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DESCRIPTION

[0001] This invention relates to insulated electric cords. More particularly, but not exclusively, this invention relates to flexible insulated electric cords. Embodiments of the invention relate to flexible electric cords for supporting loads.

[0002] A standard insulated electrical flexible cord comprises conductors to carry the current, insulating material to prevent the conductors coming into electrical contact with one another, and an insulating sheath material to protect the insulating material. Some electric cords can be used to suspend light fittings from ceilings, providing the light fittings do not exceed a maximum weight.

[0003] DE 9302982 U1 discloses electric cord having electric conductors. An elongate cavity receives a supporting steel cable.

[0004] According to the invention, an insulated electric cord is provided as defined in claim 1, and a method of suspending an electrical device from a support using such an insulated electric cord is provided as defined in claim 14.

[0005] According to one aspect of this invention, there is provided an insulated electric cord comprising an elongate outer covering arrangement, first and second elongate electrical conductors held within the outer covering arrangement and extending longitudinally therethrough, and an elongate load bearing member held within the outer covering arrangement and extending longitudinally therethrough, wherein the outer covering arrangement has an elongate access formation to allow a portion of the load bearing member to be extracted from the outer covering arrangement, wherein the access formation comprises a severable region of weakness of the outer covering arrangement, said severable region extending alongside the load bearing member.

[0006] An insulated electric cord for suspending an electrical device from a support may comprise an elongate outer covering arrangement, first and second elongate electrical conductors for electrically connecting the electrical device to wiring of a mains supply of electricity at the support, said first and second elongate electrical conductors being held within the outer covering arrangement and extending longitudinally therethrough, an elongate load bearing member for connection at a first end portion thereof to a first non-electrical load bearing connector in the device and for connection at a second opposite end portion to a second non-electrical load bearing connector at the support, the load bearing member being held within the outer covering arrangement and extending longitudinally therethrough, wherein the outer covering arrangement has an access formation to allow the first and second opposite end portions of the load bearing member to be extracted from the outer covering arrangement via the access formation and connected respectively to the aforesaid load bearing connectors.

[0007] A suspension arrangement may comprise an insulated electric cord as described

above, an electrical device having a first non-electrical load bearing connector, and a support having a second non-electrical load bearing connector, said first and second elongate electrical conductors electrically connecting the electrical device to wiring of a mains supply of electricity at the support, said elongate load bearing member being connected at the first end portion thereof to the first non-electrical load bearing connector in the device and being connected at the second opposite end portion thereof to the second non-electrical load bearing connector at the support, wherein the first and second opposite end portions of the load bearing member extend from the outer covering arrangement via the access formation.

[0008] According to another aspect of this invention, there is provided a method of suspending an electrical device from a support using an insulated electric cord as described above, said method comprising electrically connecting the first and second elongate electrical conductors to the electrical device and to a supply of electricity at the support, extracting a first end portion of the load bearing member from the outer covering arrangement via the access formation, effecting a non-electrical connection between a first end portion of the load bearing member and a first load bearing connector in the device, extracting a second opposite end portion of the load bearing member from the outer covering arrangement via the access formation, and effecting a non-electrical connection between a second end portion of the load bearing member and a second load bearing connector at the support.

[0009] The insulated electric cord may comprise a flexible insulated electric cord.

[0010] The portion of the load bearing member so extracted may be an end portion. The access formation may allow opposite end portions of the load bearing member to be extracted from the outer covering arrangement.

[0011] The step of extracting the first end portion of the load bearing member from the outer covering arrangement may comprise peeling the first end portion of the load bearing member from the outer covering arrangement via the access formation. The step of extracting the second end portion of the load bearing member from the outer covering arrangement may comprise peeling the second end portion of the load bearing member from the outer covering arrangement via the access formation.

[0012] If desired, the extracted load bearing member may be inserted back into the covering arrangement after extraction. This provides the advantage in the embodiments described herein that some of the load bearing member can be hidden away in the covering arrangement if, for example, too much of the load bearing member is extracted.

[0013] The access formation may be elongate. The access formation may extend longitudinally along the outer covering arrangement. The access formation may extend substantially the whole length of the outer covering arrangement. In an example not according to the invention, the access formation may be an elongate opening defined by the elongate outer covering arrangement.

[0014] The feature of the access formation extending substantially the whole length of the outer covering arrangement provides the advantages in the embodiments described herein that the manufacturing cost is minimised, and the insulated electric cord can be cut to any desired length.

[0015] According to the invention, the access formation comprises a severable region of the outer covering arrangement. The severable region may be thinner than the remainder of the outer covering arrangement, said region extending alongside the load bearing member. The severable region may be configured to allow easy and safe access to the load bearing member. In the embodiment described herein, the severable region is sufficiently wide so as not to affect adversely the overall performance of the outer covering arrangement.

[0016] The outer covering arrangement may be flexible. The outer covering arrangement may have a substantially circular cross-sectional end profile.

[0017] The insulated electric cord may include a third elongate electrical conductor held within the outer covering arrangement. Each elongate conductor may be embedded in the material of the outer covering arrangement.

[0018] The outer covering arrangement may define an elongate cavity extending longitudinally through the outer covering arrangement. In the example, the elongate cavity may have a substantially circular cross-sectional end profile. The load bearing member may extend through the elongate cavity. The access formation may be an elongate opening of the cavity to allow said portion of the load bearing member to be removed from the outer covering arrangement.

[0019] In the example, the access formation may include a channel extending from the opening of the cavity to an external surface of the outer covering arrangement. In the example, the outer covering arrangement may be an elongate insulating sheath.

[0020] In an embodiment, the outer covering arrangement may comprise an outer sleeve and an insulating sheath. The outer sleeve may be provided around the insulating sheath. The outer sleeve may extend substantially the whole length of the insulating sheath. The load bearing member may extend through the opening in the insulating sheath to engage the sleeve.

[0021] The portion of the outer sleeve in engagement with the load bearing member may be weaker than the remainder of the sleeve. The portion of the sleeve in engagement with the load bearing member may be thinner than the remainder of the sleeve.

[0022] The insulating sheath may define at least one elongate space extending longitudinally through the outer covering arrangement. The conductors may be mounted in the, or each, elongate space. In the example, a single elongate space is defined through the insulating sheath, whereby each of the conductors extends longitudinally through the single elongate

space. In the embodiment, a respective elongate space may be defined in the outer covering arrangement for each conductor, whereby each conductor extends longitudinally through the respective space. The outer covering arrangement may engage around a major proportion of the longitudinally extending perimeter of each conductor.

[0023] In the embodiment, the elongate cavity and the, or each, elongate space may be defined in the insulating sheath.

[0024] In the example, the elongate space may have a substantially triangular end profile. Each of the conductors may be provided at a respective apex of the triangle.

[0025] In the embodiment, each elongate space may have a substantially circular end profile.

[0026] Each conductor may comprise an elongate electrically conductive core, which may be formed of a metal, such as copper. Each conductor may comprise an elongate insulator extending around the electrically conductive core. The insulator may be formed of a synthetic material, which may be a resilient synthetic material, such as a polymer material. Each insulator may be plastically deformable. The synthetic material may comprise PVC.

[0027] The load bearing member may be a wire rope, such as a 7 x 7 wire rope.

[0028] The insulating sheath may be formed of a synthetic material, which may be electrically insulating and may be a resilient synthetic material, such as a polymer material. The insulating sheath may be plastically deformable.

[0029] Reference is now made to the accompanying drawings, in which:

Figure 1 is a cross-sectional end view of an exemplary electrically insulating cord not according to the invention,

Figure 2 is a perspective view of an end region of the electrically insulating cord shown in Figure 1;

Figure 3 shows the connection of one end region of the electrically insulating cord to a fixture;

Figure 4 shows the connection of the opposite end region of the insulating cord to a connection arrangement in a ceiling; and

Figure 5 is a cross-sectional end view of an electrically insulating cord, being an embodiment of the invention.

[0030] A flexible insulating electric cord 10 is shown in Figures 1 to 4 of the drawings, and comprises a flexible elongate outer covering arrangement in the form of an insulating sheath 12 formed of a suitable plastically deformable synthetic material, such as PVC. The flexible

electrically insulating cord 10 further includes three electrically insulating elongate conductors 14, 16, 18 embedded within the flexible insulating sheath 12, and an elongate load bearing member 20, also embedded within the insulating sheath 12. The conductors 14, 16, 18 and the load bearing member 20 extend longitudinally through the whole length of the insulating sheath 12. Each of the elongate conductors 14, 16, 18 comprises an elongate electrically conductive core 22 and an insulator 24 surrounding the electrically conductive core 22. The core 12 of each of the conductors 14, 16, 18 comprises a plurality of strands 26 of an electrically conductive material, such as copper. The elongate strands 26 are arranged around each other to form a wire.

[0031] The load bearing member 20 comprises a plurality of elongate strands 28 of a load bearing material, such as steel. The elongate strands 28 are arranged around each other to form a wire.

[0032] The insulating sheath 12 defines an elongate cavity 30 in which the load bearing member 20 is held. The elongate cavity 30 extends longitudinally through the whole length of the insulating sheath 12. As can be seen from Figure 1, the elongate cavity 30 has a substantially circular cross-sectional end profile.

[0033] The insulating sheath 12 has an access formation in the form of an elongate opening 31 in the insulating sheath 12 for the cavity 30 which extends the longitudinally through the whole length of the insulating sheath 12. An elongate channel 32 extends from the opening 31 to the external surface of the insulating sheath 12. The elongate opening 31 communicates with the elongate cavity 30, and allows the end portions of the load bearing member 20 to be extracted from the cavity 30 in which the load bearing member 20 is held, and peeled outwardly from the insulating sheath 12, as shown by the arrow A in Figure 2

[0034] The insulating sheath 12 defines an elongate space 34 extending the length of the insulating sheath. The conductors 14, 16, 18 are provided within the elongate space 34.

[0035] The elongate space 34 is of a generally triangular configuration having part circular elongate recesses 36 at each apex of the triangle. The conductors 14, 16, 18 are held within a respective one of the recesses 36. As can be seen, each of the recesses extends around a major portion of the longitudinally extending perimeter of the respective conductors 14, 16, 18, thereby holding the conductors 14, 16, 18 in position.

[0036] Figure 3 shows the connection of one end region of the electrically insulating cord 10 to a first connection assembly 101 in an electrical device in the form of a fixture, such as a light fitting 100. Figure 4 shows the connection of the opposite end region of the electrically insulating cord 10 to a second connection assembly 102 in a support, such as a ceiling 104.

[0037] Referring to Figure 3, the upper region of the light fitting 100 is shown, which comprises a housing 105. The first connection assembly 101 comprises a mechanical connector in the form of a first load bearing connector in the form of a first gripping device 106, suitable for

gripping the load bearing member 20. The first gripping device 106 is mounted on the outside of the housing 105.

[0038] In Figure 3, a lower end portion 20A has been extracted from a lower end region 12A of the insulating sheath 12. The first gripping device 106 has suitable internal gripping components for gripping the extracted lower end portion 20A of the load bearing member 20 and to fasten the light fitting 100 securely to the load bearing member 20.

[0039] The first connection assembly 101 in the light fitting 100 also has a first electrical connection arrangement generally designated 108 having electrical terminals to connect to the elongate electrical conductors 14, 16, 18. The first electrical connection arrangement 108 can be any suitable electrical connection arrangement known in the art. The lower end portion 12A of the insulating sheath no longer has the load bearing member 20 extending therethrough, and can be arranged within the first electrical connection arrangement 108 in a manner in which each of the conductors is connected to a respective electrical terminal.

[0040] The electrically insulating cord 10 extends through an aperture 110 in the housing 105. An O-ring seal 112 is mounted in the aperture 110 to seal against the insulating sheath 12. As shown in the drawings, the insulating sheath 12 has a cross-sectional end profile that is substantially circular. In the electrically insulating cord 10 described herein, this provides the advantage that the O-ring seal 112 can seal fully against the insulating sheath 12, thereby preventing the ingress of water and insects.

[0041] Referring to Figure 4, the upper end region of the electrical insulating cord 10 is shown, which is connected to the second connection assembly 102 at the ceiling 104. The connection assembly 102 comprises a mechanical connector in the form of a second load bearing connector in the form of a second gripping device 114 mounted on the ceiling 104, and extending downwardly therefrom. The second gripping device 114 is the same as the first gripping device 106.

[0042] The second connection assembly 102 further includes a second electrical connection arrangement 116, which is the same as the first electrical connection arrangement 108.

[0043] In Figure 4, an upper end portion 20B of the load bearing member 20 has been extracted from an upper end region 12B of the insulating sheath 12, and is inserted into the second gripping device 114 to be gripped thereby.

[0044] The second connection assembly 102 also has a second electrical connection arrangement generally designated 116 having electrical terminals to connect to the elongate electrical conductors 14, 16, 18. The second electrical connection arrangement 116 can be the same as the first electrical connection arrangement 108.

[0045] The upper end portion 12B of the insulating sheath 12 no longer has the load bearing member 20 extending therethorough, and can pass through an aperture 118 in the ceiling to

be arranged within the second electrical connection arrangement 116 in a manner in which each of the electrical conductors 14, 16, 18 is connected to a respective electrical terminal.

[0046] Thus, the light fitting 100 is suspended from the ceiling by the mechanical connection between the extracted portions 20A, 20B, and provides electrical connection between the first and second electrical connection arrangements 108, 116, thereby providing a supply of electricity to the light fitting 100.

[0047] Figure 5 shows an electrically insulating cord 10, being an embodiment of the invention. The electrically insulating cord 10 shown in Figure 5 includes such modifications. The electrically insulating cord 10 shown in Figure 5 is similar to the electrically insulating cord 10 shown in Figure 1, having many of the same features as the electrically insulating cord 10 shown in Figure 1, these features having been designated with the same reference numerals as in Figures 1 to 4.

[0048] The electrically insulating cord 10 shown in Figure 5 differs from the example in that the electrically insulating cord 10 shown in Figure 5 has an outer covering arrangement 40 comprising the insulating sheath 12 and an outer sleeve 42, wherein the outer sleeve 42 extends around the insulating sheath 12. The outer sleeve 42 has an inner surface 42A in engagement with the insulating sheath 12, and an outer surface 42B

[0049] The insulating sheath 12 defines the elongate cavity 30 in which the load bearing member 20 is tightly held. The insulating sheath 12 also defines three elongate cylindrical spaces 34A, 34B and 34C in each of which a respective one of the conductors 14, 16, 18 is tightly held.

[0050] The outer covering arrangement 40 has an access formation in the form of an opening 31 in the insulating sheath 12 for the cavity 30, and a severable region 44 of the outer sleeve 42, the severable region 44 being thinner than the remainder of the outer sleeve 42. The severable region 44 of the outer sleeve 42 extends longitudinally along the load bearing member 20 in engagement therewith.

[0051] The opening 31 opens onto the inner surface 42A of the outer sleeve 42, so that the load bearing member 20 protrudes out of the insulating sheath 12 through the opening 31 to engage the outer sleeve 42. As can be seen from Figure 5, the region 44 of the outer sleeve 42 along the opening 31 is thinner than the thickness of the remainder of the outer sleeve 42. This thinner region 44 of the outer sleeve 42 is thereby weaker than the remainder of the outer sleeve 42.

[0052] The end portions of the load bearing member 20 can be peeled outwardly from the insulating sheath 12, thereby splitting the outer sleeve 42 at the region 44. This allows the end portions of the load bearing member to be extracted from the cavity 30 to extend through the outer sleeve 42, thereby disposing the end portions of the load bearing member so that they can, for example, be gripped by the first and second gripping devices 106, 114, in the same

way as described above.

[0053] With the load bearing member 20 held within the insulating sheath 12, the electrically insulating cords 10 described herein provide aesthetically pleasing products, which are devoid of any external load bearing members.

[0054] The electrically insulating cords 10 described herein can be used to suspend light fittings from ceilings where the weight of the light fittings exceeds the maximum weight of light fittings that can be suspended using some of the prior art electrically insulating cords.

[0055] In the electrically insulating cords 10 described herein, the features of the channel 32 and the severable region 44, allowing the load bearing member 20 to be peeled away from the sheath 12, are advantageous. For example, they provide the advantages that installation of the insulating electric cord 10 is simple, and that any need to use a knife slit the cord 10 along its length is obviated.

[0056] Various modifications can be made without departing from the scope of the invention as defined by the appended claims.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE9302982U1 [0003]

PATENTKRAV

1. Isoleret elektrisk ledning (10), der omfatter en aflang, udvendig afdækningsanordning (12), hvor første og anden aflange, elektriske ledere (14, 16) er holdt inde i den udvendige afdækningsanordning og strækker sig på langs derigennem, og et aflangt, lastbærende element (20) er holdt inde i den udvendige afdækningsanordning og strækker sig på langs derigennem, hvor den udvendige afdækningsanordning har en aflang adgangsformation (31, 44), der er konfigureret til at gøre det muligt for en del af det lastbærende element at blive trukket ud af den udvendige afdækningsanordning, **kendetegnet ved, at** adgangsformationen omfatter et adskilleligt svækkelsesområde (44) af den udvendige afdækningsanordning, hvilket adskilleligt område strækker sig langs det lastbærende element.

2. Elektrisk ledning ifølge krav 1, hvor delen af det lastbærende element, der skal trækkes ud, er en endedel (20A, 20B).

3. Elektrisk ledning ifølge krav 1 eller 2, hvor adgangsformationen (31, 44) er konfigureret til at gøre det muligt for modstående endedele (20A, 20B) af det lastbærende element (20) at blive trukket ud af den udvendige afdækningsanordning (12).

4. Elektrisk ledning ifølge krav 1 til ophængning af en elektrisk anordning (100) fra en bærer (104), hvor den første og den anden aflange elektriske leder (14, 16) er konfigureret til elektrisk forbindelse af den elektriske anordning med ledning til lysnettet ved bæreren, hvor det aflange lastbærende element (20) er konfigureret til forbindelse ved en første endedel (20A) deraf med en første ikke-elektrisk lastbærende konnektor (106) i anordningen og til forbindelse ved en anden modstående endedel (20B) med en anden ikke-elektrisk lastbærende konnektor (114) ved bæreren, hvor den aflange adgangsformation (31, 44) er konfigureret til at gøre det muligt for den første og den anden modstående endedele af det lastbærende element at blive trukket ud af den udvendige afdækningsanordning (12) via den aflange adgangsformation og forbundet med henholdsvis ovennævnte lastbærende konnektorer.

5. Elektrisk ledning ifølge et hvilket som helst foregående krav, hvor adgangsformationen (31, 44) er aflang og strækker sig i alt væsentligt langs hele længden af den udvendige afdækningsanordning (12).

6. Elektrisk ledning ifølge et hvilket som helst foregående krav, hvor hver aflang leder (14, 16) er indlejret i den udvendige afdækningsanordnings (12) materiale.

7. Elektrisk ledning ifølge et hvilket som helst foregående krav, hvor den udvendige afdækningsanordning (12) omfatter en aflang isolerende kappe, der definerer et aflangt hulrum (30), som strækker sig på langs gennem den udvendige afdækningsanordning.

8. Elektrisk ledning ifølge krav 7, hvor den udvendige afdækningsanordning (12) omfatter et aflangt udvendigt hylster (42), der er tilvejebragt omkring den isolerende kappe.

9. Elektrisk ledning ifølge krav 8, hvor adgangsformationen er en aflang åbning (31) til hulrummet (30) for at gøre det muligt for delen (20A, 20B) af det lastbærende element (20) at blive fjernet fra den udvendige afdækningsanordning (12), hvilket lastbærende element strækker sig gennem åbningen i den isolerende kappe for at gå i indgreb med hylsteret (42).

10. Elektrisk ledning ifølge krav 9, hvor delen af hylsteret (42) i indgreb med det lastbærende element (20) er tyndere end det resterende af hylsteret, hvorved delen af det udvendige hylster i indgreb med det lastbærende element er svagere end det resterende af hylsteret.

11. Elektrisk ledning ifølge et hvilket som helst af kravene 8 til 10, hvor den isolerende kappe definerer mindst ét aflangt rum (34), der strækker sig på langs gennem den udvendige afdækningsanordning (12), hvor lederne (14, 16) er monteret i det aflange, eller hvert aflangt, rum.

12. Elektrisk ledning ifølge krav 11, hvor et enkelt aflangt rum (34) er defineret gennem den isolerende kappe, hvor hver af lederne strækker sig på langs gennem det enkelte aflange rum, hvilket aflangt rum har en i alt væsentligt trekantet endeprofil, og hver af lederne (14, 16) er tilvejebragt ved et tilsvarende toppunkt af trekanten.

13. Elektrisk ledning ifølge krav 11, hvor et tilsvarende aflangt rum (34A, 34B) er defineret gennem den isolerende kappe for hver leder, hvorved hver leder (14, 16) strækker sig på langs gennem det tilsvarende rum.

14. Fremgangsmåde til ophængning af en elektrisk anordning (100) fra en bærer (104) ved hjælp af en isoleret elektrisk ledning (10) ifølge et hvilket som helst af kravene 1 til 13, hvilken fremgangsmåde omfatter elektrisk forbindelse af den første og den anden aflange elektriske leder (14, 16) med den elektriske anordning og med en strømtilførsel ved bæreren, udtrækning af en første endedel (20A) af det lastbærende element (20) fra den udvendige afdækningsanordning (12) via adgangsformationen (31, 44), etablering af en ikke-elektrisk forbindelse mellem den første endedel af det lastbærende element og en første bærende konnektor (106) i anordningen, udtrækning af en anden modstående endedel (20B) af det lastbærende element fra den udvendige afdækningsanordning via adgangsformationen, og etablering af en ikke-elektrisk forbindelse mellem den anden endedel af det lastbærende element og en anden lastbærende konnektor (114) ved bæreren.

15. Fremgangsmåde ifølge krav 14, hvor trinnet med udtrækning af den første endedel (20A) af det lastbærende element (20) fra den udvendige afdækningsanordning (12) omfatter afskalning af den første endedel af det lastbærende element fra den udvendige afdækningsanordning via adgangsformationen, (31, 44) og hvor trinnet med udtrækning af den anden endedel (20B) af det lastbærende element fra den udvendige afdækningsanordning omfatter afskalning af den anden endedel af det lastbærende element fra den udvendige afdækningsanordning via adgangsformationen.

DRAWINGS

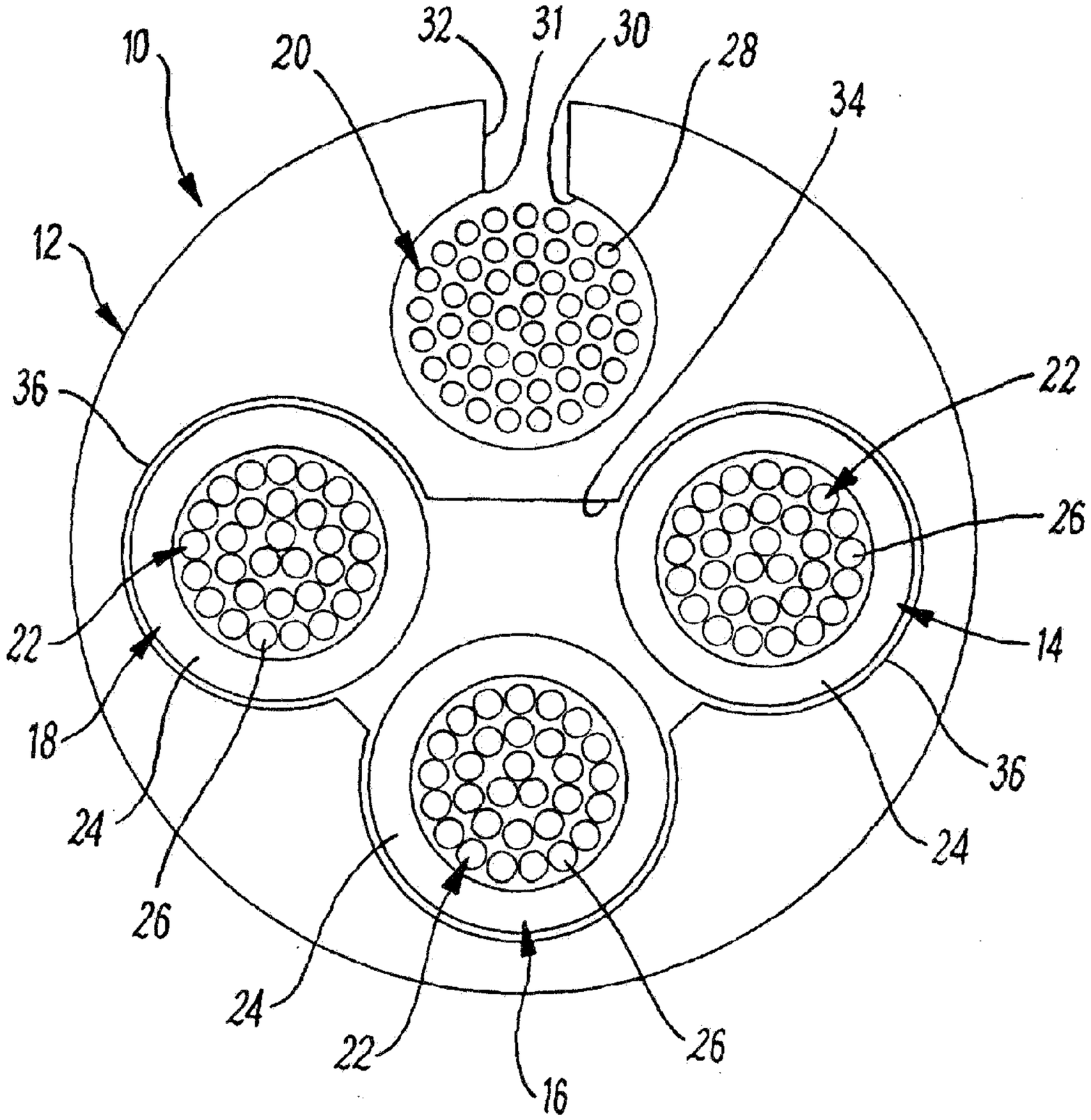

Fig. 1

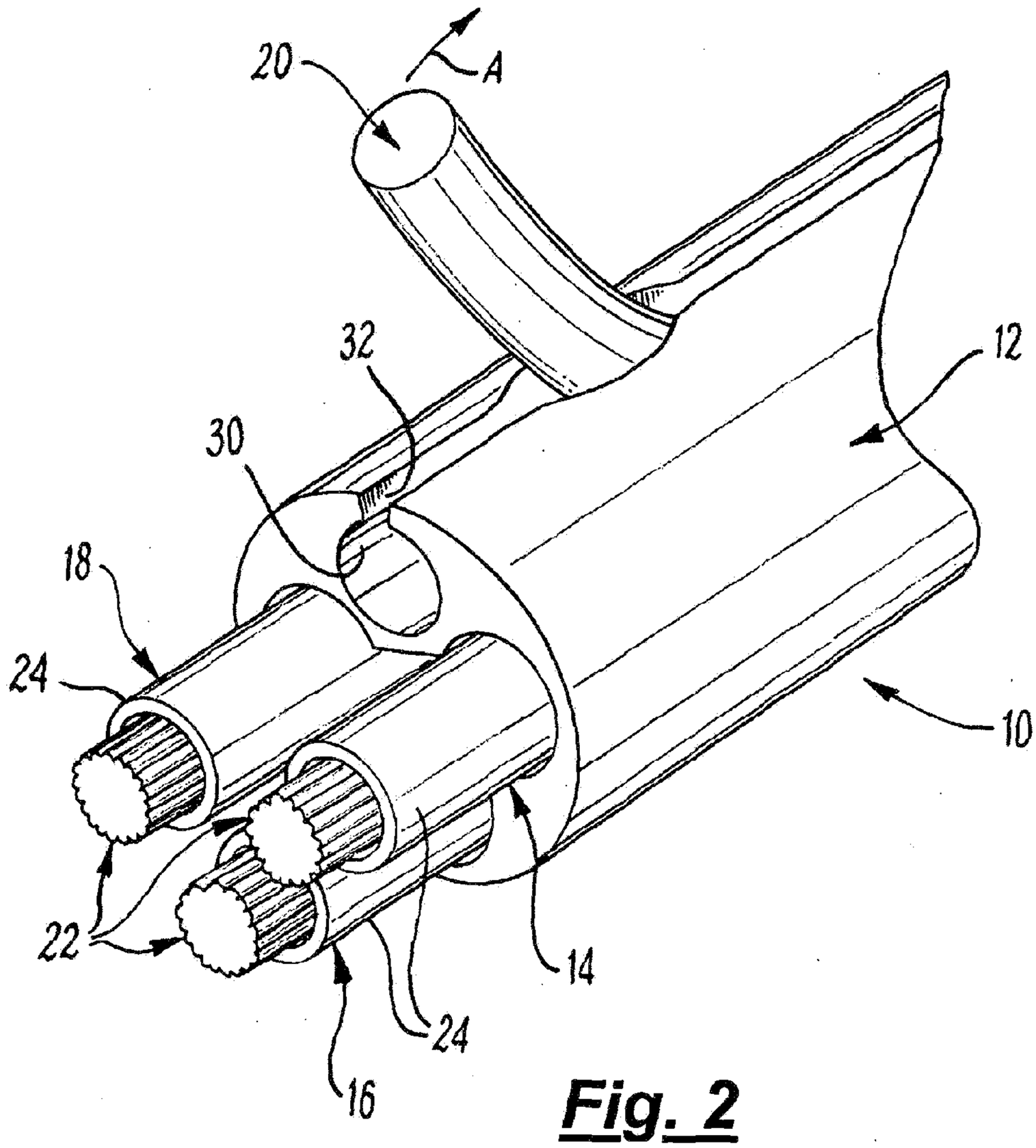

Fig. 2

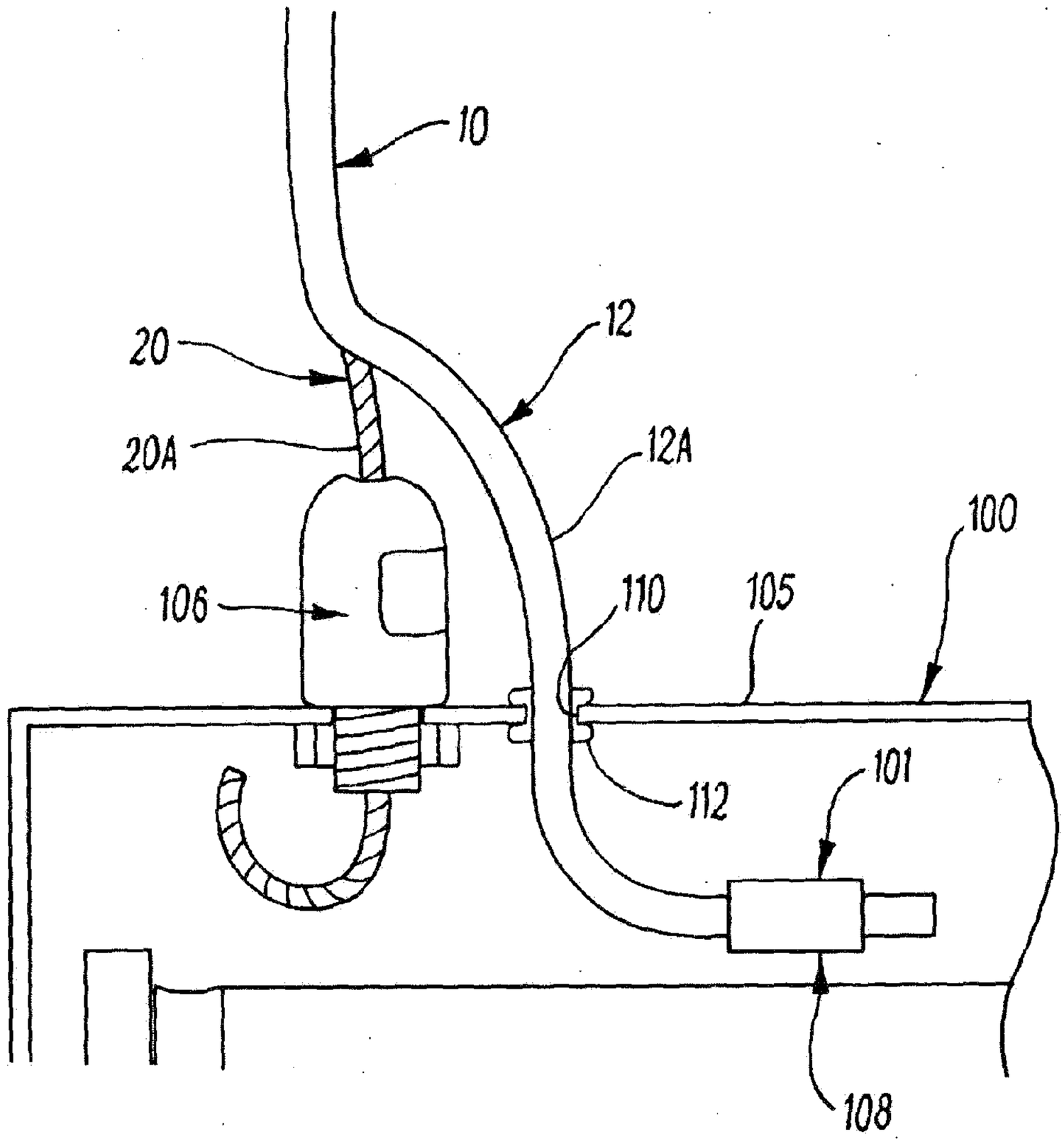

Fig. 3

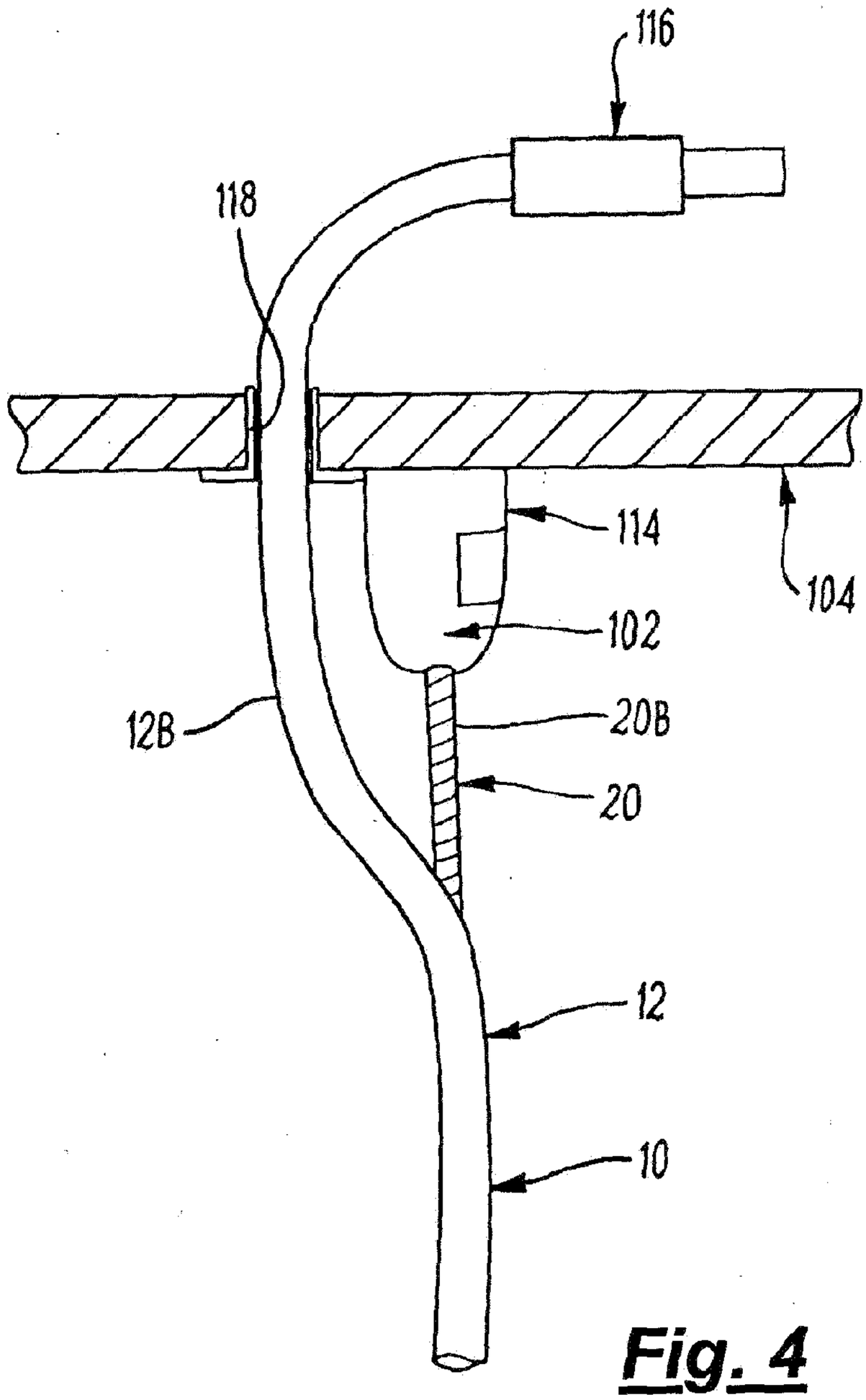

Fig. 4

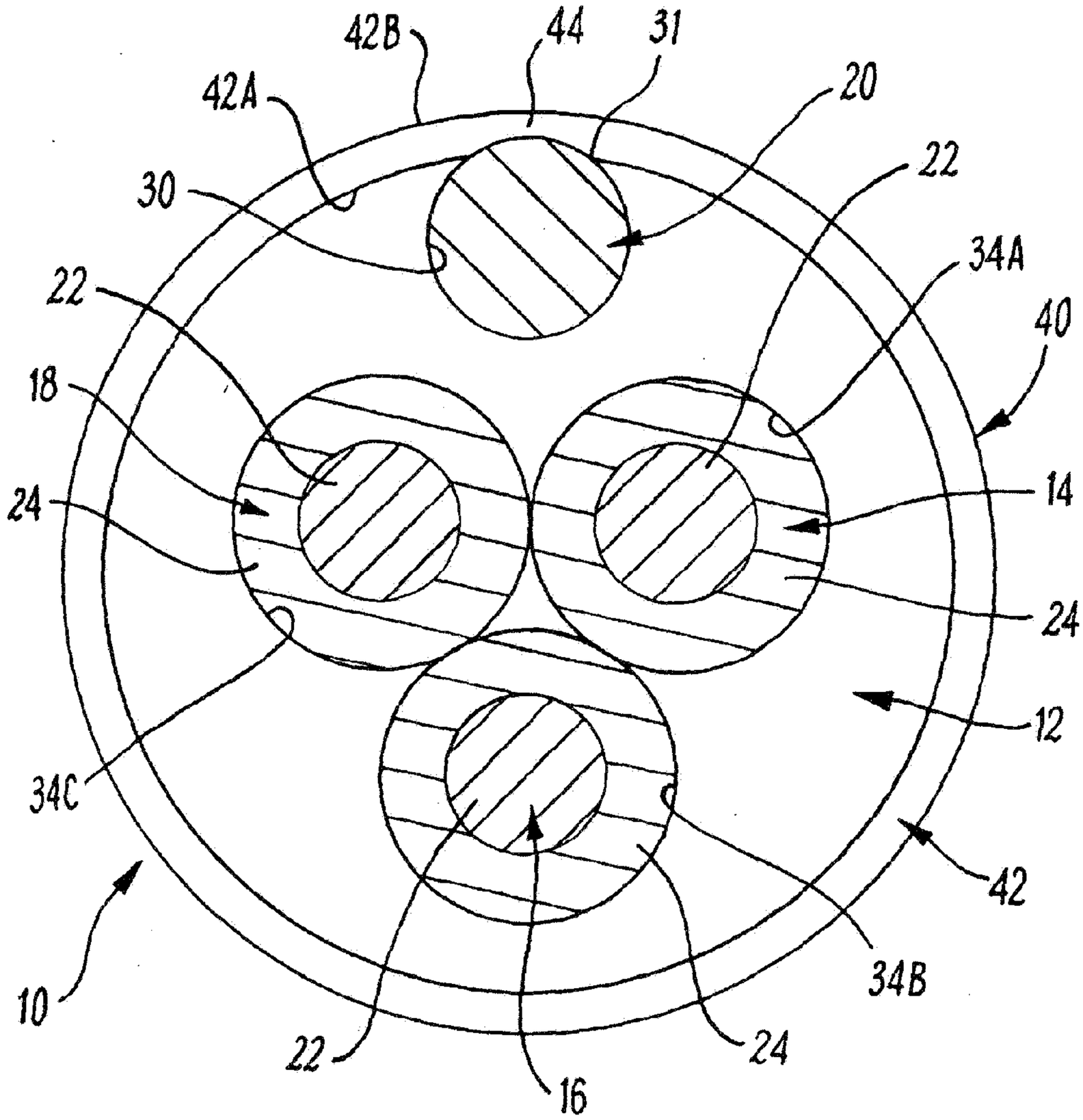

Fig. 5