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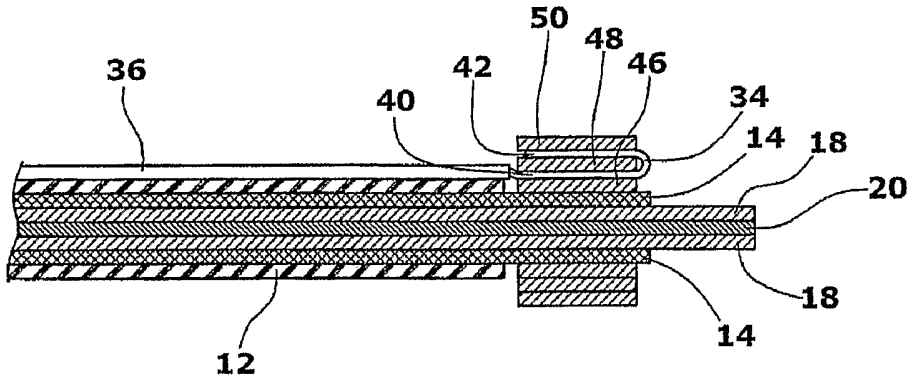
(54) **Title:** FLAT CABLE SHIELD GROUND CONNECTION



(57) **Abstract:** A shielded flat cable comprises a ribbon cable having at least one layer of a plurality of adjacent individual insulated wires, an electrically conductive shielding layer surrounding the ribbon cable, and a ground cable having a conductor electrically connected to the shielding layer. At least two electrically conductive layers of an electrically conductive adhesive tape are adhered to at least a portion of the shielding layer, the adhesive tape having an electrically conductive backing and an electrically conductive adhesive on at least one side of the backing, thereby forming a superimposed layer arrangement comprising the shielding layer and the at least two adhesive tape layers. The ground cable is formed to comprise at least a first and a second portion, at least one of them at least partially being free of an insulation jacket, and the second portion being folded back with respect to the first portion.

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FLAT CABLE SHIELD GROUND CONNECTION

Field

The present invention relates to the ground connection of a shielded flat cable.

Background

Shielded flat cables are often used for signal transmissions in telecommunication and computer applications. A shielded flat cable comprises a plurality of individual insulated wires arranged as a ribbon cable having at least one layer of adjacent insulated wires and an electrically conductive shielding layer surrounding the ribbon cable. The shielding layer serves for preventing the signals transmitted via the individual wires of the ribbon cable from being affected by external noise or other external influences. The shielded layer of a flat cable has to be electrically connected to a ground potential e.g. to the casing of an electronic equipment. For this purpose, so called pigtail and drain wire connections exist which comprise ground cables electrically connected to the shielding layer and to the ground potential.

One example of a drain wire connection is disclosed in JP-A-08077836. In this example, a ground wire is arranged in electrical and mechanical contact with the shielding layer of a flat cable, wherein the ground wire extends parallel to the flat cable and projects beyond the connectors arranged at the ends of the flat cable. The ends of the ground wire are connected to a ground potential.

JP-A-06243731 discloses a ground cable soldered to a copper foil tape which is adhered to the shielding layer of a flat cable.

Soldering a ground wire to the shielding layer of a flat cable is a commonly known technique for ground connection of the shielding layer of a flat cable. However, soldering is disadvantageous in that the application of heat to the shielding layer may damage the ribbon cable underneath the shielding layer. Also, the electrical connection between the shielding layer and the ground cable is merely established at one location of the shielding layer (point-like connection). Finally, when the cable is bent, the soldering connection can be damaged and break.

Another problem with the connection of a ground cable to the shielding layer of a flat cable is strain relief of the ground cable. Without such a strain relief for the ground cable the risk exists that the electrical connection between the ground cable and the shielding layer is destroyed when tension is applied to the ground cable.

For providing strain relief and ground connection of the ground cable, a jacketed cable strain relief/grounding clamp is offered in the market, e.g. by 3M (see e.g. the 3504 series products). These products comprise two clamps for applying a clamping force to the shielded flat cable arranged therebetween. The two clamping elements are arranged at a cabinet wall adjacent an opening through which the flat cable extends.

There is a need for an improved flat cable shield ground connection which can be easily established and also provides for a sufficient strain relief.

SUMMARY OF THE INVENTION

In one aspect of the invention there is provided a shielded flat cable comprising

- a ribbon cable having at least one layer of a plurality of adjacent individual insulated wires,
- an electrically conductive shielding layer surrounding the ribbon cable, and
- a ground cable having a conductor electrically connected to the shielding layer,
- wherein at least two electrically conductive layers of an electrically conductive adhesive tape are adhered to at least a portion of the shielding layer, the adhesive tape having an electrically conductive backing and an electrically conductive adhesive on at least one side of the backing, thereby forming a superimposed layer arrangement comprising the shielding layer and the at least two adhesive tape layers,
- wherein the ground cable is formed so as to comprise at least a first and a second portion, at least one of them at least partially being free of an insulation jacket, and the second portion being folded back with respect to the first portion, and
- wherein, for making electrical contact with the shielding layer and for providing strain relief, the first and second portions of the ground cable are

arranged between layers of different pairs of adjacent layers of the superimposed layer arrangement.

According to this embodiment of the present invention, the ground cable comprises a conductor formed so as to comprise at least a first and a second portion, with the second portion being folded back with respect to the first portion. At least one of these two portions at least partially is free of an insulation jacket which may surround the conductor in the remaining part of the ground cable. The folded back first and second portions are arranged between different pairs of adjacent layers of a superimposed layer arrangement comprising the shielding layer of the ribbon cable of the shielded flat cable and at least two electrically conductive layers of an electrically conductive adhesive tape. By means of the electrically conductive adhesive tape layers the ground cable and, in particular, its first and second portions are fixed to the shielding layer as well as between the electrically conductive adhesive tape layers for making electrical contact with the shielding layer and for providing strain relief.

According to another aspect of the present invention, for electrically connecting the ground cable to the shielding layer of the ribbon cable of the shielded flat cable, the following steps are performed:

- providing an electrically conductive adhesive tape comprising an electrically conductive backing and an electrically conductive adhesive on at least one side of the backing,
- arranging a first portion of the ground cable on the shielding layer,
- fixing the first portion of the ground cable to the shielding layer via a first layer of the electrically conductive adhesive tape adhered to both lateral sides of the first portion of the ground cable,
- folding back the ground cable onto the first adhesive tape layer such that a second portion of the ground cable is arranged at the first adhesive tape layer, and
- fixing the second portion of the ground cable to the first adhesive tape layer by a second layer of the electrically conductive adhesive tape,

- wherein the conductor of the ground cable in at least one of the first and second portions is free of an insulation jacket.

In a further aspect of the present invention, the ground cable is connected to the shielding layer of the ribbon cable by performing the following steps:

- providing an electrically conductive adhesive tape comprising an electrically conductive backing and an electrical conductive adhesive on at least one side of the backing,
- fixing a base layer of the electrically conductive adhesive tape on the shielding layer,
- arranging a first portion of the ground cable on the base layer,
- fixing the first portion of the ground cable to the shielding layer via a first layer of the electrically conductive adhesive tape adhered to both lateral sides of the first portion of the ground cable,
- folding back the ground cable on the first adhesive tape layer such that a second portion of the ground cable is arranged on the first adhesive tape layer, and
- fixing the second portion of the ground cable to the first adhesive tape layer by a second layer of the electrically conductive adhesive tape,
- wherein the conductor of the ground cable in at least one of the first and second portions is free of an insulation jacket.

The conductor of the ground cable used in the present invention may comprise a solid single wire, a stranded or braided flat bend, or a plurality of individual twisted wires. The conductor may be surrounded by an insulation jacket but also may be free of any insulation surrounding the conductor. Also, a conductive ribbon can be used as a ground conductor. For preventing strain relief to the ground cable, the conductor is folded back by bending the conductor by 180° at least once. As an alternative, the conductor may comprise e.g. three or more portions within which the ground conductor is folded back so as to form a Z-shape or a zigzag folded shape.

In one embodiment of the present invention, the electrically conductive layers each comprise individual strips of an electrically conductive adhesive tape arranged on each other with the at least two portions of the ground cable arranged therebetween. Typically, the individual electrically conductive layers are formed by wrapping the electrically conductive adhesive tape around the shielding layer of the ribbon cable. Prior to arranging the ground cable onto the shielded flat cable, several layers of the electrically conductive adhesive tape can be applied to the shielding layer. Further, after having fixed the last portion of the ground cable, more than one layer of the electrically conductive adhesive tape may be applied. In one alternative of the present invention, the first portion of the ground cable is directly placed onto the shielding layer of the ribbon cable so as to be fixed at the shielding layer by the first electrically conductive layer of the electrically conductive adhesive tape, with the second portion of the ground cable being fixed via a different one of the electrically conductive layers of the electrically conductive adhesive tape.

For providing electrical connection of the ground cable to the shielding layer, at least one of the portions of the conductor of the ground cable contacting the shielding layer and the electrically conductive layers has to be free of an insulation jacket. Preferably, the ground cable is free of insulation within all of its portions contacting the shielding and electrically conductive layers.

For extending the electrical connection of the ground cable over a larger area of the shielding layer, it is suitable to use a ground cable having a plurality of twisted individual wires which are fanned-out and folded back within the portions of the ground cable connecting the shielding and electrically conductive layer arrangement.

The electrically conductive adhesive tape used in accordance with the present invention typically comprises a metallic backing (e.g. made of copper) and an adhesive which most preferably is electrically conductive. An electrically conductive adhesive tape suitable for the present invention is e.g. the copper foil with conductive adhesive as sold by 3M (e.g. 1181 series).

Typically, the shielding layer surrounding the ribbon cable of the shielded flat cable according to the invention comprises a metal foil placed around the ribbon cable with lateral opposite ends overlapping each other. As an alternative, the shielding layer

can also comprise a braided layer made of individual wires or a mesh. Around the connection of the shielded flat cable and the ground cable there may be arranged an insulation configured as an insulation adhesive tape wrapped around the shielded flat cable or by a heat shrink insulation tape. Such an insulation provided around the connection further improves strain relief of the ground cable.

In a further embodiment the present invention provides a ground connection for a shielded flat cable having a ribbon cable with at least one layer of a plurality of adjacent individual insulated wires, and an electrically conductive shielding layer surrounding the ribbon cable, the ground connection comprising

- a ground cable having a conductor and formed so as to comprise at least a first and a second portion, at least one of them at least partially being free of an insulation jacket, and the second portion being folded back with respect to the first portion, and
- at least two superimposed electrically conductive adhesive layers each comprising an electrically conductive backing and an electrically conductive adhesive on at least one side of the backing,
- wherein the second portion of the ground cable is arranged between two adjacent layers of the superimposed electrically conductive adhesive layers and the first portion is arranged underneath the lowermost layer of the superimposed electrically conductive adhesive layers, and
- wherein, for making electrical contact between the ground cable and the shielding layer of the shielded flat cable and for providing strain relief to the ground cable, the superimposed electrically conductive adhesive layers with their lowermost layer are adherable to the shielding layer of the shielded cable.

BRIEF DESCRIPTION OF THE DRAWINGS

A full and enabling disclosure of the present invention, including the best mode thereof, enabling one of ordinary skill in the art to carry out the invention, is set forth in greater detail in the remainder of the specification, including reference to the accompanying drawings in which

Fig. 1 is a side view of a shielded flat cable with an end portion of the outer insulation jacket removed,

Fig. 2 shows the shielded flat cable with an end portion of the shielding layer being removed,

Fig. 3 shows an electrically conductive adhesive tape adhered at its end to the shielding layer from underneath the shielded flat cable,

Fig. 4 shows the situation in which the adhesive tape is wound around the shielding layer by about 3/4 of the first winding,

Fig. 5 shows the situation in which the adhesive tape is wound around the shielding layer for more than one winding,

Fig. 6 shows the arrangement of the ground cable with its individual wires fanned-out and placed on top of the outermost layer of the adhesive tape,

Fig. 7 shows the situation in which the first portion of the individual wires of the ground cable are fixed by the adhesive tape,

Fig. 8 shows further winding of the adhesive tape around the shielding 15 layer,

Fig. 9 shows the arrangement of the ground cable with the projecting portions of its individual wires folded back onto the outermost winding of the adhesive tape,

Fig. 10 shows the fixing of the folded back portions of the individual wires by means of a further layer of the adhesive tape wound around the shielding layer,

Fig. 11 shows a side view of the shielded flat cable provided with a connector clamped and connected to the end portion of the ribbon cable of the shielded flat cable,

Fig. 12 shows a cross sectional view taken along line XII-XI1 of Fig. 10, 30

Fig. 13 shows a cross sectional view taken along line XIII-XI11 of Fig. 10,

Fig. 14 shows a view similar to that of Fig. 6 but with the end portions of the individual wires of the ground cable placed onto the outer winding of the adhesive tape,

Fig. 15 shows a view similar to that of Fig. 7 and depicting the fixation of the end portions of the individual wires of the ground cable by a further layer of the adhesive tape,

Fig. 16 shows a side view of the shielded flat cable similar to that of Fig. 8 and with the adhesive tape further wound around the shielding layer,

Fig. 17 shows the situation in which the ground cable is folded back onto the outermost adhesive tape layer,

Fig. 18 shows the shielded flat cable of Fig. 17 but with the adhesive tape further wound around the shielding layer for fixing the ground cable at its portion adjacent to the end portions of the individual wires,

Fig. 19 shows a cross sectional view taken along line XIX-XIX of Fig. 18,

Fig. 20 shows a cross sectional view taken along line XX-XX of Fig. 18,

Fig. 21 shows a cross sectional view similar to those of Figs. 13 and 20, respectively, but with the ground cable being z-folded between the 25 individual adhesive tape layers for electrically and mechanically connecting and fixing the ground cable at the adhesive tape layers, and

Fig. 22 shows a perspective view of a prefabricated ground connection.

DESCRIPTION OF PREFERRED EMBODIMENTS

A first embodiment of a shielded flat cable with a ground cable being connected and fixed thereto as well as the individual steps of making the electrical and mechanical connection between the shielded flat cable 10 and the ground cable is shown in Figs. 1 to 13.

The process starts with a shielded flat cable 10 having an outer insulation jacket 12 arranged around an electrically conductive shielding layer 14 of e.g. a copper foil which in turn is wrapped around a ribbon cable 16 comprising an insulation layer 18 in which a plurality of wires 20 are embedded (see also Figs. 2 and 12).

In a first step, the outer insulation jacket 12 is removed at the one end 22 of the shielded flat cable 10. Thereafter, a portion of the thus exposed shielding layer 14 is removed so that the situation of Fig. 2 occurs in which an end portion of the ribbon cable

16 is exposed, followed by an exposed portion of the shielding layer 14, followed by the remaining portion of the shielded flat cable 10 with its outer jacket 12 arranged therearound.

In Fig. 3 it can be seen that an adhesive tape 24 is adhered to the shielding layer 14. The adhesive tape 24 comprises an electrically conductive backing 26 in the form of a copper foil and an electrically conductive adhesive layer 28 arranged on the one side of the electrically conductive backing 26.

As can bee seen in Figs. 4 to 6, the adhesive tape 24 is wound around the shielding layer 14 by more than one winding. In this embodiment, the adhesive tape 24 is wound by about 1 ¼ windings around the shielding layer 14 before a prepared ground cable 30 is placed onto the first winding of the 30 adhesive tape 24 (see Fig. 6). As an alternative, the ground cable 30 can also be placed directly onto the shielding layer 14. The ground cable 30 comprises a conductor 32 having a plurality of individual wires 34 twisted with respect to each other. The twisted wires 34 are arranged inside an outer insulation jacket 36 which is removed at the one end 38 of the ground cable 30 so that the individual wires 34 are exposed. Within this exposed end portions the individual wires 34 are fanned-out as shown in Fig. 6. The fanned-out individual wires 34 are placed on the first winding of the adhesive tape 24, as shown in Fig. 6, with a first portion 40 of the individual wires 34 adjacent to the outer jacket 36 arranged on the first winding of the adhesive tape 24, while a second portion 42 of the individual wires 34 projects beyond the adhesive tape 24.

As shown in Figs. 7 and 8, the adhesive tape 24 is wound around the shielding layer 14 by one further winding, thereby fixing the first portions 40 of the individual wires 34 of the ground cable 30 between the first and second windings of the adhesive tape 24.

Thereafter, the projecting second portions 42 of the individual wires 34 of the ground cable 30 are folded back on top of the second winding of the adhesive tape 24 (see Fig. 9), followed by a further winding of the adhesive tape 24 around the shielding layer 14 (see Fig. 10).

Thereafter, the adhesive tape 24 can be wound around the shielding layer 14 by at least one further winding. This is not necessary for the electrical connection, but further strengthens the mechanical connection of the ground cable 30 to the shielded flat cable 10. Also, prior to placing the wires 34 of the conductor 32 of the ground cable 30 onto the

adhesive tape 24 wound around the shielding layer 14 by at least one winding, the adhesive tape 24 may be wound around the shielding layer 14 by more than one winding in order to also further strengthen the shielding layer 14 underneath the wires 34 of the ground cable 30. Finally, also between the steps of placing the ground cable 30 onto the adhesive tape 24 (see Fig. 6) and folding back the projecting second 30 portions 42 of the wires 34 (see Fig. 10), the adhesive tape 24 may be wound around the shielding layer 14 by more than one winding.

With the aid of the individual steps shown in Figs. 1 to 10 and described above, the electrical connection of the ground cable 30 to the shielding layer 14 of the shielded flat cable 10, as well as the mechanical connection and strain relief of the ground cable 30 at the shielded flat cable 10 are established and realized. Thereafter, a connector 44 can be applied to the exposed end portion of the ribbon cable 16. The connector 44 can be an insulation displacement connector (IDC). However, other types of connectors are also possible.

The internal construction of the connection between the ground cable 30 and the shielded flat cable 10 can be seen from Figs. 12 and 13. Fig. 12 shows that the individual first and second portions 40,42 of the wires 34 of the ground cable 30 are arranged between different pairs of adhesive tape layers 46,48, and 50. Instead of applying the adhesive tape layers 46,48, and 50 by winding the adhesive tape 24 around the shielding layer 14, individual sections of an electrically conductive adhesive tape (e.g. cut from the length of adhesive tape 24) may be affixed t o each other in order to form for the superimposed layer arrangement 52 on top of the one flat surface of the shielded flat cable 10 as shown in Fig. 12 and comprise the shielding layer 14 as well as the individual adhesive tape layers 46,48, and 50. Fig. 13 shows that due to the folded back arrangement of the first and second portions 40 and 42 of the wires 34 of the ground cable 30 a reliable strain relief of the cable 30 is realized, together with a reliable electrical contact to the shielding layer 14 either directly or indirectly through the layers 46,48, and 50 of the adhesive tape 24.

With reference to Figs. 14 to 20 another embodiment of the present invention will be described herein. As far as the elements shown in these Figures are identical to the those of Figs. 1 to 13, the same reference numerals are used.

The major difference between the arrangement of Figs. 1 to 13 and that of Figs. 14 to 20 is that the ground cable 30 is prepared in a different way. Namely, as can be seen in Fig. 14, the ground cable 30 according to the second embodiment of the invention comprises individual twisted wires 34 free from the outer insulation jacket 36 merely in one portion (second portion 42), while the portion of the ground cable 30 adjacent to the portion 42 of the wires 34 is provided with the outer insulation jacket 36 around the wires 34.

After placing the fanned-out individual wires 34 onto the adhesive tape 24 wound around the shielding layer 14, the individual wires 34 in their exposed (second) portions 42 are fixed by the adhesive tape 24 by further winding the tape 24 around the shielded flat cable 10 (see Figs. 15 and 16). Thereafter, as can be seen in Fig. 17, the ground cable 30 is folded back so that its portion 40 provided with the outer insulation jacket 36 is placed onto the outer layer of the adhesive tape 24. Thereafter, the ground cable 30 at its portion 40 is fixed by further applying adhesive tape 24, as can be seen from Fig. 18.

This arrangement of the mechanical and electrical connection of the ground cable 30 and the shielded flat cable 10 can be seen in Figs. 19 and 20.

Finally, Fig. 21 shows a cross sectional view of a further embodiment of the present invention, wherein the ground cable 30 is z-folded so as to include three portions 40,42,54 in its section electrically and mechanically connected to the shielded flat cable 10 by means of the adhesive tape 24. In the embodiment of Fig. 21, one of the portions of the ground cable 30 arranged between adjacent layers 50,56 of the adhesive tape 24 is still provided with the outer insulation jacket 36. Also, in this portion the outer jacket 36 of the ground cable 30 could be removed.

With respect to all the embodiments shown in the drawings i t is t o be noted that the number of layers of adhesive tape 24 between the individual adjacent portions of the ground cable 30 is not limited to one layer but could also be more than one layer. Finally, by arranging further material (e.g. insulating material) around the electrical and mechanical connection of the ground cable 30 to the shielded flat cable 10, strain relief can be improved. Further, a protection against environmental influences is provided. In the embodiment of Fig. 21 this protection is provided by a heat shrinkable insulation material 58 arranged around the superimposed layer arrangement 52.

Fig. 22 shows a prefabricated ground cable connection similar to that as shown in Figs. 19 and 20 but with superimposed individual layers 46,48,50 formed by arranging electrically conductive adhesive strips one on each other. This superimposed layer arrangement with the first and second portions 40,42 of the ground cable 30 already arranged therebetween, can be provided with a protective release liner 60 releasable from the adhesive of the lowermost strip of the electrically conductive adhesive layer 46. The superimposed strips can be longer than the width of the shielding layer 14 surrounding the ribbon cable 16 so that the superimposed strips at their end can be bent around the shielded flat cable (see arrows 62 in Fig. 22).

Although the invention has been described and illustrated with reference to specific illustrative embodiments thereof, it is not intended that the invention be limited to those illustrative embodiments. Those skilled in the art will recognize that variations and modifications can be made without departing from the true scope of the invention as defined by the claims that follow. It is therefore intended to include within the invention all such variations and modifications as fall within the scope of the appended claims and equivalents thereof.

CLAIMS

1. A shielded flat cable comprising

- a ribbon cable having at least one layer of a plurality of adjacent individual insulated wires,
- an electrically conductive shielding layer surrounding the ribbon cable, and
- a ground cable having a conductor electrically connected to the shielding layer,
- wherein at least two electrically conductive layers of an electrically conductive adhesive tape are adhered t o at least a portion of the shielding layer, the adhesive tape having an electrically conductive backing and an electrically conductive adhesive on at least one side of the backing, thereby forming a superimposed layer arrangement comprising the shielding layer and the at least two adhesive tape layers,
- wherein the ground cable is formed so as to comprise at least a first and a second portion, at least one of them at least partially being free of an insulation jacket, and the second portion being folded back with respect to the first portion, and
- wherein, for making electrical contact with the shielding layer and for providing strain relief, the first and second portions of the ground cable are arranged between layers of different pairs of adjacent layers of the superimposed layer arrangement.

2. The shielded flat cable according to claim 1, wherein the superimposed layer arrangement comprises at least three electrically conductive adhesive tape layers, and wherein the first and second portions of the ground cable are arranged between layers of different pairs of adjacent layers of the adhesive tape layers of the superimposed layer arrangement.

3. The shielded flat cable according to claim 1 or 2, wherein the electrically conductive adhesive tape is wound around the shielding layer so as to form the at least two electrically conductive tape layers.

4. The shielded flat cable according to any one of claims 1 to 3, wherein underneath and/or above the pairs of layers of the layer arrangement having the first and second portions of the ground conductor arranged therebetween, at least two adhesive tape layers are located.

5. The shielded flat cable according to any one of claims 1 to 4, further comprising a protective material for covering the shielding layer and the superimposed layer arrangement.

6. The shielded flat cable according to claim 5, wherein the protective material comprises an insulating adhesive tape.

7. The shielded flat cable according to any one of claims 1 to 6, wherein the ground cable comprises a third portion which together with the first and second portions is arranged in a z-folded manner.

8. The shielded flat cable according to any one of claims 1 to 7, wherein the conductor of the ground cable comprises a plurality of wires fanning out within the portions of the ground cable arranged within the superimposed layer arrangement.

9. The shielded flat cable according to any one of claims 1 to 8, wherein the shielding layer comprises a mesh of electrically conductive wires.

10. The shielded flat cable according to any one of claims 1 to 9, wherein the backing of the electrically conductive adhesive tape comprises a metal foil.

11. The shielded flat cable according to any one of claims 1 to 10, wherein the second portion of the ground cable is folded back over its first portion.

12. The shielded flat cable according to any one of claims 1 to 11, wherein the ground cable comprises an insulation jacket removed at least partially in at least one of the first and second, and, if provided, third portions.

13. A method for electrically connecting a ground cable having a conductor to a shielding layer of a shielded flat cable and for providing strain relief to the ground cable comprising the steps of

- providing an electrically conductive adhesive tape comprising an electrically conductive backing and an electrically conductive adhesive on at least one side of the backing,
- arranging a first portion of the ground cable on the shielding layer,
- fixing the first portion of the ground cable to the shielding layer via a first layer of the electrically conductive adhesive tape adhered to both lateral sides of the first portion of the ground cable,
- folding back the ground cable onto the first adhesive tape layer such that a second portion of the ground cable is arranged at the first adhesive tape layer, and
- fixing the second portion of the ground cable to the first adhesive tape layer by a second layer of the electrically conductive adhesive tape,
- wherein the conductor of the ground cable in at least one of the first and second portions at least partially is free of an insulation jacket.

14. A method for electrically connecting a ground cable to a shielding layer of a shielded flat cable and for providing strain relief to the ground conductor comprising the steps of

- providing an electrically conductive adhesive tape comprising an electrically conductive backing and an electrical conductive adhesive on at least one side of the backing,
- fixing a base layer of the electrically conductive adhesive tape on the shielding layer,
- arranging a first portion of the ground cable on the base layer,
- fixing the first portion of the ground cable to the shielding layer via a first layer of the electrically conductive adhesive tape adhered to both lateral sides of the first portion of the ground cable,
- folding back the ground cable on the first adhesive tape layer such that a second portion of the ground cable is arranged on the first adhesive tape layer, and

- fixing the second portion of the ground cable to the first adhesive tape layer by a second layer of the electrically conductive adhesive tape,
- wherein the conductor of the ground cable in at least one of the first and second portion at least partially is free of an insulation jacket .

15. The method according to claim 13 or 14, wherein the electrically conductive adhesive tape is wound around the shielding layer for forming the individual adhesive tape layers.

16. The method according to any one of claims 13 to 15, further comprising the step of applying several layers of the electrically conductive adhesive tape prior to the arranging of the first portion of the ground cable on the shielding layer or the base layer and/or after the arranging of the first portion and prior to the arranging of the second portion of the ground cable on the first layer or base layer and/or after the arranging of the second portion of the ground cable on the first layer or base layer, respectively.

17. The method according to any one of claims 13 to 16, further comprising the step of covering the shielding layer and the arrangement of the adhesive tape layers and the portions of the ground cable located therebetween by a protective material.

18. The method according to claim 17, wherein covering the shielding layer by the protective material comprises wrapping an insulating adhesive tape around the shielding layer and the arrangement of the adhesive tape layers.

19. The method according to any one of claims 13 to 18, wherein after the steps of applying the second adhesive tape layer for fixing the second portion of the ground cable, a third portion of the ground cable is arranged on the second adhesive tape layer or on another adhesive tape layer applied to the second adhesive tape layer and wherein the third portion of the ground cable is fixed by a third adhesive tape layer.

20. The method according to any one of claims 13 to 19, wherein the step of providing the ground cable includes providing a ground cable having a conductor comprising a plurality of individual wires arranged side-by-side and fanning out the individual

wires within the first and second and, if provided, third portions of the ground cable.

21. The method according to any one of claims 13 to 20, wherein the step of providing the ground cable includes removing an insulation jacket arranged around the conductor of the ground cable at least partially within at least one of the first and second and, i f provided, third portions of the ground cable.

22. Use of an electrical conductive adhesive tape for the manufacturing of a shielded flat cable according to any one of claims 1 to 12.

23. Use of an electrical conductive adhesive tape for making electrical contact of a ground cable to the shielding layer of a shielded flat cable and for fixing the ground cable at the shielding layer for providing strain relief.

24. Kit for making electrical contact of a ground cable to the shielding layer of a shielded flat cable and for fixing the ground cable at the shielding layer for providing strain relief, comprising an electrical conductive adhesive tape having an electrically conductive backing and an electrically conductive adhesive on at least one side of the backing, and the ground cable having a conductor.

25. Ground connection for a shielded flat cable having a ribbon cable with at least one layer of a plurality of adjacent individual insulated wires, and an electrically conductive shielding layer surrounding the ribbon cable, the ground connection comprising

- a ground cable having a conductor and formed so as to comprise at least a first and a second portion, at least one of them at least partially being free of an insulation jacket, and the second portion being folded back with respect to the first portion, and
- at least two superimposed electrically conductive adhesive layers each comprising an electrically conductive backing and an electrically conductive adhesive on at least one side of the backing,
- wherein the second portion of the ground cable is arranged between two adjacent layers of the superimposed electrically conductive adhesive layers and

the first portion is arranged underneath the lowermost layer of the superimposed electrically conductive adhesive layers, and

- wherein, for making electrical contact between the ground cable and the shielding layer of the shielded flat cable and for providing strain relief to the ground cable, the superimposed electrically conductive adhesive layers with their lowermost layer are adherable to the shielding layer of the shielded cable.

26. Ground connection for a shielded flat cable having a ribbon cable with at least one layer of a plurality of adjacent individual insulated wires, and an electrically conductive shielding layer surrounding the ribbon cable, the ground connection comprising

- a ground cable having a conductor and formed so as to comprise at least a first and a second portion, at least one of them at least partially being free of an insulation jacket, and the second portion being folded back with respect to the first portion, and
- at least three superimposed electrically conductive adhesive layers each comprising an electrically conductive backing and an electrically conductive adhesive on at least one side of the backing,
- wherein the first and second portions of the ground cable are arranged between layers of different pairs of adjacent layers of the superimposed electrically conductive adhesive layers, and
- wherein, for making electrical contact between the ground cable and the shielding layer of the shielded flat cable and for providing strain relief to the ground cable, the superimposed electrically conductive adhesive layers with their lowermost layer are adherable to the shielding layer of the shielded cable.

27. Ground connection according to claim 25 or 26, wherein a release liner covers the adhesive layer of the lowermost layer of the superimposed electrically conductive adhesive layers.

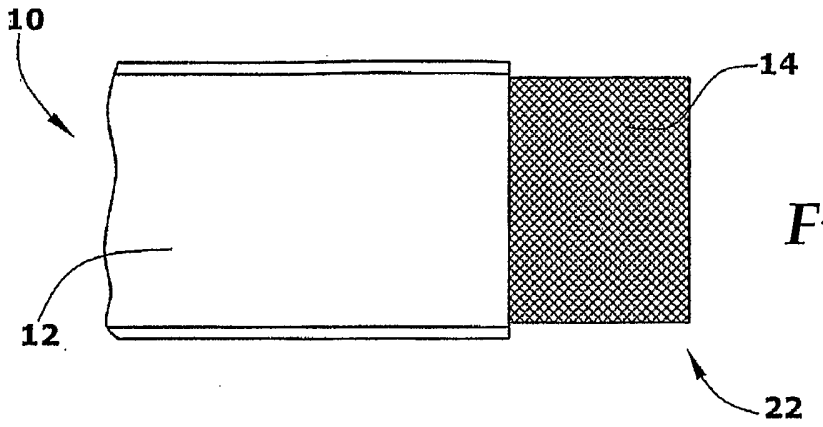

Fig. 1

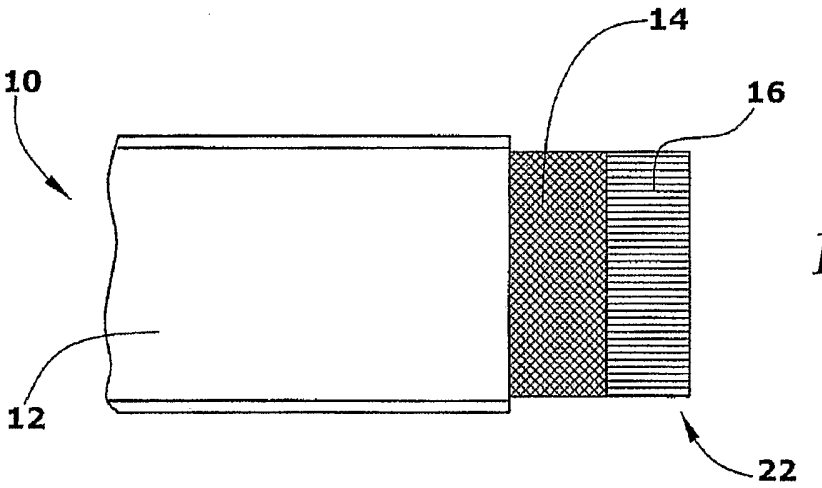

Fig. 2

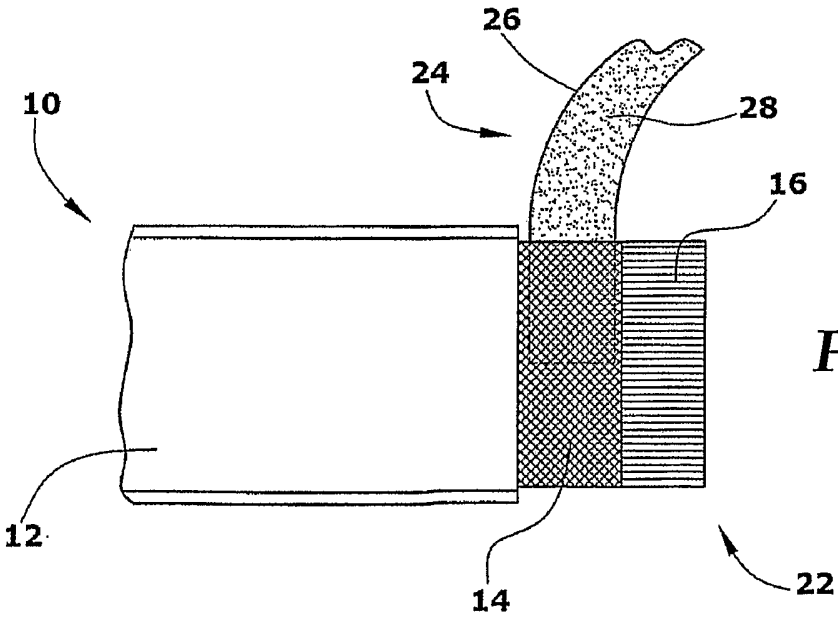

Fig. 3

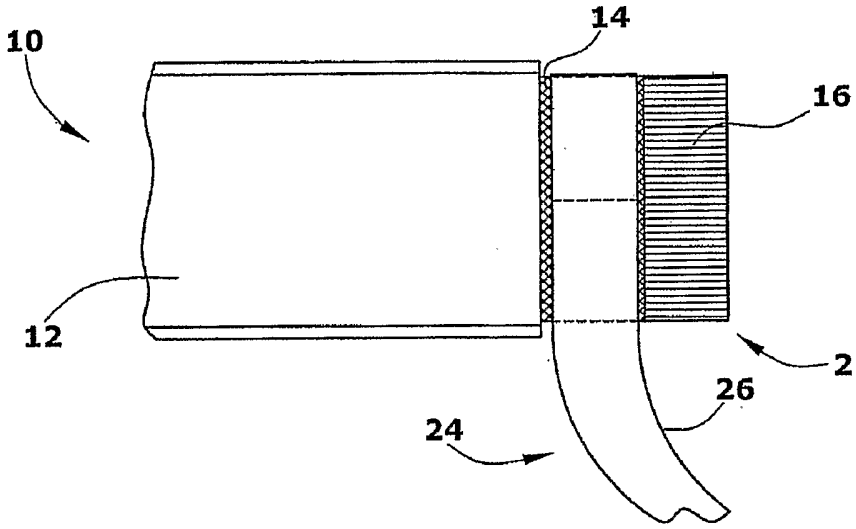

Fig. 4

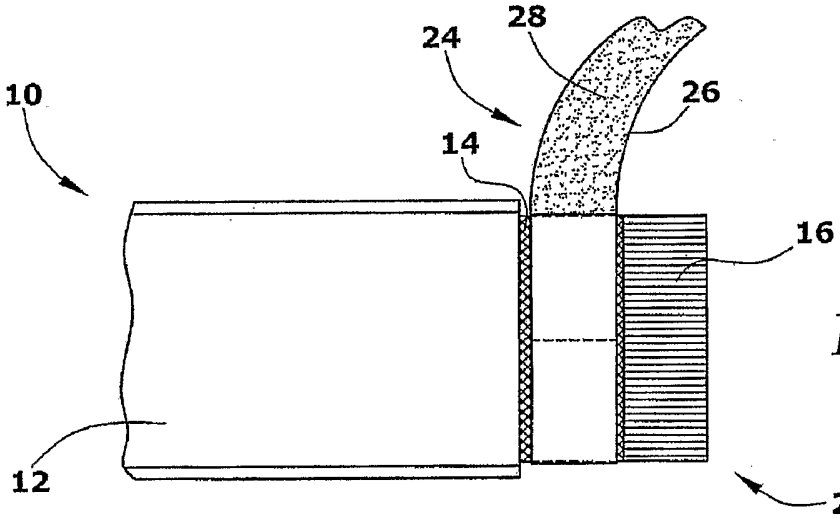

Fig. 5

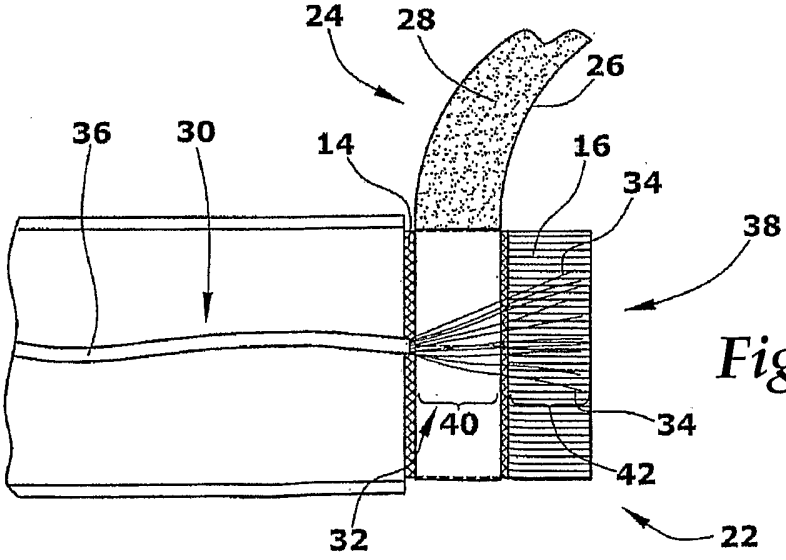

Fig. 6

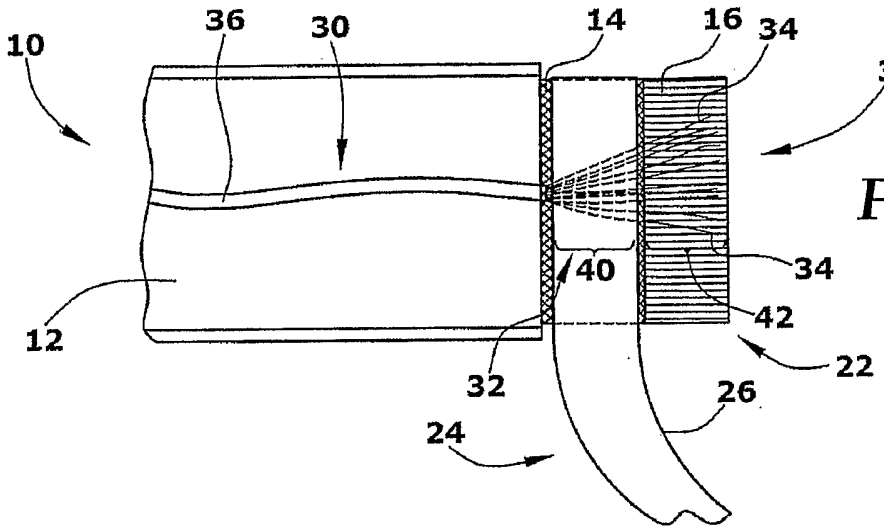

Fig. 7

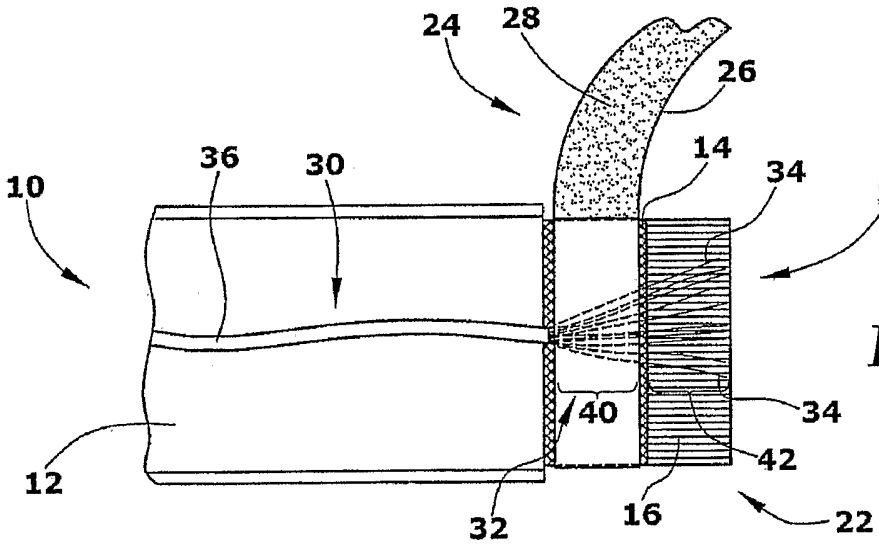

Fig. 8

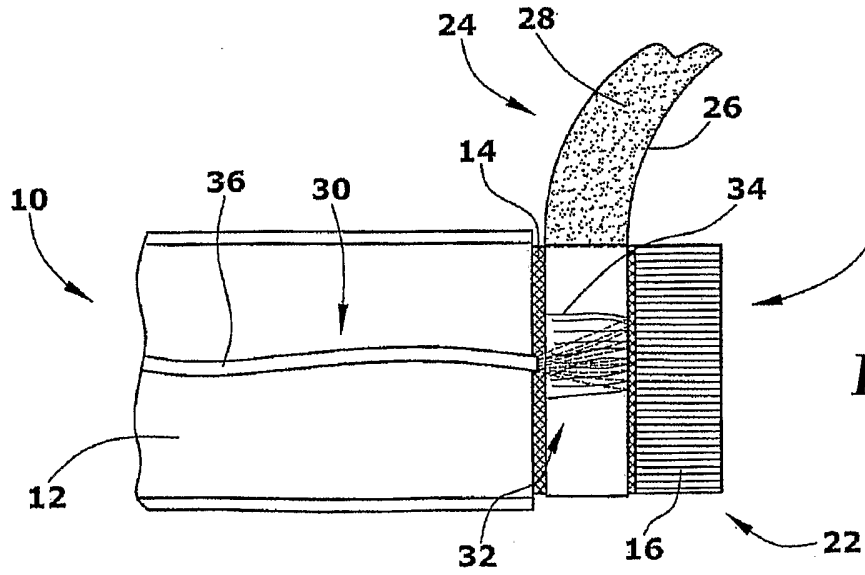

Fig. 9

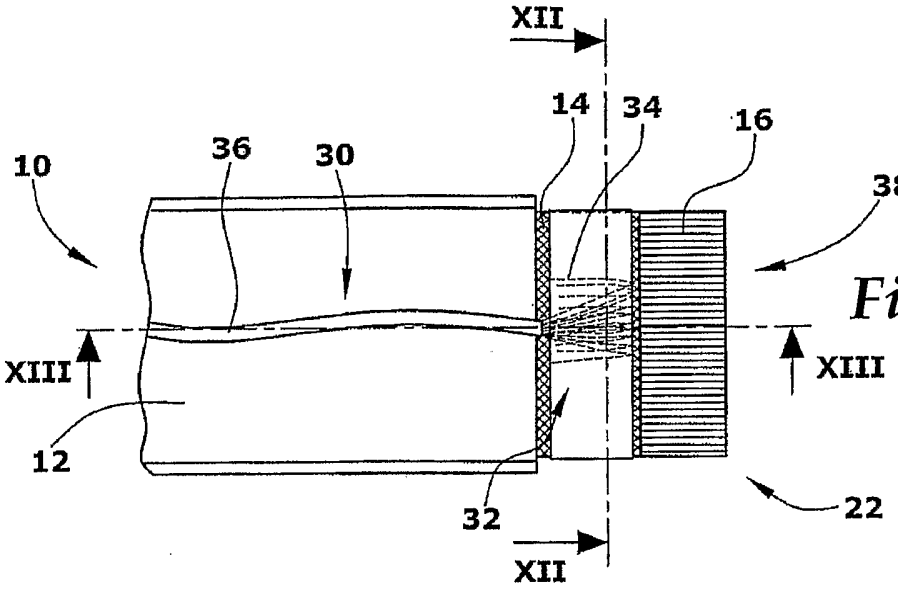

Fig. 10

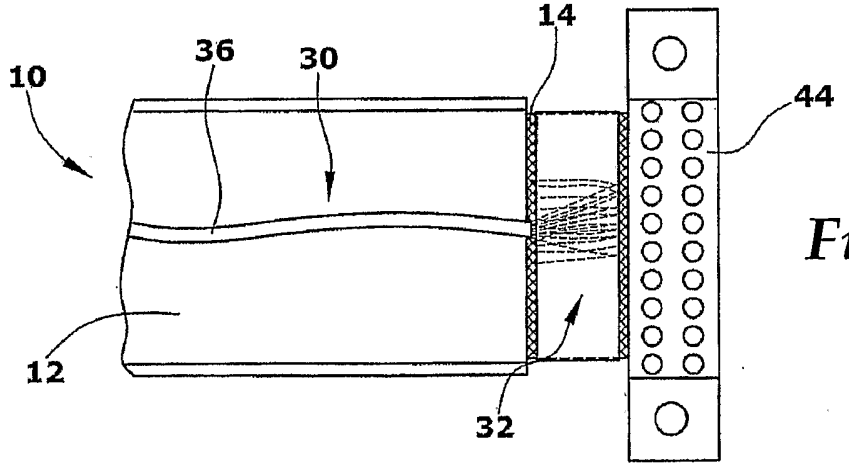

Fig. 11

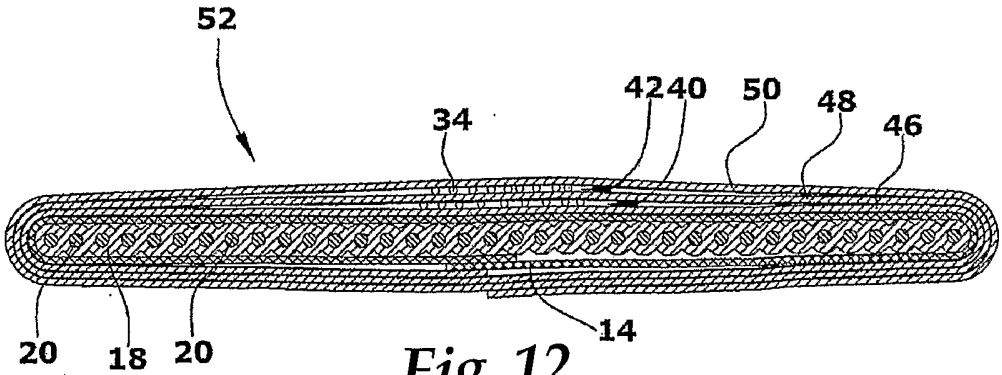

Fig. 12

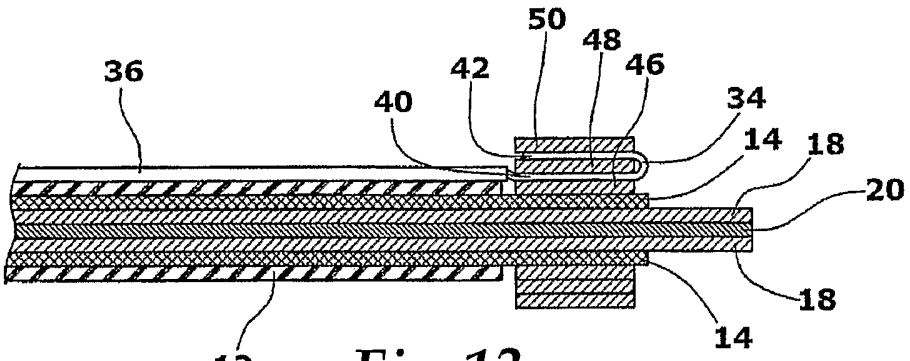

Fig. 13

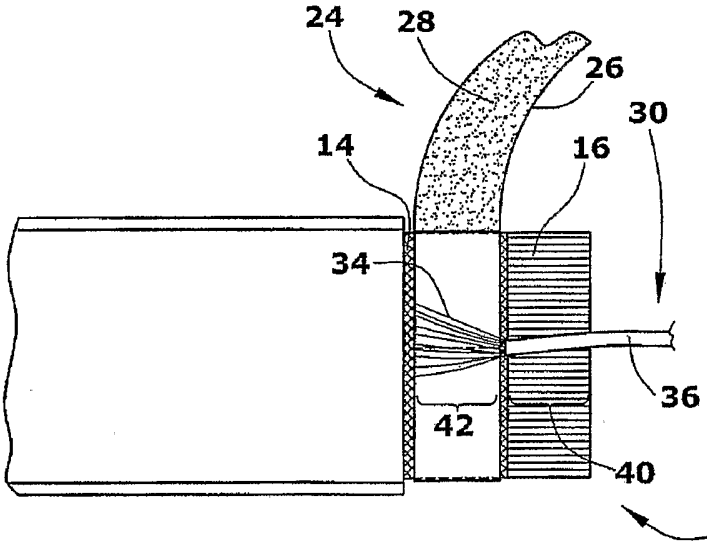

Fig. 14

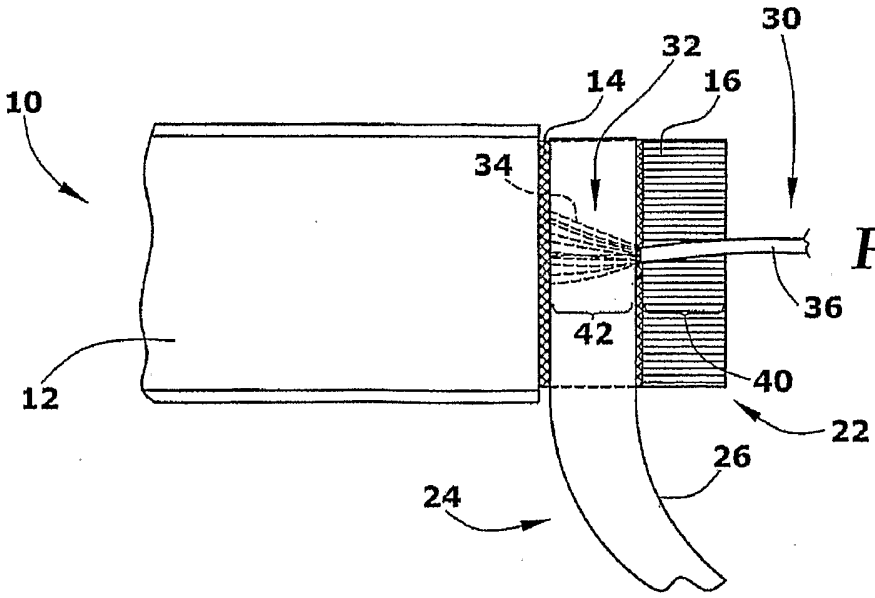

Fig. 15

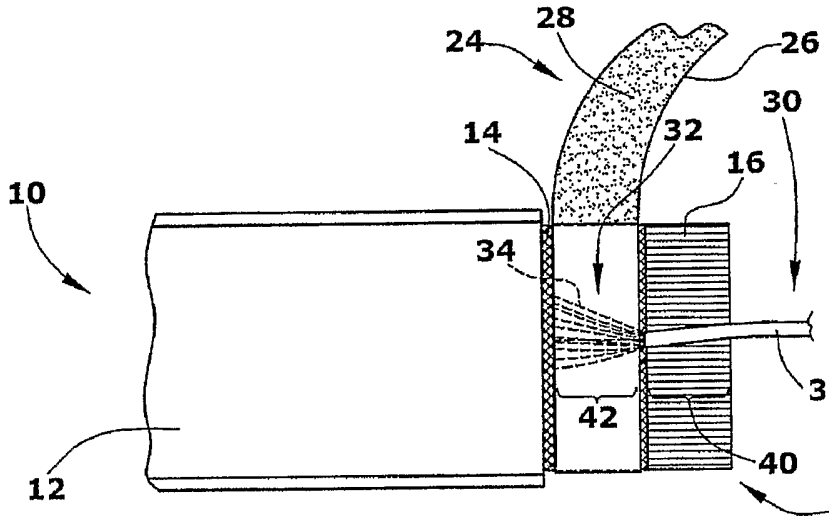

Fig. 16

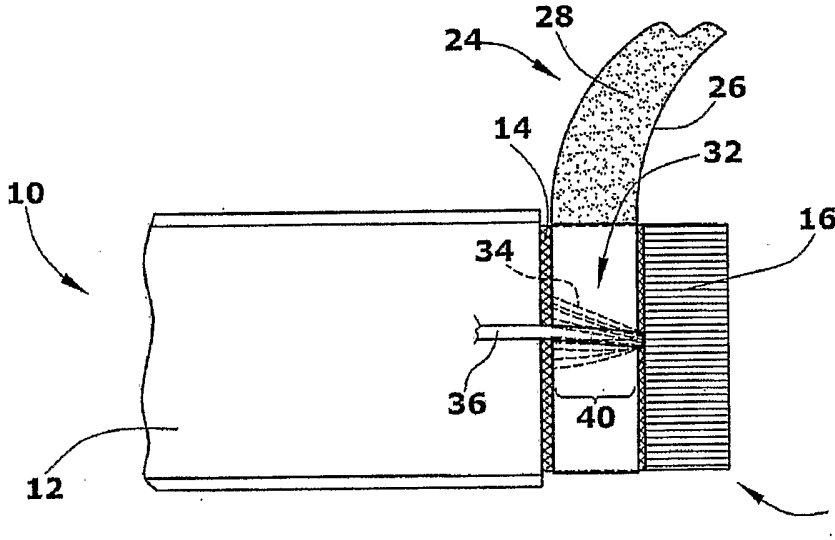

Fig. 17

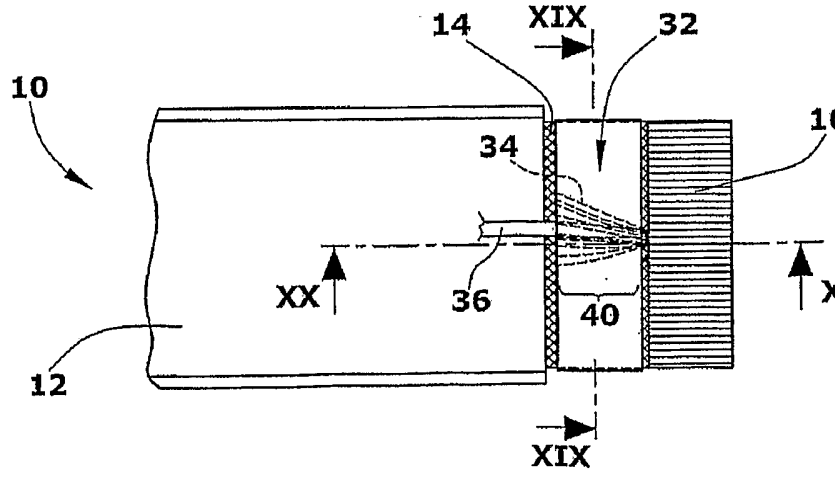

Fig. 18

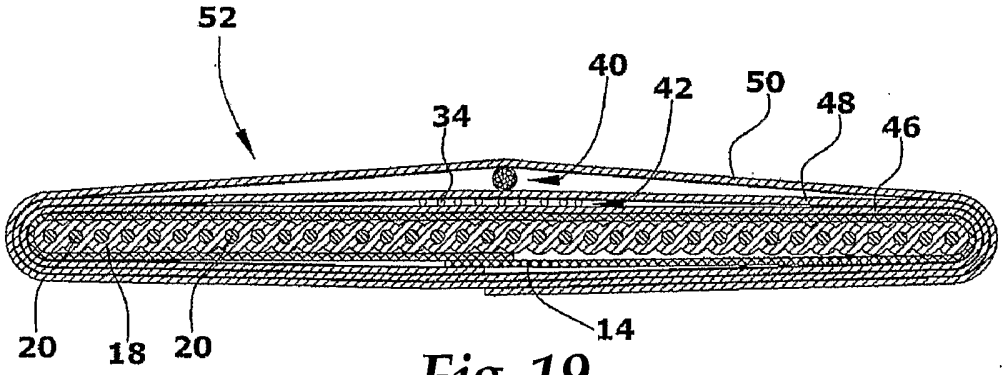

Fig. 19

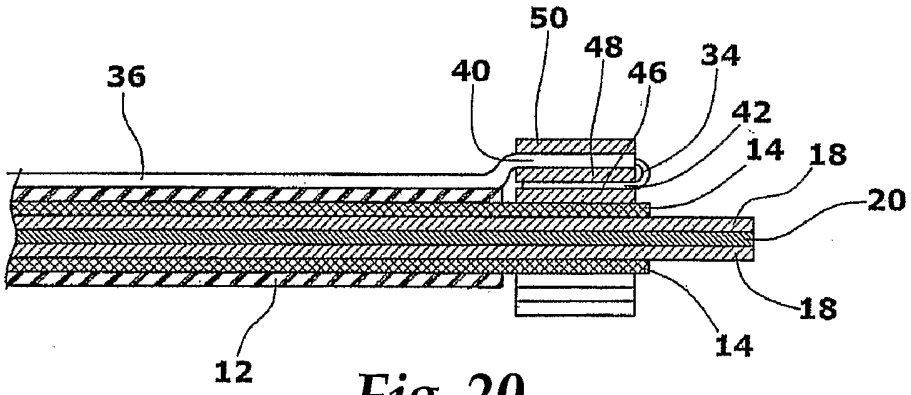

Fig. 20

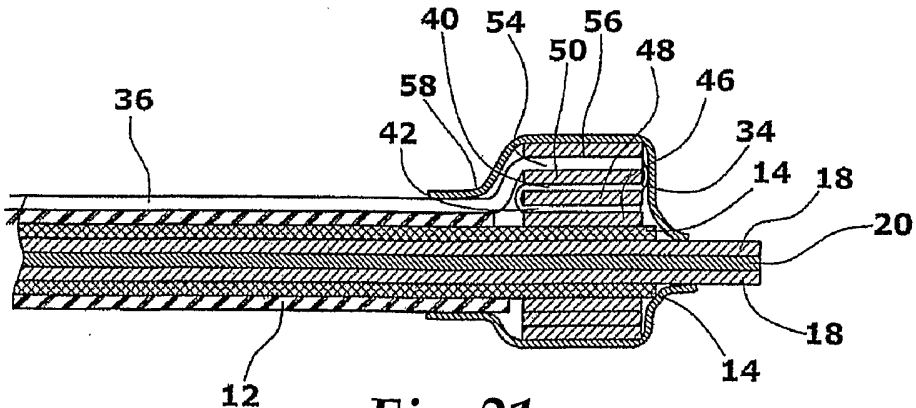

Fig. 21

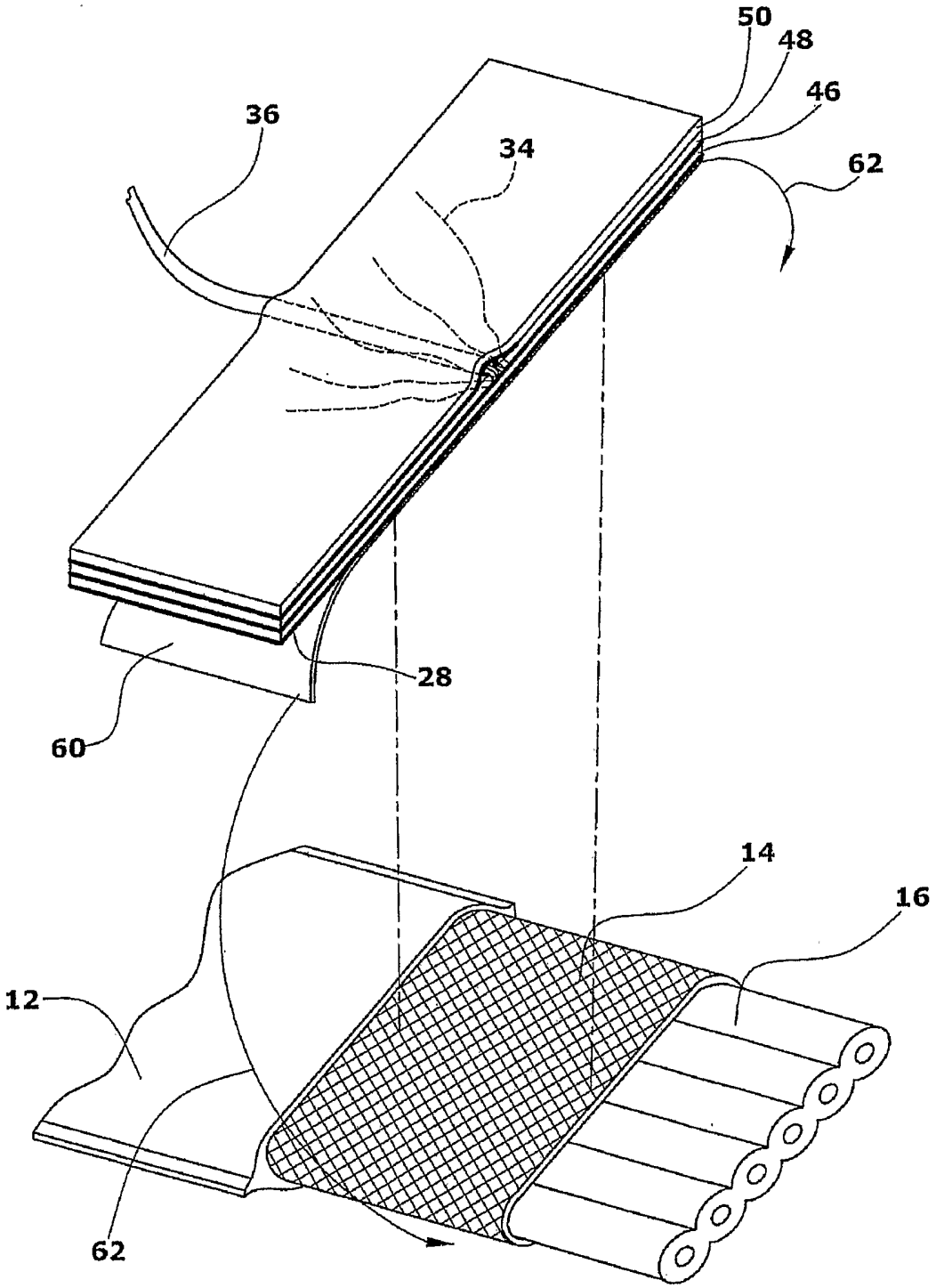

Fig. 22