INSULATION WINDING AND WIRE STANDING MACHINE FOR THE PRODUCTION OF TELECOMMUNICATION CABLES

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Filed: Nov. 9, 1970

Appl. No.: 87,941

Foreign Application Priority Data
Dec. 31, 1969 Italy 26517-A/69

U.S. Cl. 57/12, 57/18, 57/66

Int. Cl. H01b 13/00, H01b 13/08

Field of Search 57/3, 12, 16, 17, 18, 58, 52, 57/59, 60, 66

ABSTRACT

A combined insulation winding and wire strandng machine comprising a pair of sections for separately wrapping each of two bare wires with insulation, each section including wire feeding spools, a wire pulling wheel, a tape wrapper and a pair of sets of pulleys, at least one set of each pair being resiliently mounted, and a bobbin rotatable about its own axis and an axis perpendicular thereto for receiving and twisting the two insulated wires together.

6 Claims, 3 Drawing Figures
INSULATION WINDING AND WIRE STANDING MACHINE FOR THE PRODUCTION OF TELECOMMUNICATION CABLES

The present invention relates to an insulation winding and wire stranding machine, in particular a machine for producing a stranded element of insulated wires for telecommunication cables, starting from bare conductors.

A stranded element for telecommunication cables is in general made of pairs and quads of insulated wires. The pairs are preferred in Great Britain and in U.S.A., while the quads are more widely used in Europe, where they are deemed more economical from the point of view of manufacturing. It is, of course, understood that stranded elements formed by three, four, five conductors and so on, can be required for particular uses.

The processes heretofore used to form stranded elements from bare conductors involve the use of separate machines, one machine having several components for the operation of insulating the core by means of appropriate tapes which can be, for instance, made of paper, and one machine having several components for the production of the stranded element with several insulated cores.

The machine which provides the core with the insulating tape is generally called a spindle machine and comprises a device able to originate the passage of the core from a pay-off bobbin, carrying the bare conductor, towards a take-up bobbin for the insulated conductor through the center hole of the plate carrying a roll for the insulating tape and positioned transversely of the conductor. The insulating tape, the end of which is caused to adhere to the bare conductor at the beginning of the operation, is pulled by said bare conductor during its movement towards the take-up bobbin, and the plate is rotated which, combined with the forward speed of the bare conductor, determines the speed of the core.

The take-up bobbins filled with the insulated cores are detached from the spindle machine and are then conveyed to the stranding machines, where they are used as pay-off bobbins for feeding the insulated conductor to the stranding apparatus. Each stranding machine carries as many pay-off bobbins or other feeding means equal to the number of wires intended to constitute the stranded element.

From the pay-off bobbins, the insulated conductors or cores go to a conveyor, or a rotating cage, or a rotating pulling wheel, which strands them at a pre-established pitch. Then, the stranded element is conveyed first, to a sizing die which can be stationary, or which can be rotatable in order to reduce friction with the insulating paper, then to suitable electric control devices, and finally to the final take-up bobbin.

It is evident to those skilled in this art that the use of two separate machines for passing from the bare conductor to the stranded element involves substantial disadvantages as regards organization and technique.

The first disadvantage concern the existence of down times in the production line, due to the transfer of the bobbins from the spindles to the stranding machine, and the need for space for storing the bobbins already discharged from the spindle machine and ready to be transferred to the stranding machine. The second disadvantage is the stresses to which the formed insulated core is subjected in consequence of its first winding on the take-up bobbin and of its unwinding thereafter to be stranded. In many cases, these intermediate operations may damage the insulation or may produce stretching of the conductor, impairing its electric characteristics.

The present invention aims at obviating the above-described disadvantages by providing a simple apparatus which receives at its inlet the bare conductors and the insulating tape and delivers at its outlet the formed stranded element. It will be evident that, by means of the apparatus of the invention it is possible not only to eliminate down times, storage of the bobbins carrying the insulated cores and the risk of stretching the conductor and damaging the insulation but also to reduce considerably the number of operators required for the production of stranded elements, for equal lengths of stranded cable produced.

More particularly, the object of the present invention is a insulation winding and wire stranding machine, especially for making telecommunication cables, which is provided with at least a first and a second series of operating elements running in parallel with each other, each of said series comprising a means for feeding the bare conductor, a first accumulator constituted by two sets of pulleys, at least one of said sets being mounted to permit limited movement thereof against a return force, a plate carrying a bobbin or roll with insulating tape thereon and a pulling wheel. A connecting or feed pulley and a second accumulator are provided in series with the pulling wheel, said second accumulator of each series being followed by a die for sizing and directing the individual insulated wires, and said die being in turn followed by one means for collecting and stranding the insulated wires, said one means being rotatable about an axis parallel to the direction of movement of the incoming stranded element and simultaneously about its own longitudinal axis which is perpendicular to the direction of movement of the stranded element.

As can be seen, by means of the apparatus according to the present invention, it is possible to obtain a simplified machine, able to carry out directly the same work performed by two machines, the winding and the stranding machines, and such simplified machine omits several elements of required by the two individual machines.

The figures of the enclosed sheet of drawing represent by way of example, a presently preferred embodiment of the invention. In the drawing:

FIG. 1 illustrates diagrammatically, in end elevation, one preferred embodiment of the machine of the invention;

FIG. 2 illustrates in side elevation the machine shown in FIG. 1; and

FIG. 3 illustrates in plan the machine shown in FIGS. 1 and 2.

The apparatus 10 illustrated in the figures is a wire insulating and stranding machine, able to produce twisted wire pairs as finished products, which may be more appropriately called “doubling-winding machine.”

The doubling-winding machine 10 comprises at least two series of operating elements operating in parallel to each other. Each series comprises a pay-off bobbin or feeding means 11, 11' for the bare conductor.
Each pay-off bobbin 11, 11' is respectively followed by a first accumulator 12, 12' constituted by two sets of pulleys 13, 14 and 13', 14' (one set of which is fixed in position and the other set of which permitted to move toward the one set, the movement being opposed, such as by springs 30, 30', a plate 15, 15' for receiving a roll of insulating tape 16, 16', a pulling wheel 17, 17', a connecting or direction changing pulley 18, 18', and a second accumulator 19, 19', also constituted by two sets of pulleys 20, 21; 20', 21', one set of which is fixed and the other set of which is moveable toward the one set against a resilient restraining member, such as springs 31, 31'.

The accumulators 19 and 19' are disposed in parallel to each other, and are both situated upstream from a single forming die, or directing means, 22, in series with a take-up bobbin 23 for the stranded element 26, which rotates both about the axis F—F parallel to the incoming stranded element 26 and transverse to its longitudinal axis H—H.

In the embodiment illustrated in the figures, the second accumulator 19, 19' of each series constitutes, with the forming die 22 and with the axis F—F for the rotation of the take-up bobbin 23 a series of components which are located along a substantially vertical path.

The bare conductor 24, 24' paid off from each bobbin 11, 11' is caused to pass through the corresponding accumulator 12, 12' which, by means of the restricted and restrained movements which one of the two sets of pulleys 13, 14; 13', 14' is allowed to make, is able to absorb and to eliminate possible stretching of the wire.

Subsequently, the conductor 24, 24' passes through the central opening of the plate 15, 15' and of the roll of insulating tape 16, 16'.

The plate 15, 15' rotates about its own axis causing rotation of the roll 16, 16' of insulating tape, whose end is applied, at the beginning of the operation, to the corresponding bare conductor 24, 24'. In this way the insulating tape is helically wound up about the bare conductor, and the winding pitch is determined by the forward speed of the bare conductor 24, 24' and by the rotation speed of the roll of insulating tape 16, 16'.

Tension is exerted on the insulated core 25, 25' coming from the tape winding station by the pulling wheel 17, 17'. Each insulated core 25, 25' directed by the pulley 18, 18' travels to the accumulator 19, 19' which, like the accumulators 12 and 12', has two sets of pulleys 20, 21; 20', 21' one set of which is movable toward the other against resilient restraining springs 31, 31', is able to absorb and to eliminate possible stretching.

The doubling of the insulated cores 25, 25' is obtained by conveying them, at their leaving the corresponding accumulators 19, 19', to the forming die 22 and from there to the one take-up bobbin or single collecting means 23 for the stranded element 26.

The take-up bobbin 23, which is rotated about axis F—F by means 32, imparts to the insulated cores a twist about their longitudinal median axis, causing a twisting or doubling (stranding of a pair), the pitch of which is determined by an appropriately adjusted speed of rotation around the axis F—F.

The take-up bobbin 23 is simultaneously rotated about its own longitudinal axis H—H by means 33 which causes advancement of the doubled or stranded element 26 which winds up onto the bobbin 23. A conventional wire-guides or distributor (not illustrated) may be used to provide a regular distribution of the element 26 on the take-up bobbin 23.

The take-up bobbin 23, for constructional reasons, preferably is disposed in an off-center position, or in off-set relation, with respect to the two feeding bobbins 11, 11'.

The collecting operation may be carried out on other storing means, such as, for example, conventional hollow cylindrical containers into which the stranded element is laid in layers after it is twisted and as it is pulled. Other modifications of the details of construction of the invention will be readily apparent to those skilled in the art.

What is claimed is:

1. A combined insulation winding and wire stranding machine comprising a pair of wire insulating sections, each section comprising means for feeding bare wire followed by a first accumulator including resiliently mounted pulleys permitting movement thereof with tension on said wire, a rotatable plate following said accumulator for receiving said wire from said pulleys and for carrying insulating tape to be wrapped around said wire, a pulling wheel following said plate for engaging and pulling the insulation wrapped wire, and a second accumulator following said pulley wheel and including resiliently mounted pulleys permitting movement thereof with tension on said wire, a directing means for receiving insulation wrapped wire from both of the second accumulators, and stranding means following said directing means comprising twisting means for receiving both insulation wrapped wires in side-by-side relation, and means for rotating said twisting means around a first axis substantially parallel to the direction of movement of said wires as they approach said twisting means and for rotating said twisting means at the same time around a second axis substantially perpendicular to said first axis.

2. A machine as set forth in claim 1 in which said stranding means comprises a bobbin mounted for rotation about its longitudinal axis and an axis perpendicular thereto, the stranded wire being collected on said bobbin.

3. A machine as set forth in claim 1 further comprising means for collecting the stranded wire as it is stranded.

4. A machine as set forth in claim 1 wherein said second accumulator comprises two sets of pulleys at least one set of which is mounted for movement toward the other against an elastic restraining means.

5. A machine as set forth in claim 4 wherein the second accumulator of each said section is mounted above said directing means and said stranding means is mounted vertically below said directing means.

6. A machine as set forth in claim 1 wherein said stranding means is disposed in horizontally offset relation with respect to the means for feeding bare wire in each said section.