

[54] **METHOD AND DEVICE FOR MANUFACTURING A FLAT CABLE AS WELL AS A CABLE ACQUIRED BY MEANS OF THE SAME**

117 FF, 36, 96, 97, 98; 425/113

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174/117 F

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[58] **Field of Search**..... 29/624, 203 C, 202.5;
156/270, 51, 52, 55, 47; 83/5; 174/117 F,

[56]

References Cited

UNITED STATES PATENTS

3,487,538	1/1970	Kakizaki	65/59 UX
3,663,739	5/1972	Chevrier	174/117 F X

FOREIGN PATENTS OR APPLICATIONS

2,016,730	4/1970	Germany	174/117 F
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[57]

ABSTRACT

A method for manufacturing a flat cable comprising a grooved tape-like body which is guided along a curved surface such that the grooves are lying on the convex side; a conductor is fed into each groove under some tension and a strip is applied to the grooved face of the tape.

2 Claims, 9 Drawing Figures

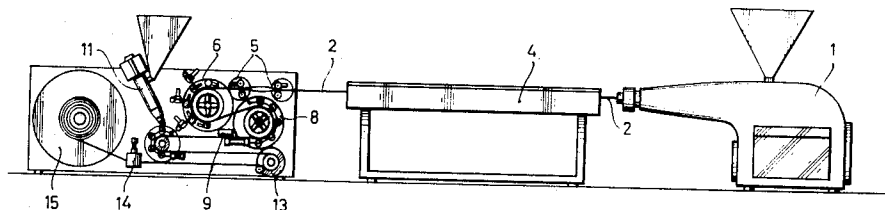


Fig. 1.

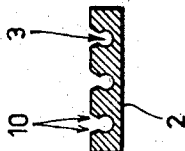
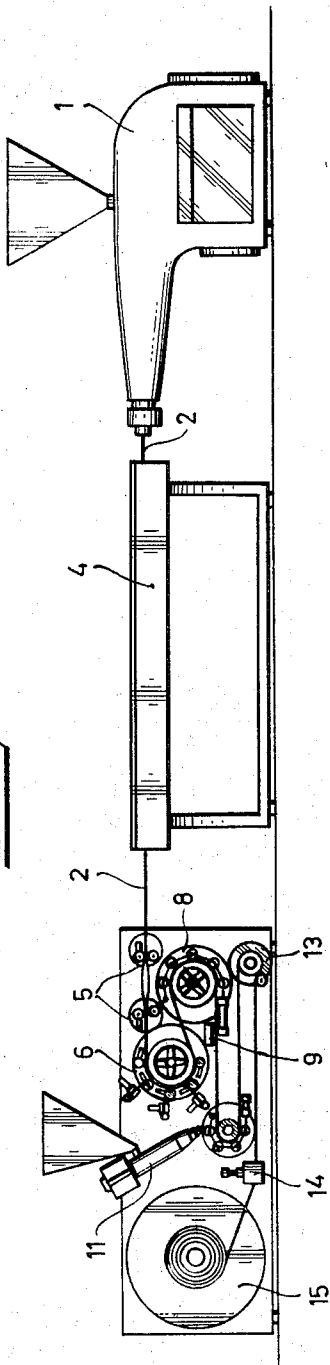


Fig. 2a.

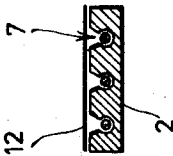
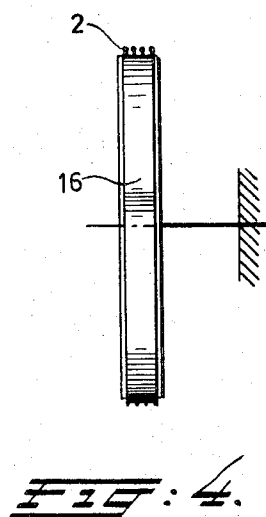
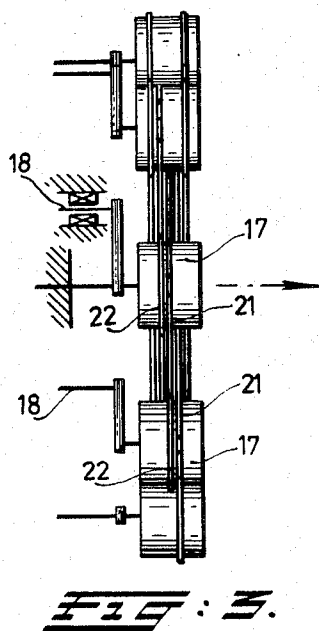
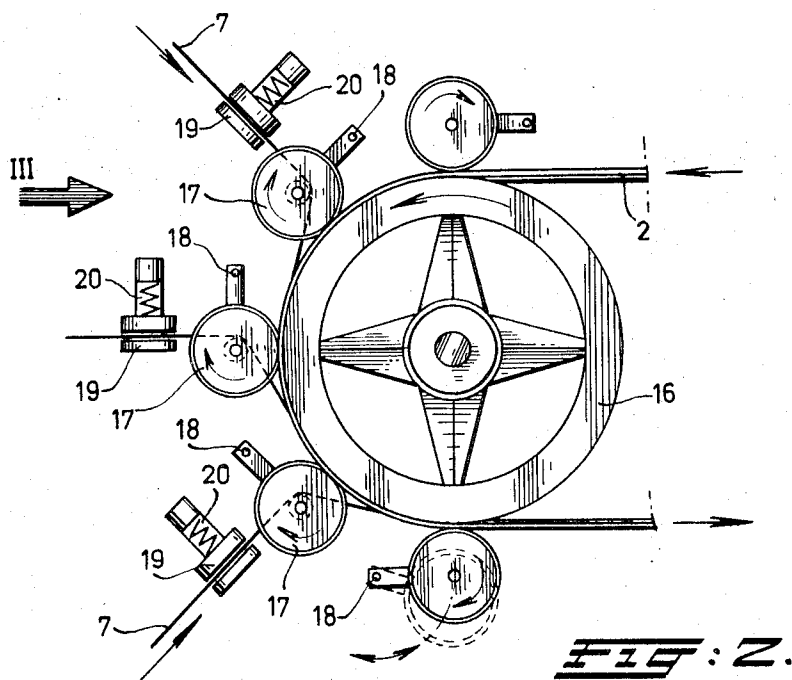
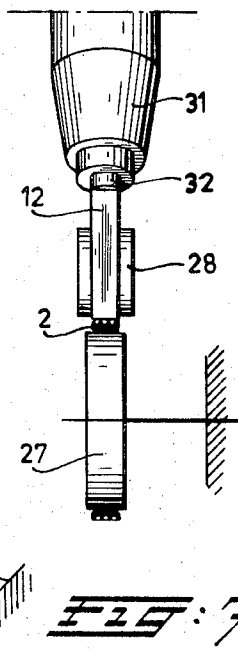
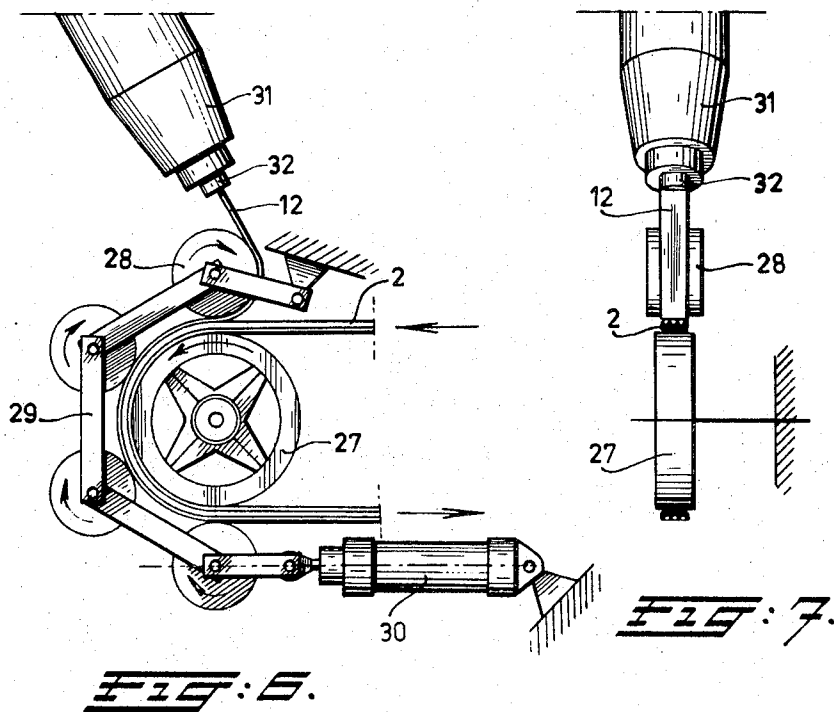
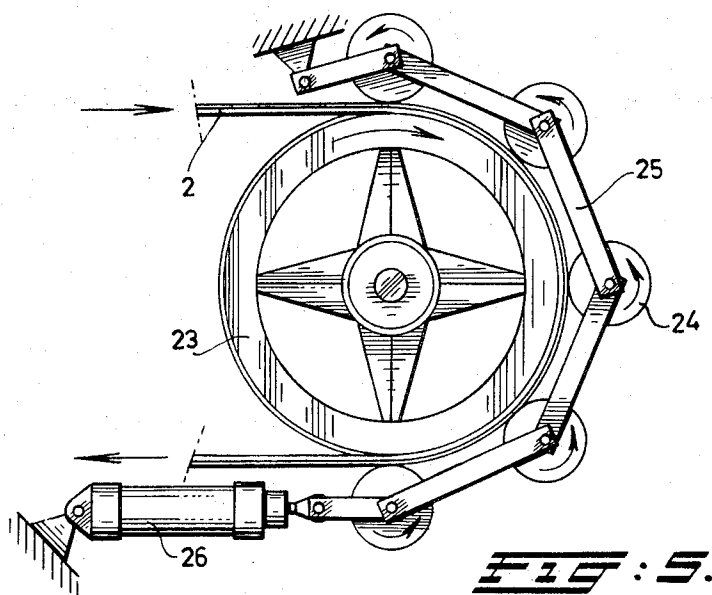


Fig. 2b.





METHOD AND DEVICE FOR MANUFACTURING A FLAT CABLE AS WELL AS A CABLE ACQUIRED BY MEANS OF THE SAME

BACKGROUND OF THE INVENTION

The invention relates to a method for manufacturing a so-called flat cable. According to the present state of the art such a manufacture is effected in various stages. In the first stage a plurality of (copper) conductors are surrounded by an insulating layer which as a rule contains a colour code in order to allow the indication of the phase. In a further stage these conductors are surrounded such, that a flat shape is obtained in order to realize the final product aimed at.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a method by which a flat cable of arbitrary length is manufactured in a continuous process. For that purpose the invention is distinguished by the following steps:

extruding a tape of flexible insulating material with grooves extending in longitudinal direction, the upper part of each groove being narrower than the bottom part thereof;

advancing the extruded tape along a curved path and feeding under slight tension one or more conductors tangentially, to a particular groove in the tape in this curved path.

Due to these features a flat cable can be manufactured at a fast rate, ensuring each conductor to be well confined on the bottom of the groove.

The tape may be covered on its grooved side with a preferably transparent strip of elastical insulating material which is attached to the tape in such a way that it is possible to tear off this strip at the end of the tape. Prior to covering the tape, the edges of the grooves are colour marked in order to allow for the indication of the phase. Due to these features a fully insulated cable is obtained in which the various conductors remain visible or can be made visible by tearing off the covering layer, when the cable should be connected to a source of current or another line.

SURVEY OF THE DRAWINGS

FIG. 1 is a view of a complete device for manufacturing a flat cable;

FIG. 2 is a side elevation on an enlarged scale of the device for introducing conductors into the tape;

FIG. 3 is a view according to the arrow III in conformity with the device shown in FIG. 2;

FIG. 4 is a section through the central part of the device according to the FIGS. 2 and 3;

FIG. 5 shows another detail of FIG. 1 to an enlarged scale;

FIG. 6 and FIG. 7 show a further detail of FIG. 1 to a larger scale;

FIG. 8a and FIG. 8b show a section through a flat cable containing three conductors and acquired whilst performing the method according to the invention.

DESCRIPTION OF A PREFERRED EMBODIMENT.

As is visible in FIG. 1 the device consists of an apparatus 1 for extruding a tape 2 of flexible material (like plastic), the tape being provided with one or more longitudinally extending grooves 3 (see FIG. 8a). The extruded section is further passed through a cooling tank 4 with calibrator, in which the section is calibrated and

cooled. So far the device consists of conventional elements.

The extruded tape 2 after having left the cooling tank 4, enters the principal element of the invention, this element being constructed of the following parts:

a reversing unit 5 in which the tape 2 is turned through 180° in longitudinal direction;

a unit 6 in which means are provided for disposing a (copper) conductor 7 in the grooves 3 of the tape 2 (see FIG. 8b);

a drawing device 8, cooperating with the extruder 1 for determining the correct size of the tape 2;

a device 9 for colour marking the outwardly diverging edges 10 (see FIG. 8a) of the grooves 3 of the tape 2;

a device 11 for disposing a transparent cover strip 12 (see FIG. 8b) on the grooved side of the tape 2;

a tension unit 13 for drawing the tape 2 through the devices 9 and 11;

a cutting device 14 by means of which a previously adjustable length of the strip 2 can be let through and covered thereupon;

a device 15 for spooling the finished flat cable consisting of the tape 2 filled with conductors 7 and covered by a strip 12.

The tape 2 issuing from the cooling tank 4 has its grooves 3 in a downwardly directed position. The reversing unit 5 ensures that the grooves come to lie on the upper side. In this position the tape 2 enters the unit 6, see FIG. 2. The tape 2 is passed along a curved support 16 constituted by the rim of a wheel (see FIG. 4). The grooves 3 are lying on the convex side of this support. Five elements 17 are arranged along the support 16 and are tiltable about a pivotal point 18. The three central elements 17 are arranged to introduce each a conductor 7 into the concerning groove 3. Each conductor 7 is at first passed through a tension roller 19 the tension of which being adjustable by means of a spring 20, so that the conductor glides under some tension along the roller. The conductor is thereupon passed through the slot 21 (see FIG. 3) of the element 17 and then tangentially introduced into the relating groove 3 of the tape 2. As is best seen in FIG. 3, the three central elements 17 each consist of a roller provided with a slot 21 and a ridge 22. Each conductor 7 is passed through this slot 21. The ridge 22 of the one roller 17 corresponds with the slot 21 of the preceding roller and consequently also with the groove 3 of the tape 2 into which the conductor, associated with that slot should be introduced.

The rollers 17 are pneumatically (not shown) pressed against the convex side of the tape 2, the ridges 22 pressing open the upper part of the grooves 3 of the tape, thereby facilitating the introduction of the conductors. By adjusting the correct tensions, the conductors 7 can be tightly disposed in the grooves 3 of the tape 2 owing to the curved shape of the supporting wheel 16.

The drawing device 8 (see FIG. 5) consists of a central driving wheel 23, showing on the outer side of the rim a profile which is substantially complementary to the profile of the tape 2 filled with conductors 7. It should be born in mind that the tape 2 is passed along the wheel 23 in a position with the grooves inwardly turned. A plurality of pressure rollers 24 are arranged around the wheel 23, which are mutually connected by links 25 and are tightened by means of an air cylinder

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26 whereby the pressure of the rollers 24 is adjustable. The wheel 23 is driven, so that by means of the device 8 the desired pull can be exerted on the preceding elements 6, 5, 4 and 1.

The device 11 (see FIGS. 6 and 7) consists again of a centrally arranged wheel 27 with a plurality of rollers 28 connected by links 29. The pressing force is adjusted by a pneumatic cylinder 30. The rollers 28 consist of heat insulating and heat resistant material. It is also possible to use heat conductive rollers provided with internal heating e.g., oil heating. The device serves to apply the eventually transparent cover strip 12 to the grooved side of the tape 2. For that purpose an auxiliary extruder 31 is provided extruding the strip 12 by means of a slotted die 32 in the width of the tape 2. The upper roller 28 ensures the required drawing tension by which the strip 12 is drawn from the die 32.

The strip 12 is caused to adhere to the tape 2 by a gluing or sealing operation. In this connection the temperature of the rollers 28 as well as the chemical composition of the materials used for the extruded tape and the strip plays a part.

The invention allows to manufacture a flat cable of arbitrary length and any desired width in a continuous process. Such a cable can be advantageously applied in the construction of houses since the cable can be easily concealed in a plinth or in the ceiling, while at all desired locations one or more branchings can be produced.

Due to the selection of a particular thickness of the strip 12 and the composition of the material of this

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strip, it is possible to push contacts through the covering layer of the cable so that the strip locally is elastically stretched and tears open. As a consequence it is possible to establish an electrical connection with each of the available conductors. After retracting the contact member the material of the strip will recover so that the tear in the covering layer closes.

What I claim is:

1. An apparatus for manufacturing a flat cable of the type which is extruded as a tape of flexible material having one or more longitudinally extending grooves, the apparatus comprising:

A. means for disposing a conductor in each groove of said flat cable and including:

i. a curved support, supporting the tape such that the grooves are on the convex side; at least one feeding element arranged along the support for feeding a conductor toward a particular groove; including:

- a. a tension unit for the conductor, and
- b. a guide roller which is provided with a ridge along its circumference and a slot adjacent said ridge, said ridge engaging the groove such that the conductor is passed through the slot in said guide roller and into said groove.

2. A device according to claim 1, in which beyond the path within which the conductors are disposed in the grooves, a device is provided for applying a preferably transparent cover strip to the grooved side of the tape.

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