

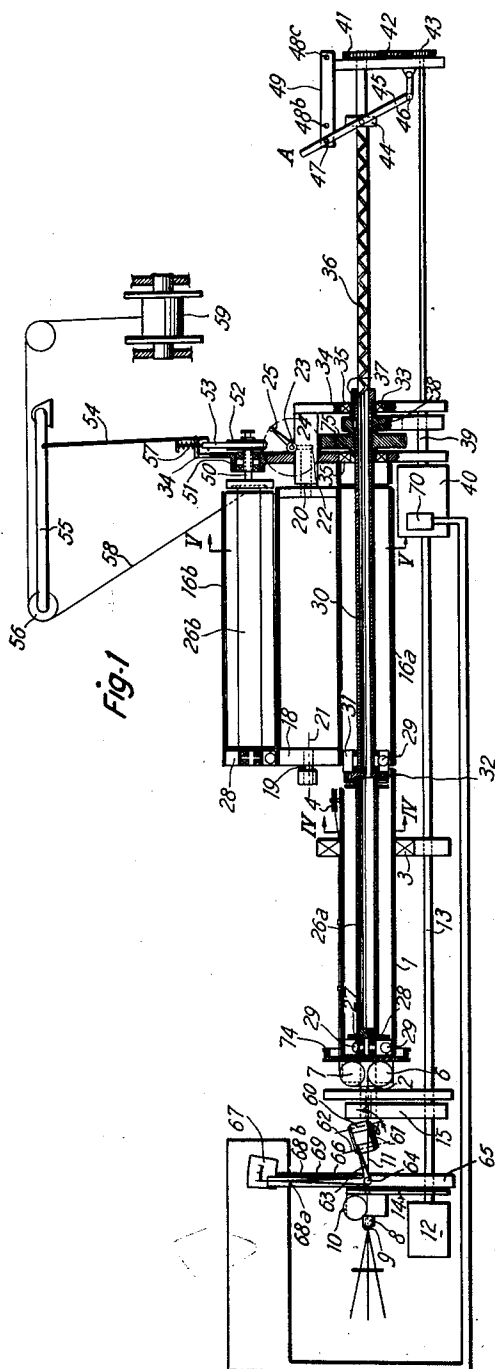
Dec. 11, 1962

O. HAUGWITZ  
STRANDING MACHINE

3,067,568

Filed Jan. 31, 1961

3 Sheets-Sheet 1



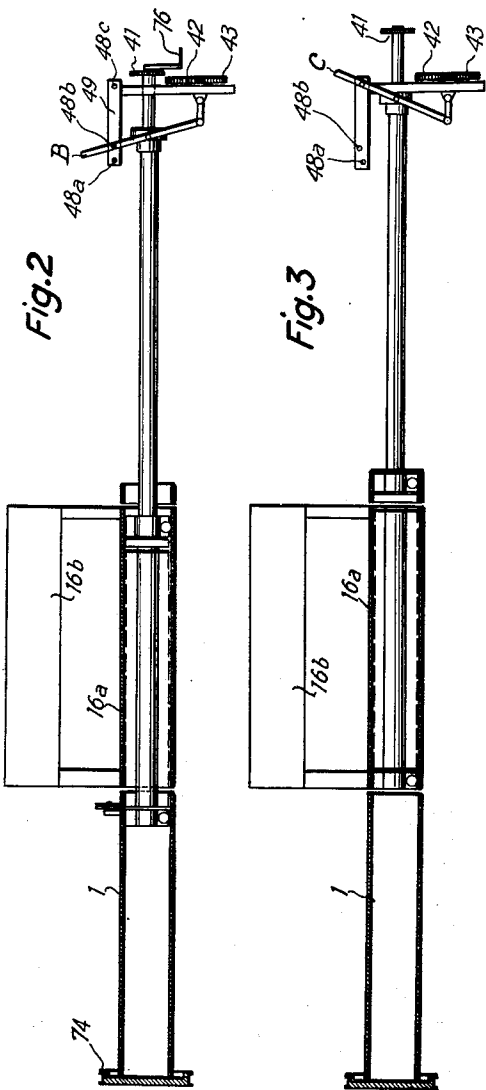
Dec. 11, 1962

O. HAUGWITZ  
STRANDING MACHINE

3,067,568

Filed Jan. 31, 1961

3 Sheets-Sheet 2



Dec. 11, 1962

O. HAUGWITZ  
STRANDING MACHINE

3,067,568

Filed Jan. 31, 1961

3 Sheets-Sheet 3

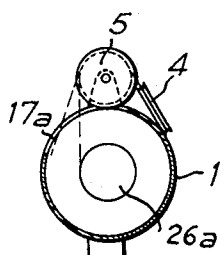


Fig. 4

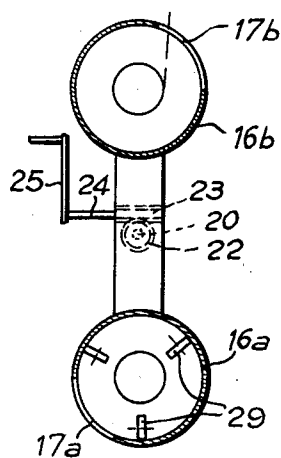


Fig. 5

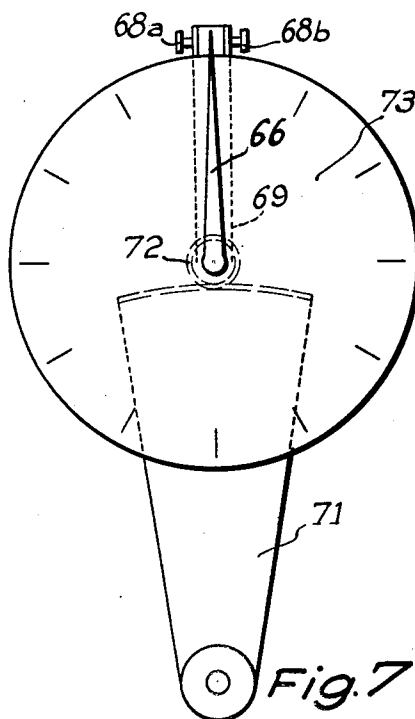


Fig. 7

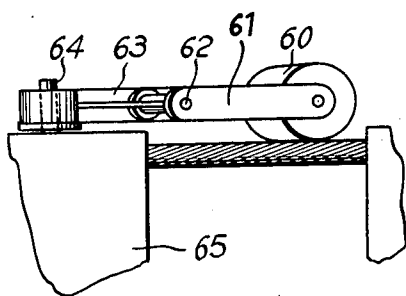


Fig. 6

1

3,067,568

## STRANDING MACHINE

Otto Haugwitz, La Celle Saint Cloud, France, assignor to Societe Anonyme Geoffroy-Delore, Paris, France, a French company

Filed Jan. 31, 1961, Ser. No. 86,212

Claims priority, application France Feb. 1, 1960

6 Claims. (Cl. 57--66)

In the cabling machines, referred to as "stranding machines," made up to now, the cable manufactured is wound on a movable spool arranged inside the stranding machine and removed after the cable has been wound on it and then stored. In order to take a sufficient length of cable, such a spool must have a relatively large diameter and this limits its rotational speed and consequently the output of the stranding machine.

The present invention has as an object a stranding machine which will allow a high rotational speed to be given to the internal receiver spool.

According to the invention, the stranding machine comprises two receiving spools of elongated shape, mounted in an interchangeable manner between a working position inside the revolving frame, ensuring the twisting of the cable members, and a removal position, means for exchanging the two spools between these two positions, and an external spool intended to have the cable which is on the spool in the removal position wound on to it.

By using such a stranding machine, the cable manufactured can be wound on to one of the receiving spools while the removal of the cable which is on the other spool and the winding of this cable on to an external spool is carried out. Thereafter, the exchange of the two spools is carried out and this does not necessitate their removal from the machine and therefore the use of a special lifting apparatus, on the contrary to that which is the case with conventional stranding machines. Since the spools are of elongated shape, which is made possible by the fact that they do not have to be removed from the stranding machine in order to be individually handled outside the machine, their diameter for an equal volume is far smaller than that of a conventional-type receiving spool and this allows them to be given a higher rotational speed and therefore to obtain a higher output from the machine.

In a preferred embodiment of the invention, the two receiving spools are carried, at least partially, by a support which is pivotally mounted, for preference on the structure of the stranding machine, about an axis parallel to the axis of rotation of the frame.

The support can for example comprise two tubular members parallel to the axis of rotation of the frame, of an internal diameter substantially equal to that of the tube of this frame, and in each one of which one or the other of the spools is mounted in such a way as to be able simultaneously to rotate and be axially displaced.

One of the tubular members is taken into the extension of the tube of the frame in such a way that the spool in its operative position can slide both in the frame and in the tubular member. At the end of the operation, the spool is completely removed from the frame and the support is caused to pivot in such a way that the second tubular member is located in its turn in front of the said frame. Then, a new length of cable may be stranded by winding it on to the spool which was located in this second member while the cable of the first spool is removed.

In order that the invention shall be more clearly understood, reference will now be made to the accompanying drawings which show one specific embodiment thereof by way of example and in which:

FIGURE 1 is an elevation of the complete machine with two interchangeable receiving spools,

2

FIGURE 2 is a view of part of the machine of FIGURE 1, the full spool having been taken into its end position, furthest away from the frame,

FIGURE 3 is a view similar to that of FIGURE 2, the full spool being completely removed from the frame,

FIGURE 4 is a cross-sectional view along the line IV-IV of FIGURE 1,

FIGURE 5 is a cross-sectional view along the line V-V of FIGURE 1,

FIGURE 6 is an elevation of the withdrawal-speed regulating roller, and

FIGURE 7 is a plan of a detail of a modification of the withdrawal regulation device.

Referring to the drawings, the stranding machine comprises a frame comprising a tubular portion 1, which is open at one end and which is integral with a hollow drive shaft 2 and supported by a roller bearing or rollers 3 at its open end. At its open end, the frame has two guide pulleys 4 and 5 (FIGURE 4), and at its other end, two other guide pulleys 6 and 7.

In the axis of the shaft 2 is located a second hollow shaft 8 which carries an entry die 9 and a loose pulley 10. The cable members 11 to be stranded pass across the die 9, make a turn around the pulley 10, which ensures the precision of the pitch at the assembly point, pass into the hollow shaft 2 and, by means of the two pulleys 6 and 7, pass to the outside of the frame; finally, the cable is guided by the two pulleys 4 and 5 on to a receiving spool, which is located inside the frame as will be shown further on.

The stranding machine has a single drive motor 12, which drives a main shaft 13; this shaft is connected by a belt 14 to the hollow shaft 8 and by a belt 15 to the hollow shaft 2, the pulleys over which the belts pass being so proportioned that the two shafts 2 and 8 revolve at the same speed.

Two tubes 16a and 16b, each provided with an axial opening 17a or 17b (FIGURE 5), and of which the diameter is substantially equal to that of the frame 1, are carried by a support 18 provided with two pivots 19 and 20, the axis 21 of which is parallel to the axis of rotation of the frame 1. The pivot 20 carries a worm wheel 22 which is in engagement with a worm 23. This worm is fixed on a shaft 24 which has a crank handle 25, this latter thus allowing the support 18 to be pivoted about the axis 21. The pivots 19 and 20 are arranged in such a way that the two tubes 16a and 16b can successively be received into the extension of the frame 1.

The stranding machine comprises two receiving spools 26a and 26b; these spools are elongated, their length being of the order of at least six to ten times their diameter. In FIGURE 1, the spool 26a is located inside the frame 1 while the spool 26b is in the tube 16b.

The end of the spool 26a located on the closed end of the frame 1 is mounted by means of a roller bearing 27 in a support 28 which bears on the internal walls of the tube of the frame by rollers 29. The axis of the rollers 29 are perpendicular to the axes of the frame 1 so that these rollers turn with the frame but allow the axial displacement of the support 28, and, therefore, of the spool 26a.

In the position of FIGURE 1, a hollow shaft 30 is disposed inside the tube 16a. Its end located beside the frame is carried by a support 31 similar to the support 28 and is provided, like the latter, with rollers 29. This shaft is connected to the spool 26a by a coupling 32.

The hollow shaft 30 is keyed to slide in a hollow shaft 33 which is located opposite the frame 1 and supported by the structure 34 of the machine by means of roller bearings 35. Within the hollow shaft 30 is connected a cross-threaded bolt 36 which co-operates with a pin 37 carried by the hollow shaft 30.

The hollow shaft 33 is driven by a belt 38 acting from the output shaft 39 of a variator 40 driven by the main shaft 13. The bolt 36 is also connected to this shaft 39 by a train of exchangeable gears 41, 42 and 43. The bolt 36 carries a ball-stop 44 mounted on a lever 45 articulated at 46 on the structure of the machine. This lever carries a pin 47 which can be engaged in one of a plurality of holes 48a, 48b and 48c provided in a bar 49 integral with the structure. In FIGURE 1, the pin 47 is engaged in the hole 48a in such a way that the bolt 36 cannot be axially displaced. The result is that any relevant rotation of the shaft 30 and of this bolt 36 induces an axial displacement of this shaft 30 and, therefore, of the spool 26a which is coupled thereto. Thus, it may be seen that the relation of the train formed by the gears 41, 42 and 43 which determines its relative speed, determines the stranding pitch.

The end of the spool 26b located beside the frame 1 is mounted in a support 28 in a similar way to the corresponding end of the spool 26a. The other end of the spool 26b in the position of FIGURE 1 is coupled to a shaft 50 which is supported by the structure 34 by means of roller bearings 51. This shaft 50 carries a brake-drum 52. Over this drum 52 passes a braking belt 53 one end of which is connected by means of a rod 54 to an articulated rocker 55 carrying a pulley 56; an adjustable spring 57 tends to apply the belt 53 on to the drum 52 and consequently tends to brake the latter. The stranded cable 58 passes over the pulley 56 which guides it towards an external receiving spool 59. The rocker 55, tending to displace the rod 54, against the action of the spring 57, regulates the action of the brake. The assembly forms means for unwinding the cable which is located on the spool 26b.

On that part of the members of the cable 11 which are located between the die 9 and the hollow shaft 2 rests a roller 60, the surface of which can be smooth or can be provided with parallel circular grooves. This roller 60 is carried by arms 61 which are mounted to be pivotable about a horizontal axis 62 on an arm 63 (FIGURES 1 and 6). This arm is itself pivotally mounted about a vertical axis 64 on a support 65 integral with the structure of the machine. The arm 63 is integral with a needle 66 movable in front of a quadrant 67 having a graduation corresponding to the quotient  $k$  of the stranding pitch  $p$  of the cable divided by the diameter  $d$  of this cable. The needle 66 is disposed between two contacts 68a and 68b which are carried by adjustable lever 69 pivotally mounted about the axis 64; these contacts are connected to a servo-motor 70 controlling the variator 40. This variator can, for example, be of the extensible pulley type, the displacement of the movable pulley or pulleys being ensured by a motor rotating in one direction or in the other following which contact 68a or 68b is contacted by the needle 66.

In the modification shown in FIGURE 7, the displacement of the needle 66 is multiplied. To this end, a toothed sector 71 is integral with the arm 63. This toothed sector is in engagement with a pinion 72 the axis of which carries the needle 66. The adjusting lever 69 carrying the contacts 68a and 68b is pivotally mounted about the axis of the pinion 72. The graduated quadrant 73 in front of which the needle 66 is movable is in this case circular.

Finally, the frame 1 and the hollow shaft 33 carry brake-drums 74 and 75 which permit a quick stopping of the machine in spite of the inertia of these members which, during their operation, rotate at high speed.

The machine which has just been described operates in the following way:

In FIGURE 1, the spool 26a is located completely within the frame 1 when the spool 26b is in the discharge position; the cable which this spool 26b carries is ready to be removed in order to be wound on to the external re-

ceiver spool 59. The lever 45 is in position A in which the spool 26a is connected to the shaft 39.

After the machine has been set in operation, the stranded thread is wound by the frame 1 on to the spool 26a which rotates in the same direction as the frame but at a different speed from that of the frame, this speed being controlled by the variator 40, as will be shown further on. At the same time, the bolt 36, which is driven at a different speed from that of the spool 26a but in a fixed relation with regard to this latter speed, imparts a to-and-fro axial movement to the spool 26a in such a way that the stranded cable is wound on to the spool while forming on the latter several successive layers.

When the spool 26a is full, the machine is stopped and the lever 45 is taken into position B (FIGURE 2) and the effect of this is to throw the pinions 41 and 42 out of engagement. A crank handle 76 is then placed on the end of the bolt 36 and this crank handle is turned until the spool 26a, which was halted in any position, is located in the righthand end position in FIGURE 2. The lever 45 is then taken into the position C (FIGURE 3) and this results in the complete removal of the spool 26a from the frame 1, the shaft 30 being completely removed from the tube 16a. This shaft 30 is then uncoupled from the spool 26a.

With the help of the crank handle 25, the support 18 is caused to pivot in such a way as to bring the tube 16b containing the spool 26b which is now empty to the position of the tube 16a. This spool 26b is then coupled to the shaft 30 and put into the operative position by placing the lever 45 into the position A.

When the cabling of the following length is begun and while the manufactured cable is wound on to the spool 26b, the spool 26a is coupled to the shaft 50 and the cable is unwound from this spool on to the external spool 59; during this operation, the rotation of the spool 26a is braked by the drum 52, the braking force being automatically regulated by the rocker 55.

During the winding of the cable on to the spool 26a (or on to the spool 26b), the roller 60 is automatically orientated so that its axis forms an angle  $\alpha$  with the cable. This angle depends solely upon the quotient  $k$  of the stranding pitch  $p$  of the cable divided by the diameter  $d$  of the finished conductor, this quotient being equal to  $\tan \alpha$ .

The quadrant 67 (FIGURE 1), or quadrant 73 (FIGURE 7), is graduated in function of this quotient, that is to say of  $\tan \alpha$ . At the beginning of the operation of the machine, the lever 69 is placed in front of the graduation corresponding to the required quotient  $k$ .

When the cable is wound on to the spool 26a (or the spool 26b), the drag of the cable members 11 tends to increase by reason of the increase in the diameter of the spool. As a result of this drag increase, the angle  $\alpha$  tends to increase and this causes the arm 63 of the needle 66 to pivot. This needle tends to touch the contact 68b and this entails the modification of the relation of the transmission of the variator 40, in the direction corresponding to an increase of the rotational speed of the spool, until the drag on the cable once more has the required value and, as a result, the roller 60 regains its original position. The reverse happens if the drag on the cable decreases. It may thus be seen that the drag on the cable can be held constant.

It will be apparent that the invention is not limited to the specific embodiment described and shown and that various modifications may be made thereto. For example, the shaft 39 could be driven by means of an independent motor, the speed of which would be electronically controlled as a function of the position of the roller 60.

What I claim is:

1. A cable stranding machine, comprising a revolving frame for effecting the twisting of cable members, two elongated receiving spools mounted in an interchangeable manner between an operative position inside the frame

5

and a removal position outside the frame, means for exchanging the two spools, and an external spool adapted to be fed the cable which is located on the spool in the removal position.

2. A stranding machine as claimed in claim 1, comprising a support in which the two receiving spools are at least partly carried, the support being pivotally mounted on the structure of the machine.

3. A stranding machine as claimed in claim 2, in which the support comprises two tubular members parallel to the axis of rotation of the frame, of internal diameter substantially equal to that of the inside of said frame and in each of which one or the other of the spools is mounted so as to be able simultaneously to revolve and to be axially displaced.

4. A stranding machine as claimed in claim 3, in which means for unwinding the cable are provided, said means being coupled to the spool which is in the removal position.

6

5. A stranding machine as claimed in claim 2, in which means for unwinding the cable are provided, said means being coupled to the spool which is in the removal position.

6. A stranding machine as claimed in claim 1, in which means for unwinding the cable are provided, said means being coupled to the spool which is in the removal position.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

|           |               |               |
|-----------|---------------|---------------|
| 1,956,730 | Reichelt      | May 1, 1934   |
| 2,622,810 | Stream et al. | Dec. 23, 1952 |
| 2,826,035 | Cogger        | Mar. 11, 1958 |

##### FOREIGN PATENTS

|           |         |               |
|-----------|---------|---------------|
| 1,211,978 | France  | Oct. 12, 1959 |
| 1,072,160 | Germany | Dec. 24, 1959 |