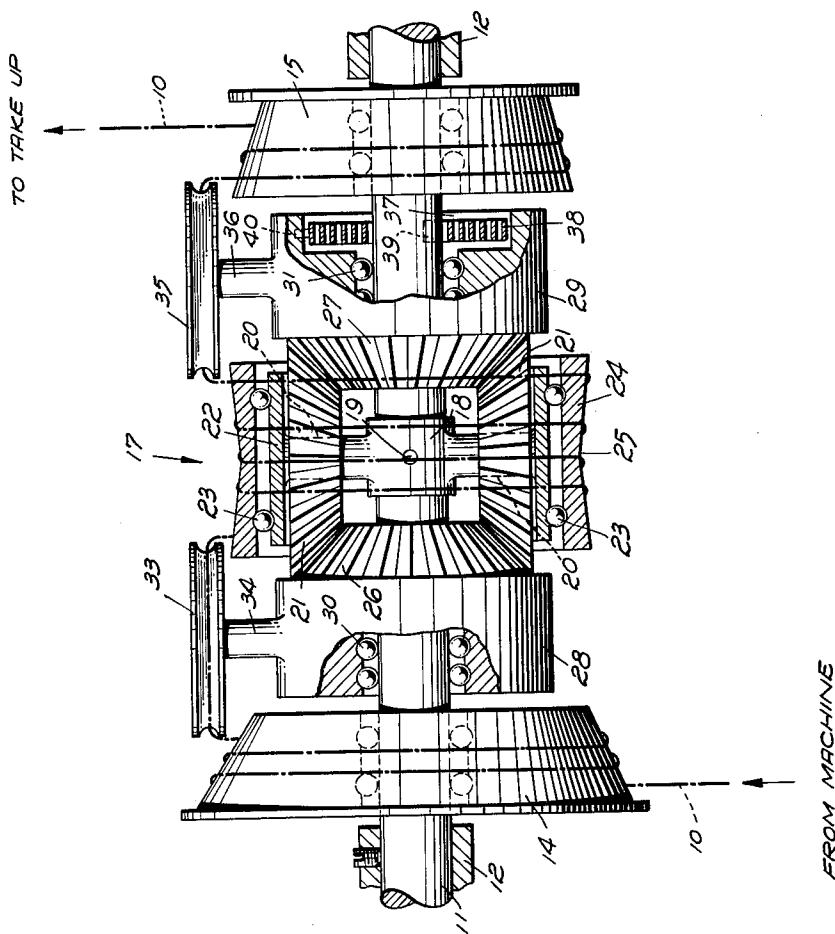


July 30, 1963

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STRAND CONTROL APPARATUS
Filed April 2, 1962

3,099,412



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3,099,412

STRAND CONTROL APPARATUS

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Filed Apr. 2, 1962, Ser. No. 184,143

5 Claims. (Cl. 242—47.01)

This invention relates to strand control apparatus particularly apparatus adapted to control the tension of strands fed between processing machines and as they are fed to take-up units.

In the manufacture of various types of strands including insulated wires, there is always the problem of creating predetermined tensions in the strands and to eliminate damage to the strands during stopping of the take-up unit.

An object of the present invention is an apparatus which, although simple in structure, is highly efficient in providing the solutions to these problems when interposed between a strand processing machine and a take-up for the strand.

In accordance with the object the strand control apparatus is interposed between a machine to supply a strand and a take-up for the strand, the apparatus including a first shive, adapted to receive turns of the strand from the machine, a second shive adapted to receive turns of the strand prior to moving to the take-up, and a control unit interposed between the first and second shives to control the strand extending between the machine and the take-up.

Other objects and advantages will be apparent from the following detailed description when considered in conjunction with the accompanying drawing wherein the single FIGURE is a top plan view of the apparatus portions thereof being shown in section.

The machine for processing a strand 10 is not shown as the apparatus may be employed in association with various types of strand processing machines, such as machines for manufacturing threads, filaments, bare wires, insulated wires or the like. In the present instance, the apparatus was designed for use in a machine forming pulp insulation on wires. Machines of this type may operate continuously to insulate numerous wires simultaneously and, although the machine may operate continuously through the addition of supply reels for the various wires the take-up reels for the different wires must be stopped at different intervals as the take-up reels become filled and must be replaced by empty reels. If the reels at the take-up are changed automatically there is the problem of wire breaking in advance of the take-up.

The apparatus includes a stationary shaft 11 supported at its ends by members 12 and having a free running first shive 14 mounted thereon to receive one or more turns of the strand 10 from the machine. A second shive 15 is of the free running type, both shives being supported by bearings on the shaft, the shive 15 being of the contour shown and adapted to receive one or more turns of the strand 10 before moving toward the take-up. A control unit, indicated generally at 17, is interposed between the first and second shives and includes a gearing mechanism having a spider 18 fixed at 19 to the stationary shaft 11. The spider 18 has aligned stationary spindles 20 for rotatably supporting bevelled gears 21 of the unit 17. A stationary annular member 22 is mounted on the spindles 20 and supports bearing members 23 for supporting a central shive 24 having a V-groove 25 therein.

Bevelled gears 26 and 27 are free to rotate on the fixed shaft 11 and are fixed to members 28 and 29 supported by bearings 30 and 31 on the fixed shaft. A first rotatable guide 33 is mounted on a projection 34 of the member 28 and a second rotatable guide 35 is mounted

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on the projection 36 of the member 29. The member 29 has a recess 37 therein of a size sufficient to receive a clock spring 38 having its inner end fixed at 39 to the stationary shaft 11 and the outer end fixed at 40 to the member 29.

Operation

During normal threading of the strand 10 through the apparatus, a given number of turns are placed about the first shive 14 then a half turn or turn of approximately 180° is placed in the manner shown about the first rotatable guide 33 after which a predetermined number of turns are placed about the central shive 24, in the V-groove 25 thereof, followed by a half turn or a turn of 180° about the second rotatable guide 35 in the manner shown followed by a given number of turns about the second shive 15, after which the strand is extended to the take-up and secured thereto. The apparatus is adapted to create a predetermined tension in the strand in the area between the processing machine for the strand and the take-up. This tensioning means is embodied in the clock spring 38 and for this reason, the clock spring may be of any desired size including a predetermined width and thickness to bring about the force required to be embodied therein and a predetermined overall length so that a desired number of convolutions may be embodied in the spring to bring about the various results desired. Actually, the spring is not nearly as thick as shown and has many more spiral turns to impart numerous cycles to the member 29 if required.

During normal conditions, the number of turns shown are placed about the various shives 14, 24 and 15 and prior to completing the threading of the strand to the take-up, including the placing of the strand about the second rotatable guide 35, the member 29 is rotated a predetermined number of turns to create a desired force in the clock spring 38 to establish the predetermined tension in the strand after it has been threaded to the take-up. The machine, with the apparatus, and the take-up may at this time be operated, the operation of the apparatus being responsive to the operations of the machine and take-up, allowing the strand to move in its path about the first shive 14, the first rotatable guide 33, the central shive 24, the second rotatable guide 35 and the second shive 15. At this point, with the force previously set in the spring 38, it will be apparent that an unexpected increase in tension in the strand between the machine and the take-up will apply forces to the rotatable guides 33 and 35 to oppose the predetermined force in the spring against the members 28 and 29 through their respective gears 26 and 27 and the intermediate gears 21 of the control unit 17 to cause the guides to rotate in directions tending to unwind convolutions of the strand from both the first and second shives 14 and 15 and their central shives 24. This, in effect, decreases the convolutions and thus the length of the strand in the apparatus, that is, on the free running shives 14, 24 and 15 to thereby decrease the tension on the strand. In a similar manner, a decrease in the predetermined tension in the strand such as the forming of a slack position in the strand between the machine and the take-up will immediately condition the spring 38 to force rotation of the member 29 about the axis of the shaft 11 to apply additional or added convolutions of the strands to both the second shive 15 and the central shive 24. This action of the control unit, that is, the rotation of the bevelled gear 27 with the member 29, causes rotation of the bevelled gears 21 to rotate a bevelled gear 26 together with the member 28 in a direction so that the first rotatable guide 33 will wind added whole or partial convolutions of the strand to both the first shive 14 and the central shive 24.

Another function of the apparatus is to act as an ac-

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cumulator for the strands. For example, during an interval when it is desirable to stop the take-up without stopping the machine. When this condition occurs, with the leading end of the strand 10 near the area of take-up being held fixed by any suitable means, the machine may continue operating to process and supply the strand during which time the numerous convolutions of the spring 38 will cause driving of the member 29 in a direction to cause the rotatable guide 35 to wind portions of the strand on the free running shives 15 and 24. Through the action of the gears in the control unit 17 the member 28 will rotate so that the first rotatable guide 33 will wind turns of the strand on the free running shive 14 and the central shive 24. This condition may continue until the problem created at the take-up has been solved such as the connection of a break in the wire or the removal of a full reel and the mounting of an empty reel. At this time, the take-up reel may be rotated for a given interval faster than the desired normal speed to remove the excess turns of the strand accumulated on the shives 14 and 15 and 24 and until the apparatus is back to the normal position illustrated in the drawing. It is to be understood that during the accumulating period the predetermined tension in the strand will be maintained as close as possible, it being important to allow the machine to continue operating and providing storing areas on the shives for this particular strand without disturbing the numerous other strands being processed in the machines. Once excess convolutions of strands have been removed from the apparatus, the spring 38 has been returned automatically to its normal setting and the apparatus may continue to control the travel of the strand between the machine and the take-up of a known predetermined tension.

It is to be understood that the above described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. A strand control apparatus interposed between a machine to supply a strand and a takeup for the strand comprising:

- a rotatable first shive positioned to receive lengths of the strand in turns thereon after the strand leaves the machine,
- a rotatable second shive positioned to receive lengths of the strand in turns thereon prior to reaching the takeup,
- a control unit interposed between the shives and operable to maintain a predetermined tension in the strand by varying the lengths of the strand in the turns on the shives when the tension in the strand varies from the predetermined tension,
- a fixed shaft rotatably supporting the shives,
- the control unit including spaced rotatable strand guides disposed adjacent the shives,
- supports for the guides rotatable on the shaft,
- an intermediate member interposed between the supports and adapted to receive a variable length of the strand in turns thereon, the length of which is controlled by the guides, and
- means operatively connecting the supports so that rotation of one of the supports to cause its guide to vary the length of the strand on said first shive will cause rotation of the other support to cause its guide to cause like variation in the length of strand on said second shive.

2. A strand control apparatus according to claim 1 in which:

- a gearing mechanism is interposed between the supports and having a spider, rotatably supporting first

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diametrically opposed gears, fixed to the shaft and positioned between second gears concentric with the shaft and fixed respectively to the guide supports so that rotation of one of the supports to cause its guide to vary the length of the strand on said first shive will operate the gearing mechanism to cause rotation of the other support to cause its guide to make like variations in the length of strand on said second shive.

3. A strand control apparatus according to claim 1 in which:

- a gearing mechanism is interposed between the supports and having a spider, rotatably supporting first diametrically opposed gears, fixed to the shaft and positioned between second gears concentric with the shaft and fixed respectively to the guide supports so that rotation of one of the supports to cause its guide to vary the length of the strand on said first shive will operate the gearing mechanism to cause rotation of the other support to cause its guide to make like variations in the length of strand on said second shive, and

means fixedly mounted on the spider of the gearing mechanism to rotatably support the intermediate member.

4. A strand control apparatus according to claim 1 in which:

- a gearing mechanism is interposed between the supports and having a spider, rotatably supporting first diametrically opposed gears, fixed to the shaft and positioned between second gears concentric with the shaft and fixed respectively to the guide supports so that rotation of one of the supports to cause its guide to vary the length of the strand on said first shive will operate the gearing mechanism to cause rotation of the other support to cause its guide to make like variations in the length of strand on said second shive, and

said intermediate member comprising a shive rotatably supported by the spider and having a V-shaped periphery to receive a variable length of the strand in turns thereon, the length of which is controlled by the guides.

5. A strand control apparatus interposed between a machine to continuously supply a strand and a takeup for the strand comprising:

- a shaft,
- a pair of spaced outer shives rotatably mounted on the shaft for receiving convolutions of strand,
- an intermediate shive rotatably mounted about said shaft and positioned between said outer shives for receiving convolutions of strand,
- a pair of guides rotatably mounted about said shafts between said outer shives and said intermediate shive for guiding strand from one outer shive to the intermediate shive and from the intermediate shive to the other outer shive,
- means responsive to variations in tension in the strand for rotating a first of said guides about said shaft relative to the intermediate shive to simultaneously remove or lay convolutions of strand on said intermediate shive and the adjacent outer shive until said tension is restored to the initial value,
- and a gearing mechanism for imparting the rotation of the first guide to the second guide to rotate said second guide in an opposite direction to simultaneously remove or lay convolutions of strand on said intermediate shive and the adjacent outer shive.

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