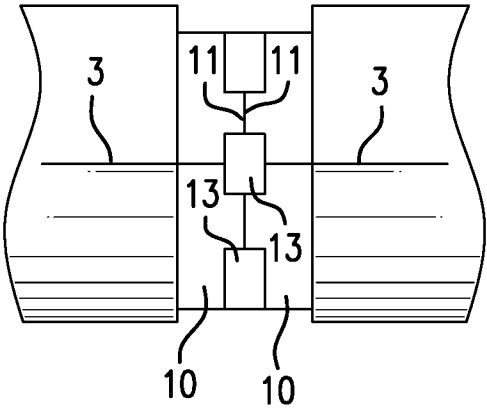


FIG. 10

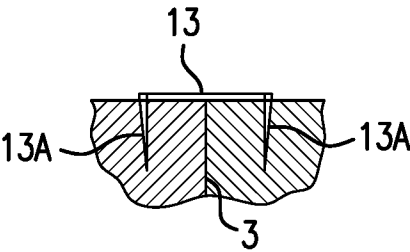


FIG. 11

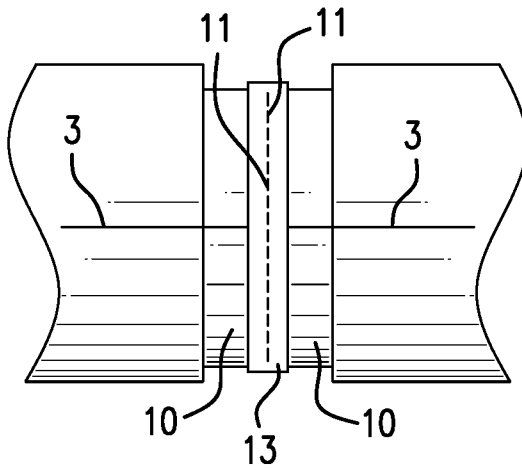


FIG. 12

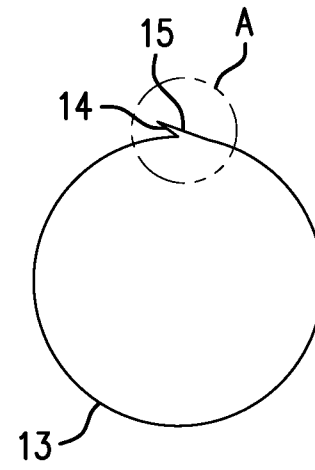
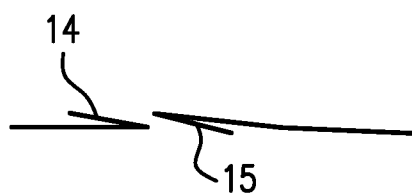
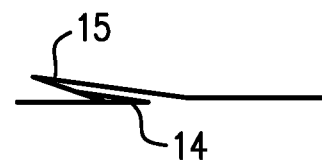


FIG. 13



Detail A

FIG. 14



Detail A

FIG. 15

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CA2016/051222

A. CLASSIFICATION OF SUBJECT MATTER
IPC: **F16L 59/16** (2006.01), **F16L 59/02** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: F16L 59/02 (2006.01), F16L 59/14 (2006.01), F16L 59/16 (2006.01), F16L 59/18 (2006.01), F16L 59/20 (2006.01), F16L 59/22 (2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
QUESTEL ORBIT

Keywords: half, halves, conform, deform, adapt, shape, fitting, valve, housing, etc.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3684609 A (SCHNEIDER, M.) 15 August 1972 (15-08-1972) The Whole Document	1-18
X	EP 0744574 A1 (KARL, R. et al.) 27 November 1996 (27-11-1996) Figures; Abstract	1, 6, 12-14
X	DE 3534374 A1 (STEINBACHER, E.) 03 April 1986 (03-04-1986) Figures; Abstract	1-18
X	US 4071043 A (CARLSON, C.D.) 31 January 1978 (31-01-1978) Figure 1	1-18
X	CN 2416336 Y (CAI, P.) 24 January 2001 (24-01-2001) Figure 4	1-18

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* "A" "E" "L" "O" "P"	Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance earlier application or patent but published on or after the international filing date document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) document referring to an oral disclosure, use, exhibition or other means document published prior to the international filing date but later than the priority date claimed	"T" "X" "Y" "&"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art document member of the same patent family
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US3684609A	15 August 1972 (15-08-1972)	US3684609A US3556158A	15 August 1972 (15-08-1972) 19 January 1971 (19-01-1971)
EP0744574A1	27 November 1996 (27-11-1996)	EP0744574A1 DE19519457C1	27 November 1996 (27-11-1996) 15 May 1996 (15-05-1996)
DE3534374A1	03 April 1986 (03-04-1986)	DE3534374A1 ATA308284A AT383200B	03 April 1986 (03-04-1986) 15 October 1986 (15-10-1986) 25 May 1987 (25-05-1987)
US4071043A	31 January 1978 (31-01-1978)	None	
CN2416336Y	24 January 2001 (24-01-2001)	None	