Jan. 19, 1971 D. POURTIER 3,555,803

MACHINES FOR LAYING CABLE STRANDS

Filed May 24, 1968 3 Sheets-Sheet 1

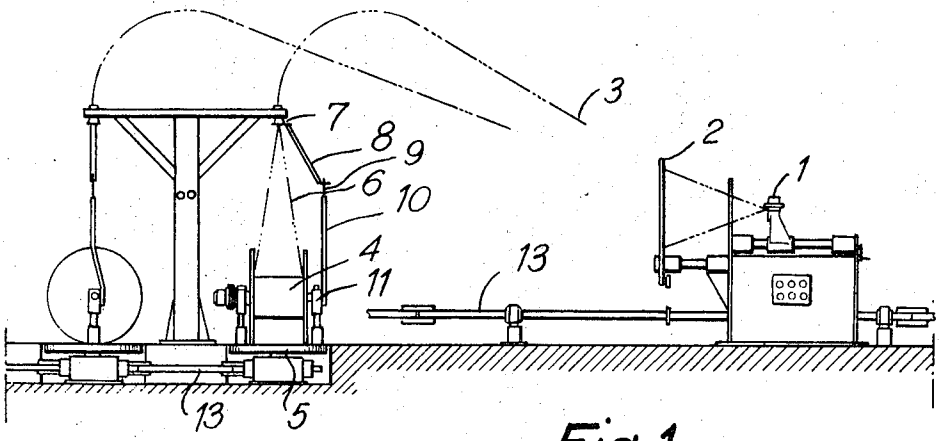


Fig. 1.

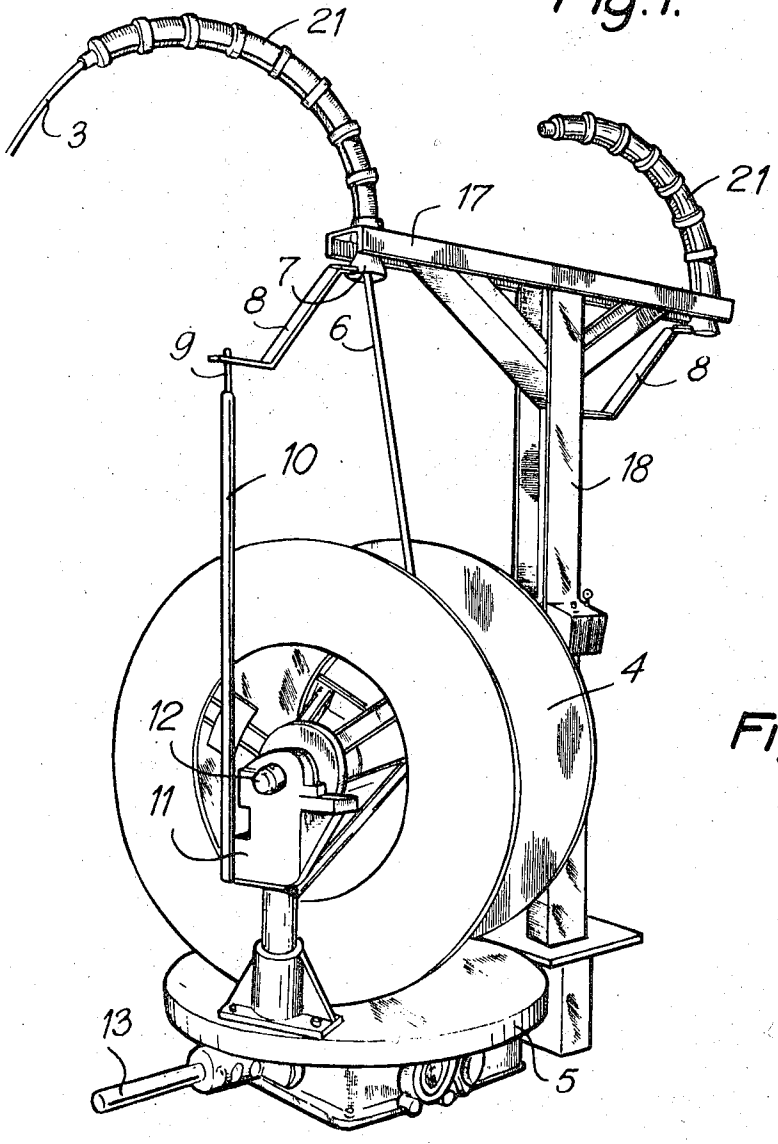


Fig. 2.

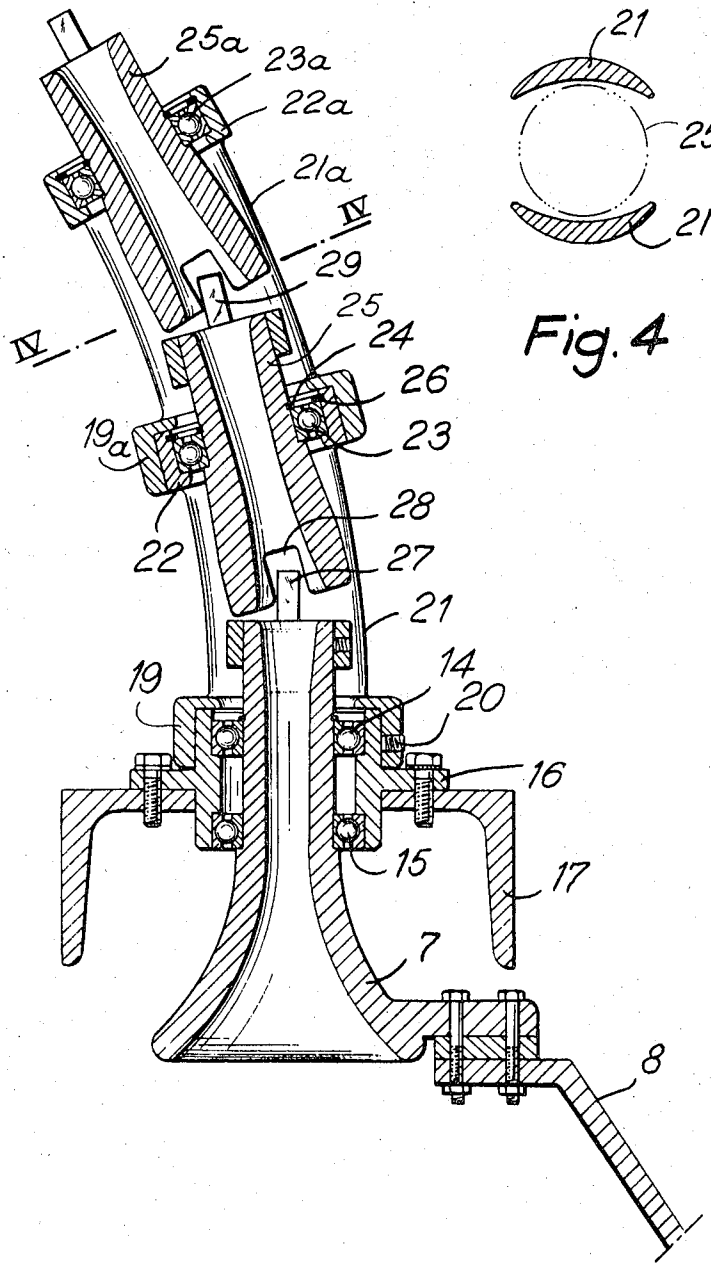

25a
23a
22a
21a
IV
29
25
24
26
23
19a
28
22
27
21
19
14
20
16
15
17
7
8
IV

Fig. 3.

21
25
21b

Fig. 4

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MACHINES FOR LAYING CABLE STRANDS

Filed May 24, 1968 3 Sheets-Sheet 3

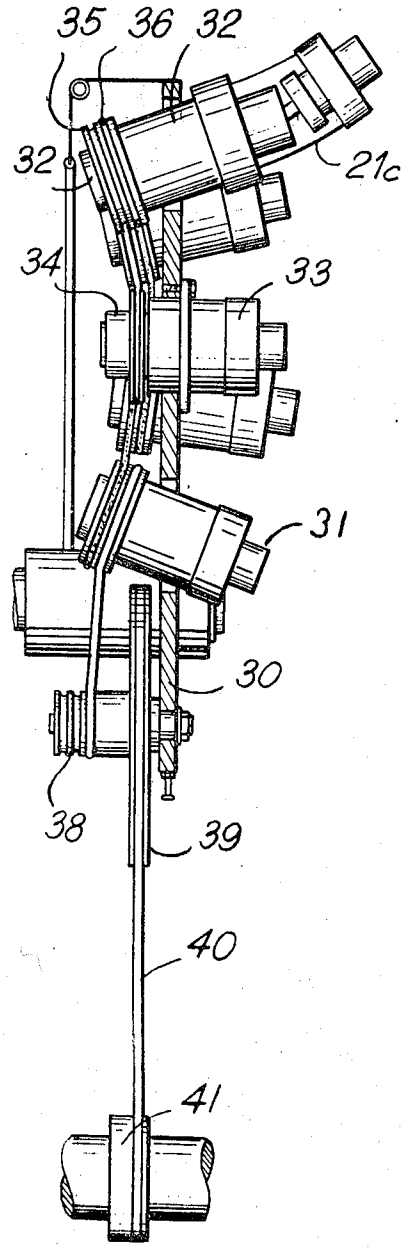


Fig. 5.

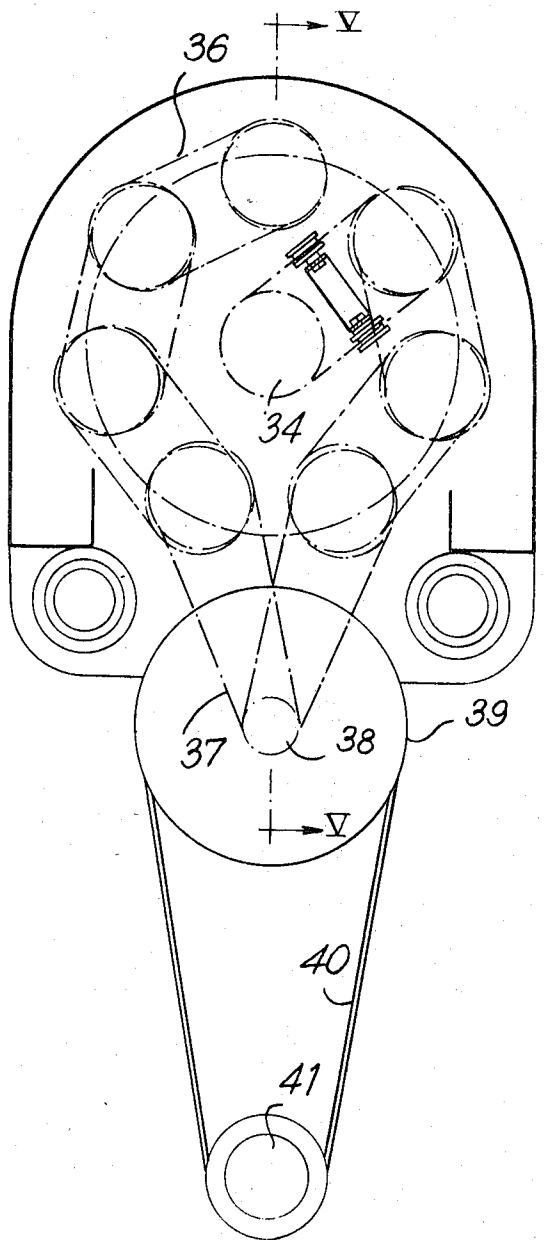


Fig. 6.

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MACHINES FOR LAYING CABLE STRANDS

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Int. Cl. D01h 1/00
U.S. Cl. 57—59 8 Claims

ABSTRACT OF THE DISCLOSURE

A guide for a cable strand laying machine is formed, at a location where a rotating cable strand undergoes change in direction, as a plurality of contoured hollow guide-sleeves through which the strand passes, the sleeves being coupled together for common rotation and individually supported in respective angular positions in a curved guide duct. The first sleeve is driven substantially synchronously with the rotation imparted to the strand and the sleeves are successively driven from the first sleeve. The coupling between the individual sleeves may be by tongue and groove connection.

The present invention relates to cable strand laying machines which include, at a location thereon where a cable strand to be laid is caused to undergo a change in direction, in accordance with the invention, at least one contoured hollow guide-sleeve through which said strand extends and which is rotated substantially synchronously with the rotation to be imparted to said strand, said guide-sleeve comprising means for driving it off power offtake means and further means for coupling it in driving relationship to a subsequent sleeve, which further means accordingly form power input means.

In a machine for laying strands into cables, especially in those intended for accurate cable manufacturing, as in the case of telephone cable in which strict observation of the pitches is vital or in those intended for laying sectorial strands, it is important to offer up the different strands at the strand laying point in a particular angular pattern.

This in turn leads to imparting a determinate rotation to each of the pay-off spools carrying the strands to be laid. All form of contact with fixed guiding means along the paths of the different strands to be laid must however be avoided as such contact could have a disrupting effect on the behaviour of the strand and prevent the latter from reaching the strand-laying point in the way it should.

In certain advantageously devised machines, the pay-off reels are mounted with their axes horizontal on turrets that are caused to revolve individually about a vertical axis, so that the strands to be laid are paid off vertically. Since it is preferable furthermore to position the laying guide located at the laying point and the machine components located past this point with their axes horizontal, each strand to be laid must undergo a change in direction between the point of exit from the associated pay-off reel and the point where it reaches the strand-laying point.

In order to circumvent the aforesaid disrupting factors recourse has been had to pay-off chenilles positioned above the exit point from each pay-off reel and ahead of the strand-laying point. Such arrangements however are complicated and costly owing to the number and complexity of the chenille driving mechanisms.

It is the object of the present invention to overcome these drawbacks whilst making it possible to retain economically the big advantages afforded by the vertical pay-off from the strand reels in machines of this kind. Of course, the invention is in no way limited to the specific layout mentioned precedingly, but includes in its scope

all layouts in which a strand to be laid is required to undergo a change in direction.

The present invention accordingly relates to a guiding device which includes at least one rotating contoured sleeve through which a strand to be laid is caused to pass, said sleeve comprising means enabling it to be coupled in driven relationship with power offtake means and means enabling it to be coupled in driving relationship with a subsequent sleeve.

Each sleeve is rotatably mounted in a tubular supporting member which includes means for uniting it with a similar associated member, said uniting means being mutually inclined at the two ends of the support whereby to enable a plurality of such supports to be joined together to form an arcuate channelling duct through which the strand to be laid can be made to undergo a change in direction through as large an angle as desired.

It has been found that such rotatable guide means avoid binding of the rotating strands to be laid, as would occur if the strands were in direct contact with a fixed guide, whereas the rotating guide means follow the rotation of the strand to be laid regardless of their shape and size.

It has been noted furthermore that the strand to be laid can rotate without deterioration notwithsanding the differences in speed resulting from the diameter ratios, to wit the ratio of the inner diameter of the rotating guide sleeve to the outer diameter of the strand to be laid.

I has finally been observed that, even with mutual sleeve driving means made to relatively wide manufacturing tolerances, the results obtained remain entirely satisfactory.

The description which follows with reference to the accompanying non-limitative exemplary drawing will give a clear understanding of how the invention can be carried into practice.

In the drawings:

FIG. 1 is a diagrammatic side elevation view of a strand laying installation in which the finished cable is drawn off from the strand laying point horizontally whereas the strands to be laid leave the pay-off reels vertically.

FIG. 2 shows in perspective on an enlarged scale one of the component parts of such an installation, to wit a pay-off reel associated at its exit to a guide according to the invention.

FIG. 3 shows on a still more enlarged scale, fragmentally and in section, a rotating guide device of the kind shown in FIG. 2.

FIG. 4 is a section taken through the line IV—IV of FIG. 3.

FIG. 5 schematically illustrates the arrangement of the strand guides according to the invention on a laying plate, the plate being in section as taken along line V—V in FIG. 6.

FIG. 6 is a diagrammatic front view of the assembly shown in FIG. 5.

The strand laying machine shown in FIG. 1 has a laying stock **1** positioned with its axis horizontal and preceded by laying plates **2** equipped with guides through which pass the different strands **3** to be laid. Each strand **3** led up obliquely to the stock **1** issues from a pay-off reel **4** having its axis horizontal and mounted on a turret **5** revolving about a vertical axis, whereby the strand **6** leaves the reel **4** in a substantially vertical direction and is caused to pass through a rotating guide **7** having its axis vertical at the point of entry thereinto. The passage through the guide **7** is of bell-mouth shape, and the bell-mouth of the guide nearest pay-off reel **4** is rigid with an outrigger **8** cooperating with the tip **9** of a rod **10** which is fixed to the support **11** of the horizontal shaft **12** carrying the reel **4** on turret **5**.

Accordingly, in order to drive laying stock **1** synchronously with the turret **5**, the machinery includes transmis-

sion shafts **13** together with all necessary angle drives and adjustment devices, as well known per se.

The entry guide element **7** is retained by a pair of ball-bearings **14** and **15** in a housing **16** fixed to the cross-member **17** of a fixed T-beam **18**, it being possible for the cross-member **17** to support a plurality of identical assemblies associated to as many pay-off reels.

The bearing housing **16** is capped by a collar **19** which is secured by a radial screw **20** and forms a supporting base for a curved duct **21** which, at its end remote from collar **19**, is formed with a reinforcement **22** which has the same configuration as the end of housing **16** receiving collar **19** and which carries a ball-bearing **23** inside it. The inner race of ball-bearing **23** is retained by an elastic keeper-ring **24** cooperating with a matching groove formed on the wall of an associated guide element **25**. The ball bearing **23** is in turn retained through the end face of its outer race abutting against a similar keeper-ring **26** cooperating with a groove formed in reinforcement **22**.

Thus, the guide-sleeve element **25** tilts away from the axis of entry guide element **7** since the plane of reinforcement **22** is at an angle to the plane of collar **19** by virtue of the curvature of duct **21**. The sleeve **25** is rotated by lateral tongues **27** projecting from the end-face of guide element **7** and engaging into slots **28** in the adjacent end-face of sleeve **25**. Similarly, the other end-face of sleeve **25** is formed with tongues **29** similar to the tongues **27**. The passage through sleeve **25** is contoured so that its inlet and outlet are flared, the flared inlet being such as to permit connection with the flared outlet from guide element **7** on the inside of the arcuate guide path formed thus, or else with the flared outlet of a preceding sleeve in the same way, as will be explained hereinafter.

Obviously, the angle imparted to the guiding device as a whole can be altered by adding one after the other as many arcuate ducts as may be required, it being possible for duct **21** to be followed by an identical duct **21***a* to which it is united by a collar **19***a* engaging over the reinforcement **22**, as shown in FIG. 3.

The successive sleeves **25**, **25***a*, etc. are all rotated synchronously. As is clearly shown in FIG. 2, it is possible, by assembling the required number of ducts **21** and sleeves **25**, to form a guide extending over approximately 120° of arc, which is sufficient to redirect the strand to be laid from the substantially vertical direction of the strand run **6** to the oblique direction of the strand run **3**. Manifestly, a longer or shorter arc may be provided, depending on the relative positions of the reels and the guides on the laying plate.

As shown in FIG. 4, the arcuate duct **21** can be of the open kind and consist merely of two arcuate uprights **21***b* separated from each other by windows for monitoring operation of the guide system and for maintenance and ball-bearing lubrication operations. The provision of positively rotated guides **25** through which the cable strand is routed makes it possible to follow the rotation of the strand regardless of its shape and size, without damage to the strand and above all without causing incorrect positioning at the laying point notwithstanding the differences in speed which result, on the one hand from the diameter ratio, i.e. the inner diameter of the sleeves to the outer diameter of the strand to be laid, and on the other from the non homogeneous nature of the ordinary screwdriver-type drive. Obviously, more accurate mechanisms could be used to transmit the rotation to the successive sleeves, examples being universal joints or even concertina-type metal bellows.

Rotating guides as hereinbefore disclosed may be used likewise at locations where contact between a strand to be laid and a fixed guide could have similar disrupting effects, even if only to a lesser degree. FIGS. 5 and 6 illustrate a laying plate **30** (similar to laying plate **2** in FIG. 1) on which the guides are formed as hereinbefore explained. The exit guides **31** projecting from ducts **32** are mounted with the required degree of convergence, about a central duct **33** surrounding an axial guide **34**, in holes formed in laying plate **30**. Each projecting guide portion has a grooved pulley **35** mounted thereon. The pulleys **35** are formed with twin-grooves and are coupled in pairs by means of drive belts **36** which, because the pairs of pulleys are not coplanar, have a circular section. Two bottom pulleys, for example, are driven by belts **37** which diverge from the grooves of a drive pulley **38** rigidly united with a wheel **39**. A V-belt **40** driven by a drive pulley **41** runs over the wheel **39**. The guides **31** are thus driven synchronously at a speed and in a direction appropriate to the strand laying.

Obviously, some of the guide supports **32** could also receive an arcuate duct **21***c* if need be, particularly in cases where the angle between the axis of guide **31** and the direction of the strand to be laid upon entry into such a guide is greater than a predetermined limit.

It goes without saying that many changes and substitutions of parts may be made to the forms of embodiment described hereinabove without departing from the spirit and scope of the invention. By way of example the guide elements formed by the aforesaid sleeve and their ducts may be united in any desired number, in a flat or skew curve configuration.

I claim:

1. A cable strand laying machine comprising, at a location where a rotating cable srand to be laid is caused to undergo a change in direction, in combination, a plurality of contoured hollow guide-sleeves through which said strand passes, means supporting said guide sleeves at successively inclined positions for individual rotation thereof, coupling means for coupling said guide sleeves together for common rotation, means for rotating the first of said guide sleeves substantially synchronously with the rotation to be imparted to said strand, said coupling means including power offtake means on each said guide-sleeve for cooperating with the previous guide-sleeve for being rotated thereby, and power input means on each said guide-sleeve for cooperating with the power offtake means of a subsequent guide-sleeve.

2. A machine as claimed in claim **1** wherein said means which supports the guide sleeves comprises an arcuate duct in which each guide-sleeve is disposed, and means uniting each guide-sleeve with said duct, the uniting means for the sleeves at either end of the duct being mutually inclined.

3. A machine as claimed in claim **2**, wherein said uniting means comprises circular bearing surfaces permitting pivotal adjustment of at least one of said guide sleeve in relation to said duct or like support.

4. A machine as claimed in claim **1**, wherein each of said guide-sleeves is provided at one end with at least one slot and at the other end with at least one tongue member which respectively form said power offtake means and said power input means.

5. A machine as claimed in claim **1** comprising a pivotable entry bell-mouth coupled to one sleeve and having an outrigger member mechanically associated with a revolving strand-pay-off-reel support, said bell-mouth providing a passage therethrough for a strand to be laid issuing from a pay-off reel.

6. A machine as claimed in claim **5**, wherein the axis of said pay-off reel is horizontal, said bell-mouth being supported by a turret member capable of revolving about a vertical axis and said bell-mouth accordingly having its axis likewise vertical.

7. A machine as claimed in claim **6**, comprising a strand-laying guide-sleeve support associated with a plurality of successive arcuate supporting ducts each containing an inclined guide-sleeve.

8. A machine as claimed in claim **1**, wherein a plurality of guide-sleeves are mounted on a strand-laying plate with their axes converging to the required extent towards a strand-laying stock, said guide-sleeves being

individually rotated through intermediate drive means from a common power take-off.

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