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METHOD FOR SUBSEQUENTLY CLADDING A PIPE PART

The present invention relates to a method for subsequently cladding pipe fittings, in which the pipe fitting is clad by means of a shrink-on sleeve which shrinks when heat is applied. In principle, the use of shrink-on sleeves for the cladding of pipes has been known for a long time from the prior art. For example, DE 14 79 648 describes heat-shrinkable multi-layer coatings made of resilient polymers. These are materials, in particular deformed thermoplastics, that have a shape memory and return to their original shape when heat is applied. This phenomenon is referred to in the literature as thermal spring-back, also referred to as a "memory effect". This property enables the production of shrink-on sleeves, by means of which one can clad a pipe section in an expanded state and then shrink on the sleeve by applying heat to the pipe section.

DE 31 01 256 A1 describes a longitudinally divided cable sleeve made of a thermoplastic material with a shape memory, which can be shrunk onto an object to be sealed by the application of heat. To close the longitudinal seam, a type of Velcro fastener with closure elements along the longitudinal edges of the socket pipe is used. However, such a closure of the longitudinal seam is not permanently stable and sufficiently tight, such as a materially welded connection would be, for example. In addition, the socket pipe is rolled in such a way that there is an overlap in the area of the longitudinal seam, which creates a non-round pipe. For a pipe to be laid in the ground for supply lines such as gas, water, waste water, etc. such a geometric shape is not in accordance with the standards and is therefore not acceptable.

From DE 10 2007 038 257 A1 the use of shrink-on sleeves in the area of branches of steel pipelines with plastic insulation is known, wherein shrink-on sleeves are pushed over the pipeline sections to be connected in the connection area of two pipeline sections and then first a welding of the pipeline ends and then a shrinking of the shrink-on sleeve in the connection area takes place. The shrink-on sleeve must first be pushed into a position away from the connection point so that it does not shrink prematurely due to the heat that occurs during the welding process. With this known technique, fittings can also be connected to each other or with straight pipeline sections, such as T-pieces or curved pipeline sections, but they must have straight pipe sockets at the ends and the shrink-on sleeve used is ring-shaped and is pushed over the straight pipe sockets to be connected in the connection area.

DE 10 2010 015 462 A1 discloses a method for connecting jacketed pipes using shrink-on sleeves. In this method, however, pipes are connected to one another, the jacket of

which having an inner foam layer. The method is therefore also specifically designed for pipes of this type with foam layers, wherein an annular space between the jacket ends of the pipes to be connected is foamed. In addition, a gas permeation barrier film is wound around the foamed annular space, which must be sealed laterally by means of sealing/adhesive tapes. The gas permeation barrier film prevents oxygen from the atmosphere from coming into contact with the foam layer.

Multi-layer pipes, in particular multi-layer plastic pipes, for example consisting of core pipes with a protective jacket and possibly further intermediate layers between the core pipe and the protective jacket, can be machined, in particular by pipe extrusion, provided that there are straight pipeline sections. However, in the case of fittings with non-linear sections, such as bends, T-pieces, reducers for multi-layer pipelines, the core pipe sections cannot be subsequently clad by machine. Therefore, according to the prior art, the subsequent cladding takes place, for example, by means of adhesive tapes, by means of which core pipe sections of the fittings are clad to form a protective jacket, i.e. an outer layer for the mechanical protection of the core pipe section of the fitting. The requirements for fittings in which intermediate layers are present are even more complex, for example an electrical intermediate layer which is used to monitor a pipeline, because these intermediate layers must be made absolutely watertight.

In the case of fittings of the aforementioned type, for example pipe bends, it is also not possible to use conventional shrink tubes for the subsequent cladding, since a shrink tube would compress on the inside of the pipe bend of the fitting.

US 3 455 336 A describes a method for subsequently cladding fittings, in which the pipe fitting is clad by means of a shrink-on sleeve which shrinks when heat is applied, wherein a plastic pipe material expanded under pressure and heat is first cut into axial segment elements, and these segment elements are then fitted together again at the angles corresponding to the pipe fitting to be produced so as to form a segmented shrink-on sleeve, the segmented shrink-on sleeve is placed around the pipe fitting to be subsequently clad and the segmented shrink-on sleeve is then shrunk by applying heat. DE 36 27 911 A1 describes a tape made of a cross-linked plastic that can be shrunk when heat is applied, which can be folded around an elongated object in the manner of a cuff and can be shrunk onto the object after the band edges have been connected by supplying heat, wherein the band edge regions consist of non-cross-linked plastic and the band edges are connected by fusion welding. From this document it is also known to produce a tape from two individual tapes by welding the longitudinal edges, wherein the weld seam is produced by mirror welding with an electrically or gas-heated mirror.

From DE 202 10 474 U1 it is known to clad the connection point of a conduit consisting of an inner tube and an outer plastic tube with a plastic tube bend, wherein the tube bend consists of two bend segments which can be connected to one another and a parting plane of the bend segments runs at an angle of 45° to the longitudinal axes of the bend segments. The ends of the bend segments facing away from the parting plane are designed to be shrinkable, in particular heat-shrinkable.

DE 32 11 796 A1 discloses a flexible object made of a material that can be recovered when exposed to heat and is suitable for being wrapped around a tubular object. The object has spaced side edges extending longitudinally and is wrapped around the pipe to create an overlap. Threads or fibres in the overlap zone result in a tangle, i.e. a releasable fastening, when pressed together, and the object is then shrunk onto the pipe by the application of heat.

EP 0 046 027 A1 describes heat-shrinkable polymeric hollow bodies which are shaped in such a way that they cannot be produced directly by extrusion, for example grommets. The starting point here is a film that is heated, placed over a mould and deep-drawn using a vacuum. The half of the hollow body produced in this way is welded to a hollow body with a second complementary half and then irradiated with electron radiation in order to cross-link the plastic material.

FR 2 332 116 A1 describes heat-shrinkable objects, for example in the form of pipe bends, in which two halves are also initially produced, which are joined together along a longitudinal seam, in the area of which they each have moulded profiles. A U-shaped profile is used for the connection, which overlaps the profiles formed on the two halves. These objects are placed around a pipe bend and shrunk onto it using heat.

The object of the invention is to provide a method for subsequently cladding pipe fittings with the features of the type mentioned, which is more efficient than known methods and leads to mechanically resilient and stable pipe fittings.

The object is achieved in that it provides a method for subsequently cladding a pipe fitting of the type mentioned at the outset having the features of the main claim.

According to the invention it is provided that a plastic pipe material expanded under pressure and heat is first cut into axial segment elements, these segment elements are then fitted together again at the angles corresponding to the pipe fitting to be produced so as to form a segmented shrink-on sleeve, the segmented shrink-on sleeve is separated in the longitudinal direction, is placed around the pipe fitting to be subsequently clad, the longitudinal seam is closed and the segmented shrink-on sleeve is then shrunk by applying heat.

According to a preferred development of the present invention, the longitudinal seam of the segmented shrink-on sleeve placed around the core pipe of the fitting is welded, for example by means of a hand welding extruder.

The segmented shrink-on sleeve can be heated in order to shrink it onto the core pipe of the fitting, for example by means of a gas flame or by means of hot air.

The segments for producing the segmented shrink-on sleeve can be connected to one another, for example, by butt welding at the angles corresponding to the fitting to be produced. Before this welding process, it is advantageous to mechanically fix the segment elements in their intended angular position relative to one another, for example with the aid of sleeves or the like. It is also possible to also fix the segment elements together, for example, by tacking them together.

A pipe fitting according to the invention can be, for example, a T-piece, a reducer or a pipe bend. If a segmented shrink-on sleeve is constructed for a pipe bend of, for example, a total of 90° from several segment elements, then it is possible, for example, to use a first straight segment element which is cut off in a straight line at one outer end in a transverse direction, but is cut obliquely at its other (inner) end is cut, for example at an angle of about 22.5° to its transverse plane. This can then be followed by a segment element which is cut obliquely at both ends, for example at an angle of approximately 22.5° to the transverse plane and which is angled on the outside in relation to the pipe bend to be produced by approximately 30° to the longitudinal axis of the first straight segment element. This can then be followed by a third angular segment element, which is shaped in the same way as the second segment element, so that the second and third segment elements each have a trapezoidal shape, as seen in the side view, and a fourth straight segment element can then be connected to them, which is cut obliquely at its end facing the pipe bend, but at its other outer end is cut straight in the transverse direction and thus has a basic shape corresponding to the first segment element. Since between the first and the second segment element an angle of about 30° is made on the outside in relation to the pipe bend, then between the second and the third segment element again an angle of about 30° is made and likewise between the third segment element and the fourth segment element an angle of about 30° is also made, this results in a pipe bend of 90° overall. A corresponding example of such a pipe bend is explained in more detail and more clearly in the description of the figures with reference to the drawings.

According to a preferred development of the invention, the segment elements for the production of the segmented shrink-on sleeve can consist, for example, of a comparatively thin-walled polyolefin material, in particular of a polyethylene material.

The features mentioned in the dependent claims relate to preferred developments of the solution according to the invention. Further advantages of the invention are derived from the following detailed description.

The present invention is described in more detail below on the basis of embodiment examples with reference to the accompanying drawings.

In the drawings:

Figure 1 shows a core pipe of a pipe fitting, which is subsequently clad by means of the method according to the invention;

Figure 2 shows the core pipe of the pipe fitting of Figure 1, which was first clad with a shrink-on sleeve with a metallic film;

Figure 3 shows a segmented shrink-on sleeve made from a plurality of pipe segments in the form of a 90° bend, by means of which the core pipe shown in Figure 2 is clad;

Figure 4 shows the segmented shrink-on sleeve of Figure 3, cut open in the longitudinal direction, which was placed around the core pipe shown in Figures 1 and 2;

Figure 5 shows the segmented shrink-on sleeve of Figure 4 after it has been tacked and fixed for the subsequent welding operation;

Figure 6 shows the segmented shrink-on sleeve of Figure 5 during the welding process for closing the longitudinal seam;

Figure 7 shows the finished pipe fitting after the shrinking process;

Figure 8 shows a cross-section through the pipe fitting of Figure 7.

First, reference will be made to Figure 1. The illustration shows a core pipe 10 of a pipe fitting, which is the starting point and which is subsequently clad by means of the method according to the invention. This core tube is a tube bend of, for example, 90°. An intermediate layer 11 made of a metallic film is first wound onto this core pipe, which consists of an inner pipe suitable for the transport of liquid or gaseous media, before the final cladding is applied. This is an electrically conductive intermediate layer that is used, for example, to monitor leaks in the pipeline when the pipeline is installed. For this reason, the outer protective layer to be applied afterwards by subsequent cladding must be absolutely watertight, otherwise a leak would be indicated and the desired monitoring would not work.

Figure 3 now shows the segmented shrink-on sleeve 12, which, as can be seen, has been produced from a total of four segment elements welded together in order to obtain a 90° bend which can be shrunk onto the core pipe 10. Of course, numerous other possibilities are conceivable for assembling such a 90° bend from several segment elements. In the present case, two largely straight segment elements 12a and 12d have

been used, each of which has been cut straight in the transverse direction at its outer end, but cut obliquely at its inner end facing the bend. In addition, there are two shorter segment elements 12b and 12c which are approximately trapezoidal in the view according to Figure 3 and which are each attached to the inner end of the two rectilinear segment elements 12a and 12d, wherein the two shorter segment elements 12b and 12c essentially form the bend section of the bent segmented shrink-on sleeve. If the outside of the bend section is viewed, then the outer radius of the first trapezoidal segment element 12b forms an angle of approximately 30° with the straight segment element 12a. With its outer radius, the second trapezoidal segment element 12c in turn forms an angle of approximately 30° with the first trapezoidal segment element 12b. The latter in turn forms an angle of approximately 90° with the second straight segment element 12d in the outer radius of the bend, so that the total results in a 90° bend. The angles in the area of the inner radius of the arc section are composed accordingly.

If, on the other hand, the transverse direction is viewed, then the common welding edge of the first straight segment element 12a and the first trapezoidal segment element 12b forms an angle of approximately 22.5° with respect to the transverse plane or the straight cut outer end of the first straight segment element 12a. Since the first trapezoidal segment element 12b and the second trapezoidal segment element 12c are each cut at their two ends in the transverse direction at an angle of 22.5° and both straight segment elements 12a and 12d are also each cut at their inner ends facing the bend at an angle of 22.5° , these four angles also add up to 90° ; therefore, the two straight sections 12a and 12d form an angle of 90° with one another. The two trapezoidal segment elements 12b and 12c are arranged between the two straight segment elements 12a and 12d. It can be seen that a segmented shrink-on sleeve is formed in this way, which does not form a uniformly curved bend both in the area of the outer radius of the bend and in the area of the inner radius of the bend, but forms a bend that is made up of the respectively straight segment sections of the four segment elements 12a, 12b, 12c, 12d. Such a segmented shrink-on sleeve welded together from segment elements can be shrunk onto a bent core pipe 10, whereas this is not possible with a shrink-on sleeve with a continuous bend (radius of curvature).

The segmented shrink-on sleeve 12 produced in accordance with the above explanations is now cut lengthways in the longitudinal direction and can then be placed around the core pipe 10 of the pipe fitting, as shown in Figure 4. After cutting open in the longitudinal direction, the segmented shrink-on sleeve is flexible enough that it can be opened. In the longitudinal direction, following the bend shape, there remains a longitudinal slot 13 which

is initially somewhat wider after folding over, as can be seen in Figure 4, since the segmented shrink-on sleeve 12 tends to bend slightly. Therefore, before the longitudinal slot 13 can be closed again by a welding process, the segmented shrink-on sleeve must first be tacked and fixed.

This state is shown in Figure 5. It can be seen that with the aid of straps 14 and tensioning devices 15, the segmented shrink-on sleeve 12 is fixed on the core pipe 10 wrapped with the intermediate layer 11 in such a way that the longitudinal slot 13 is only comparatively narrow. A welding process can now take place, for example, by means of a manual welding extruder 16 in order to close the longitudinal slot with a thermoplastic

This welding process is illustrated in Figure 6. A front section of a manual welding extruder 16 can be seen with a welding shoe 17 at the front end, from which a strand 18 of a melted plastic emerges, which closes the longitudinal slot 13 and forms a weld seam after cooling. The manual welding extruder 16 is guided by an operator so that the welding shoe 17 moves above and along the longitudinal slot 13, so that the strand of the melted plastic is deposited along the longitudinal slot.

After the weld seam has cooled, the segmented shrink-on sleeve 12 completely encloses the core pipe 10 and the intermediate layer 11 in the region of the tube bend with a slight circumferential distance. The segmented shrink-on sleeve 12 can now be shrunk onto the pipe bend of the core pipe 10 by applying heat, for example by means of a hot air gun 19. During this heating, the material of the segmented shrink-on sleeve 12 returns to an earlier shape due to the memory effect (shape memory), wherein it contracts (shrinks). This final state of the pipe fitting after shrinking on the segmented shrink-on sleeve 12 is shown in Figure 7.

Figure 8 shows a cross-section through the finished segmented shrink-on sleeve 12 of Figure 7. Here the core pipe 10 can be seen, which forms the inner layer of the pipe fitting, the intermediate layer 11 applied to the core pipe 10, and the shrunk-on segmented shrink-on sleeve 12, which only tightly encloses the core pipe 10 and the intermediate layer. Furthermore, the weld seam 18 can be seen which, after the welding process, tightly closes the longitudinal slot of the segmented shrink-on sleeve which has been created by cutting open.

List of reference symbols

- 10 Core pipe
- 11 Intermediate layer
- 12 Segmented shrink-on sleeve

- 12a Segment element, straight
- 12b Segment element, trapezoidal
- 12c Segment element, trapezoidal
- 12d Segment element, straight
- 13 Longitudinal slot
- 14 Straps
- 15 Tensioning device
- 16 Manual welding extruder
- 17 Welding shoe
- 18 Strand of melted plastic, weld seam
- 19 Hot air gun

FREM GANGSMÅDE TIL EFTERBEKLÆDNING AF ET RØRFORMSTYKKE**Patentkrav:**

1. Fremgangsmåde til efterbeklædning af rørformstykker, via hvilken man beklæder rørformstykket ved hjælp af en krympemuffe, der krymper ved anvendelse af varme, idet man først skærer et plastrørmateriale, der er udvidet under tryk og varme, op til aksiale segmentelementer, fjører disse segmentelementer (12 a, 12 b, 12 c, 12 d) sammen igen i vinkler, der svarer til rørformstykket, der skal fremstilles, til en segmentkrympemuffe (12), skærer segmentkrympemuffen op i længderetningen, lægger den rundt om rørformstykket (10), der skal efterbeklædes, lukker længdesømmen (13) og derefter krymper segmentkrympemuffen (12) under tilførsel af varme.
2. Fremgangsmåde til efterbeklædning af rørformstykker ifølge krav 1, kendetegnet ved, at segmentkrympemuffens (12) længdesøm (13) svejses.
3. Fremgangsmåde til efterbeklædning af rørformstykker ifølge krav 1, kendetegnet ved, at segmentkrympemuffen (12) opvarmes ved hjælp af en gasflamme eller ved hjælp af varmluft og krympes.
4. Fremgangsmåde til efterbeklædning af rørformstykker ifølge krav 2 eller 3, kendetegnet ved, at segmentelementerne (12 a, 12 b, 12 c, 12 d) forbindes med hinanden ved hjælp af stuksvejsning i de indbyrdes vinkler, der passer til formstykket, der skal fremstilles.
5. Fremgangsmåde til efterbeklædning af rørformstykker ifølge et af kravene 2 til 4, kendetegnet ved, at segmentelementerne (12 a, 12 b, 12 c, 12 d), inden de forbindes med hinanden til segmentkrympemuffen (12), fikseres mekanisk i deres planlagte vinkelposition.
6. Fremgangsmåde til efterbeklædning af rørformstykker ifølge et af kravene 1 til 5, kendetegnet ved, at rørformstykket er en rørbøjning, særligt en rørbøjning med en vinkel inden for et område på mellem ca. 45° og ca. 90°.

Figure 1

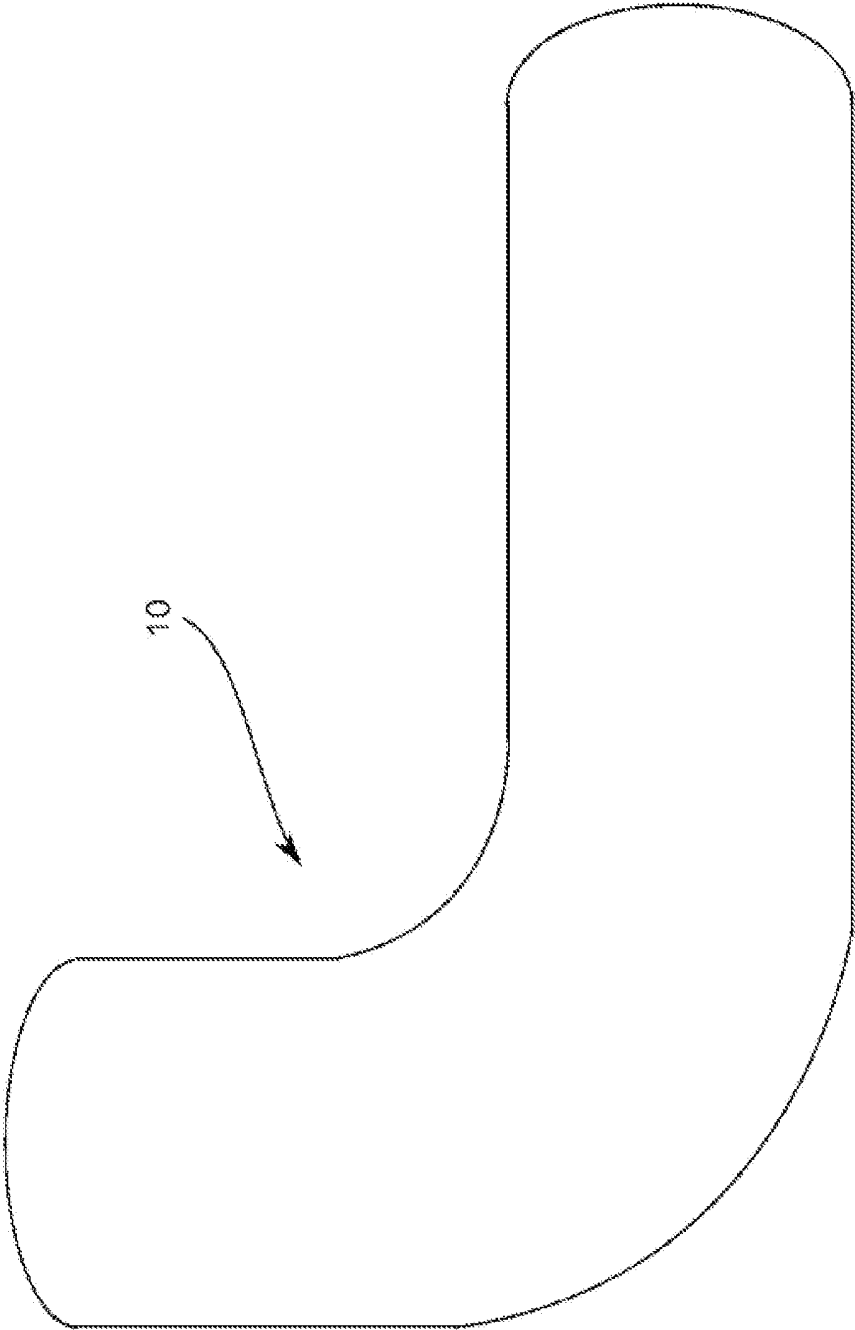


Figure 2

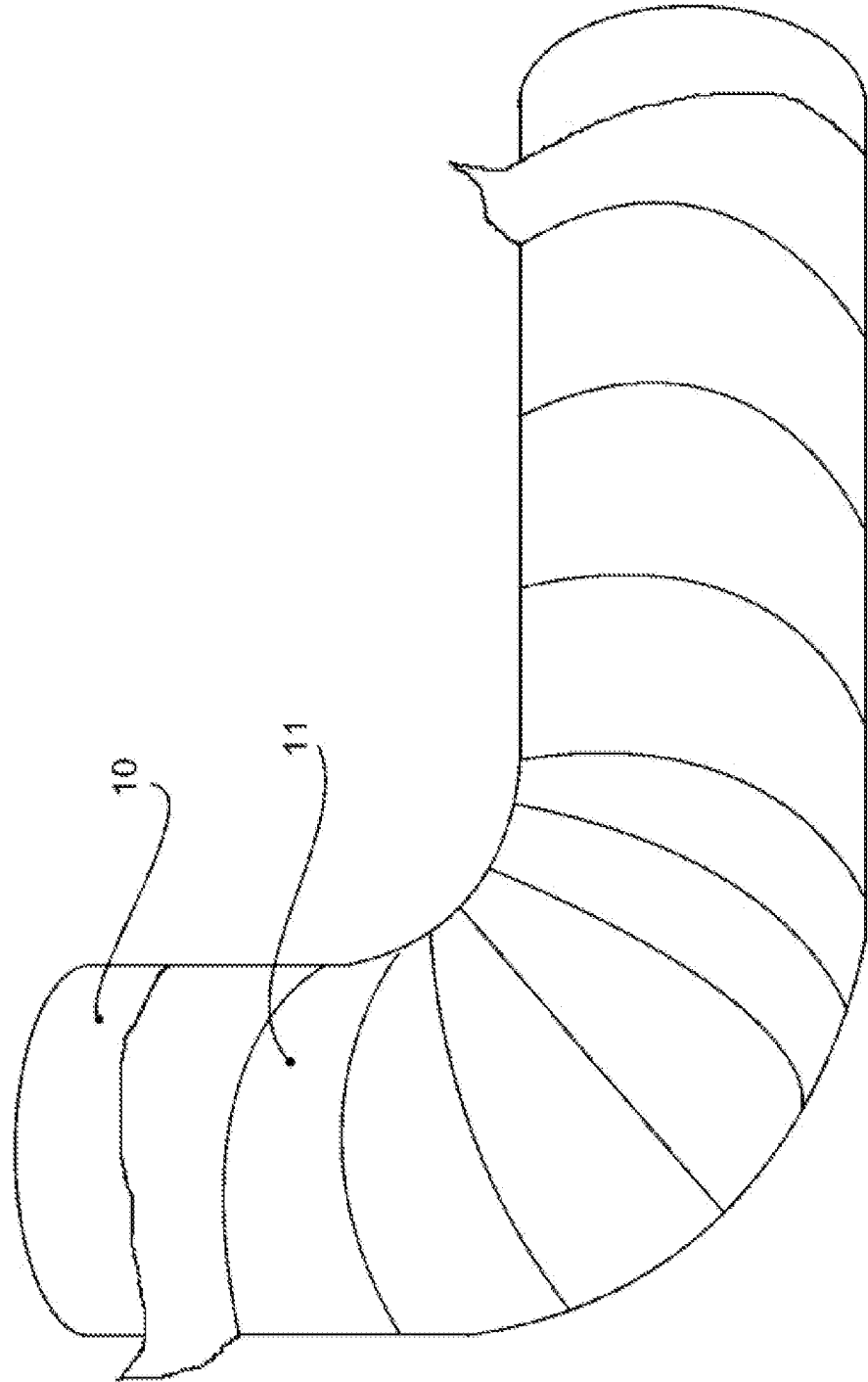


Figure 3

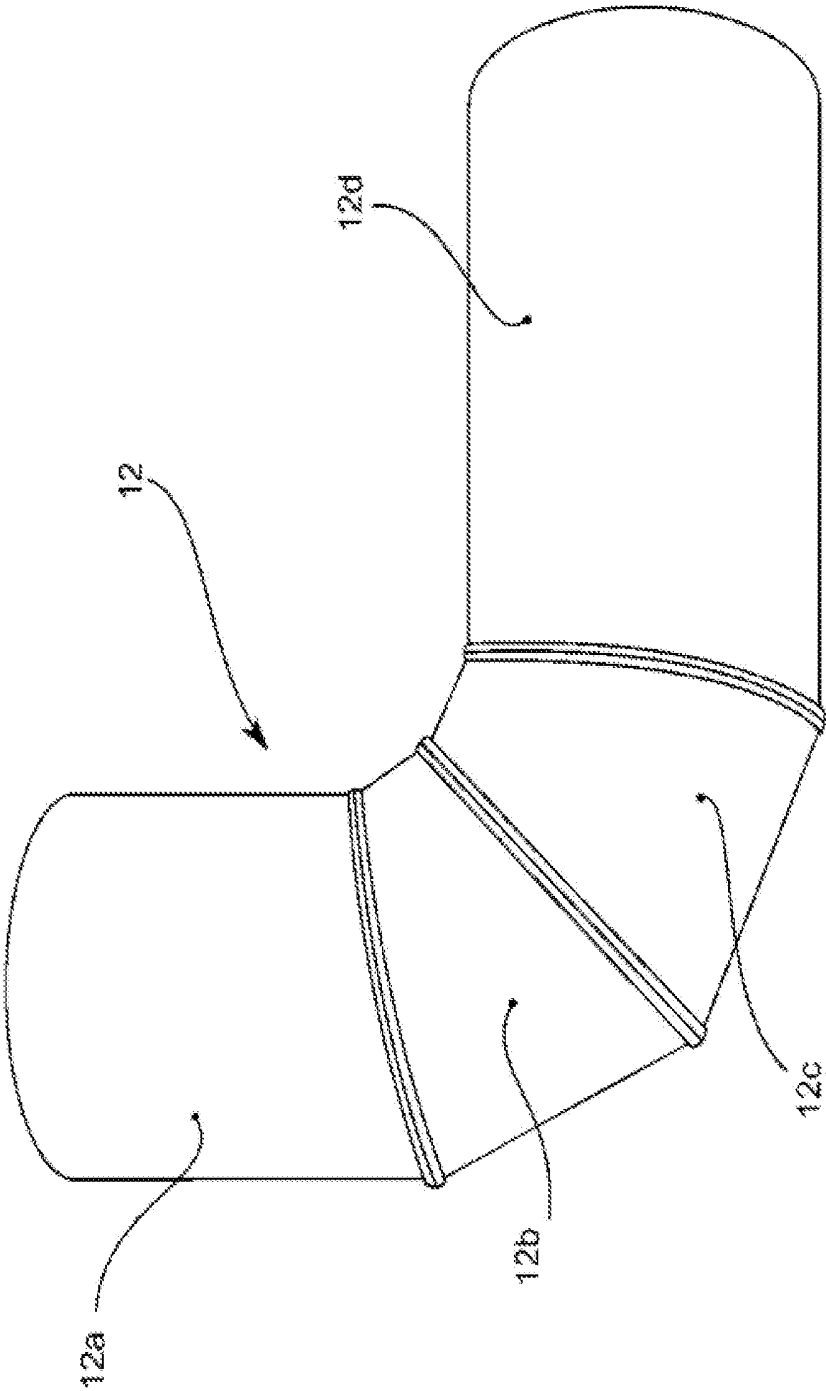


Figure 4

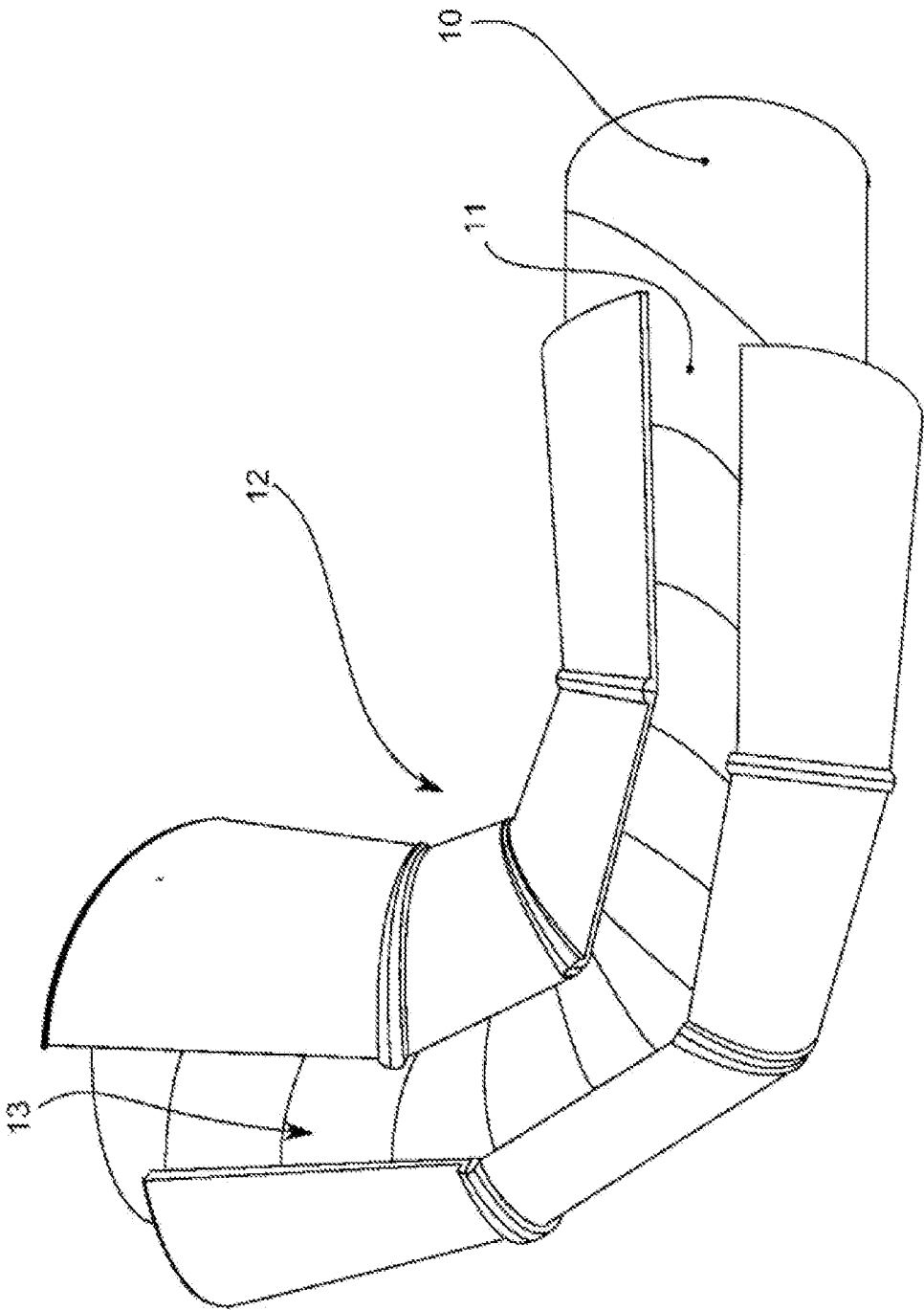


Figure 5

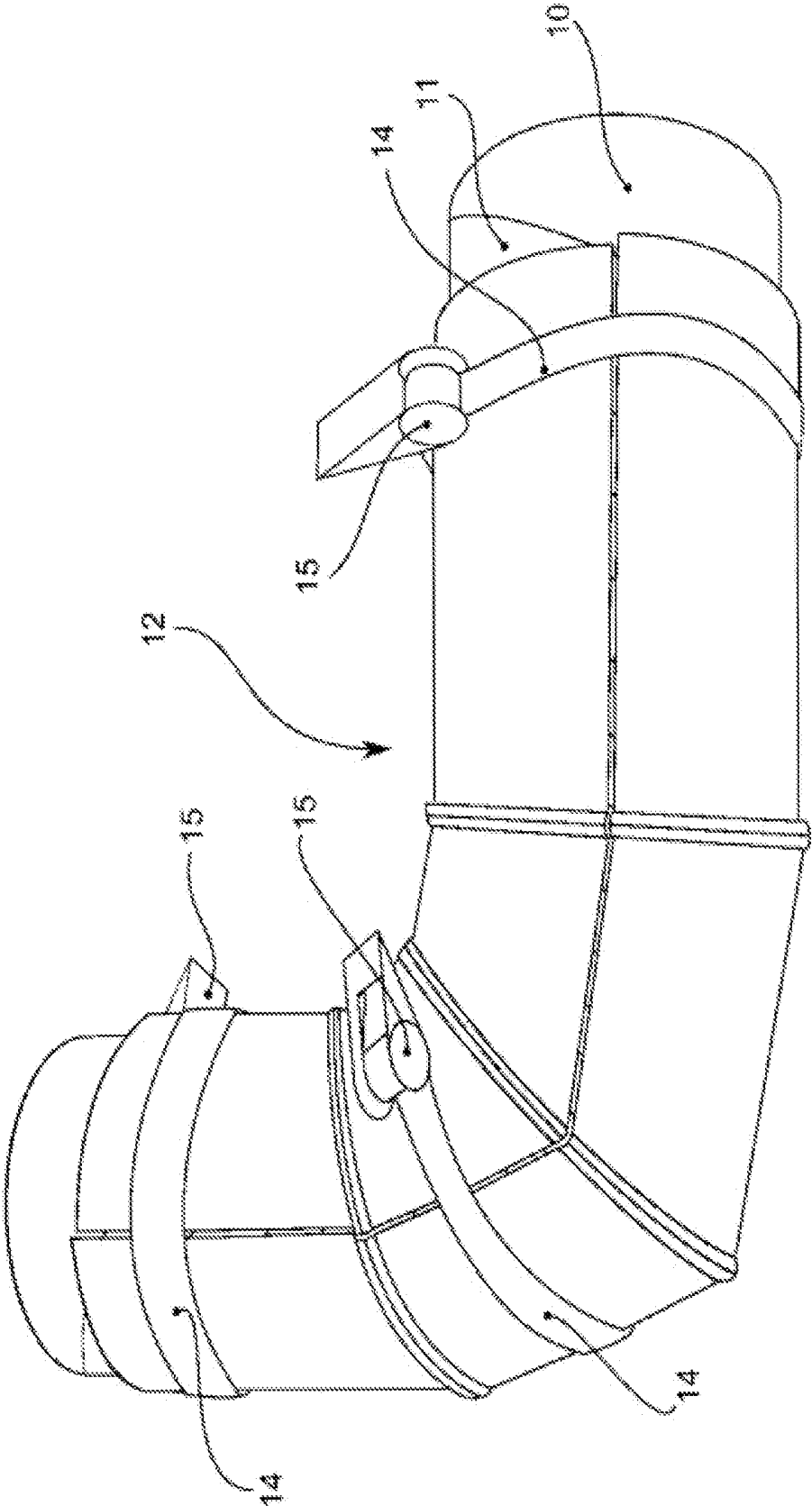


Figure 6

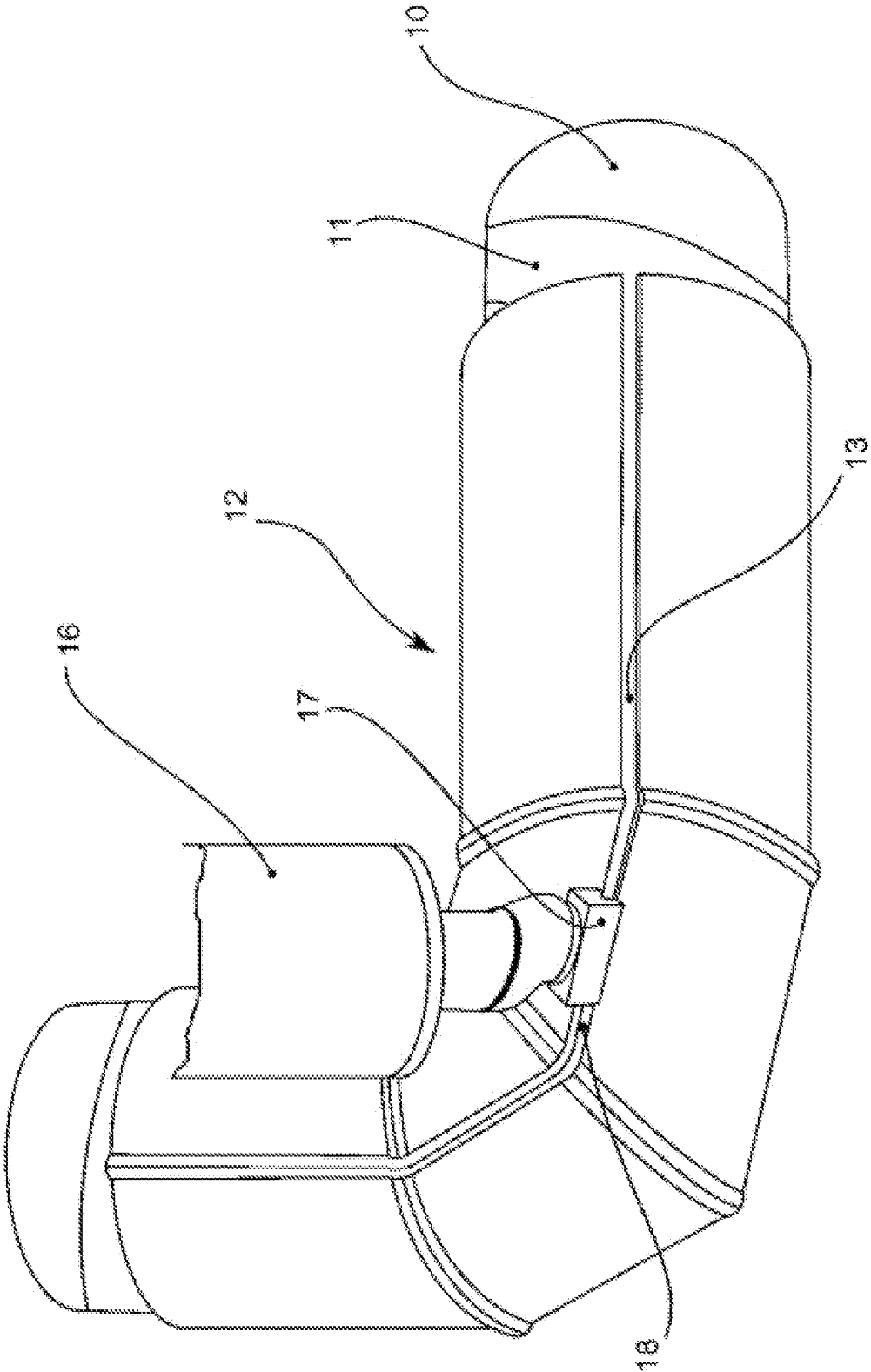


Figure 7

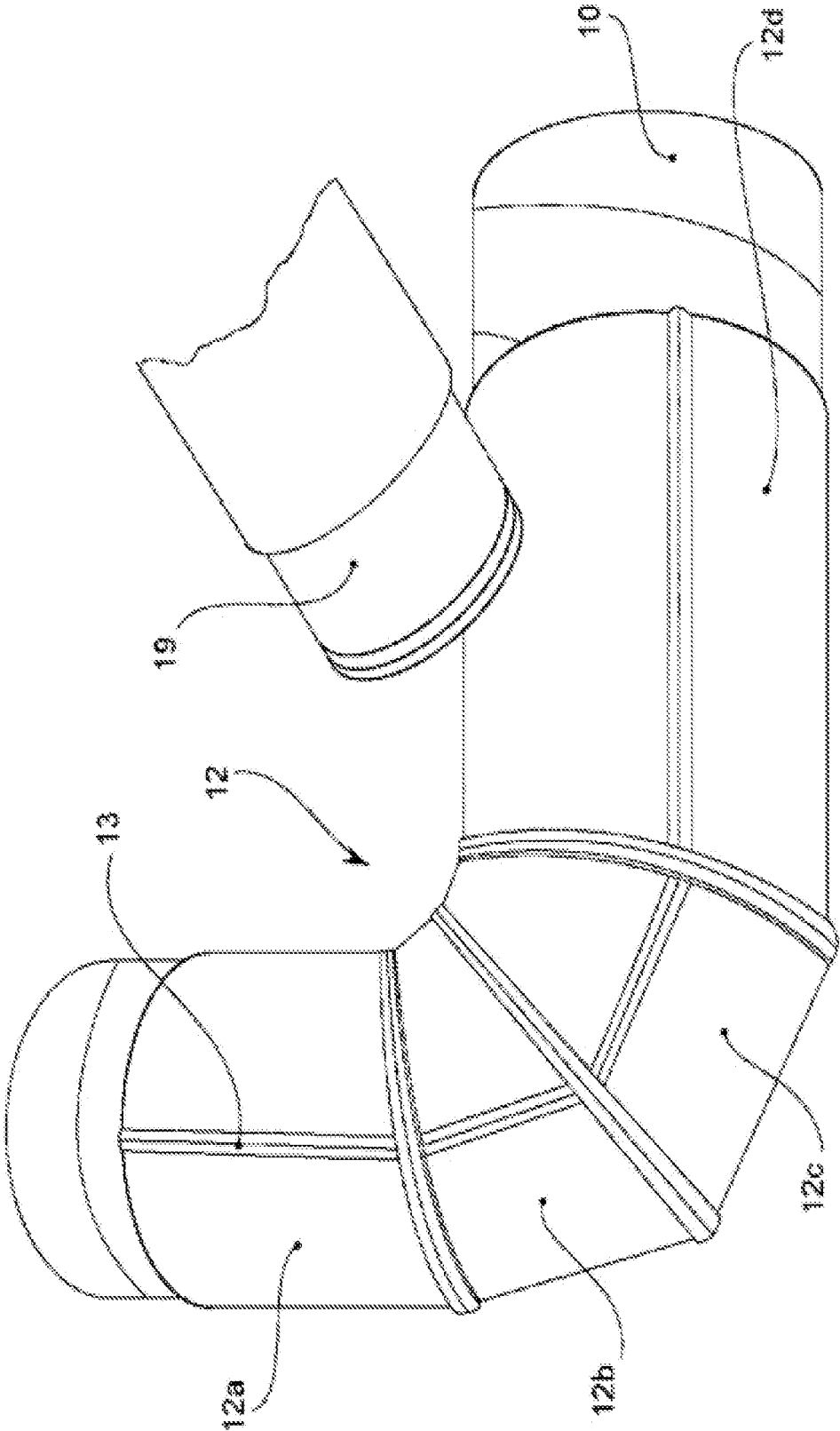


Figure 8

