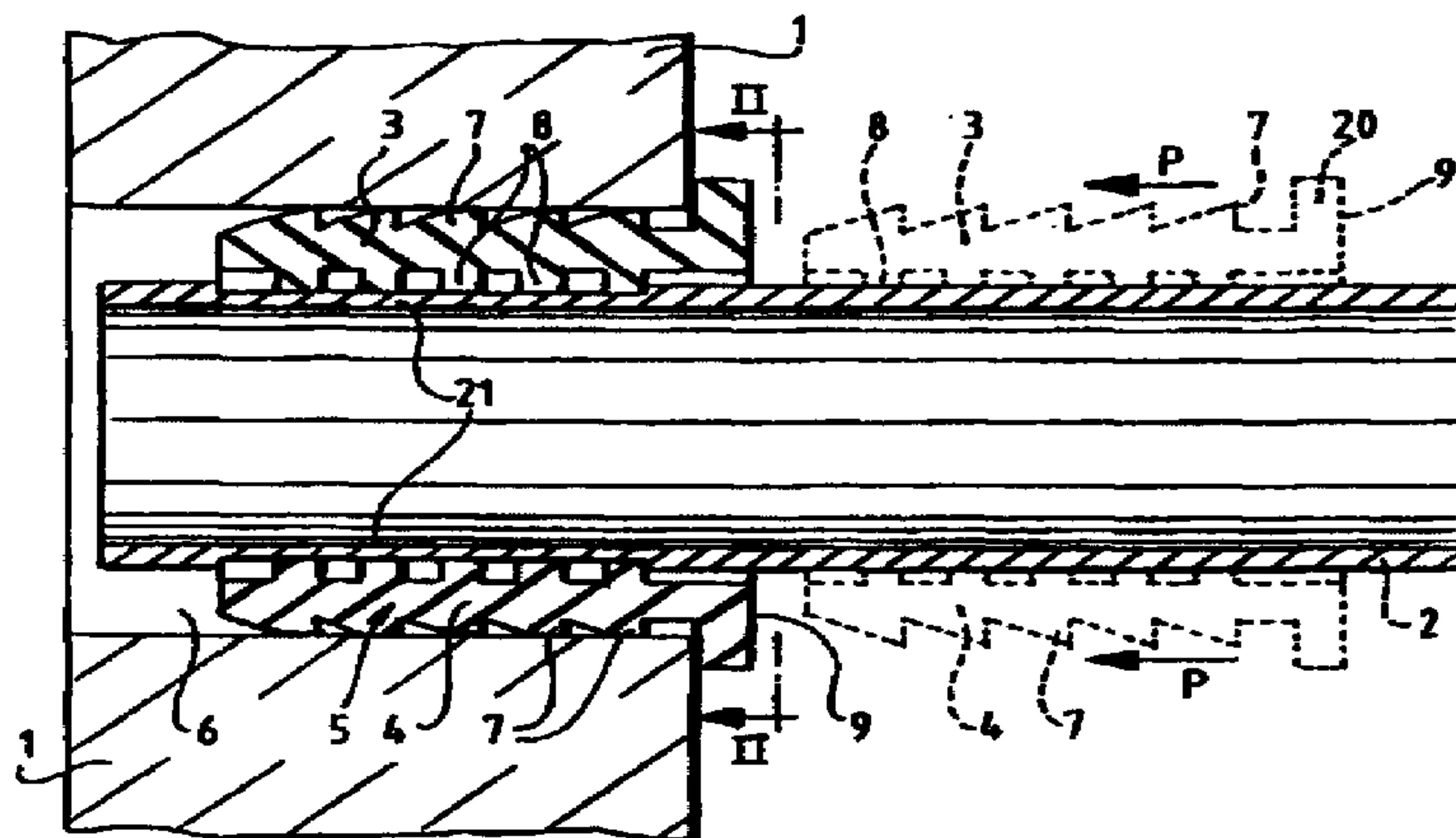




- (72) BEELE, JOHANNES ALFRED, NL
(71) BEELE ENGINEERING B.V., NL
(51) Int.Cl.⁶ H02G 3/22, H02G 3/08, H04B 15/00
(30) 1998/03/06 (1008522) NL
(54) **TRAVERSEE ISOLANTE**
(54) **A BUSHING**



(57) L'invention concerne une traversée isolante permettant au moins le passage d'un câble à travers une ouverture ménagée dans un mur et analogue tout en fournissant une protection contre une surtension et/ou une interférence électromagnétique. Cette invention est caractérisée en ce que ladite traversée isolante comprend un collier hermétique en matériau élastique, qui peut être ajusté de manière hermétique dans l'ouverture du mur. Un canal traversant au moins est prévu pour permettre le passage du câble de manière hermétique dans l'ouverture du mur. Le collier hermétique est électroconducteur et est en contact avec un blindage de câble électroconducteur lorsque de la traversée isolante est mise en oeuvre.

(57) A bushing for leading at least one cable through an opening in a wall or the like whilst providing protection against electromagnetic overvoltage and/or interference, characterized in that said bushing comprises a sealing collar of an elastic material, which can be sealingly fitted in the opening in the wall, and which is provided with at least one through channel for sealingly leading said cable therethrough, which sealing collar is electrically conductive and which is in contact with an electrically conductive cable shield of the cable in the operative condition of the bushing.



PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁶ : H02G 3/22, 3/08, H04B 15/00</p>	A1	<p>(11) International Publication Number: WO 99/45620</p> <p>(43) International Publication Date: 10 September 1999 (10.09.99)</p>
<p>(21) International Application Number: PCT/NL99/00084</p> <p>(22) International Filing Date: 17 February 1999 (17.02.99)</p> <p>(30) Priority Data: 1008522 6 March 1998 (06.03.98) NL</p> <p>(71) Applicant (for all designated States except US): BEELE ENGINEERING B.V. [NL/NL]; Beunkdijk 11, NL-7122 NZ Aalten (NL).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): BEELE, Johannes, Alfred [NL/NL]; Beunkdijk 11, NL-7122 NZ Aalten (NL).</p> <p>(74) Agents: HOOIVELD, Arjen, Jan, Winfried et al.; Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published With international search report. In English translation (filed in Dutch).</p>
<p>(54) Title: A BUSHING</p>		
<p>(57) Abstract</p> <p>A bushing for leading at least one cable through an opening in a wall or the like whilst providing protection against electromagnetic overtension and/or interference, characterized in that said bushing comprises a sealing collar of an elastic material, which can be sealingly fitted in the opening in the wall, and which is provided with at least one through channel for sealingly leading said cable therethrough, which sealing collar is electrically conductive and which is in contact with an electrically conductive cable shield of the cable in the operative condition of the bushing.</p>		

A BUSHING

- 5 The invention relates to a bushing for leading at least one cable through an opening in a wall or the like whilst providing protection against electromagnetic overvoltage and/or interference.
- 10 Such a bushing is known from Dutch patent application NL 173.226. This known bushing comprises an electrically conductive wall bushing and a protective circuit against overvoltage incorporated therein, which comprises at least two conduction components for each supply and
15 return cable core to be connected from outside, and which terminates in terminal connecting points for said cable cores. A cross partition connected to said wall bushing divides said components into two departments, wherein all components of the protective circuit and the
20 terminal contact points of the supply and return cable cores are placed on an electrically insulating circuit board. Said circuit board is fitted in the cavity of said wall bushing as a prefabricated insert unit, and fixed thereto together with said cross partition.
- 25 One drawback of the known bushing is that it is not chemically resistant, fire resistant, gastight and watertight. Another drawback of the known bushing is the fact that its construction is complicated and expensive.
- 30 Furthermore, this known bushing hardly offers a possibility to inspect the protective circuit in the mounted condition of the bushing.
- The objective of the invention is to provide a bushing
35 comprising a protection against electromagnetic overvoltage and/or interference, which is simple, inexpensive, chemically resistant, fire resistant, gastight and watertight, and whose protective device can

easily be inspected in mounted condition.

A bushing of the kind referred to in the introduction is according to the invention characterized in that said
5 bushing comprises a sealing collar of an elastic material, which can be sealingly fitted in the opening in the wall, and which is provided with at least one through channel for sealingly leading said cable therethrough, which sealing collar is electrically
10 conductive and which is in contact with an electrically conductive cable shield of the cable in the operative condition of the bushing. The term electrically conductive sealing collar which is used in this framework is understood to mean that the material of the
15 sealing collar is at least substantially electrically conductive, in particular in that additives have been added to the sealing material (preferably a resilient material such as rubber). Electrical conductivity has been realised by chemical means, therefore. Electrical
20 installations and machines, wherein generally highly sensitive components are used for control and registration purposes, are highly susceptible to interference caused by various external electromagnetic fields and impulses. Said external electromagnetic
25 fields and impulses may for example be generated by radar installations, thunderstorms, nuclear explosions and by electric/electronic equipment. In practice, steel constructions functioning as a Faraday cage are often placed round a space intended for electronic equipment
30 in order to minimise such interference. Nevertheless, there is still a chance that electric cables, which are led into such a shielded space, will conduct undesirable electromagnetic fields and impulses into said electronic equipment. As a rule, said conduction will take place
35 via the electrically conductive shielding ("braiding") of the bushed cables in question. According to the invention, said external, undesirable electromagnetic

fields and impulses will flow to earth along the electrically conductive shielding of a bushed cable, via the electrically conductive sealing collar. Thus, the occurrence of said interference in electronic equipment is prevented in a simple manner. Furthermore it has become apparent that the present bushing is also quite suitable for leading a cable through a steel deck or bulkhead of a ship.

10 It is noted that within the framework of the invention, the term "cable" as used herein is understood to include an electrically conductive conduit, tube, pipe or the like, for example a metallic tube or conduit, with which the present sealing collar is in electrically conductive contact in the operative condition.

In one embodiment of a bushing according to the invention, the sealing collar abuts at least partially against the electrically conductive cable shield of the cable in the operative condition of the bushing. This makes it possible to fit the sealing collar easily and firmly round the electrically conductive cable shield.

In another embodiment of a bushing according to the invention, said sealing collar is made of (massive) rubber, to which carbon particles in the form of soot ("carbon black") have been added. Preferably, said rubber is EPDM rubber, with the carbon particles in particular having a concave, dish-like shape, preferably being of the type "Ketjenblack" EC 300J or 600JD™. These types of soot, which are known under the trade name "Ketjenblack", have a unique morphology in comparison with conventional types of soot, which makes them uniquely suitable for the present electrically conductive application. The letters EPDM stand for Ethylene/Propylene/Diene/Monomer.

In another embodiment of a bushing according to the invention, said sealing collar is provided with circular internal and external ribs, which external ribs have a diameter which is larger than the inside diameter of the opening in the wall, and wherein the inside diameter of the internal ribs is at least at the most substantially the same as the outside diameter of the cable. Thus, a reliable seal is realised between the sealing collar and the wall opening on the one hand and between the sealing collar and the cable on the other hand.

In another embodiment of a bushing according to the invention, the rear flanks, seen in the direction of insertion, of the outer serrated ribs extend in radial direction, and the inner ribs are provided in pairs in the radial area of the outwardly extending tops of the outer serrated ribs. Preferably, the inner ribs, seen in the direction of an axial longitudinal section, are trapezoidal. Thus, an optimum sealing effect is realised, wherein the serrated ribs are slightly compressed against the wall opening.

In another embodiment of a bushing according to the invention, the sealing collar is made in one piece.

In another embodiment of a bushing according to the invention, the sealing collar comprises two shell parts, whose abutting boundary surfaces extend at least substantially in axial direction. In the operative condition, a pressure is thereby generated on the axial boundary surfaces, such that a reliable seal is formed between said two boundary surfaces.

The invention furthermore relates to a method for manufacturing a bushing according to the invention, wherein said sealing collar is made of an electrically conductive rubber by incorporating concave, dish-like

carbon particles into the rubber by means of a vulcanizing process. The rubber is in particular EPDM rubber, whilst the carbon particles are preferably of the type "Ketjenblack" EC 300J or 600JD™.

5

The invention will be explained in more detail hereafter with reference to figures illustrated in a drawing of a preferred embodiment of the present invention, wherein:

- 10 Figure 1 is a schematic front view along line I - I in Figure 2 of a cable which is sealingly led through an opening in a wall by means of a sealing collar according to the invention, the present bushing;
Figure 2 is a view along line II - II in Figure 1; and
15 Figure 3 shows the cable of Figure 1 separately in perspective view.

Figure 1 shows a wall in which an opening is present, through which a cable 2 is led. The sealing of the wall
20 opening and the cable with a sealing collar according to the invention takes places as follows: a collar 5 consisting of two halves 3 and 4, which may be made of a hard resilient rubber material, is placed round cable 2 in surrounding relationship with respect thereto, as is
25 shown in dotted lines in Figure 1, and is subsequently inserted into the opening between walls 1 and cable 2 in the direction indicated by arrows p. The collar halves are formed with ridges 7 having a right-angled, triangular cross-section and with trapezoidal ridges on
30 the inside. Collar 5 is now driven into opening 6, for example by tapping on front 9 of flange 9 in several places on the circumference thereof. Ridges 7 are compressed by wall 1 thereby, as a result of which the respective ridges 8 opposite ridges 7 attempt to reduce
35 their diameter and press forcefully and sealingly down on the outside of cable 2. The compressive forces thus produced in the rubber also press the boundary surfaces

10 and 11, 12 and 13 sealingly together. The seal is now
gastight, due to the pressures being produced, and will
remain reliably in position as a result of the clamping
action of the rubber. The contact surfaces of the collar
5 and of the wall/cable may be moistened in situ with
water, or with another suitable lubricant, to that the
fitting of the bushing can take place more efficiently.

As is shown in Figure 1, sealing collar 5 abuts against
10 the electrically conductive cable shield 21 ("braiding")
of cable 1. To this end, cable 2 has been stripped in
situ of its metal shield and of its electrically
insulating shield. Sealing collar 5 is electrically
conductive, due to the incorporation of concave, dish-
15 like carbon particles of the type "Ketjenblack" EC 300J
or 600JD™ therein by means of a vulcanizing process, as
a result of which external, undesirable electromagnetic
fields and impulses flow to earth along the electrically
conductive shield of the bushed cable 2, via the
20 electrically conductive sealing collar 5.

Figure 3 is a perspective view of cable 2 comprising
"braiding" 21, an electrically insulating shield 22, as
well as a metal shield 23.

Annex to letter dated 8 March 2000 to the European Patent Office concerning international (PCT-) patent application no. PCT/NL99/00084 in the name of Beele Engineering B.V. - "A bushing"

5

AMENDED CLAIMS

- 10 1. A bushing for leading at least one cable (2) through an opening (6) in a wall (1) or the like whilst providing protection against electromagnetic overtension and/or interference, characterized in that said bushing comprises a sealing collar (5) of an elastic material, which can be sealingly fitted in the opening (6) in the wall (1), and which is
15 provided with at least one through channel for sealingly leading said cable (2) therethrough, which sealing collar (5) is made of an electrically conductive material formed by adding carbon particles to a resilient sealing material, and
20 which is in contact with an electrically conductive cable shield (21) of the cable (2) in the operative condition of the bushing.
- 25 2. A bushing according to claim 1, wherein said sealing collar (5) abuts at least partially against the electrically conductive cable shield (21) of the cable (2) in the operative condition of the bushing.
- 30 3. A bushing according to claim 1 or 2, wherein said sealing collar (5) is made of (massive) rubber, to which carbon particles in the form of soot ("carbon black") have been added.
- 35 4. A bushing according to claim 3, wherein said carbon particles have a concave, dish-like shape.
5. A bushing according to claim 3 or 4, wherein said

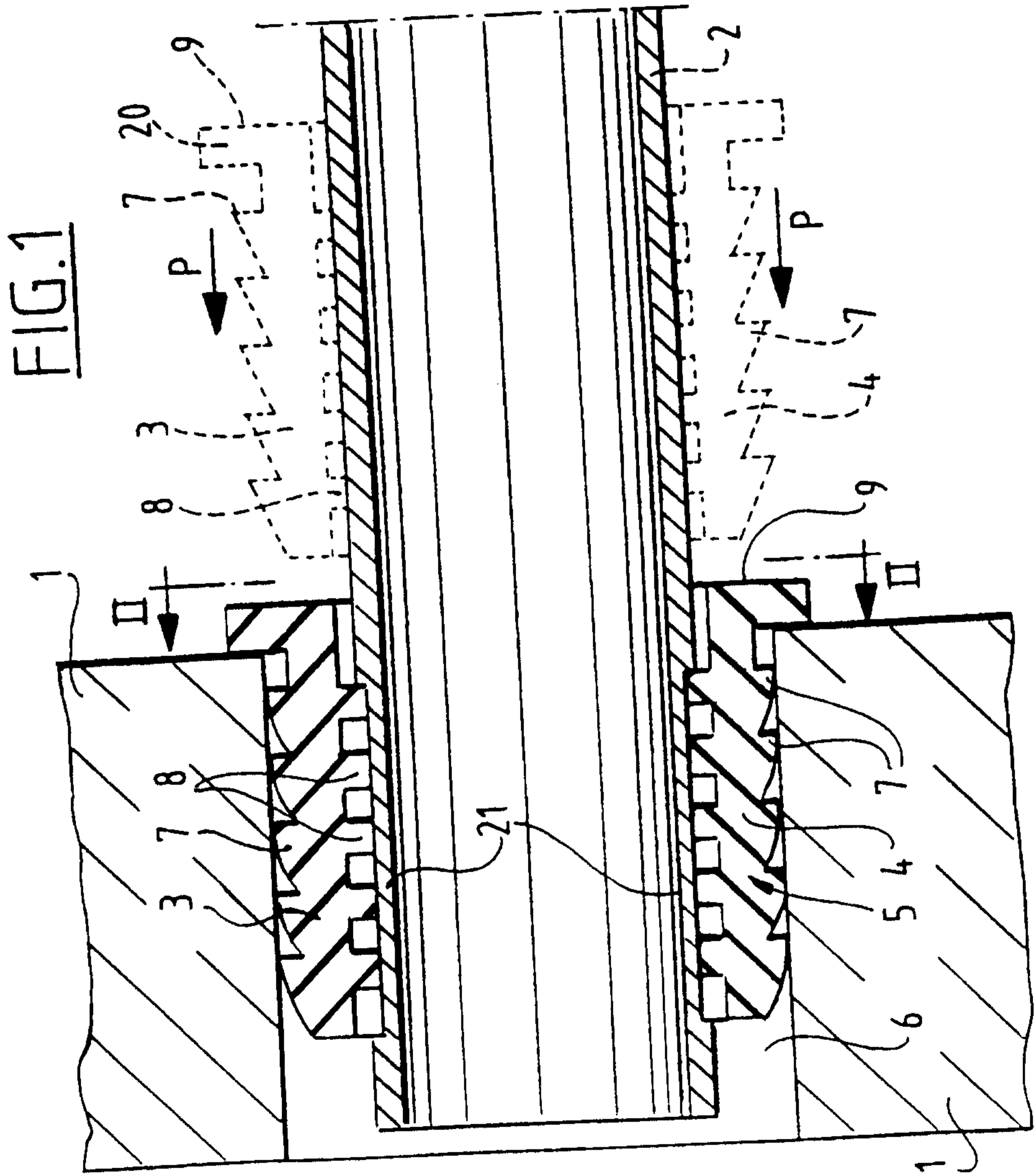
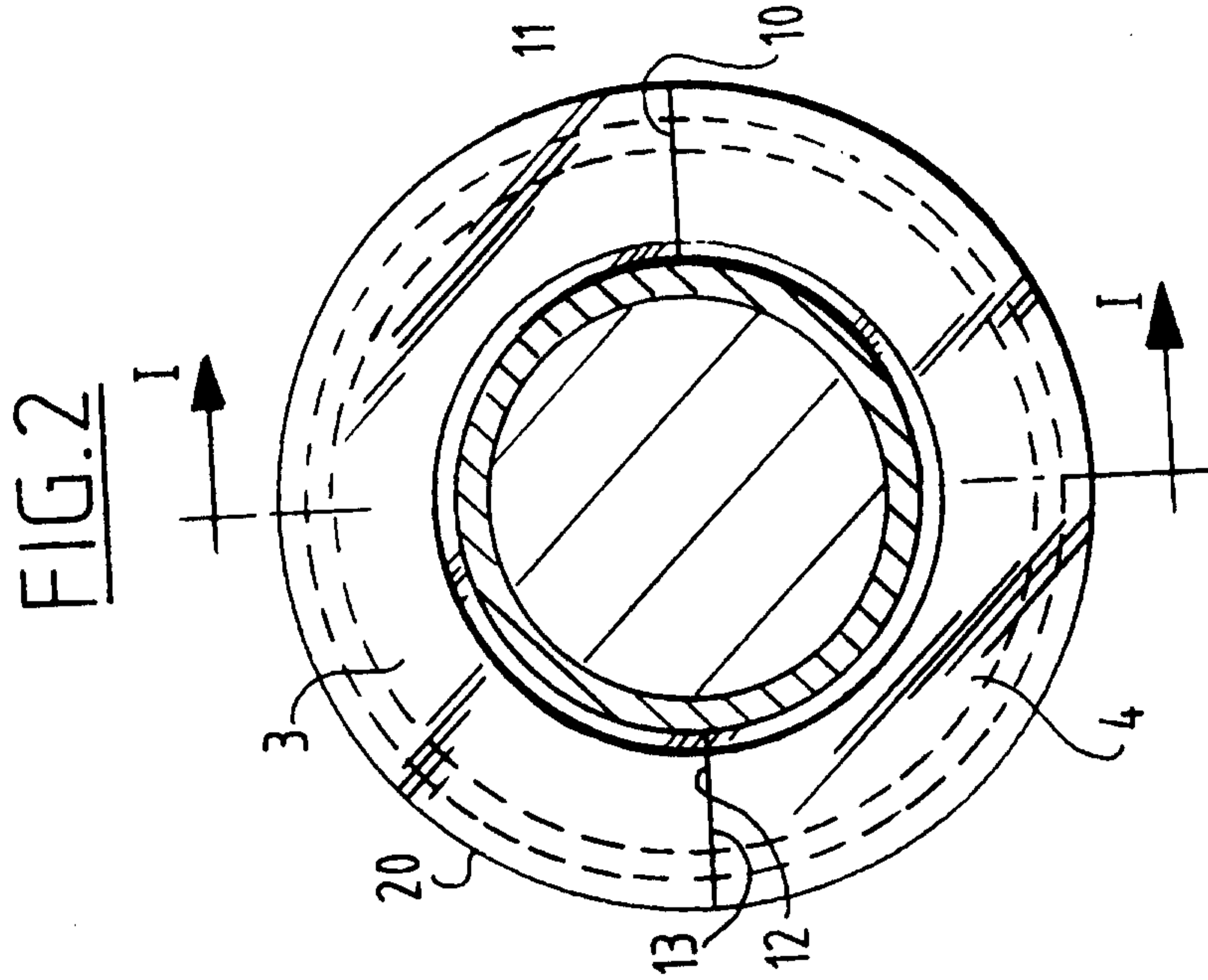
carbon particles are of the type "Ketjenblack" EC 300J or 600JD™.

- 5 6. A bushing according to claim 3, 4 or 5, wherein said rubber is EPDM rubber.
- 10 7. A bushing according to any one of the preceding claims 1 - 6, wherein said sealing collar (5) is provided with circular internal and external ribs (7,8), which external ribs (7) have a diameter which is larger than the inside diameter of the opening (6) in the wall (1), and wherein the inside diameter of the internal ribs (8) is at least at the most substantially the equal to the outside diameter of the cable (2).
- 15 8. A bushing according to any one of the preceding claims 1 - 7, wherein the rear flanks, seen in the direction of insertion, of the outer serrated ribs (7) extend in radial direction, and the inner ribs (8) are provided in pairs in the radial area of the outwardly extending tops of the outer serrated ribs (7).
- 20 9. A bushing according to claim 8, wherein preferably, the inner ribs (8), seen in the direction of an axial longitudinal section, are trapezoidal.
- 25 10. A bushing according to any one of the preceding claims 1 - 9, wherein said sealing collar (5) is made in one piece.
- 30 11. A bushing according to any one of the preceding claims 1 - 9, wherein the sealing collar (5) comprises two shell parts (3,4), whose abutting boundary surfaces extend at least substantially in axial direction.
- 35

12. A method for manufacturing a bushing according to any one of the preceding claims 1 - 11, wherein said sealing collar (5) is made of an electrically conductive rubber by incorporating concave, dish-like carbon particles into the rubber by means of a vulcanizing process.
- 5
13. A method according to claim 12, wherein said rubber is in particular EPDM rubber.
- 10
14. A method according to claim 12 or 13, wherein said carbon particles are of the type "Ketjenblack" EC 300J or 600JD™.

WO 99/45620

1 / 2



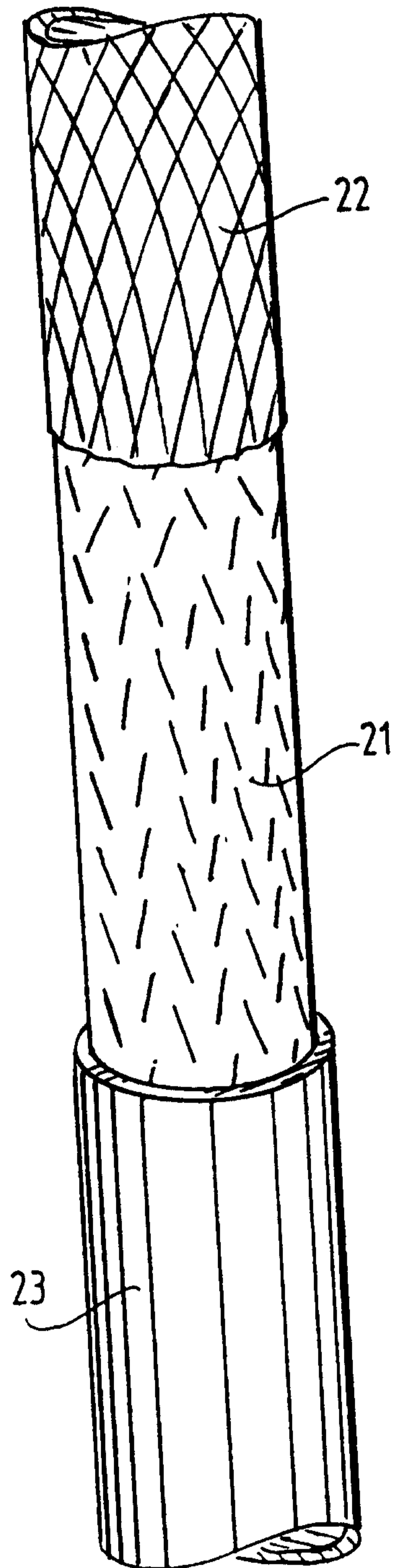


FIG. 3

