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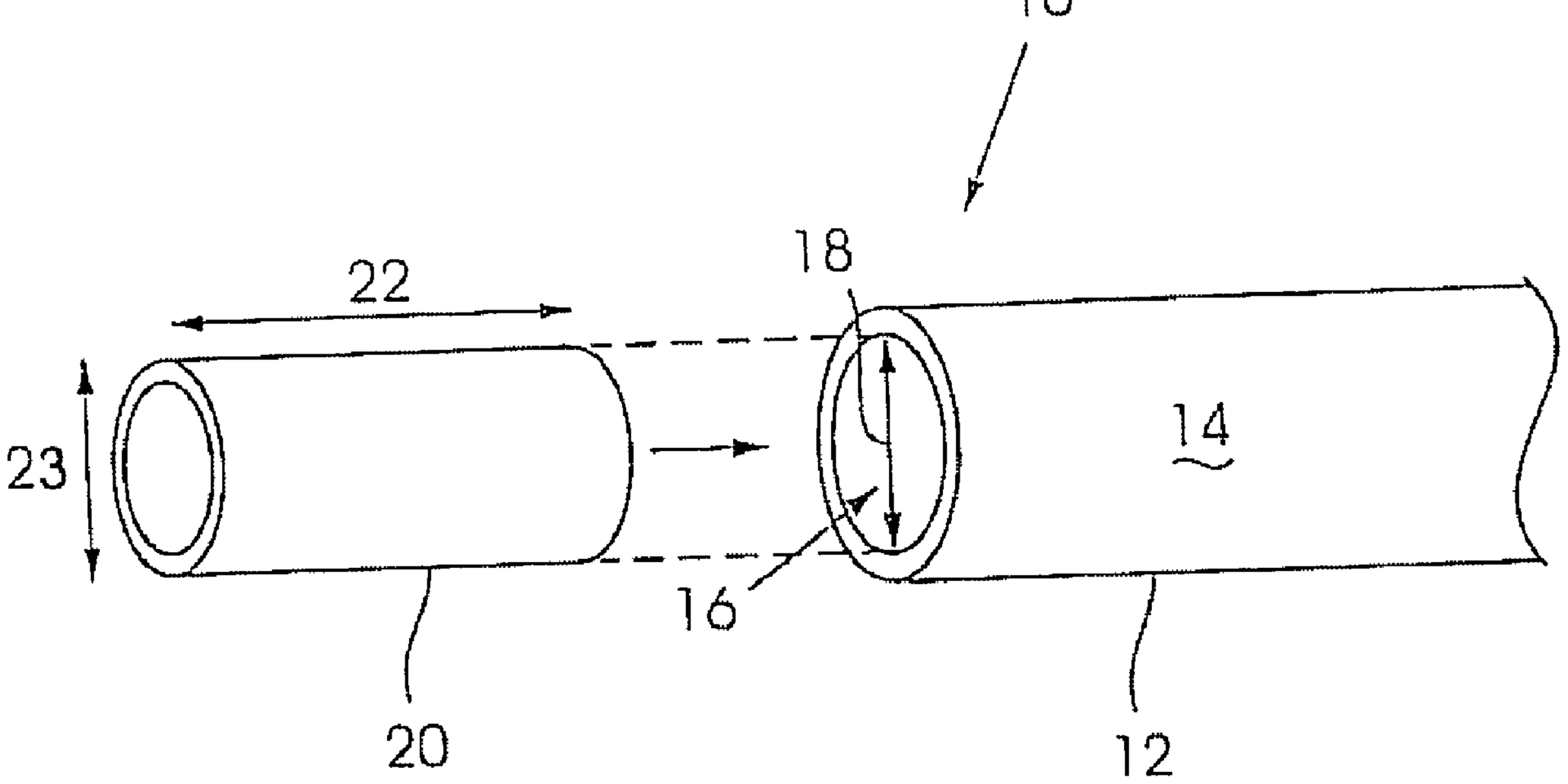
(54) Title: ROCK BOLT



(57) Abrégé/Abstract:
A rock bolt comprising an elongate tubular body with filler material inside the body at one end which is deformed into a U-shape.

ABSTRACT

A rock bolt comprising an elongate tubular body with filler material inside the body at one end which is deformed into a U-shape.

ROCK BOLT

BACKGROUND OF THE INVENTION

[0001] This invention relates to a rock bolt.

[0002] Various support techniques are used in underground mining. In hard rock mining in South African gold mines, for example, a large diameter hole is drilled into a rock body whereafter a rock bolt is inserted into the hole. Full column grouting of the rock bolt is preferred to obtain superior performance. To achieve this objective without excessive use of steel, a tubular steel rock bolt is used. Typically the tubular steel rock bolt is inserted into a borehole and is fixed in place using a grout or a resin mixture.

[0003] Normally a capsule which contains resin components is placed in a borehole. The capsule is punctured when the rock bolt is inserted into the hole and the contents of the capsule are mixed by rotating the rock bolt. If the rock bolt is tubular then a leading end of the rock bolt must be closed to prevent the resin mix from flowing into an interior of the rock bolt. One way of sealing the tubular rock bolt is to deform the leading end, so that it is pointed. However when this point penetrates the capsule a so-called "finger gloving" effect may arise, when the bolt is rotated, which results in the resin not being adequately mixed or correctly distributed throughout the borehole.

[0004] If the leading end of the rock bolt is pressed flat and closed, a chisel shape results. This helps to avoid finger gloving during resin mixing, but the

leading end will have a width which exceeds the width of a borehole – a feature which works against the adoption of this technique.

[0005] An object of the present invention is to provide a rock bolt which enables the aforementioned situation to be addressed.

SUMMARY OF INVENTION

[0006] The invention provides a rock bolt which includes an elongate tubular body with an internal bore, a leading end and a trailing end, and filler material in the leading end, and wherein the leading end is deformed so that the filler material seals the bore at the leading end.

[0007] The filler material may be of any appropriate kind. In one example of the invention the filler material is non-metallic e.g. of a plastics material. The filler material may, initially, have any suitable shape and in one form of the invention the filler material initially is tubular.

[0008] Preferably the filler material is initially a tube of a plastics material which can fit closely into the bore at the leading end prior to deformation thereof.

[0009] When the leading end is deformed this is preferably done in a way which does not meaningfully increase the width of the leading end. Additionally, an objective in this respect is to ensure that the filler material acts to seal gaps between opposing surfaces of the rock bolt at the leading end.

[0010] The leading end may be deformed so that, in cross-section, it is generally of a U-shape.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The invention is further described by way of example with reference to the accompanying drawings in which:

Figure 1 shows a leading end of a tubular rock bolt and a length of filler material;

Figure 2 illustrates how the leading end is deformed to achieve a sealing action; and

Figure 3 illustrates an aspect of a possible manufacturing step.

DESCRIPTION OF PREFERRED EMBODIMENT

[0012] Figure 1 of the accompanying drawings illustrates, in perspective, a leading end 10 of a tubular rock bolt 12. A trailing end of the bolt is not shown.

[0013] The rock bolt is made from a suitable metal and has external keying formations, not shown, on an outer surface 14.

[0014] The rock bolt has an inner bore 16 with a diameter 18.

[0015] In order to seal the leading end 10 use is made of a short tube 20 of a plastics material such as high density polyethylene (HDPE). The tube has a length 22 and an external diameter 23 which is substantially the same as the diameter 18 of the bore 16. The tube 20 can thus be inserted with a relatively tight fit into the bore 16 at the leading end 10.

[0016] In a subsequent manufacturing step the leading end, with the tube 20 engaged therewith, is inserted into a suitable press, as shown in Figure 3 (by way of example only). The press has a bed 24 which cradles a first half section 26 of the leading end 10. A tool, not shown, which has a narrow elongate shape and a length which is of the order of the length 22 of the tube 20 is then pressed onto an outer surface 30 of a diametrically opposing second half section 32 of the leading end which is formed into the half section 26. In this way an elongate U-shaped recess or channel 36 is formed in the half section 32 extending towards the half section 26. The tube 20 is readily deformed in this process and fills a space 38 between opposing surfaces of the half section 26 and the now deformed section 32. The plastic material is in tight sealing engagement with these opposed surfaces and a sound seal results. Additionally the transverse dimension of the sealed leading end is not meaningfully increased relative to the external diameter of the rock bolt shank.

[0017] It has been found if an attempt is made to seal the leading end of the rock bolt without using a filler material that the material of the rock bolt is liable to fracture or split due to the excessive amount of metal working which is required. When the filler material is used the leading end is sealed and the integrity of the leading end is maintained i.e. there is no cracking or splitting of the metal. The filler is, conveniently, initially of tubular shape but this is exemplary only, and non-limiting. Additionally the leading end is shaped so that when it is used for penetrating and then mixing a resin capsule there is no “finger gloving” effect.

CLAIMS

1. A rock bolt which includes an elongate tubular body with an internal bore, a leading end and a trailing end, and filler material in the leading end, and wherein the leading end is deformed so that the filler material seals the bore at the leading end.

2. A rock bolt according to claim 1 wherein the filler material is non-metallic.

3. A rock bolt according to claim 1 or 2 wherein the filler material is initially a tube of a plastics material which can fit closely into the bore at the leading end prior to deformation thereof.

4. A rock bolt according to claim 1, 2 or 3 wherein the leading end is deformed so that at the leading end a half section of the tubular body is forced into a diametrically opposed half section of the body, and the filler material fills a space between opposing surfaces of the two half sections.

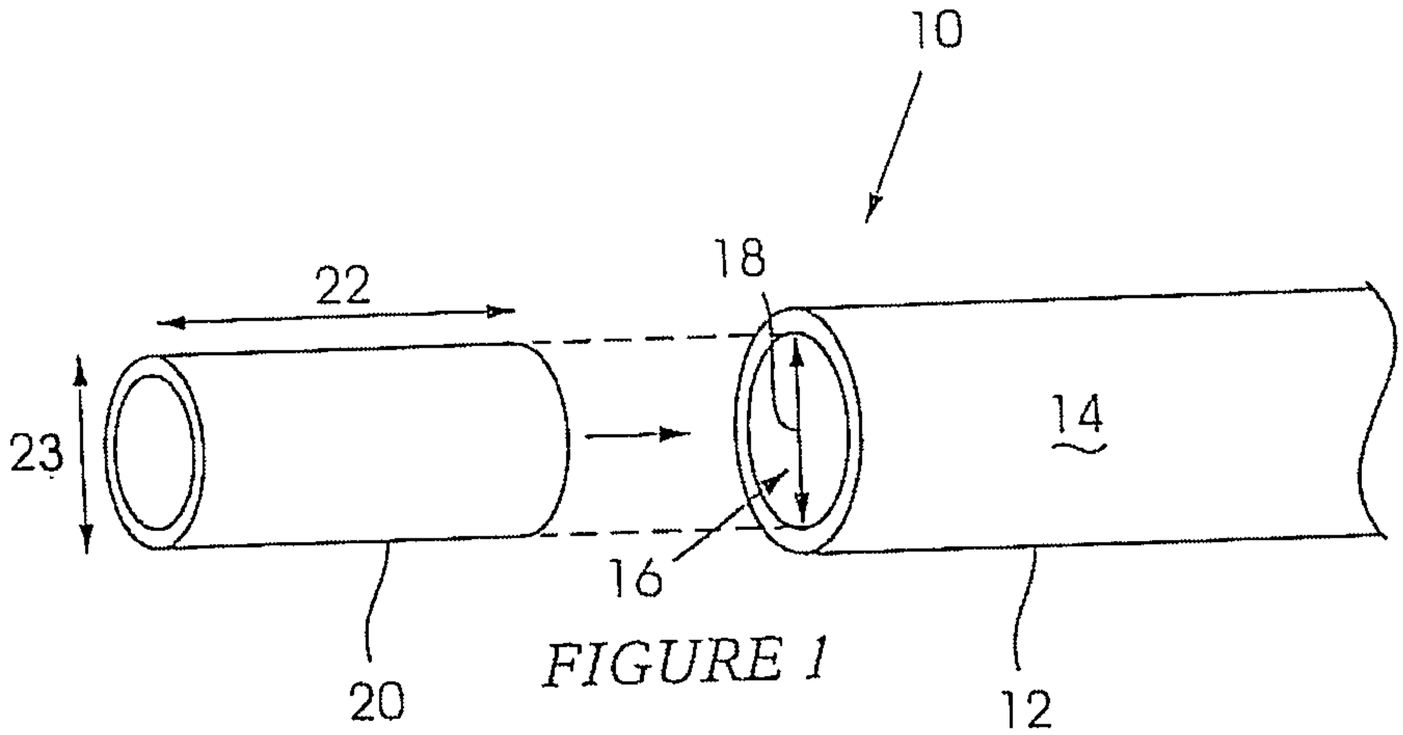


FIGURE 1

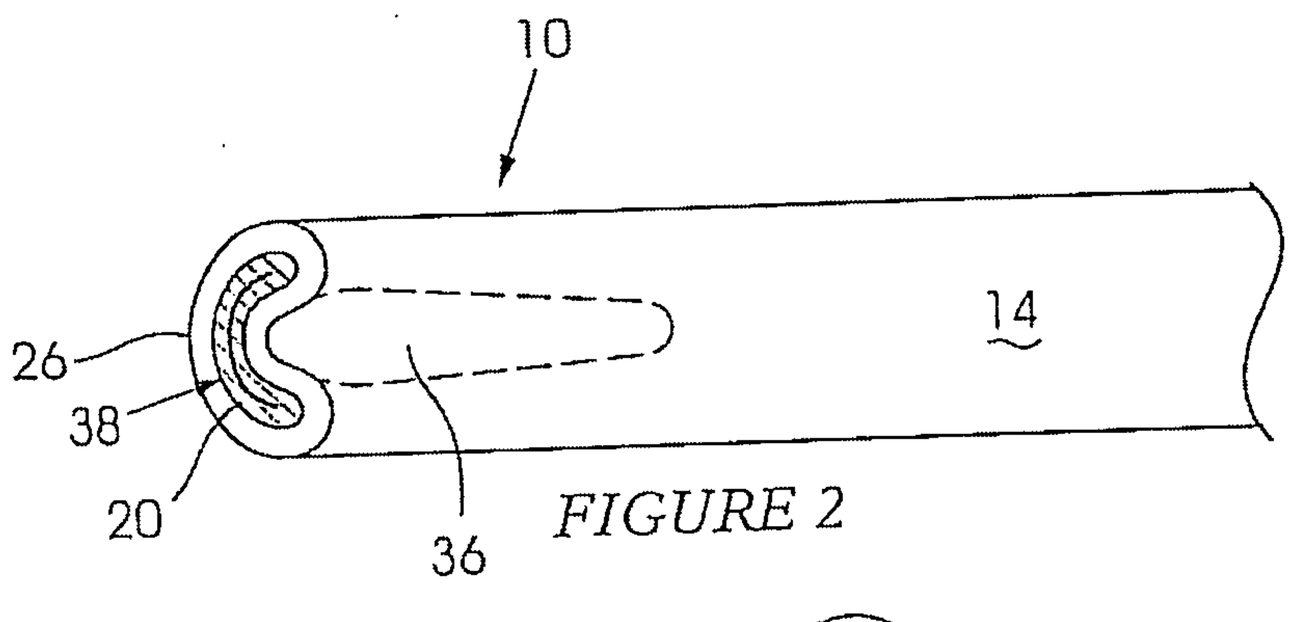


FIGURE 2

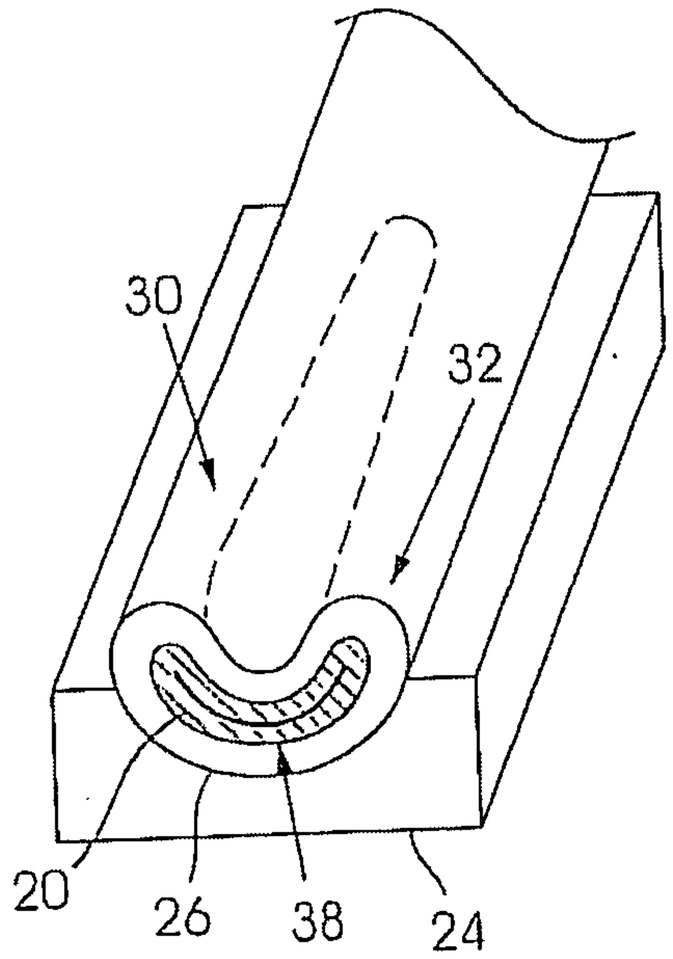
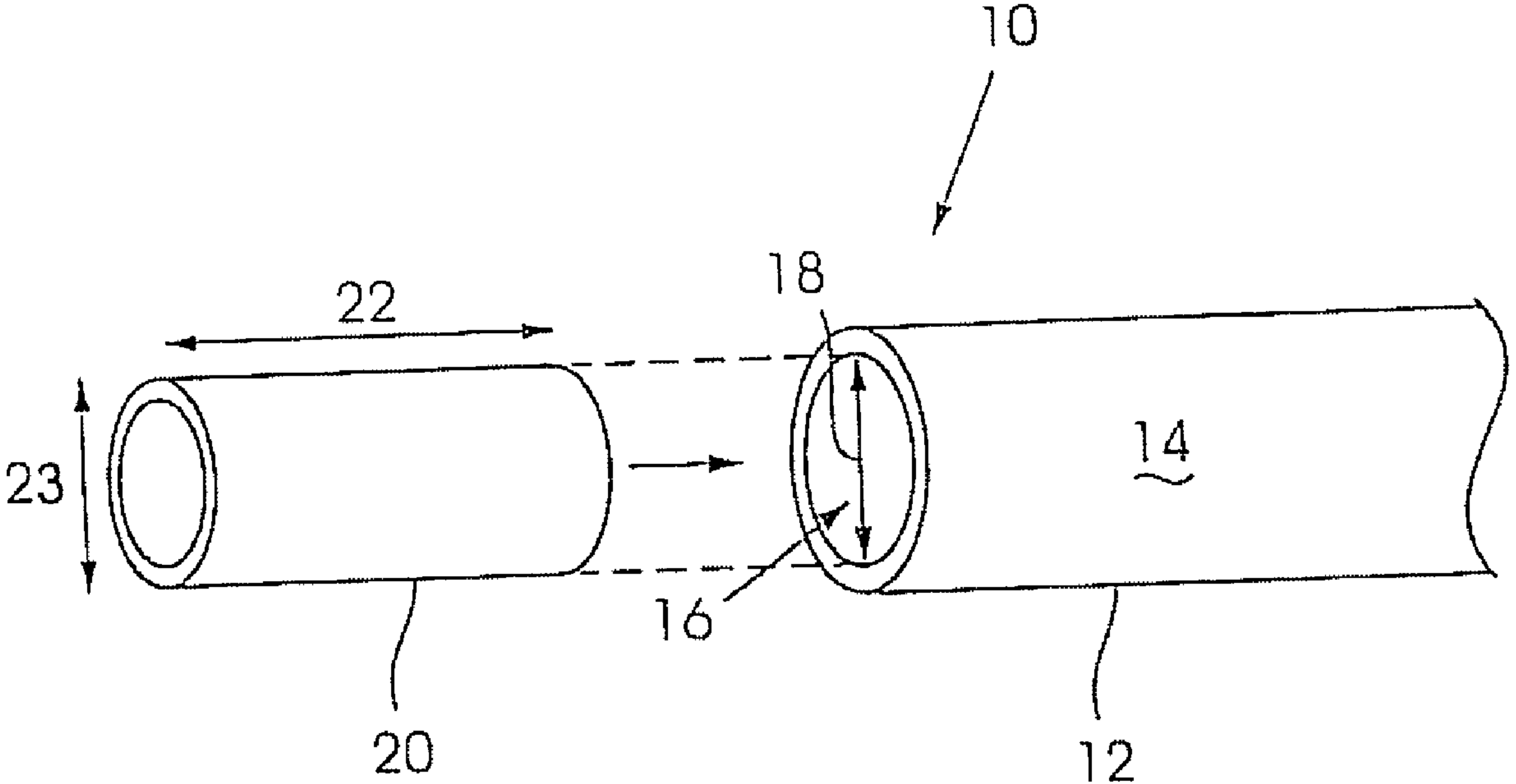


FIGURE 3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