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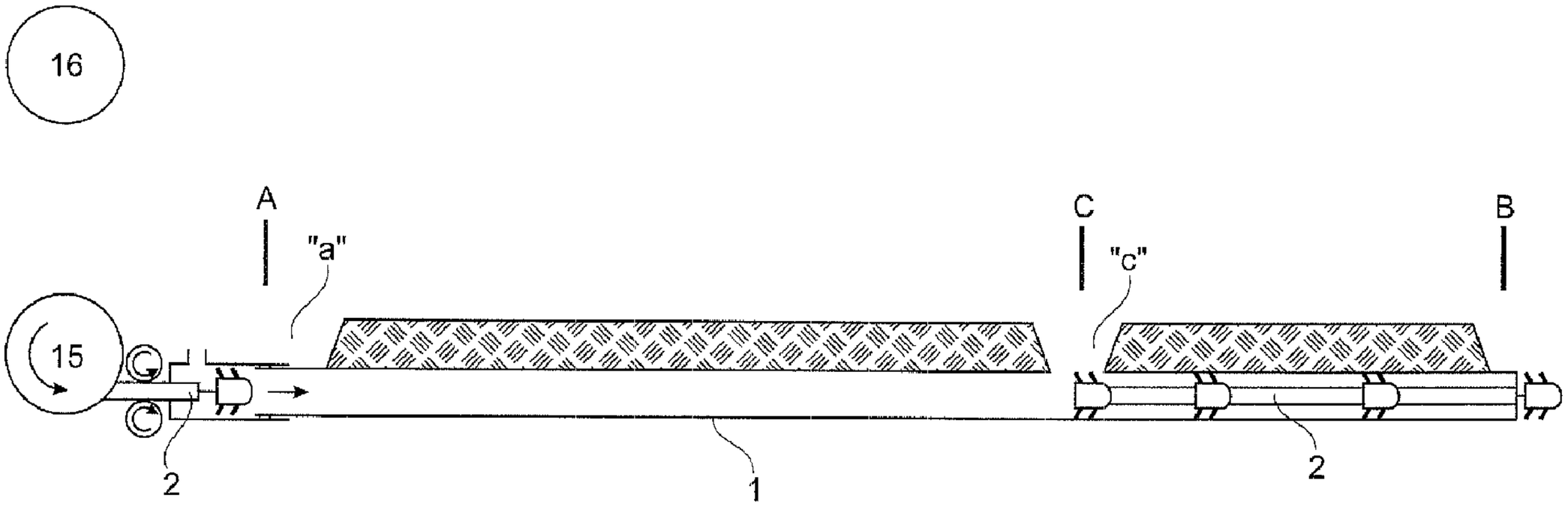
(54) Titre : PROCEDE DE POSE D'UNE PLURALITE DE TRONCONS SUCCESSIFS DE CABLES AFIN DE FORMER UNE CONNEXION CABLEE DE GRANDE LONGUEUR

(54) Title: METHOD FOR LAYING A PLURALITY OF SUCCESSIVE SECTIONS OF CABLES IN ORDER TO FORM A CABLED CONNECTION OF GREAT LENGTH



(57) Abrégé/Abstract:
A method for laying a plurality of cable sections (2) to be successively positioned in series in a buried duct (1), according to a flowing-pushing method using a pressurized fluid, characterized in that: the different cable sections (2) are successively introduced into the duct (1) in a single entry point (A) comprising a laying device (10) notably comprising an orifice (12) for introducing a pressurized fluid, a cable section (2) entirely introduced into the duct (1) is pushed towards the position which it should occupy in the duct, only by the pressure of the fluid introduced by said laying device (10) and when a cable section (2) has reached his final position in the duct, an opening is made in the duct (1) near to the rear of said cable section (2).

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(54) **Title**: METHOD FOR LAYING A PLURALITY OF SUCCESSIVE SECTIONS OF CABLES IN ORDER TO FORM A CABLED CONNECTION OF GREAT LENGTH

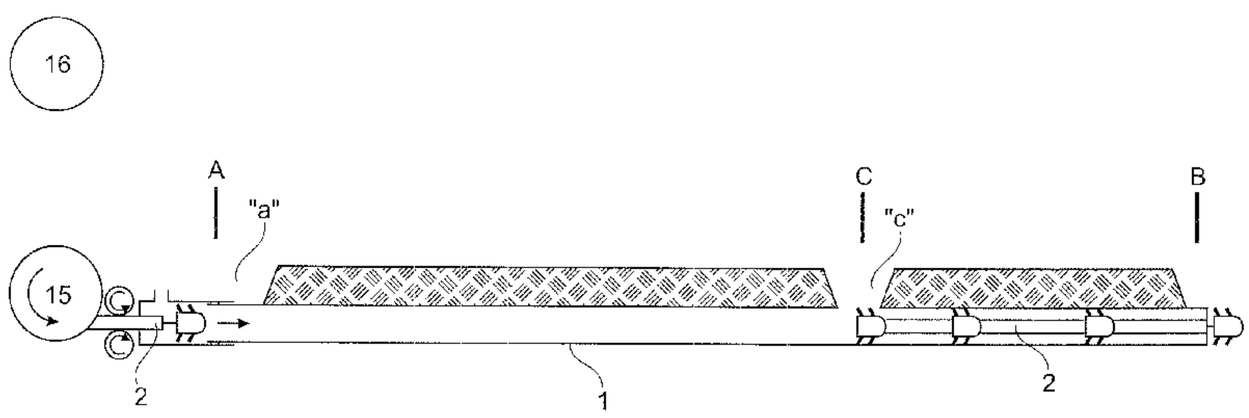


Fig. 3

(57) **Abstract**: A method for laying a plurality of cable sections (2) to be successively positioned in series in a buried duct (1), according to a flowing-pushing method using a pressurized fluid, characterized in that: the different cable sections (2) are successively introduced into the duct (1) in a single entry point (A) comprising a laying device (10) notably comprising an orifice (12) for introducing a pressurized fluid, a cable section (2) entirely introduced into the duct (1) is pushed towards the position which it should occupy in the duct, only by the pressure of the fluid introduced by said laying device (10) and when a cable section (2) has reached his final position in the duct, an opening is made in the duct (1) near to the rear of said cable section (2).

WO 2012/022799 A3

Method for laying a plurality of successive sections of cables in order to form a cabled connection of great length

Field of the invention

The present invention relates to a method for laying a cable connection of great length by successively laying a plurality of sections of cables of customary length.

Background

A cable connection of great length, whether this is a connection of electric power cables, telecommunications cables or optical cables, generally consists of a succession of sections of cables, the length of each section generally corresponding to the length which may be transported on a drum. After laying, these successive sections are connected together through suitable junctions.

The laying of a cable connection of great length according to the prior art, after the ducts which should receive the sections of cables have been buried, consists of making a cavity or laying excavation at each duct end in order to be able to bring a full drum there and to introduce and lay the corresponding cable section, in particular according to any of the techniques described in patent EP 1 518 317 or application PCT/EP2010/060 371.

The major drawback of such a laying technique lies in the fact that a cavity or laying excavation has to be made between each laid duct, which entails significant civil engineering costs. Further, it may be difficult to access the laying cavity with a drum of great dimensions, for example if the junction between two successive ducts is located on a mountain or in a tunnel or else in a built-up environment.

Summary of the invention

In order to propose a solution to these drawbacks, according to a broad aspect, the invention provides a method for laying a plurality of cable sections to be successively positioned in series in a buried duct, according to a flowing-pushing method using a pressurized fluid, the method comprising: successively introducing different cable sections into the duct in a single entry point comprising a laying device comprising an orifice for introducing a pressurized fluid; and entirely introducing a cable section into the duct by pushing towards a position which it should occupy in the duct, only by the pressure of the fluid introduced by the laying device; wherein, when the cable section has reached its final position in the duct, an opening is made in the duct near a rear of the cable section.

Brief description of the drawings

The invention is described in detail hereafter, with reference to the drawing schematically illustrating certain steps of the method according to the invention and including figures wherein:

Figure 1 illustrates a laying operation of a first cable section according to the method of the invention,

Figure 2 illustrates the same operation for laying the first cable section an instant later,

Figure 3 illustrates the end of the laying operation of the 1st cable section as well as the beginning of the laying operation of a 2nd cable section,

Figure 4 illustrates the end of the laying operation of the 2nd cable section as well as the beginning of the laying operation of a 3rd cable section,

Figure 5 illustrates the end of the laying operations of the three cable sections, and

Figure 6 illustrates a cable of great length, consisting of three sections and laid according to the method of the invention.

Detailed description of the embodiments

Figure 1 shows a buried duct 1 between points A and B, the distance between points A and B being generally greater than the length of the cable which may be wound on a transport drum.

At one of the ends of the duct 1, here the end A, a laying device 10 is positioned for laying by a floating-pushing method. This device comprises a pressure housing 11 comprising a pressurized fluid inlet 12 (for example water), mechanical pushing means 13, and means (not shown here) for introducing and attaching pigs 3 on a cable section 2. The cable section 2 is being unwound from the drum 14 and is pushed towards the interior of the duct 1 by the pressure exerted by the pressurized fluid introduced through the orifice 12. As described in the aforementioned application, each of the pigs 3 comprises means with which a pressure drop may be obtained between the rear and the front of the pig 3, the pressure drop between the one introduced by the orifice 12 and the one prevailing at the front of the cable section being absorbed by the pigs 3 positioned along the cable section 2 as well as by the one of the front end 3a. The duct 1 was sealed throughout its length between points A and B, the B end being opened putting this duct portion 1 under atmospheric pressure.

According to a specific embodiment of the process, the total drop of pressure between the rear end and the front end of the cable section is equally divided by the pigs disposed along the cable section.

At the point A, a relatively large laying cavity “a” was made for positioning the laying device 10 therein. It is noted that two other drums 15, 16 each containing a cable section 2 were brought into proximity to the laying cavity “a”.

In Figure 2, the same device is seen an instant later, while the whole first cable section 2 has been unwound from the drum 14. The latter was moved away from the building site. It is seen that three pigs 3 in addition to those of the front end 3a have been attached to the cable section 2, that the orifice through which the cable section 2 was introduced into the pressure housing 11 was blocked by a sealing means 11a, the cable section 2 being only propelled by the pressurized fluid inside the duct 1 towards the end B. Pushing the cable section 2 is then only carried out by the fluid.

Figure 3 illustrates a step of the method according to the invention wherein the front portion of the first cable section 2 has reached the end B of the duct 1. At the location where the rear of the first cable section 2 is found, an excavation “c” is made which will subsequently allow the joining to be achieved between the 1st and 2nd cable sections 2, but which for the moment is used for lowering the fluid pressure towards the front of the second cable section 2 in order to allow its displacement towards the point C. This excavation “c” comprises an opening of the duct 1 in order to access the ends of the cable sections 2 at the point C and to lower the fluid pressure in this location. It is seen in the figure that the 2nd cable section 2 is being introduced into the laying device 10 from the 2nd drum 15.

The excavation “c” made at the point C is clearly less significant than the one in end A made for introducing sections of cables 2. In particular, it is by means of these intermediate excavations of less significance that the method according to the invention is clearly more advantageous than the methods according to the prior art.

At a subsequent step of the method, as illustrated in Figure 4, the 2nd cable section 2 was placed between the points C and D. It is seen that the pigs 3 on the rear end of the 1st cable section 2 as well as the pig 3a on the front end of the 2nd cable section 2

have been disassembled in order to allow subsequent joining of these cable sections 2.

In point D, an excavation "d" similar to the excavation "c" allows lowering of the fluid pressure at the front of the 3rd cable section 2 which is seen being introduced into the end A of the duct 1 from the 3rd drum 16.

Figure 5 shows a step of the method where all the cable sections 2 have been laid as described earlier, the pigs 3 and 3a mounted on the ends of the cable sections have been disassembled, while those which had been assembled along the sections remain in place considering that they are inaccessible.

In Figure 6, the finished cable connection between points A and B is seen, suitable junctions 4 having been made for connecting together successive sections of cables 2. The excavations "c" and "d" have been refilled, the laying device 10 has been disassembled. The electric or optical end equipment in A and B has not been illustrated in the figure.

In the exemplary method described above, three sections of cables 2 have been laid; it is obvious that it is possible to have another number of successive cable sections for obtaining the cable connection. Also, each illustrated cable section included a front end pig 3a and three pigs 3 placed along the section, including a pig 3 at the rear end. Depending on the length of the section, its mass, the rectilinear or curved plot of the path of the duct 1, it is possible to have a different number and arrangement of the pigs, the arrangement and the number of pigs may also be different from one cable section to the next. For a relatively lightweight cable section 2, such as for example an optical cable section, and over not very meandering path, it is possible to only attach one single pig to the section, preferably the front end pig 3a.

With the method according to the invention described above, it is therefore possible to obtain cable connections of great length at a reasonable cost while avoiding the

need of digging a large excavation for introducing cables at each intermediate point as well as assembling and disassembling several times the laying device.

Any feature of any embodiment discussed herein may be combined with any feature of any other embodiment discussed herein in some examples of implementation.

Various embodiments and examples have been presented for the purpose of describing, but not limiting, the invention. Various modifications and enhancements will become apparent to those of ordinary skill in the art and are within the scope of the invention, which is defined by the appended claims.

CLAIMS

1. A method for laying a plurality of cable sections to be successively positioned in series in a buried duct, according to a flowing-pushing method using a pressurized fluid, the method comprising:

- successively introducing different cable sections into the duct in a single entry point comprising a laying device comprising an orifice for introducing a pressurized fluid; and

- entirely introducing a cable section into the duct by pushing towards a position which it should occupy in the duct, only by the pressure of the fluid introduced by the laying device;

wherein, when the cable section has reached its final position in the duct, an opening is made in the duct near a rear of the cable section.

2. The method according to claim 1, wherein the fluid is a liquid.

3. The method according to claim 2, wherein the liquid is water.

4. The method according to claim 1, wherein the fluid is a gas.

5. The method according to claim 4, wherein the gas is air.

6. The method according to any one of claims 1 to 5, wherein the different cables sections are successively pushed towards positions which they should occupy in the duct.

7. The method according to any one of claims 1 to 6, wherein each cable section is provided with at least one pig during its introduction into the duct.

8. The method according to claim 7, wherein each pig with which each cable section is equipped, comprises means for obtaining a pressure drop of the pressurized fluid between a rear face of the pig and its front face.

9. The method according to claim 8, wherein at least one cable section is provided with a front end pig.

10. The method according to claim 8, wherein at least one cable section is provided with a rear end pig.

11. The method according to claim 8, wherein at least one cable section is provided with at least one intermediate pig, placed over the length of the section of cable.

12. The method according to claim 8, wherein the drop of pressure between rear end and front end of the cable section is divided over pigs disposed along the cable section.

13. The method according to claim 12, wherein the drops of pressure caused by each pig are equal.

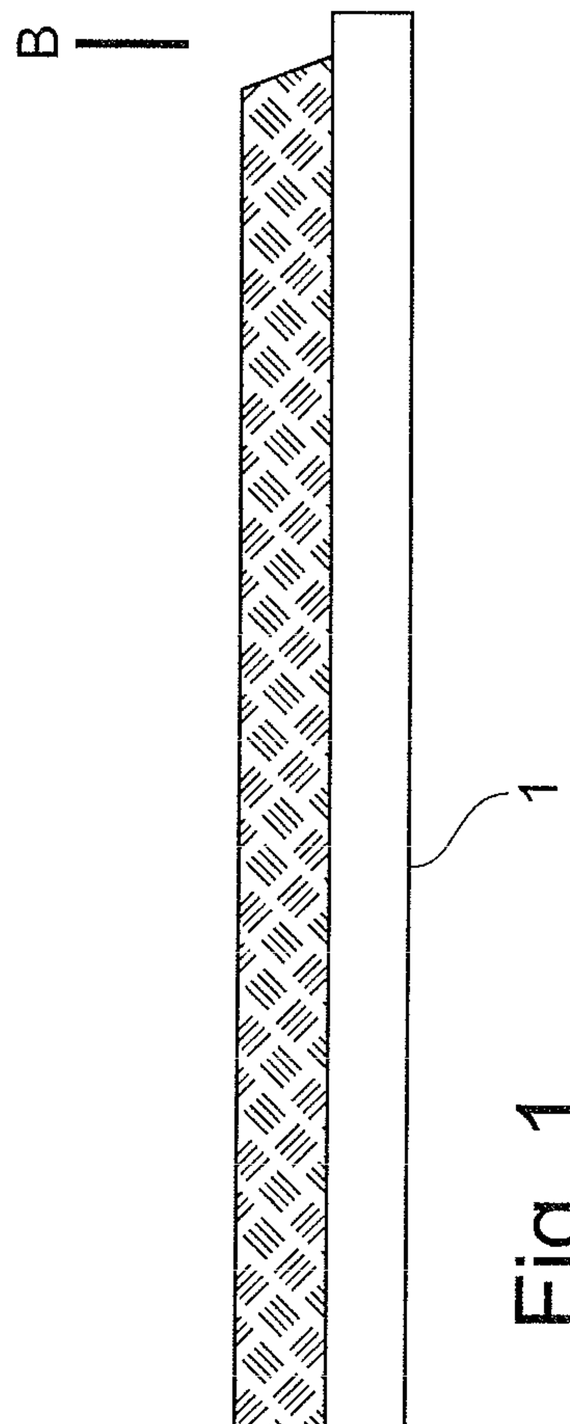


Fig. 1

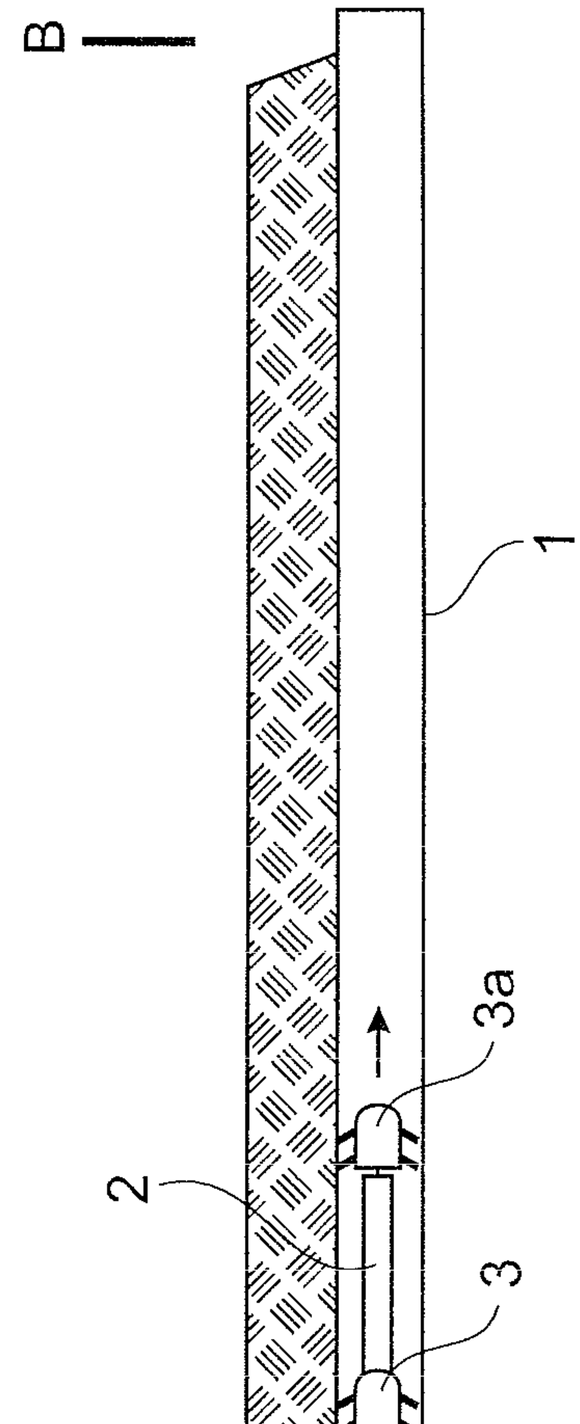


Fig. 2

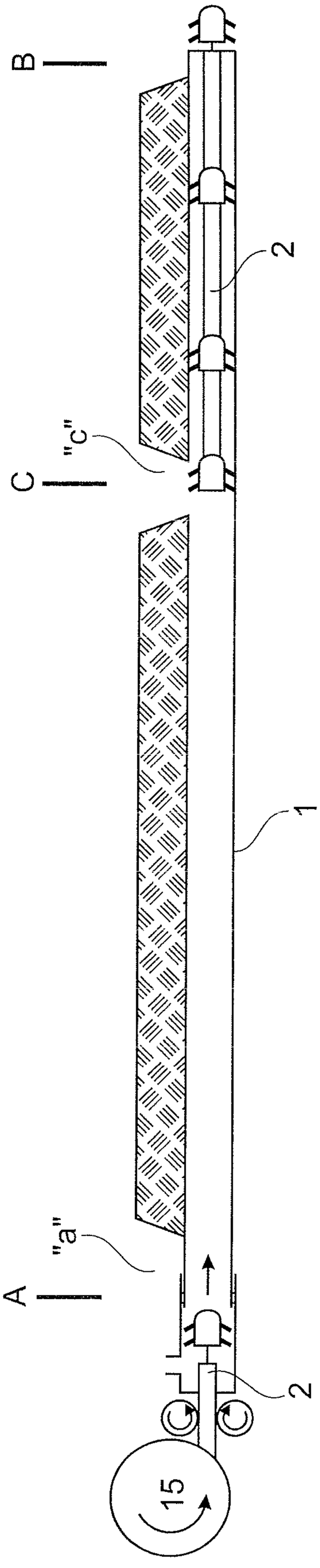


Fig. 3

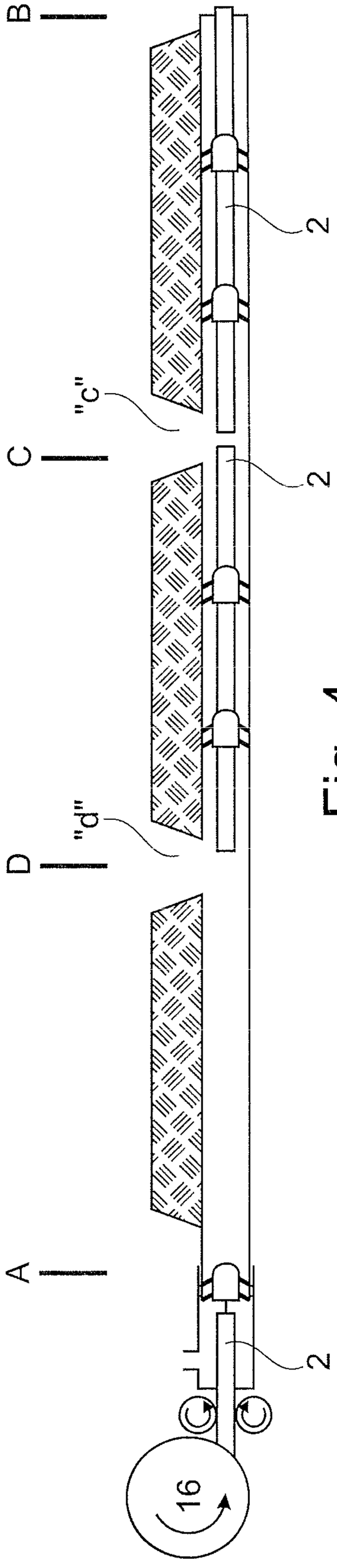


Fig. 4

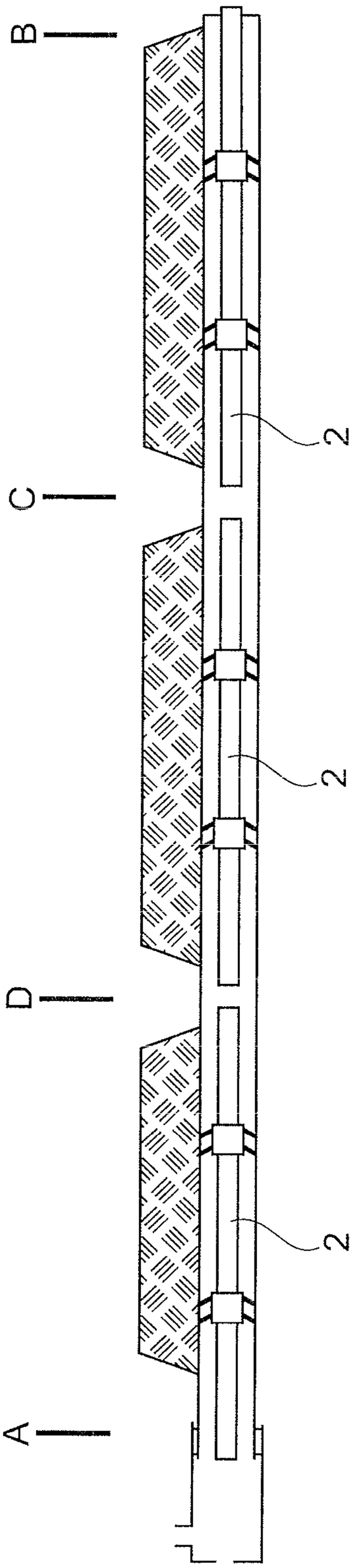


Fig. 5

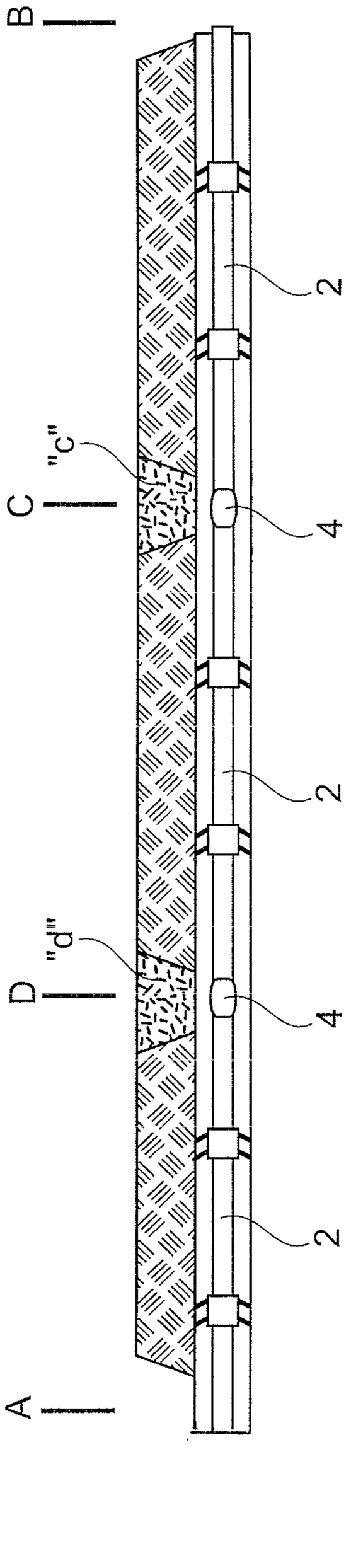
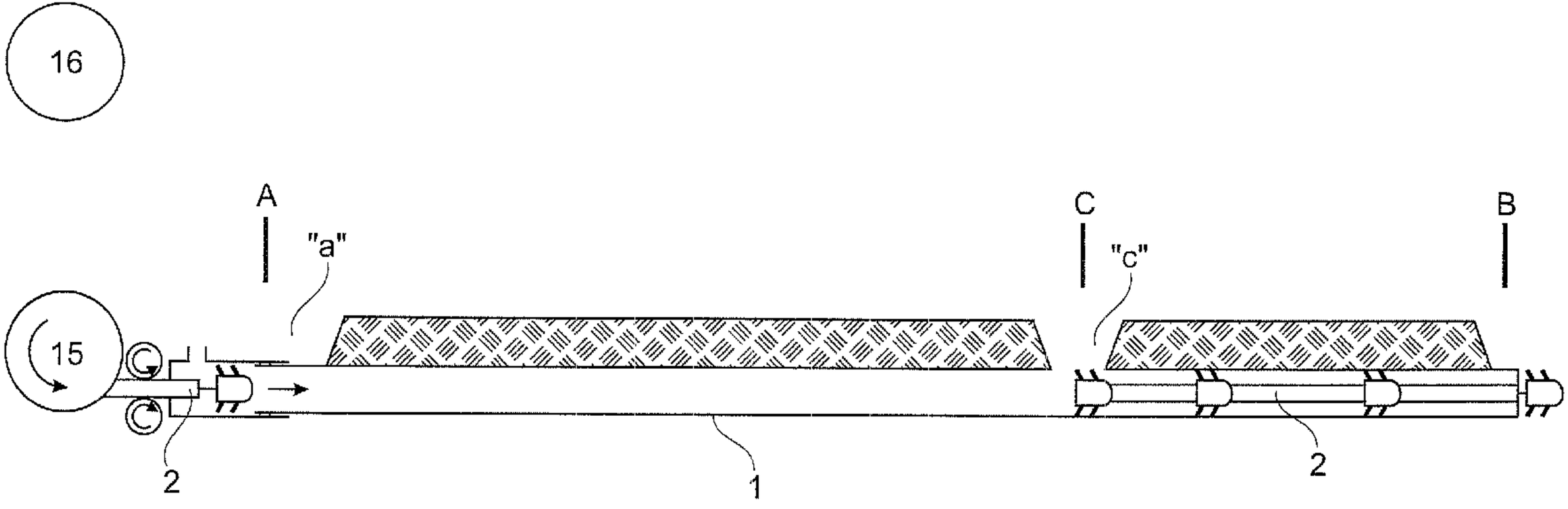


Fig. 6


16
A
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