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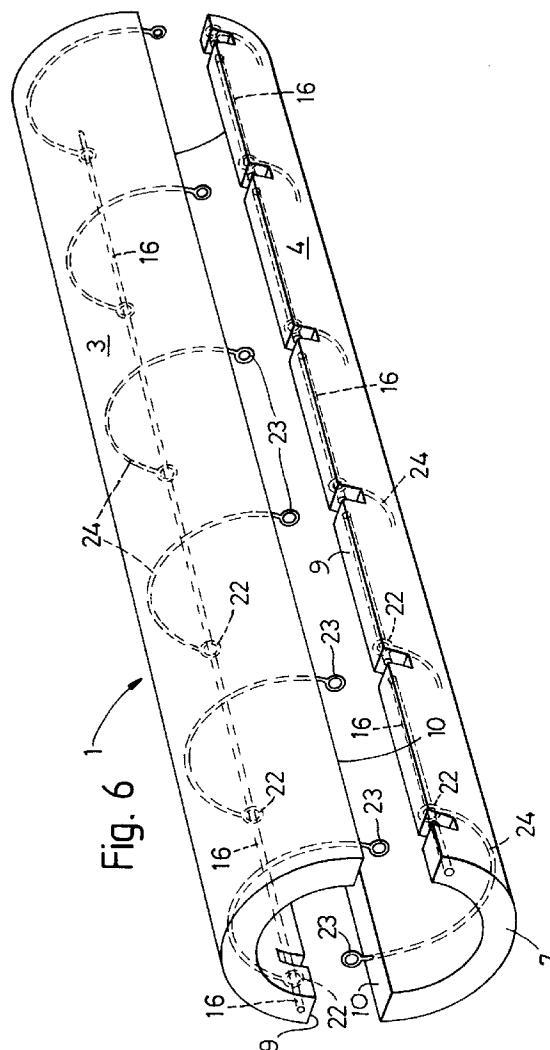
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(54) **Cable protection sleeve.**

(57) A protection sleeve (1) for securing on a cable (2), has a longitudinal axis and comprising a plurality of elongate parts (3, 4) each having an arcuate internal profile (5) and an arcuate external profile (6), and with inter-engageable or alignable formations (11, 13, 22, 23, 15, 16) provided adjacent each axially extending edge of each part (3, 4) and, when the parts are assembled together to define the sleeve, with a common, axially extending flexible fastener (17) located in the inter-engaged or aligned formations (11, 13, 22, 23, 15, 16) of adjacent edges (9, 10) of two parts (3, 4).



This invention relates to a protection sleeve for a cable, hawser, wire rope or the like (all hereinafter referred to generally as "cable(s)") for an area of a cable prone to wear - such as the area of a towing or mooring cable that passes over, and is intended to slide, along a ship's rail.

Known cable protection sleeves are of synthetic plastics material, notably polyurethane, but inevitably the protection sleeves themselves become worn or damaged and eventually require replacement.

In a first known construction it is necessary to drop the cable to wind it in, to remove a socket which frequently cannot be re-used but must be scrapped, to thread a new sleeve onto the cable, to attach a fresh socket and to wind the cable out. At sea, and depending on weather conditions, such operation can take up to 6 hours, while the cost of a new socket is several hundred pounds.

With a view to obviating the above procedures, split sleeves are known, cf GB 11434949, with the two sleeve halves secured together by bolts. Whilst this type of sleeve is much quicker to attach, the inevitable flexing of the sleeve which occurs, in use, frequently results in deformation of the bolts by which the two halves are secured together around the cable, resulting in substantial difficulties in removing such worn bolts when a worn or damaged sleeve of this kind needs replacing.

According to the present invention there is provided a protection sleeve for securing on a cable, the sleeve having a longitudinal axis and comprising a plurality of elongate parts each having an arcuate internal profile and an arcuate external profile, and with inter-engageable or alignable formations provided adjacent each axially extending edge of each part and, when the parts are assembled together to define the sleeve, with a common, axially extending flexible fastener located in the inter-engaged or aligned formations of adjacent edges of two parts.

The sleeve in accordance with the invention, by retaining the multi-part characteristic, enables sleeve fitting to be effected without the need for the cable to be wound in etc., while the use of flexible fasteners obviates the bolt deformation problem of prior art two-part sleeves. The arcuate internal periphery needs to be such that the sleeve is able to rotate about the cable around which it is located.

The formations may be axially extending holes, with or without axially apertured eyes. In detail, the holes and/or eyes are aligned and the fastener passed through. Another formation may comprise a slot in the edge(s) of one part, to receive an eye(s) projecting from an adjacent edge of another part, with axially extending holes emerging at the cheeks of the slot, so that the eye aperture and holes are alignable coaxially.

In one embodiment with holes but without eyes, at least one tongue on one part may be provided, to

engage a complementary groove on the other part such that, when engaged, the tongue(s) and groove(s) resist axial separation of the assembled parts. Each part of the body member may have one tongue and one groove. Alternatively, each part may have multiple tongues and grooves to provide a castellated effect so that the tongues and grooves interdigitate.

With a single tongue and a single groove, these formations may be provided at the mid-length of the parts. If so, they may extend axially for approximately one third of the length of the parts.

With the single tongue and single groove embodiment, at the side of the part provided with the groove the axial holes would extend from each terminal end of the part towards the mid-length of the part and terminate at the commencement of the groove, while at the side of the part provided with the tongue, the axial hole extends the length of the tongue.

In another embodiment, with both holes and eyes, the eyes may be provided at opposite ends of a strap, e.g. of carbon fibre, glass fibre etc., or a wire rope, which strap is conveniently moulded into the sleeve part during casting of the material e.g. polyurethane, of the sleeve part, with one (embedded) eye co-axial with the hole of one edge and with the other eye projecting from that edge, so that with a slot adjacent the embedded eye of axial length slightly exceeding that of the projecting eye, the latter is accommodated in the receiving slot, when the parts forming the sleeve are assembled, for the two adjacent eyes to be co-axial for the passage of the common flexible fastener.

Such eyes may be provided only adjacent the ends of the sleeve. Alternatively, they may be provided as regularly or irregularly spaced intervals e.g. 150 mm along a 2m long sleeve. The provision of eyes, and hence a banding effect at least adjacent the sleeve ends, resists any tendency for the sleeve end to become opened or splayed by the action of the cable being protected with the cable then possibly jamming in a splayed end.

As an alternative to eyes at opposite ends of an embedded band or rope, a band clamping effect can similarly be attained at or adjacent the sleeve ends by applying an external band clamp of some suitable form. Again such clamps can consist of one, or several windings of a wire rope, with the ends secured by a suitable tensioning connector. Alternatively, a spring steel hoop may be provided, e.g. in two parts with suitable fastening means. It is desirable for any external band clamp not to stand proud, but to be housed in a peripheral recess or groove, so as not to interfere with the rolling action of the sleeve about the cable, or to become worn or damaged itself by such rolling action.

The parts may be two in number, in which case each would be hemispherical or "C"-shaped in cross-section, extending over 180°, with flat radial end faces

butted together in a common diametral plane when the two parts are assembled. Alternatively, the parts may be three or four in number extending over 120° or 90°, respectively.

The sleeve may be produced in any suitable wear or abrasion resistant material, typically polyurethane. With the latter material, the individual sleeve parts may be produced by casting (either gravity or pressure casting) into suitably profiled moulds.

Conveniently, each flexible fastener may be constituted by a wire rope or a polyurethane rod of external diameter approximating to the diameter of the aligned holes and the apertures of any eyes. To fit such ropes or rods a small diameter "pull-through" tool slightly exceeding the length of the sleeve, may be passed through the aligned holes and any eyes and when the tool end emerges from the far end of the sleeve, a leading end of the rope or rod may be attached and be pulled through the aligned holes and any eyes until a collar at the other end of the rope or rod abuts the end of the sleeve. The tool can then be disconnected and a similar collar applied to the exposed, leading end of the rope or rod which has just emerged from the sleeve. The flexible fastener could also take the form of a chain, for instance a round link chain

The invention will now be described in greater detail, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is an exploded, perspective view of a first embodiment of cable protection sleeve in accordance with the invention, with the cable omitted for clarity;

Figure 2 is an end elevation of Figure 1;

Figure 3 is a side elevation of a second embodiment of sleeve;

Figure 4 is an end elevation of a third embodiment of sleeve;

Figure 5 is an end elevation of a fourth embodiment of sleeve;

Figure 6 is an exploded, perspective view of a fifth embodiment;

Figure 7 is an end view of one half of Figure 6;

Figure 8 is an enlarged sectional view of a portion of Figure 6;

Figures 9 to 11 are respectively an end view, a plan view and a side view of an alternative; and Figure 12 is an end view of a hinged sleeve incorporating straps of Figures 9 to 11.

In all embodiments, like parts are accorded like reference numerals.

A multi-part sleeve 1, for protecting a cable 2, is formed in the embodiment of Figures 1 and 2, from two hemispherical, "C"-section halves 3, 4 each extending over 180° of polyurethane cast to shape in a suitable mould. Each half 3, 4 has an arcuate internal profile 5 and an arcuate external profile 6, and each half 3, 4 which terminate in end faces 7 located

in a common, diametral plane 8. Each half 3, 4 has flat radial end faces 9 and 10. On the end face 9 is formed a tongue 11, with end walls 12 while on the end face 10 is formed a complementary groove 13 with end walls 14, such that when the two halves are assembled together around the cable 2, the tongue of one half is a close fit within the groove of the other half, such that the walls 12 and 14 abut, so as to resist axial separation of the two halves. Adjacent each end face 10, 9 is formed an axially extending hole 15, extending from the terminal end faces 7 to the groove walls 14. At the other side, an axially extending hole 16 is formed along the tongue 11. When the two hemispherical halves 3, 4 are assembled together around a cable 2, the holes 15, 16 become co-axial. At this stage a simple tool, consisting basically of an elongate rod slightly exceeding the length of the sleeve, and with a pull handle at one end, is threaded through the co-axial holes 15, 16, until the end of the wire remote from its handle emerges at the far end of the sleeve 1. To that end is attached, by any convenient means, one end of a flexible fastener 17 which could be of wire rope, but which preferably is synthetic plastics, e.g. polyurethane with bonded metallic end pieces (not shown) having tapped holes to receive securing bolts. As an alternative to bolts, the end pieces may have screw threaded spigots projecting beyond the end faces 7 of the sleeve 1, onto which spigots are screwed a first stop collar 18 (Figure 3). The rod is then pulled from the sleeve, and simultaneously the fastener 17 is pulled along the aligned holes 15, 16, the leading end of the wire rope eventually emerging from the sleeve and being fitted with a further stop collar 19 before or after detachment of the fastener 17 from the pull-through tool. Obviously, this operation is repeated at the other side of the hemispherical halves 3, 4 to insert the second fastener 17 diametrically opposite the first, and hence to complete the attachment of the two halves 3 and 4 and to resist radial separation.

It will be appreciated that the flexing of the sleeve 1 about its longitudinal axis, which invariably occurs e.g. during marine towing or mooring operations, has no adverse effect on the flexible fasteners 17 which simply flex with the sleeve 1. Hence, when the sleeve 1 in accordance with the invention becomes worn or damaged to an extent that it needs replacing, the fasteners 17 present no obstruction in that after removal e.g. by bolt clippers, of one or other collar 18 or 19, the fasteners 17 can simply and quickly be pulled out of the sleeve. At the ends of the sleeve 1, a band clamping effect can be attained by providing a peripheral groove 20 to receive a band clamp in the form of a steel hoop 21 (or a plurality of wire etc. rope windings) such that the band clamp does not project from the arcuate surface 6, but is flush, or below, that surface.

The embodiment of Figure 3 illustrates the pos-

sibility of providing multiple tongues and grooves, three tongues 11 and three grooves 13 being illustrated.

In the embodiments of Figure 4 and 5 are illustrated the possibilities of constructing the sleeve 1 from three or four parts respectively, as may in some cases be more convenient than two parts, but requiring the insertion of three or four fasteners 17.

In the embodiment of Figures 6 to 8, eyes 22, 23 are provided at opposite ends of a strap 24 e.g. a wire rope, moulded into the sleeve halves 3, 4, during casting of the latter, with one embedded eye 22 co-axial with a longitudinally extending hole 15, 16, adjacent each edge of each hemispherical halves 3, 4, and with each other, projecting eye 23 projecting from its edge 3, 4 and locatable in a slot 25 open to the end faces 9 and 10 and extending a short distance therefrom, such that a projecting eye 23 of one half can be comfortably accommodated within the slot of the other half adjacent an embedded eye 22, so that the eyes 22, 23 and the associated holes 10 are co-axial to receive the fasteners 17 as with the embodiment of Figures 1 to 5.

Figures 9 to 11 show a sheet metal strap 24, e.g. of spring steel, with two eyes 22 at one side and one eye 23 at the other side.

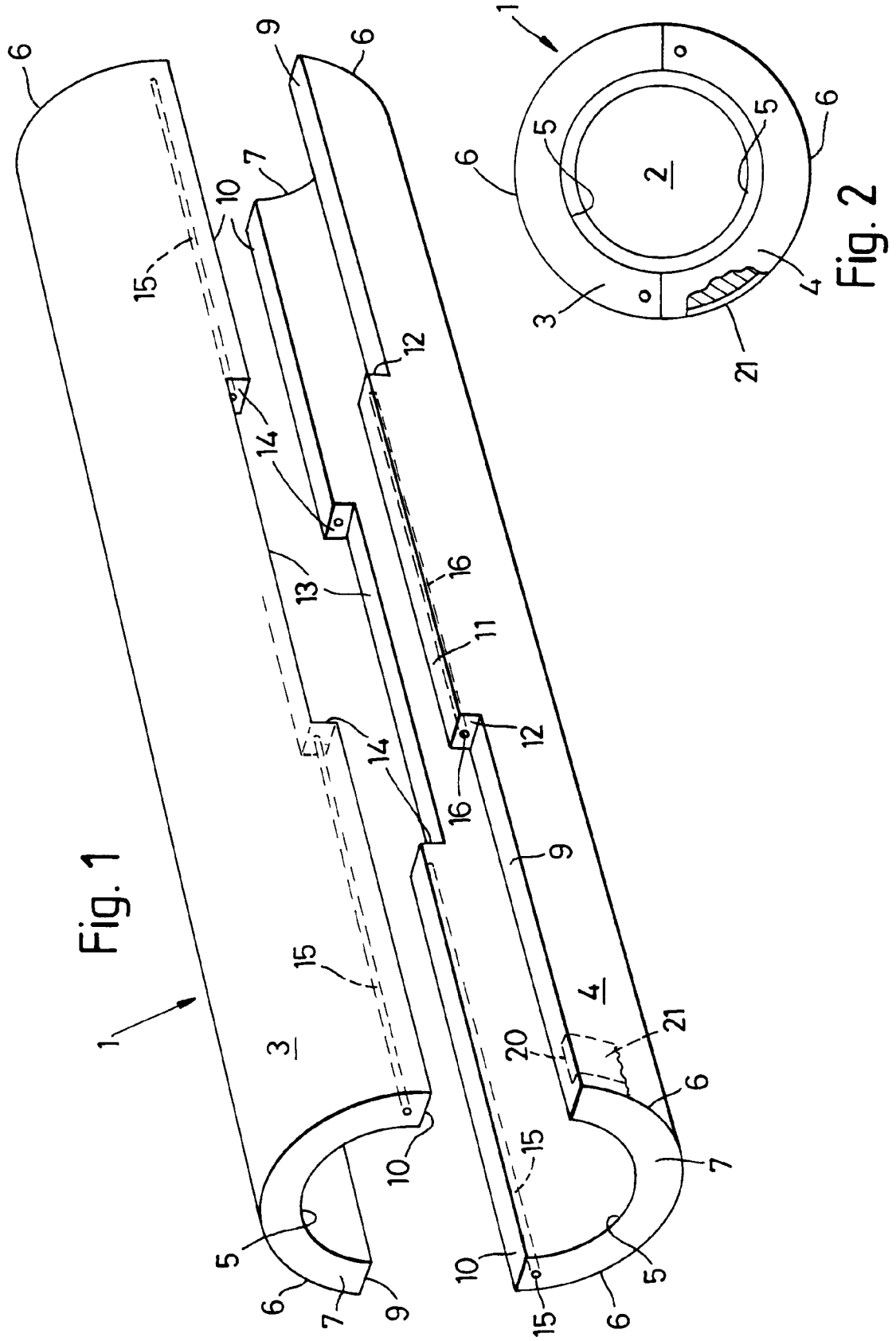
Figure 12 indicates the possibility of hinging the two halves 3, 4 permanently together at one side, so that, on site, it is only necessary to fit, or remove, one flexible fastener 17.

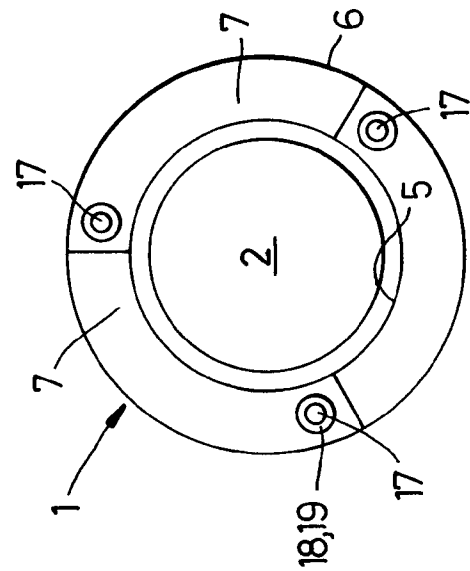
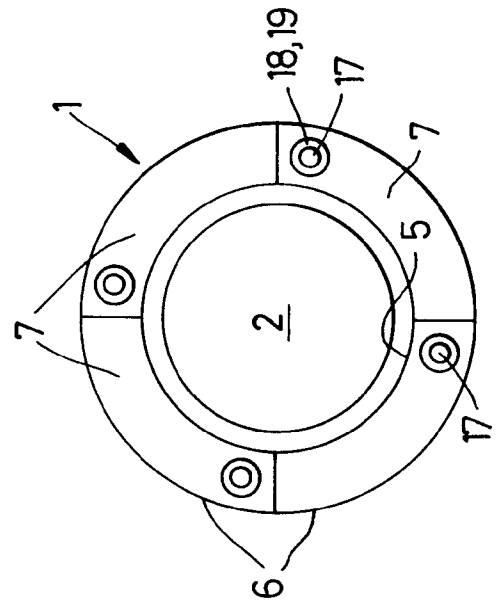
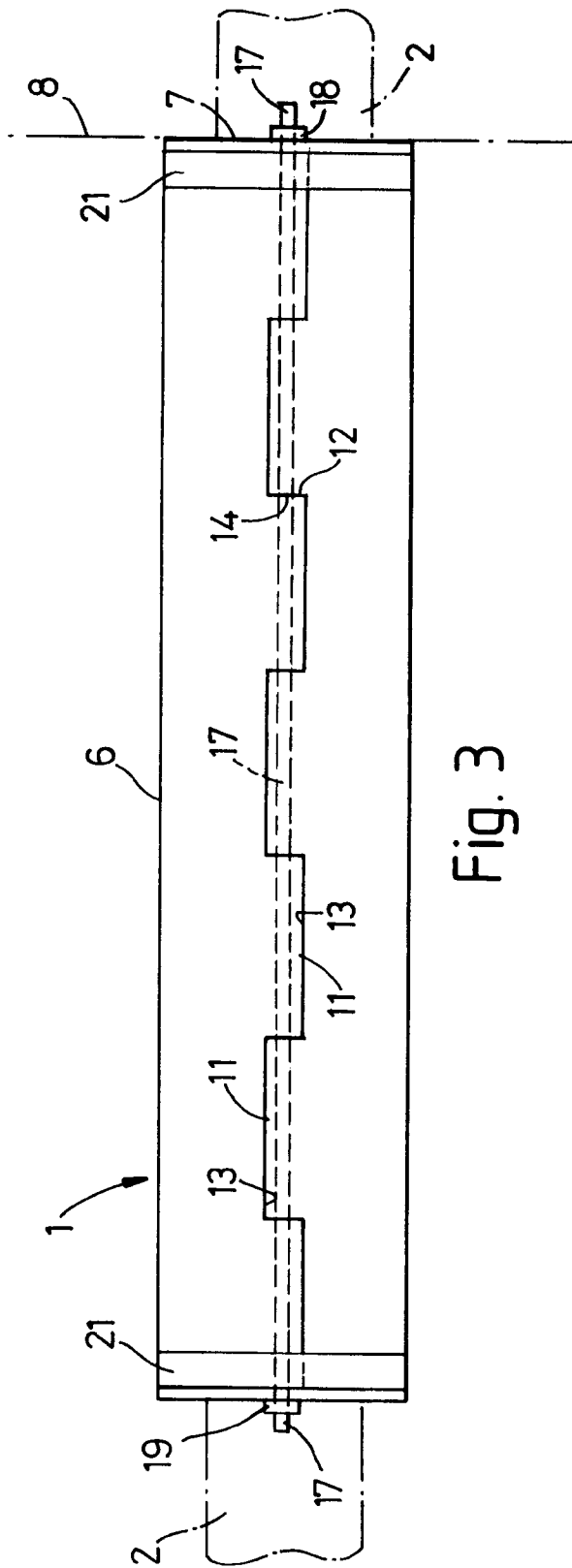
Claims

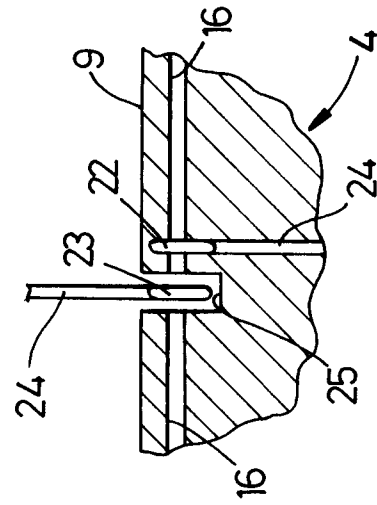
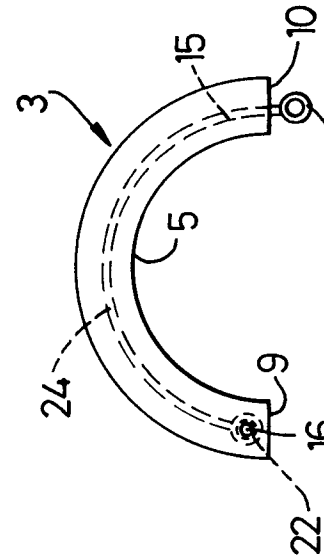
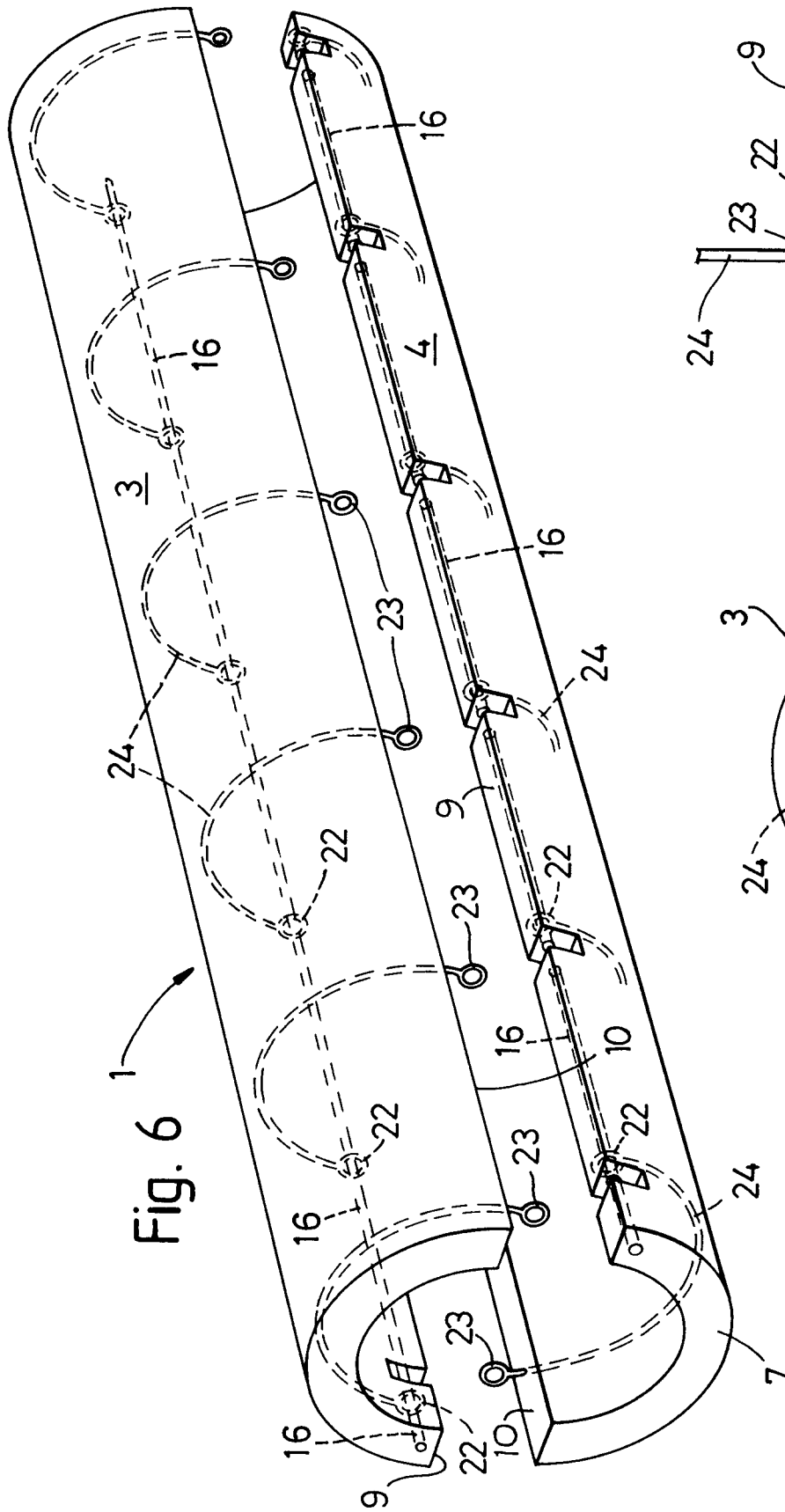
1. A protection sleeve (1) for securing on a cable (2), the sleeve (1) having a longitudinal axis and comprising a plurality of elongate parts (3, 4) each having an arcuate internal profile (5) and an arcuate external profile (6), characterised in that each part (3, 4) has inter-engageable or alignable formations (11, 13 or 16, 22, 23) provided adjacent each axially extending edge (9, 10) of each part (3, 4) and, when the parts (3, 4) are assembled together to define the sleeve (1), with a common, axially extending flexible fastener (17) located in the inter-engaged or aligned formations (11, 13 or 16, 22, 23) of adjacent edges (9, 10) of two parts (3, 4).
2. A sleeve as claimed in Claim 1, characterised in that the formations are axially extending holes (16).
3. A sleeve as claimed in Claim 2, characterised in that the holes (16) are provided with axially apertured eyes (22, 23).
4. A sleeve as claimed in Claim 1, characterised in

that the formations comprise a slot (25) in the edge(s) (9) of one part (4), to receive an eye (23) projecting from an adjacent edge (10) of another part (3), with axially extending holes (16) emerging at the cheeks of the slot (25), so that the eye (23) and holes (16) are alignable co-axially.

5. A sleeve as claimed in Claim 2, characterised in that at least one tongue (11) on one part (4) is provided, to engage a complementary groove (13) on the other part (3) such that, when engaged, the tongue(s) (11) and groove(s) (13) resist axial separation of the assembled parts (3, 4).
6. A sleeve as claimed in Claim 3, characterised in that the eyes (22, 23) are provided at opposite ends of a strap (24).
7. A sleeve as claimed in Claim 6, characterised in that the strap (24) is moulded into the sleeve part (3, 4) during casting thereof, with one (embedded) eye (23) co-axial with the hole (16) of one edge (9) and with the other eye (23) projecting from the edge (10), so that with a slot (25) adjacent the embedded eye (22) of axial length slightly exceeding that of a projecting eye (23), the latter is accommodated in the slot (25), when the parts (3, 4) forming the sleeve (1) are assembled, for the two adjacent eyes (22, 23) to be co-axial for the passage of the common flexible fastener (17).
8. A sleeve as claimed in Claim 6 or 7, characterised in that such eyes (22, 23) are provided only adjacent the ends (7) of the sleeve (1).
9. A sleeve as claimed in Claim 6 or 7, characterised in that the eyes (22, 23) are provided as regularly, or irregularly, spaced intervals e.g. 150 mm along a 2m long sleeve.
10. A sleeve as claimed in any preceding Claim, characterised in that the sleeve (1) is assembled from two parts (3, 4); three parts, or four parts.
11. A sleeve as claimed in any preceding Claim, characterised in that the parts (3, 4) are of synthetic plastics material, such as polyurethane.
12. A sleeve as claimed in any preceding Claim, characterised in that each flexible fastener (17) is constituted by a wire rope or a plastics rod, e.g. of polyurethane, of external diameter slightly less than the diameter of the aligned holes (16).







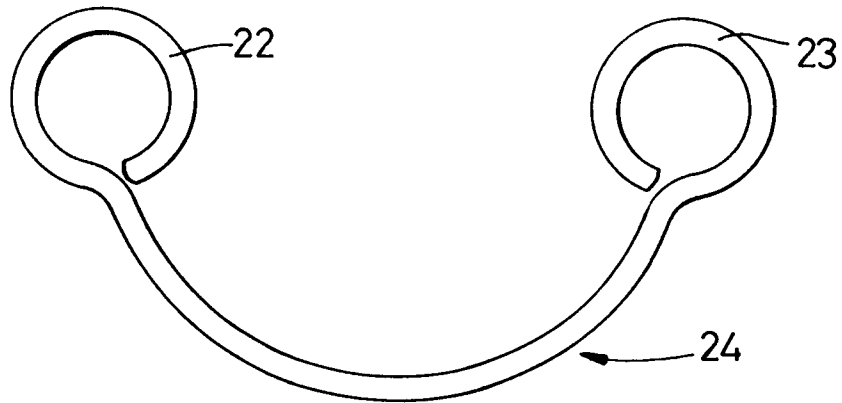


Fig. 9

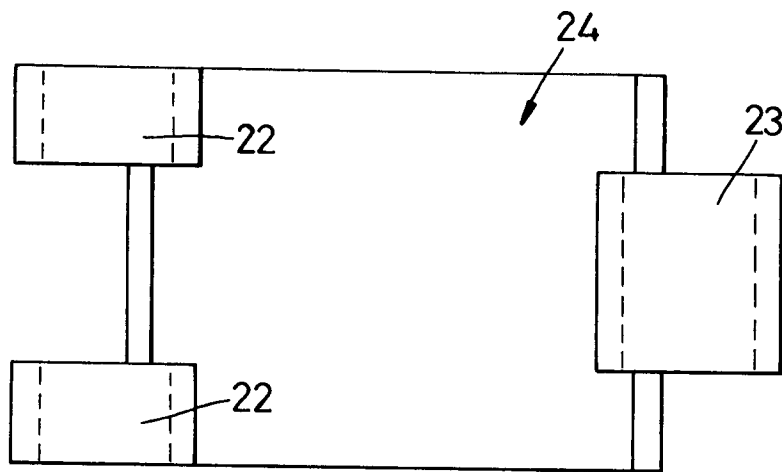


Fig. 10

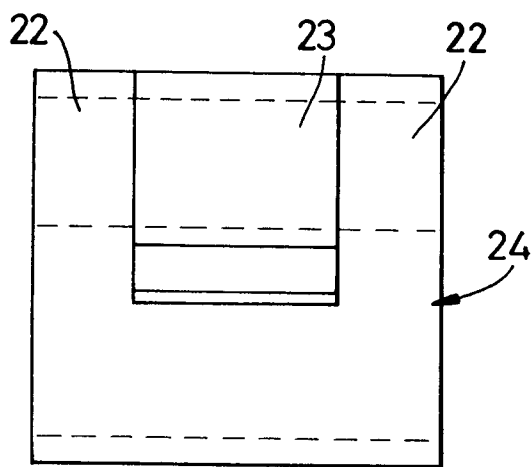


Fig. 11

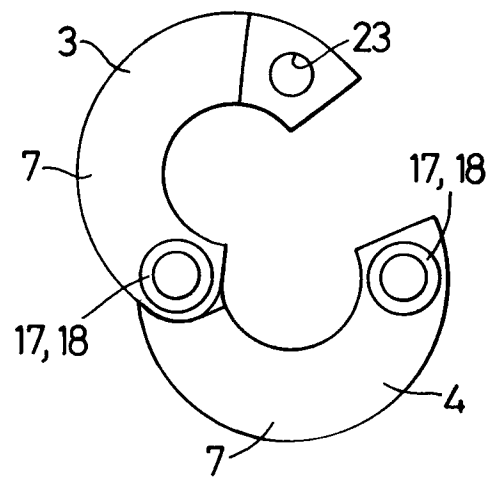


Fig. 12



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 30 0299

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
D, A	GB-A-1 434 949 (HALLAM POLYMERS & ENGINEERING LTD.) * page 2, line 4 - line 27 *	1, 10, 11	D07B1/00 B63B21/20
A	FR-A-1 482 629 (UNIROYAL LTD.) * page 2, column 2, line 4 - line 18 * * page 2, column 2, line 55 - line 60 * * page 3, column 1, line 24 - line 30 *	1, 2, 5, 11, 12	
A	GB-A-1 585 058 (PENK LTD.) * page 1, line 55 - line 78 * * page 1, line 92 - page 2, line 22 *	1, 4-8, 10, 11	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5) D07B B63B
Place of search THE HAGUE		Date of completion of the search 08 MAY 1992	Examiner GOODALL C. J.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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