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(54) METHOD AND APPARATUS FOR DIVIDING A CONDUIT INTO COMPARTMENTS

VERFAHREN UND VORRICHTUNG ZUM UNTERTEILEN EINES KANALS IN KAMMERN

PROCEDE ET APPAREIL PERMETTANT DE DIVISER UN CONDUIT EN COMPARTIMENTS

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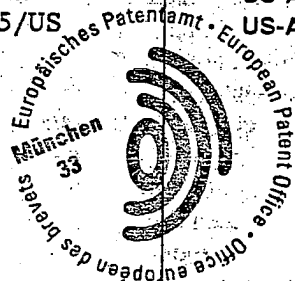
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US-A- 4 582 093
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Description

TECHNICAL FIELD

[0001] This invention relates to conduits of the type that might be employed to carry cables, such as fiber optic cables, underground. More particularly, this invention relates to a method and apparatus for dividing such conduits into compartments so that multiple cables can readily be carried in the same conduit.

Background Art

[0002] Modern communication technology utilizes cables, such as fiber optic cables, most often positioned in a conduit or casing which is buried underground. The installation of such an underground cabling network is a tedious and expensive project. First, usually a trench must be dug and then the conduit, typically of 5 to 10 cm (two to four inches) in diameter and oftentimes extending for miles in length, is positioned in the trench. The communications cable is then installed in the conduit, either by pulling or pushing the same therethrough. The trench is then filled and the communications network is ready to be utilized, being housed in the conduit safe from the environment of water, gnawing animals and the like.

[0003] One of the problems with these systems is that a conduit, particularly of a small size, usually only carries one cable which is positioned therein in a random, sinuous path thereby essentially prohibiting another cable from being readily installed in the existing conduit. Thus, if at a later date the communications system needs to be expanded, as by the addition of another cable, the entire installation process needs to be repeated - at a redundant expense. Bigger conduits, such as those of 10 cm (four inches) in diameter or larger, often have smaller conduits placed inside of them. But each of these conduits can only house one cable, and in addition, because of the wall thickness of these internal conduits, much space in the larger conduit is wasted.

[0004] One solution to the problem, which has been suggested, is to introduce a strip of material, usually formed of a polyethylene plastic, into the existing conduit which effectively pushes the existing cable to one side in the conduit thereby creating a second chamber in the conduit for the unobstructed installation of a second cable.

However, while the polyethylene material is somewhat resilient, such a process is at times difficult in that most underground conduits include many bends and turns which even this resilient material has trouble navigating. As a result, a great deal of force must be utilised to move the strip of material past the existing cable, while at the same time taking care that the strip of material does not damage the existing cable.

[0005] As a possible solution to this problem, it has been suggested to form the strip of material with a plu-

rality of notches to allow it to be more flexible and to twist as it is navigating the turns in the conduit. While the notched strip of material has been found to make installation easier, its manufacture is more costly and the possibility of damage to the existing cable is still prevalent.

[0006] Most fundamentally, there are other drawbacks to the conduit divider systems described above. First, a conduit having such dividers is only divided into two compartments thereby limiting the capacity of the conduit to two cables. While it might be feasible to further divide the conduit, most fundamentally, there are other drawbacks to the conduit divider systems described above. First, a conduit having such dividers is only divided into two compartments thereby limiting the capacity of the conduit to two cables. While it might be feasible to further divide the already divided conduit by introducing other strips of material, not only would the installation process have to be repeated, but also that process would be more difficult as there would be less operating space to negotiate turns. Second, and importantly, these divider strips themselves take up valuable and potentially useable space in the conduit, space which could, with an effective divider system, be utilised for additional cables.

[0007] WO 98/07450 claims a membrane useful in medical applications to form a tissue or bandage. One application of the membrane is to form a tube, for example comprising two membrane layers which are heat sealed along two opposed edges. The tube may be connected to respective pieces of other tubing materials, for example it may be received in another tube. The ultimate end result of going through such a procedure is a multi-layer, multitube device which is useful as a probe, inducer, catheter or balloon.

[0008] US 4582093 describes a multi-chambered conduit insert, which includes a plurality of cooperating, longitudinally extending walls having curved outer surface portions and defining a plurality of parallel, spaced apart, coextensive chambers. The insert may be made out of extruded polyethylene.

[0009] Moving away now from the subject of dividing existing conduits, US-A-5289556 discloses an optical fiber unit in which optical fibers are loosely contained with a flexible tube formed from two plastics strips which are bonded together along edge seams. The unit may be incorporated in an optical cable in which there is a core having circumferentially spaced ribs, defining between them grooves in which the units are disposed. In manufacture of the cable, a binding tape and a metal sheath are wrapped around the core.

[0010] Another cable product is described in US-A-3911200. The US patent describes electrical cables comprising an outer jacket or sheath made of an insulating material such as plastics or rubber and a multi-compartment shielding tape. The multi-compartment shielding tape located in the jacket or sheath has, for example, four fins forming four longitudinal parallel shielding compartments.

[0011] EP-A-725466 describes a device for subdividing a duct for installing cables, comprising a multicelled profile for insertion into the duct and formed from at least three cells which open outwardly. Typically, the profile forms a ring surrounding a central passage.

DISCLOSURE OF THE INVENTION

[0012] It is thus an object of the present invention to provide such an effective conduit divider system which does not take up significant space in the conduit thereby permitting a larger number of cables to be carried by the conduit.

[0013] It is another object of the present invention to provide a conduit divider system, as above, which utilises a conduit insert made of a lightweight, thin, pliant, fabric material which can deform to take the shape of the conduit in which it is positioned and the shape of the cable that it may be housing, thereby minimising unusable space in the conduit.

[0014] It is a further object of the present invention to provide a conduit divider system, as above, in which the insert can be configured to form a significant number of cable compartments.

[0015] It is an additional object of the present invention to provide a conduit divider system, as above, wherein a cable in a compartment is isolated from a cable in another compartment and is therefore protected when a new cable is being installed into a compartment in the conduit.

[0016] It is yet another object of the present invention to provide a conduit divider system, as above, in which the insert is inexpensive to manufacture and easy to install into a conduit.

[0017] It is a still further object of the present invention to provide a conduit divider system, as above, which can readily be stored on rolls which can be used at the installation site.

[0018] It is yet a further object of the present invention to provide a conduit divider system, as above, in which cables and/or pulling ropes or tapes may be pre-installed in the compartments.

[0019] These and other objects of the present invention, as well as the advantages thereof over existing prior art forms, which will become apparent from the description to follow, are accomplished by the improvements hereinafter described and claimed.

[0020] In general, an apparatus for dividing a longitudinally extending underground conduit into compartments includes a longitudinally extending insert. The insert is suitable for inserting, for example pulling, into an underground conduit during installation of the insert and formed of at least two layers of a pliant material which are attached to each other along their lateral edges to form at least one compartment between the layers.

[0021] The present invention also includes a method of dividing into compartments a longitudinally extending conduit which is installed in the ground, which method

includes the steps of forming at least two layers of a longitudinally extending, pliant material having lateral edges, attaching the lateral edges so as to form at least one compartment between the layers, and inserting the attached layers into the conduit.

[0022] A preferred exemplary conduit divider system incorporating the concepts of the present invention is shown by way of example in the accompanying drawings without attempting to show all the various forms and modifications in which the invention might be embodied, the invention being measured by the appended claims and not by the details of the specification.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

Fig. 1 is a fragmented schematic representation of a divider insert, made in accordance with the present invention, being inserted into a conduit.

Fig. 2 is a fragmented top plan view of the divider insert.

Fig. 3 is an end elevational view of the divider insert. Fig. 4 is a sectional view taken substantially along line 4-4 of Fig. 1 and showing the insert in the conduit.

PREFERRED EMBODIMENT FOR CARRYING OUT THE INVENTION

[0024] A conduit divider system made in accordance with the present invention includes an insert, generally indicated by the numeral 10. As will hereinafter be described in more detail, insert 10 is made of a longitudinally extending pliant material, and several thousand feet of insert 10 may be provided on a roll 11 to be inserted in a conduit 12. Conduit 12 is typically used for the underground confinement of a communications cable, such as fiber optic cable 13 shown in Fig. 4, and is usually made of a suitable plastic material having a typical diameter of 10cm (four inches). However, other sized conduits 12 are also prevalently used in this environment. Conduit 12 typically could extend longitudinally for several miles underground, and insert 10 can be pulled or blown into conduit 12 from roll 11 by conventional means known in the art.

[0025] Insert 10 is formed with a plurality of thin, pliant layers of material, four thin layers 14, 15, 16 and 17 being shown by way of example. Layers 14-17 have lateral edges 18 and are attached, as by stitching 19, near lateral edges 18. While stitching 19 is shown as the preferred manner to attach layers 14-17, it should be evident, particularly in view of the precise material from which insert 10 is fabricated, that other attachment systems, such as fusing or the like, could be employed.

[0026] Insert 10 thus forms longitudinally extending compartments 20, 21 and 22, compartment 20 being formed between layers 14 and 15, compartment 21 be-

ing formed between layers 15 and 16, and compartment 22 being formed between layers 16 and 17. Insert 10 may be formed with any number of layers, therefore forming any number of compartments, as desired for a particular application. Moreover, when installed in conduit 12, as shown in Fig. 4, two more compartments 23 and 24 are formed between conduit 12 and layers 14 and 17, respectively. Thus, cable 13 is shown as being positioned in compartment 23 and outside of insert 10. Because of the pliable characteristics of insert 10, that is, because it can deform to take any shape necessary as dictated by conduit 12 or the cables housed therein, it has been found that up to four cables could readily be positioned in a 5cm (two inch) diameter conduit, and up to twelve cables could readily be positioned in a 10cm (four inch) diameter conduit, over twice as many as known in the art.

[0027] In order to easily install insert 10 in conduit 12, and in order to easily install cables and the like into the compartments 20-24 formed in conduit 12, it is preferable that the layers 14-17 of insert 10 be formed of a pliant, lightweight natural or synthetic fabric having a low coefficient of friction, high abrasion resistance, and high tear resistance. The fabric should also not be water absorbent, and it need only have a suitable tensile strength to be pulled into conduit 12. While any fabric with such characteristics could be used to form insert 10, it has been determined that a fabric purchased from Milliken & Company of Spartanburg, South Carolina, known as mono-filament fabric style No. 072210, pattern 321, finish 1021, is quite satisfactory to form layers 14-17 of insert 10. By utilising this or an equivalent fabric, insert 10 is easily positionable in conduit 12 and items, such as cable 13, are readily positionable in the compartments 20-24 formed therein.

[0028] Insert 10 may be installed in an empty conduit 12 or may be installed in a conduit 12 having one or more pre-existing cables therein. For example, as shown in Fig. 4, insert 10 has been positioned in conduit 12 already having a cable 13 therein. As such, when insert 10 is being inserted into conduit 12, it pushes cable 13 aside, that is, into the longitudinally extending compartment 23 being formed as insert 10 moves longitudinally within conduit 12.

[0029] In addition, insert 10 may be installed into conduit 12 with its compartments 20-22 empty, or it may have a cable or other items positioned in compartments 20-22 when it is fabricated. That is, as shown in Fig. 4, a cable 25 can be positioned between layers 15 and 16 before their lateral edges 18 are stitched together. Then, installing insert 10 will also install a cable, such as cable 25, at the same time. Of course, alternatively, a cable, such as cables 13 or 25, can be readily inserted into any compartment of insert 10 after it has been positioned in conduit 12.

[0030] In order to insert cables into a conduit such as conduit 12, it is a standard practice to insert a rope or a tape into the conduit and then when it becomes desira-

ble to install a cable into the conduit, it is attached to the rope or tape and the rope or tape is then pulled out of the conduit thereby pulling the cable into the conduit. Fig. 4 shows a rope 26 in compartment 22 and a tape 27 in compartment 20. Like cable 25, rope 26 and/or tape 27 can be pre-inserted into insert 10 when it is formed, or they could be inserted into any empty compartment of insert 10 at a later time for subsequent installation of another cable.

[0031] Because of the pliability of insert 10, that is, because it can be deformed to almost any shape, and because it has no memory coming off of roll 11, it will easily move through conduit 12 when being installed therein. In certain situations, it may even be desirable to make insert 10 somewhat stiffer, and in that regard, stiffener rods (not shown) might be sewn into insert 10, as at the lateral edges 18 thereof. Moreover, by virtue of its pliability, the lateral width of insert 10 is not critical. While such could even slightly exceed the diameter of conduit 12, preferably the width of insert 10 is generally equal to or slightly less than the diameter of conduit 12.

[0032] In order to pre-form insert 10 into cognisable compartments, it is preferable that the lateral width of the individual layers 14-17 be different. Thus, as shown in Figs. 3 and 4, before applying stitching 19, layer 15 has a lesser lateral width than layer 14 and layer 16 which, in turn, has a lesser lateral width than layer 17. Then when stitched at their lateral edges, layers 14, 16 and 17, for example, will buckle to form compartments 20-22. The size of the compartments will obviously vary dependent on the selected length of a layer forming the compartment, and it should be evident that if one wanted to employ, for example, ten layers to make nine compartments, the lateral width of the layers would more closely approximate each other, than that shown in Fig. 4, to make smaller compartments. All of this can be accomplished without taking up significant useable space in conduit 12.

[0033] It should also be apparent that the layers 14-17 totally protect any cable, such as cables 13 and 25, positioned within insert 10. Thus, if, for example, one were to attach a new cable to rope 26 or tape 17 and pull that cable into insert 10, it will easily pass therethrough without contacting or being impeded by cables 13 and 25. If desirable, particularly when anticipating packing many cables into a conduit, the layers of insert 10 could be pre-lubricated to assist in the installation of a conduit into a compartment thereof.

[0034] In light of the foregoing, it should thus be evident that a conduit divider system employing an insert constructed as described herein substantially improves the art and otherwise accomplishes the objects of the present invention.

Claims

1. Apparatus for dividing a longitudinally extending un-

- derground conduit into compartments, comprising a longitudinally extending insert (10), said insert being suitable for inserting, for example pulling, into an underground conduit during installation of the insert and being formed of at least two layers (14-17) of a pliant material, said layers (14-17) having lateral edges (18) and being attached to each other near said lateral edges (18) to form at least one compartment (20-22) between said layers (18).
2. Apparatus according to claim 1 wherein said lateral edges (18) are stitched to each other.
 3. Apparatus according to claim 1 or claim 2 wherein said layers (14-17) are of different lateral widths so that when said layers are attached, said compartment (20-22) is formed.
 4. Apparatus according to any of claims 1 to 3 wherein there are three layers formed of a pliant material thereby forming two compartments within said insert, or wherein there are four layers formed of a pliant material thereby forming three compartments within said insert.
 5. Apparatus according to any of claims 1 to 4 wherein said pliant material is a fabric.
 6. Apparatus according to claim 5 wherein said fabric has a low coefficient of friction, high abrasion resistance, and high tear resistance.
 7. Apparatus according to any of claims 1 to 6, which is adapted to divide into compartments a conduit having a diameter of at least two inches (5cm).
 8. Apparatus according to any of claims 1 to 7, which is adapted to divide a conduit into compartments which are of such a size that a 2 inch (5cm) conduit would accommodate up to four such compartments.
 9. Apparatus according to any one of claims 1 to 8 wherein the insert is several thousand feet (m) long and provided on a roll.
 10. A method of dividing into compartments (20-22) a longitudinally extending conduit (12) which is installed in the ground, comprising the steps of forming at least two layers (14-17) of a longitudinally extending pliant material having lateral edges (18), attaching the layers near their lateral edges so as to form at least one compartment (20-22) between the layers, and inserting the attached layers into the conduit.
 11. A method according to claim 10 wherein the step of attaching is accomplished by stitching the layers together near their lateral edges (18).
 12. A method according to claim 10 or claim 11 further comprising the step of positioning the attached layers on a roll (11), the step of inserting being accomplished by removing the attached layers from the roll.
 13. A method according to any of claims 10 to 12 further comprising the step of lubricating the attached layers.
 14. A method according to any of claims 10 to 13 wherein the at least two layers are formed with a different lateral width.
 15. A method according to claim 14 wherein said step of attaching causes one of the layers (14,16,17) to buckle to form the compartment.
 16. A method according to any of claims 10 to 15 further comprising the step of positioning a cable (25), a rope (26) or a tape (27) between the layers (14-17) before attaching the layers.
 17. A method according to any of claims 10 to 16 wherein the conduit has a diameter of at least two inches (5cm).
 18. A method according to any of claims 10 to 17 which further includes the feature(s) recited in any one or more of claims 4 to 6 or 8.
 19. The use, to divide into compartments a longitudinally extending conduit which is installed in the ground, of a pliant material arranged as a plurality of layers (14-17) which define a conduit divider extending longitudinally between opposed ends of the divider and having a plurality of lateral layer edges extending between the opposed ends, the layers defining at least one compartment (20-22) between layers, the conduit divider having attachment between a plurality of lateral layer edges, such attachment of the layers forming the compartment(s).
 20. The use according to claim 19 wherein said lateral edges (18) are stitched to each other.
 21. The use according to claim 19 or claim 20 wherein said pliant material is a fabric.
 22. The use according to claim 21 wherein said fabric has a low coefficient of friction, high abrasion resistance, and high tear resistance.
 23. The use according to any of claims 19 to 22 wherein the use is to divide a conduit which is already buried and the pliant material has a suitable tensile strength to be pulled into the conduit.

24. The use according to any of claims 19 to 22 wherein the conduit is already buried.
25. The use according to any of claims 19 to 24 wherein the conduit has a diameter of at least two inches (5cm).
26. The use according to any of claims 19 to 24 wherein the conduit divider forms compartments which are of such a size that a 2 inch (5cm) diameter conduit would accommodate up to four such compartments.

Patentansprüche

1. Vorrichtung zum Teilen eines in Längsrichtung sich erstreckenden unterirdischen Kanals in Kammern, mit einem in Längsrichtung sich erstreckenden Einsatz (10), wobei der Einsatz zum Einsetzen, beispielsweise zum Ziehen, in einen unterirdischen Kanal bei der Installation des Einsatzes geeignet ist und aus wenigstens zwei Schichten (14-17) eines biegsamen Materials gebildet ist, wobei die Schichten (14-17) seitliche Kanten (18) aufweisen und nahe den seitlichen Kanten (18) aneinander befestigt sind, daß wenigstens eine Kammer (20-22) zwischen den Schichten (18) gebildet ist.
2. Vorrichtung gemäß Anspruch 1, wobei die seitlichen Kanten (18) aneinander genäht sind.
3. Vorrichtung gemäß Anspruch 1 oder 2, wobei die Schichten (14-17) unterschiedliche seitliche Breiten haben, so daß, wenn die Schichten befestigt sind, die Kammer (20-22) gebildet ist.
4. Vorrichtung gemäß einem der Ansprüche 1 bis 3, wobei drei Schichten vorhanden sind, die aus einem biegsamen Material gebildet sind, wodurch zwei Kammern innerhalb des Einsatzes gebildet sind, oder, wobei vier Schichten vorhanden sind, die aus einem biegsamen Material gebildet sind, wodurch drei Kammern innerhalb des Einsatzes gebildet sind.
5. Vorrichtung gemäß einem der Ansprüche 1 bis 4, wobei das biegsame Material ein Stoff ist.
6. Vorrichtung gemäß Anspruch 5, wobei der Stoff einen niedrigen Reibungskoeffizienten, eine hohe Abriebbeständigkeit und eine hohe Reißfestigkeit hat.
7. Vorrichtung gemäß einem der Ansprüche 1 bis 6, wobei die Vorrichtung eingerichtet ist einen Kanal in Kammern zu teilen, der einen Durchmesser von wenigstens zwei Zoll (5 cm) hat.
8. Vorrichtung gemäß einem der Ansprüche 1 bis 7, wobei die Vorrichtung eingerichtet ist einen Kanal in Kammern zu teilen, die eine derartige Größe haben, daß in einem 2 Zoll (5 cm) Kanal bis zu vier von derartigen Kammern untergebracht sind.
9. Vorrichtung gemäß einem der Ansprüche 1 bis 8, wobei der Einsatz mehrere tausend Fuß (m) lang ist und auf einer Rolle bereitgestellt ist.
10. Verfahren zum Teilen eines in Längsrichtung sich erstreckenden Kanals (12) in Kammern (20-22), der im Boden installiert ist, mit den Schritten: Bilden von wenigstens zwei Schichten (14-17) eines in Längsrichtung sich erstreckenden biegsamen Materials, das seitliche Kanten (18) hat, Befestigen der Schichten nahe ihrer seitlichen Kanten, um wenigstens eine Kammer (20-22) zwischen den Schichten zu bilden, und Einsetzen der befestigten Schichten in den Kanal.
11. Verfahren gemäß Anspruch 10, wobei der Schritt des Befestigens dadurch bewirkt wird, daß die Schichten nahe ihrer seitlichen Kanten (18) aneinander genäht werden.
12. Verfahren gemäß Anspruch 10 oder 11, ferner mit dem Schritt: Anordnen der befestigten Schichten auf einer Rolle (11), wobei der Schritt des Einsetzens dadurch bewirkt wird, daß die befestigten Schichten von der Rolle entfernt werden.
13. Verfahren gemäß einem der Ansprüche 10 bis 12, ferner mit dem Schritt: Schmieren der befestigten Schichten.
14. Verfahren gemäß einem der Ansprüche 10 bis 13, wobei die wenigstens zwei Schichten mit unterschiedlichen seitlichen Breiten gebildet werden.
15. Verfahren gemäß Anspruch 14, wobei der Schritt des Befestigens dazu führt, daß sich eine der Schichten (14, 16, 17) wölbt, um die Kammer zu bilden.
16. Verfahren gemäß einem der Ansprüche 10 bis 15, ferner mit dem Schritt: Anordnen eines Kabels (25), eines Seils (26) oder eines Bands (27) zwischen den Schichten (14-17) vor dem Befestigen der Schichten.
17. Verfahren gemäß einem der Ansprüche 10 bis 16, wobei der Kanal einen Durchmesser von wenigstens zwei Zoll (5 cm) hat.
18. Verfahren gemäß einem der Ansprüche 10 bis 17, ferner mit dem Merkmal oder den Merkmalen aus einem oder mehreren der Ansprüche 4 bis 6 oder 8.

19. Verwendung eines biegsamen Materials, das als eine Mehrzahl von Schichten (14-17) angeordnet ist, die einen Kanalteiler definieren, der in Längsrichtung zwischen entgegengesetzten Enden des Teilers sich erstreckt und eine Mehrzahl von seitlichen Schichtkanten aufweist, die zwischen den entgegengesetzten Enden sich erstrecken, wobei die Schichten wenigstens eine Kammer (20-22) zwischen den Schichten definieren, wobei der Kanalteiler eine Befestigung zwischen einer Mehrzahl von seitlichen Schichtkanten aufweist, wobei die derartige Befestigung der Schichten die Kammer(n) bildet, um einen in Längsrichtung sich erstreckenden Kanal in Kammern zu teilen, der im Boden installiert ist.
20. Verwendung gemäß Anspruch 19, wobei die seitlichen Kanten (18) aneinander genäht sind.
21. Verwendung gemäß Anspruch 19 oder 20, wobei das biegsame Material ein Stoff ist.
22. Verwendung gemäß Anspruch 21, wobei der Stoff einen niedrigen Reibungskoeffizienten, eine hohe Abriebbeständigkeit und eine hohe Reißfestigkeit hat.
23. Verwendung gemäß einem der Ansprüche 19 bis 22, wobei die Verwendung zum Teilen eines Kanals ist, der bereits erdverlegt ist, und wobei das biegsame Material eine geeignete Zugfestigkeit in den Kanal gezogen zu werden hat.
24. Verwendung gemäß einem der Ansprüche 19 bis 22, wobei der Kanal bereits erdverlegt ist.
25. Verwendung gemäß einem der Ansprüche 19 bis 24, wobei der Kanal einen Durchmesser von wenigstens zwei Zoll (5 cm) hat.
26. Verwendung gemäß einem der Ansprüche 19 bis 24, wobei der Kanalteiler Kammern bildet, die eine derartige Größe haben, daß in einem 2 Zoll (5 cm) Kanal bis zu vier von derartigen Kammern untergebracht sind.

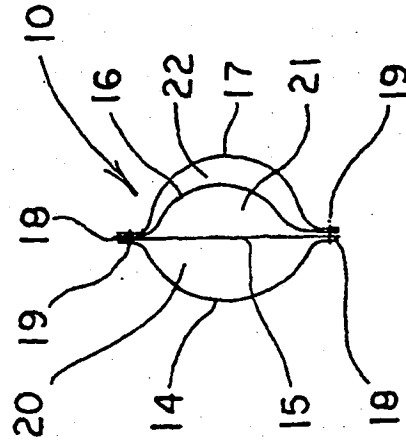
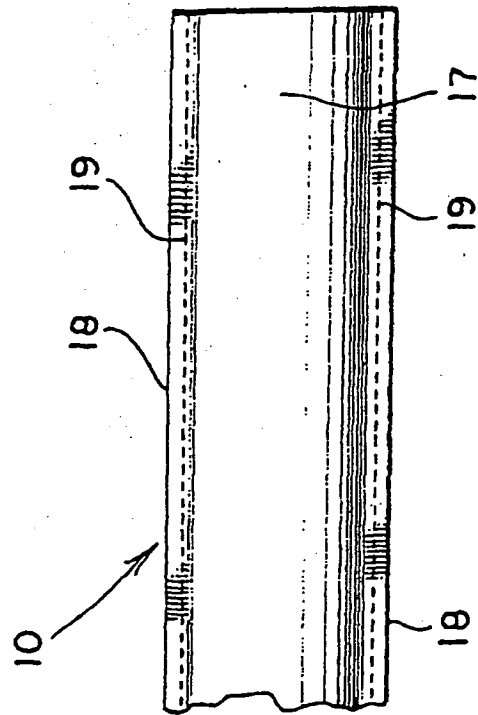
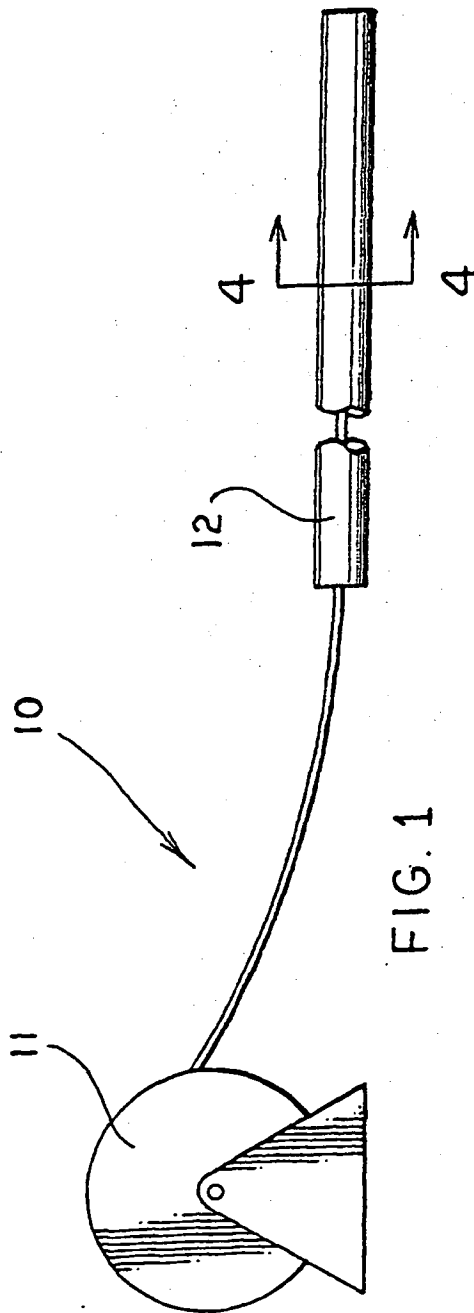
Revendications

1. Appareil pour diviser en compartiments un conduit souterrain s'étendant longitudinalement, comprenant un insert (10) s'étendant longitudinalement, ledit insert étant approprié pour l'introduction, par exemple la traction, dans un conduit souterrain pendant l'installation de l'insert et étant formé d'au moins deux couches (14-17) d'un matériau pliable, lesdites couches (14-17) ayant des bordures latérales (18) et étant attachées l'une à l'autre près des-

dités bordures latérales (18) afin de former au moins un compartiment (20-22) entre lesdites couches (18).

2. Appareil selon la revendication 1, dans lequel lesdites bordures latérales (18) sont cousues l'une à l'autre.
3. Appareil selon la revendication 1 ou la revendication 2, dans lequel lesdites couches (14-17) sont de largeurs latérales différentes, de telle sorte que, lorsque lesdites couches sont attachées, ledit compartiment (20-22) est formé.
4. Appareil selon l'une quelconque des revendications 1 à 3, dans lequel il y a trois couches formées d'un matériau pliable, formant de cette façon deux compartiments à l'intérieur dudit insert, ou dans lequel il y a quatre couches formées d'un matériau pliable, formant de cette façon trois compartiments à l'intérieur dudit insert.
5. Appareil selon l'une quelconque des revendications 1 à 4, dans lequel ledit matériau pliable est un tissu.
6. Appareil selon la revendication 5, dans lequel ledit tissu a un faible coefficient de frottement, une résistance élevée à l'abrasion et une résistance élevée à la déchirure.
7. Appareil selon l'une quelconque des revendications 1 à 6, qui est adapté pour diviser en compartiments un conduit ayant un diamètre d'au moins deux pouces (5 cm).
8. Appareil selon l'une quelconque des revendications 1 à 7, qui est adapté pour diviser un conduit en compartiments qui sont d'une dimension telle qu'un conduit de 2 pouces (5 cm) logerait jusqu'à quatre de ces compartiments.
9. Appareil selon l'une quelconque des revendications 1 à 8, dans lequel l'insert a une longueur de plusieurs milliers de pieds et est disposé sur un rouleau.
10. Procédé de division en compartiments (20-22) d'un conduit (12) s'étendant longitudinalement qui est installé dans le sol, comprenant les étapes consistant à former au moins deux couches (14-17) d'un matériau pliable s'étendant longitudinalement, ayant des bordures latérales (18), à attacher les couches près de leurs bordures latérales de façon à former au moins un compartiment (20-22) entre les couches, et à introduire les couches attachées dans le conduit.
11. Procédé selon la revendication 10, dans lequel on

- effectue l'étape d'attache en cousant les couches ensemble près de leurs bordures latérales (18).
12. Procédé selon la revendication 10 ou la revendication 11, comprenant en outre l'étape consistant à positionner les couches attachées sur un rouleau (11), l'étape d'introduction étant accomplie en retirant les couches attachées à partir du rouleau. 5
13. Procédé selon l'une quelconque des revendications 10 à 12, comprenant en outre l'étape consistant à lubrifier les couches attachées. 10
14. Procédé selon l'une quelconque des revendications 10 à 13, dans lequel les au moins deux couches sont formées avec une largeur latérale différente. 15
15. Procédé selon la revendication 14, dans lequel ladite étape d'attache amène l'une des couches (14, 16, 17) à se gauchir pour former le compartiment. 20
16. Procédé selon l'une quelconque des revendications 10 à 15, comprenant en outre l'étape consistant à positionner un câble (25), une corde (26) ou un ruban (27) entre les couches (14-17) avant d'attacher les couches. 25
17. Procédé selon l'une quelconque des revendications 10 à 16, dans lequel le conduit a un diamètre d'au moins deux pouces (5 cm). 30
18. Procédé selon l'une quelconque des revendications 10 à 17, qui comprend en outre la ou les caractéristiques exposées dans l'une quelconque ou davantage des revendications 4 à 6 ou 8. 35
19. Utilisation, pour diviser en compartiments un conduit s'étendant longitudinalement qui est installé dans le sol, d'un matériau pliable disposé sous la forme de plusieurs couches (14-17) qui définissent un diviseur de conduit s'étendant longitudinalement entre des extrémités opposées du diviseur et ayant plusieurs bordures de couches latérales s'étendant entre les extrémités opposées, les couches définissant au moins un compartiment (20-22) entre les couches, le diviseur de conduit ayant une attache entre plusieurs bordures de couches latérales, une telle attache des couches formant le ou les compartiments. 40 45 50
20. Utilisation selon la revendication 19, dans laquelle lesdites bordures latérales (18) sont cousues l'une à l'autre.
21. Utilisation selon la revendication 19 ou la revendication 20, dans laquelle ledit matériau pliable est un tissu. 55
22. Utilisation selon la revendication 21, dans laquelle ledit tissu a un faible coefficient de frottement, une résistance élevée à l'abrasion et une résistance élevée à la déchirure.
23. Utilisation selon l'une quelconque des revendications 19 à 22, dans laquelle l'utilisation est de diviser un conduit qui est déjà enterré et le matériau pliable a une résistance à la traction appropriée pour être tiré dans le conduit.
24. Utilisation selon l'une quelconque des revendications 19 à 22, dans laquelle le conduit est déjà enterré.
25. Utilisation selon l'une quelconque des revendications 19 à 24, dans laquelle le conduit a un diamètre d'au moins deux pouces (5 cm).
26. Utilisation selon l'une quelconque des revendications 19 à 24, dans laquelle le diviseur de conduit forme des compartiments qui sont d'une dimension telle qu'un conduit d'un diamètre de 2 pouces (5 cm) logerait jusqu'à quatre de ces compartiments.



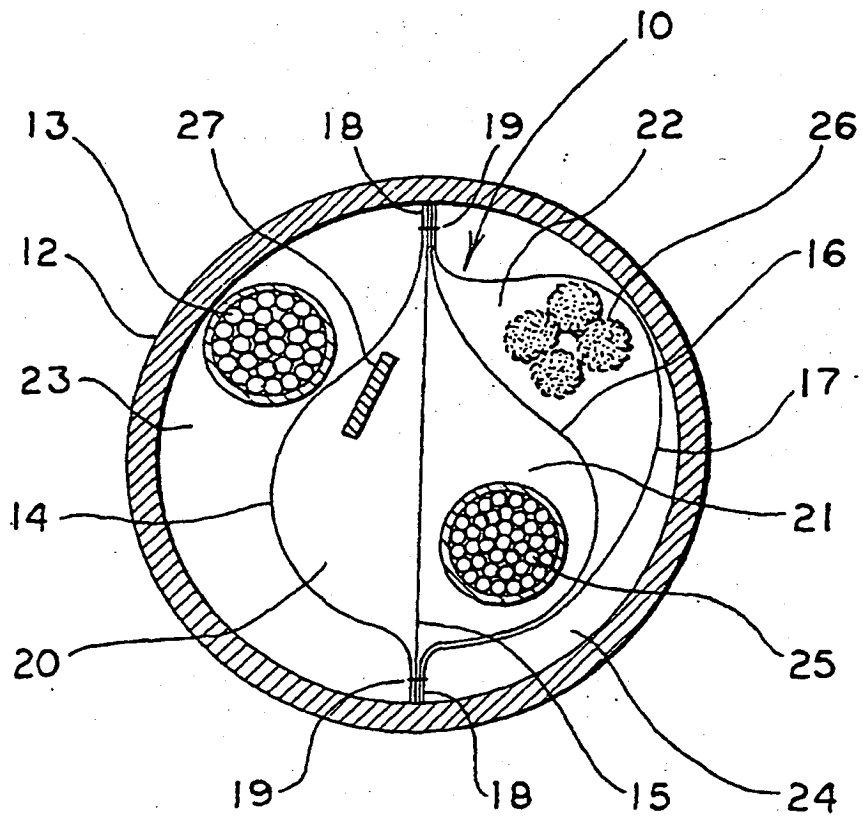


FIG. 4

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Title METHOD AND APPARATUS FOR DIVIDING A CONDUIT INTO COMPARTMENTS

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