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A CABLE-GUIDING SYSTEM AND A PROCESS FOR ITS PRODUCTION

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(56) Prior Art Documents
US 3666389
US 3498605
US 3240233

(57) Claim

1. A cable-guiding system with at least one thermoplastics cable-guiding tube which has a circular cross-section cable-guiding duct whose inner wall has parallel slide ribs, wherein said slide ribs extend in a wavy or serpentine manner in relation to, and in the direction of, the axis of said duct.

10. A method for the production of a cable-guiding system with at least one cable-guiding tube as claimed in any one of claims 1 to 9, wherein a thermoplastics material is thermoplasticised by means of an extruder, said plastics material tube being extruded by way of a subsequent extruding tool having an external tool and a mandrel forming said cable-guiding duct and being calibrated in an external calibrator, in which case said slide ribs are shaped by means of a rotating slide-rib-forming tool mounted in said mandrel, said tool rotating alternately in opposite directions and optionally at different speeds of rotation.

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COMPLETE SPECIFICATION

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TO BE COMPLETED BY APPLICANT

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Complete Specification for the invention entitled:

"A CABLE-GUIDING SYSTEM AND A PROCESS FOR ITS PRODUCTION"

The following statement is a full description of this invention, including the best method of performing it known to me:-

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The invention relates to a cable-guiding system having at least one thermoplastics cable-guiding tube which has a circular cross-section cable-guiding duct whose inner wall has parallel slide ribs. The invention also relates to a process for the production of such a system. The term "cable-guiding system" denotes, for example, discrete cable-guiding tubes (cf. DE 3 529 541) and tube units for guiding cables (cf. DE 3 217 401). The or each cable-guiding tube of the system receives discrete cables or bunches thereof which must be introduced into the tube by pushing or drawing.

In the known cable-guiding system which is the starting point of the invention and which is known from DE 3 529 541 the ribs have a constant direction as referred to the axis of, and in the direction of, the cable-guiding duct. They extend, for example, in a left or right helix over the whole length of the system. The ribs reduce considerably the frictional resistance opposing the introduction of a cable or cable bunch into such a system. This has proved satisfactory for many purposes and facilitates the drawing-in or pushing-in of the cables or bunches thereof. However, depending upon the nature of the cable or cable bunch, the interaction of a cable or cable bunch with the ribs may lead to twisting forces acting on the cable or cable bunch and causing a disturbing and very retarding twisting of the cable or cable bunch.

The present invention seeks to provide a cable-guiding system of the kind described which is so devised that disturbing twisting forces cannot act on a cable or cable bunch which it is required to push or draw into the tube. The invention further seeks to provide a process for the production of such systems.

According to a first aspect of the invention, therefore, there is provided a cable-guiding system with at least one thermoplastics cable-guiding tube which has a circular cross-section cable-guiding duct whose inner wall has parallel slide ribs, wherein said slide ribs extend in a wavy or serpentine manner in relation to, and in the direction of, the axis of said duct.

A surprising feature of the construction of the system described is that disturbing twisting forces do not act on a cable or cable bunch which it is required

to draw or push into the tube. Forces resulting from the frictional interaction between a cable or cable bunch and the ribs either prevent disturbing twisting of the cable or cable bunch from arising or cause such twistings to cancel one another out, depending upon design.

Various possibilities for further development and construction fall under the invention. In a preferred and particularly significant embodiment, the ribs have zones which are consecutive lengthwise of the cable-guiding system and which have helical parts extending in helically opposite directions to one another, and such zones are interconnected by transition zones having continuous ribs.

With regard to interaction with a cable or cable bunch to be introduced into the tube by drawing or pushing, the ribs can be devised or disposed to inhibit twisting. This occurs, for example, when the rib zones and the transition zones are all of the same length and have ribs in the same manner except that the same change their direction from zone to zone in the manner described.

According to another preferred embodiment of the invention, the ribs extend undulatingly.

The invention provides various possibilities for further development and construction. For example, the ribs can be in cross-section triangular or arcuate. Conveniently, the ribs have a height corresponding to a small proportion of the wall thickness of the cable-guiding tube. Conveniently, the ribs have a width at their base which is a small proportion of the wall thickness of the cable-guiding tube. Conveniently too, grooves are present between the ribs and are negatives thereof.

According to the invention, the ribs can be formed seamlessly from the plastics of the cable-guiding tube. Alternatively, the ribs can be placed on the duct inner wall and welded integrally thereto. Another possibility in this embodiment is for the ribs to be devised from a plastics material having more surface slip than the thermoplastics of the cable-guiding tube.

In accordance with a further aspect of the present invention, therefore, there is also provided a method for the production of a cable-guiding system with

at least one cable-guiding tube of the type referred to earlier, wherein a thermoplastics material is thermoplasticised by means of an extruder, said plastics material tube being extruded by way of a subsequent extruding tool having an external tool and a mandrel forming said cable-guiding duct and being calibrated in an external calibrator, in which case said slide ribs are shaped by means of a rotating slide-rib-forming tool mounted in said mandrel, said tool rotating alternately in opposite directions and optionally at different speeds of rotation.

A rib-forming tool which is a displacing tool and not a chip-forming tool can be used. The meaning here is that the still very soft material does not peel off before the tool. However, a rib-forming tool enabling thermoplasticised plastics to be placed integrally on - i.e., welded to - the duct inner wall to form ribs can be used.

In order that the invention may be more clearly understood and put into practical effect there shall now be described in detail preferred constructions of a cable-guiding system in accordance with the invention. The description is given by way of non-limitative example only and is with reference to the accompanying drawings, wherein:

Fig. 1 is a partial view in side elevation and with parts broken away of a cable-guiding system according to the invention;

Fig. 2 shows another embodiment of the subject of Fig. 1 looking in the direction of an arrow A thereof;

Fig. 3 is a view to an enlarged scale of the area B of Fig. 2;

Fig. 4 is a developed partial view of a cable-guiding tube of a system according to the invention;

Fig. 5 is a view similar to Fig. 4 of another embodiment of a system according to the invention, and

Fig. 6 shows another embodiment of the feature shown in Fig. 3.

A cable-guiding system shown in Figs. 1 to 6 comprises at least one thermoplastics cable-guiding tube 1 having a circular cross-section cable-guiding duct and a duct inner wall 2 having parallel ribs 3. In Fig. 1 the tube 2 is

fragmented on the right and left. In Fig. 2 there can be seen lugs 4 enabling other cable-guiding tubes (not shown) to be connected to the tube 1 to form a cable-guiding system according to the invention in the form of a cable-guiding tube unit. Figs. 4 and 5 show developed views of a cable-guiding tube to a different scale from the scale used in Figs. 1 to 3 and Fig. 6, the ribs 3 having been moved apart from one another for the sake of clarification. Figs. 4 and 5 show only the slide rib combs.

As a comparison between, on the one hand, Fig. 1, and on the other hand, Figs. 4 and 5 will show, the ribs extend in alternate directions as referred to the axis of, and in the direction of, the cable-guiding duct. Also, the ribs 3 can have a pitch differing in different parts in the direction of such axis. Fig. 1 does not show how the ribs 3 extend at changes of direction. Figs. 4 and 5 make this feature apparent. Changes in the direction of the ribs 3 are associated with continuous transitions 5.

As can be gathered more particularly from Fig. 4, the ribs 3 have helical zones 6 whose helixes extend in opposite directions to one another, the zones 6 being interconnected by transitions 5. The ribs 3 are devised to inhibit torsion as regards interaction with a cable or cable bunch to be drawn or pushed into the tube. To this end, the zones 6 are of equal length and except for the difference in direction are identical in shape, direction and number to the ribs 3.

The ribs 3 of the embodiment of Fig. 5 extend undulatingly.

As a comparison between Figs. 3 and 6 will show, the ribs 3 are in cross-section triangular or arcuate. The ribs 3 have a height which is a small proportion of the wall thickness of the tube 1. Also, the ribs 3 of the embodiment have a width which, measured at the rib base, is also only a small proportion of the latter wall thickness. In Fig. 3 grooves 7 are disposed between the ribs 3 and are, as it were, negatives thereof. In the embodiment shown in Figs. 1 to 3 the ribs 3 are shaped seamlessly from the plastics material of the tube. In the embodiment of Fig. 6 the ribs 3 are placed on the duct inner wall 2 and welded unitarily thereto. Different plastics materials can be used; more particularly the ribs 3 can be made

of a plastics material having more surface slip than the thermoplastics material used for the tube 1. The embodiments of Figs. 4 and 5 can be contrived with both seamlessly formed and placed-on keys. The grooves 7 between the ribs 3 can be rounded or of trapezoidal cross-section to obviate or reduce notch stressing. Parts in which the ribs 3 extend parallel to the duct axis can alternate with parts which extend relatively arcuately.

The claims defining the invention are as follows:

1. A cable-guiding system with at least one thermoplastics cable-guiding tube which has a circular cross-section cable-guiding duct whose inner wall has parallel slide ribs, wherein said slide ribs extend in a wavy or serpentine manner in relation to, and in the direction of, the axis of said duct.

2. The system as claimed in claim 1, wherein with regard to interaction with a cable or cable bunch to be introduced into said tube by drawing or pushing, said ribs are devised or disposed to inhibit twisting.

3. The system as claimed in claim 1 or claim 2, wherein said slide ribs are triangular or arcuate in cross-section.

4. The system as claimed in any one of claims 1 to 3, wherein said slide ribs have a height corresponding to a small proportion of the wall thickness of said cable-guiding tube.

5. The system as claimed in any one of claims 1 to 4, wherein said slide ribs have a width at their base which is a small proportion of the wall thickness of said cable-guiding tube.

6. The system as claimed in any one of claims 1 to 5, wherein grooves are present between said slide ribs and are inversions of said slide ribs.

7. The system as claimed in any one of claims 1 to 6, wherein said slide ribs are moulded without seams from the plastics material of said cable-guiding tube.

8. The system as claimed in any one of claims 1 to 6, characterised in that said slide ribs are placed on the inner wall of said duct and welded integrally thereto.

9. The system as claimed in claim 8, wherein said slide ribs are made of a plastics material having more surface slip than the thermoplastics material of said cable-guiding tube.

10. A method for the production of a cable-guiding system with at least one cable-guiding tube as claimed in any one of claims 1 to 9, wherein a thermoplastics material is thermoplasticised by means of an extruder, said plastics material tube being extruded by way of a subsequent extruding tool having an external tool and

a mandrel forming said cable-guiding duct and being calibrated in an external calibrator, in which case said slide ribs are shaped by means of a rotating slide-rib-forming tool mounted in said mandrel, said tool rotating alternately in opposite directions and optionally at different speeds of rotation.

11. The method as claimed in claim 10, wherein said tool rotates alternately in opposite directions and at different speeds of rotation.

12. The method as claimed in claim 10 or claim 11, wherein a slide-rib-forming tool is used which is a displacing tool without chip-formation (as hereinbefore defined).

13. The method as claimed in claim 10 or claim 11, wherein a slide-rib-forming tool is used with which thermo-plasticised plastics material is placed integrally on said duct inner wall to form slide ribs.

14. A cable-guiding system as claimed in claim 1, substantially as described herein with reference to the accompanying drawings.

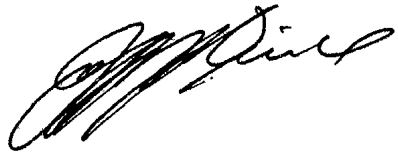
15. A method for the production of a cable-guiding system, as claimed in claim 10, substantially as described herein with reference to the accompanying drawings.

DATED this 8th day of November 1993.

DIPL.-ING. DR. ERNST VOGELSANG GMBH & CO.KG

By their Patent Attorneys:

CALLINAN LAWRIE



ABSTRACT

A cable-guiding system having at least one thermoplastics material cable-guiding tube (1) which has a circular cross-section cable-guiding duct whose inner wall (2) has parallel keys (3). The keys (3) extend in alternate directions as referred to, and in the direction of, the axis of the duct. A process for production of such a system is also disclosed.

Fig.1

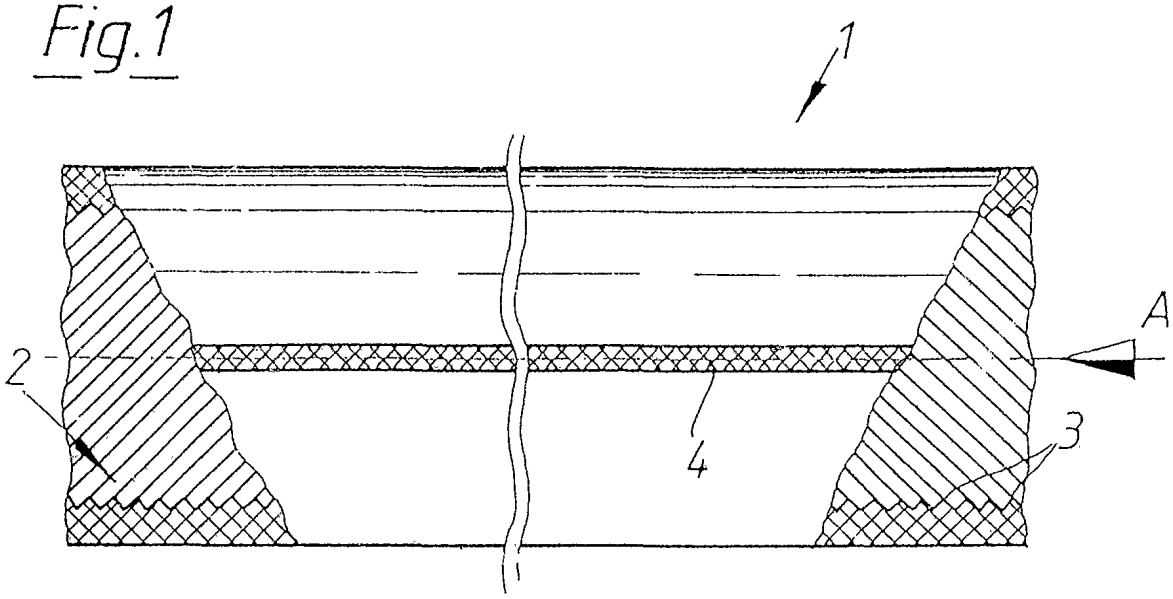


Fig.2

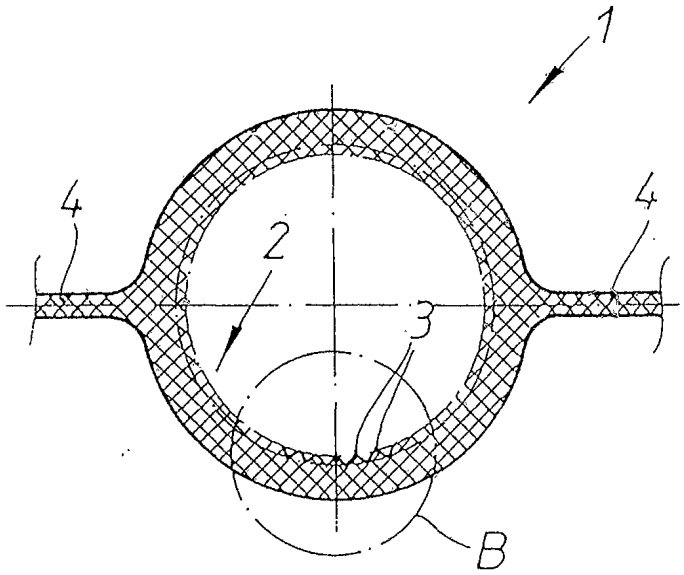


Fig.3

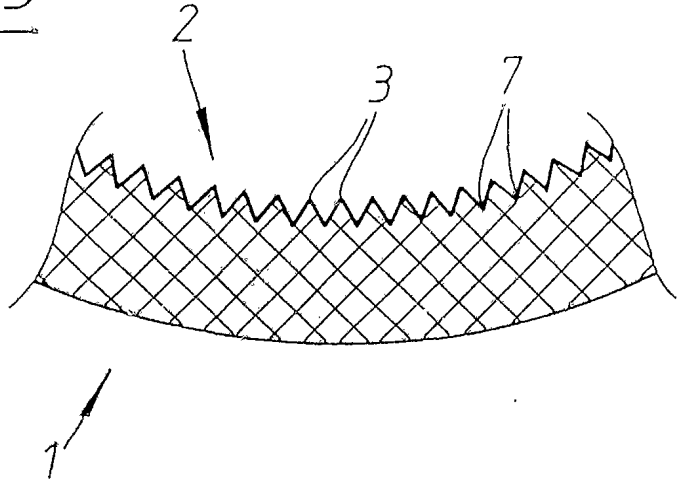


Fig. 4

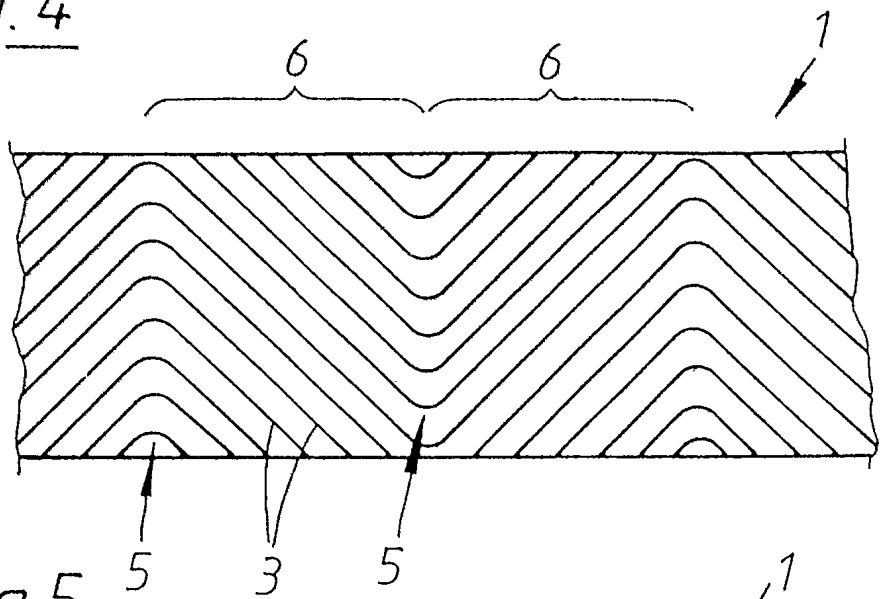


Fig. 5

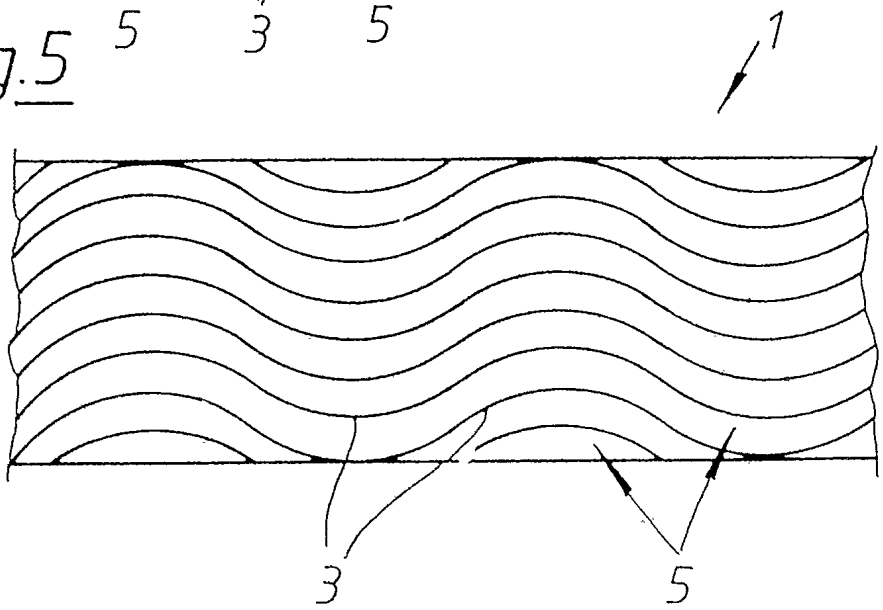


Fig. 6