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REGISTRATION OF CORRUGATED TAPES

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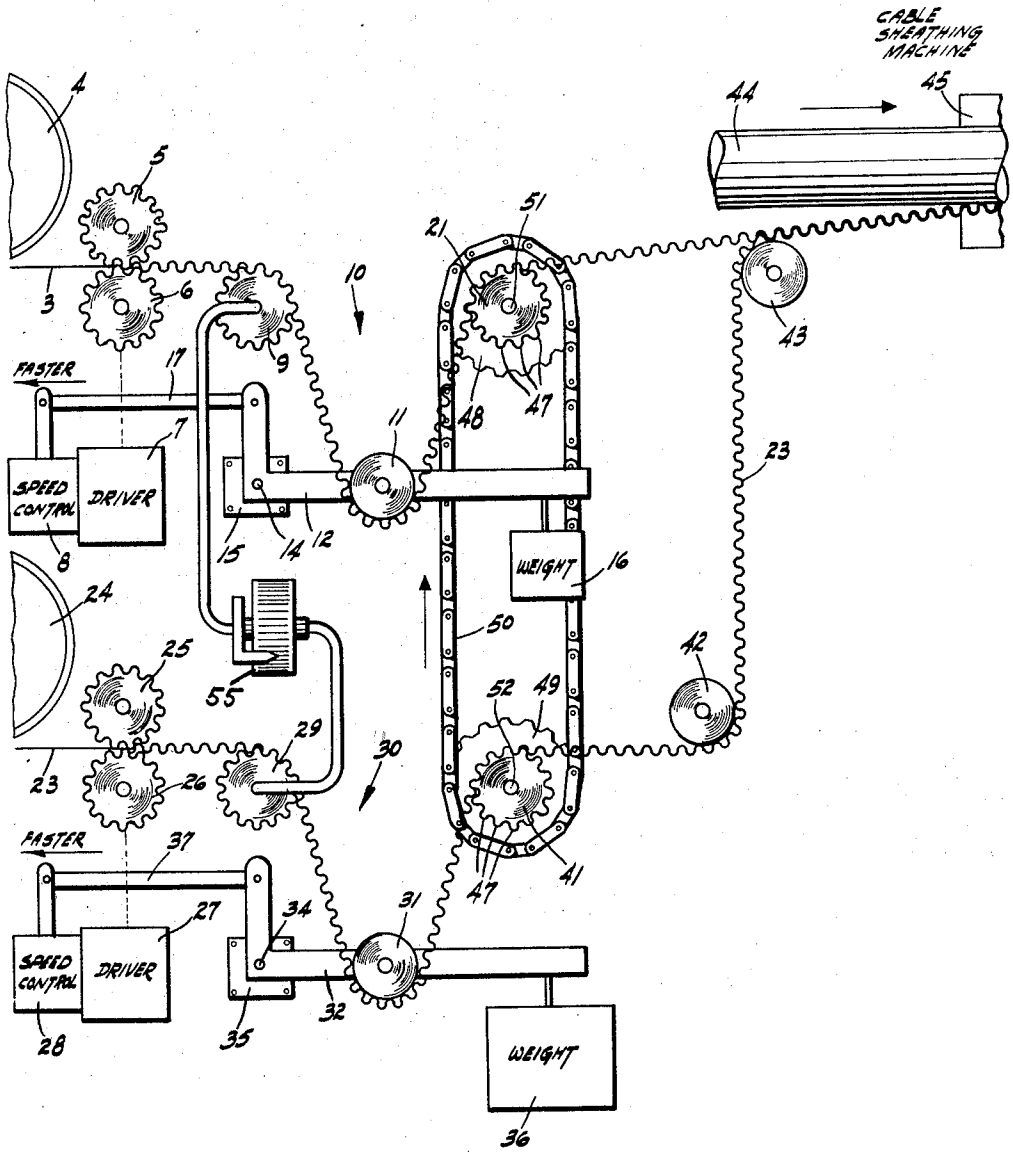

INVENTOR
C. A. HALLAM
BY W. C. Parmele
ATTORNEY

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REGISTRATION OF CORRUGATED TAPES

Cecil A. Hallam, Westfield, N.J., assignor to Western Electric Company, Incorporated, New York, N.Y., a corporation of New York

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This invention relates to the registration of corrugated tapes and particularly to a device for automatically meshing two laterally corrugated metal strips such as those used in the composite sheath of cables of the type disclosed in Patent 2,589,700 to H. G. Johnstone.

In fabricating composite metal sheaths for cables of the aforementioned type, flat aluminum and steel strips or tapes are first run through forming rolls, where the corrugations are produced, then combined in meshing relation and formed laterally around an advancing cable core with the edges of the steel tape meeting in a longitudinal overlapping seam which is subsequently soldered. Due to the different physical properties of the two tapes, it is not possible to produce and maintain exactly the same spacing between corrugations in the two tapes. Consequently, in order that the tapes may be properly meshed, as required for producing a smooth continuous seam in the outer steel tape when it is formed over the aluminum tape around the cable core, it is first necessary to stretch the tape having the greater number of corrugations per unit length so that its corrugations will mesh with the corrugations of the other tape. Heretofore, the stretch has been introduced in the tape requiring it by manually adding weights to one or the other of tensioning means operable on each of the moving corrugated tapes. The size of the required weights varies with the speed of the tapes so that as the speed of the cable line is changed, the weights have to be varied correspondingly, making it difficult to control the meshing of the tapes during transition periods such as when the line is started and brought up to optimum speed for the particular size of the cable being sheathed.

An object of the invention is to automatically mesh such corrugated tapes.

Another object is to automatically increase or decrease the speed of the corrugation forming means to adjust for changes in the length in one or the other of the tapes when one of the tapes is adjusted to bring its corrugations into registration with the corrugations of the other tape.

According to the general features of the invention, two laterally corrugated tapes pass through separate tensioning means which include output rolls having spaced teeth for engaging successive corrugations of the respective tapes. The rolls are interconnected to rotate synchronously and a force is transmitted between the output rolls to retard rotation of the roll of the tape having the greater number of corrugations per unit length entering into engagement therewith, to cause said tape to be stretched into registration with the other tape as it leaves its output roll and is brought into meshing relation with the other tape.

In one embodiment flat tapes are run through separate driven forming means to produce lateral corrugations therein, and changes in the stretch produced in the tapes leaving the output rolls produce a compensating change in the speed of the forming means, thereby preventing the forming means from supplying corrugated tape faster than it is advanced from the output rolls.

These and other features of the invention will be more fully understood by reference to the accompanying drawing showing a schematic diagram of a device for corrugating and meshing two metal tapes used in the sheath for a cable core.

In the system disclosed in the drawing, a flat aluminum tape or strip 3 is paid off a supply spool 4, and passed between opposing forming rolls 5 and 6 of a corrugating machine driven by a driver 7 whose speed is controlled by a lever actuated speed control 8. The driver and speed control therefor are of conventional design and are, therefore, not shown in detail. The corrugated tape 3 passes through a slack take-up or tensioning loop 10 comprising idler roll 9, tensioning roll 11, rotatably mounted to the mid-portion of a lever 12, and an output roll 21. Lever 12 is pivotally mounted at 14 to a fixed member designated generally as 15 and has a weight 16 at its opposite end. A linkage 17 is connected between the lever 12 and the speed control 8 for the corrugating rolls so that when the lever 12 is raised, the speed of the corrugating rolls will be increased or when it is lowered, by excessive slack in the aluminum tape 3, it will be slowed down.

In a similar manner, the steel tape 23 pays off a supply spool 24, is passed through rolls 25 and 26 of a corrugating machine driven by driver 27. This tape 23 is then fed through a slack take-up or tensioning loop 30 comprising rolls 29, 31 and 41, similar to the rolls 9, 11 and 21, respectively, of the loop 10. Roll 31 is rotatably mounted to a lever 32 which, in turn, is pivoted at 34 to a fixed member 35. A weight 36 is supported from one end of the lever and a linkage 37 is connected between its other end and the speed control 28 for the corrugating rolls. The corrugated steel tape emerges from the output roll 41, passes over idler rolls 42 and 43, and then is meshed with the aluminum tape 3 emerging from its output roll 21. The meshed tapes 3 and 23 are thereupon formed around an advancing cable core 44 in cable sheathing machine shown generally as box 45, the cable serving to pull or advance the tapes. Gear-like output rolls 21 and 41 having teeth 47 for engaging successive corrugations in their respective tapes, are rotated by the advancing tapes 3 and 23 and are interconnected by chain 50 and sprockets 48 and 49 on shafts 51 and 52, respectively, for synchronous rotation.

The weights 16 and 36 apply downward forces on the rolls 11 and 31, respectively, to tension each of the advancing tapes 3 and 23. The forces exerted on the tapes by the respective weights are made slightly less than those required to permanently deform or stretch them, or expressed otherwise, the tapes are tensioned slightly below their elastic limits. For example, for an aluminum tape four inches wide and eight one-thousandths inch thick, the downward pull or force may be in the neighborhood of ten pounds, while a corresponding weight for a steel tape four and a half inches wide and five one-thousandths inch thick may be thirty pounds.

Members 9 and 29 may be smooth fixed pins but preferably they are rolls. When rolls are used, they may perform an additional function, namely, that of actuating an indicator 55 for displaying differences in the rates at which corrugations are produced in the two tapes. This indicator then shows no difference indication under normal conditions when the two pairs of corrugating rolls are driven at identical speeds. The gage is a quick and simple device for indicating proper operation of the corrugators and the meshing of the two tapes.

In operation, each corrugator is normally driven at a speed determined by the position of its movable roll 11 or 31 in the control loop 10 or 30, respectively. If the corrugations in the two tapes are identically spaced, the out-

put rolls 21 and 41 will rotate freely, and the tapes will mesh as they enter the cable sheathing machine. When the corrugations in one of the tapes, for example, the aluminum tape 3, are closer together than those of the steel tape 23, the closer spaced corrugations engaging teeth 47 of roll 21 will tend to rotate roll 21 faster than the corrugations of the steel tape can rotate the roll 41. This results in roll 21 being held back, or its free rotation retarded, by the drag of tape 23, which includes the weight 36, reacting on roll 41. In other words, part of the pulling force required to advance tape 23 through the output roll 41 is, under such a condition, obtained from the tape 3 acting on the roll 21, the force being transmitted through the chain 50. Since the rate at which the tapes are advanced and formed around the cable is independent of this action, the tape 3 will be stretched beyond its elastic limit as it leaves the roll 21, while correspondingly less than normal pull will be exerted on the steel tape 23 as it exists from its roll 41.

Since the free rotation of the output roll 21 is prevented, corrugated tape from the corrugating rolls 5 and 6 will be supplied to the loop 10 at a faster rate than it is being used; consequently, roll 11 will move downward and the speed of the corrugating rolls will be reduced, thereby preventing overfeeding of the aluminum tape. The system works in a similar way when the corrugations per unit length in the steel tape exceed those in the aluminum. Because of the greater difficulty in stretching the steel, however, in practice, the aluminum tape is normally formed with slightly more corrugations per unit length than the steel tape, so that any stretching that is required will be on the aluminum tape.

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. In a device for automatically meshing two laterally corrugated advancing tapes, a driver for each of the tapes, a control loop for each of the tapes, each loop having at least one movable tape-engaging roll and a rotatable output roll with spaced teeth for engaging successive corrugations of the tape, means for each driver, responsive to the size of the respective loops for controlling the speed thereof, means responsive to a difference in the number of corrugations per unit length in the tapes feeding into the two respective output rolls for applying a force to the output roll of the tape having the greater number of corrugations per unit length to retard its rotation and thereby cause the corrugations of the tape leaving said output roll to be in register with those of the other tape, and means for guiding the tapes from the output rolls into meshing relation.

2. In a device for automatically meshing two laterally corrugated advancing tapes, a driver for each of the tapes, a control loop for each of the tapes, each loop having at least one movable tape-engaging roll and an output roll with spaced teeth for engaging successive corrugations of the tape, means interconnecting the output rolls causing them to rotate synchronously for transmitting forces therebetween for equalizing the spacings between corrugations in the tapes as they leave their respective output rolls, means for guiding the tapes from the output rolls into meshing relation, and means for each driver, responsive to the size of the respective loops for controlling the speed thereof.

3. A device for automatically corrugating and meshing two advancing tapes comprising first and second pairs of corrugating rolls, drivers for the rolls, a control loop for each of the tapes, each loop having at least a movable tape engaging roll and a rotatable output roll with spaced teeth for engaging successive corrugations of the advancing tape, means for guiding the tapes from the output rolls into meshing relation means responsive to a difference in the number of corrugations per unit length in the tapes feeding into the two respective output rolls for applying a force to the output roll of the tape having the greater number of corrugations per unit length to retard rotation thereof and thereby stretch the tape leaving the roll so that its corrugations are in registration with those of the other tape, and means responsive to changes in the amount of stretch produced in the tape for producing compensating changes in the speed of the driver for its corrugating rolls.

4. A device for automatically corrugating and meshing two advancing tapes comprising first and second forming means for producing corrugations in the tapes, a driver for each of the forming means, a slack take-up for each of the tapes with a movable, tape-engaging roll, an output roll having spaced teeth for engaging successive corrugations of the tape, and means for exerting a force on the movable roll to tension the tape, means for guiding the tapes from the output rolls into meshing relation, means responsive to differences in the number of corrugations per unit length of the tapes feeding into the output rolls for applying a stretching force on the tape having the larger number of corrugations per unit length as the tape passes from its output roll, and means responsive to changes in the amount of stretch produced in the tape for moving its movable roll to produce compensating changes in the speed of the driver for its corrugation forming means.

5. In a device for automatically meshing two laterally corrugated advancing tapes, a tensioning loop for each of the tapes, each loop having an input member, a rotatable output roll with spaced teeth for engaging a successive corrugations of the tape, a movable roll located between the input member and the output rolls, a weight for applying a force on the movable roll to tension the tape formed in a loop over the member and the rolls, chain sprockets mounted rotatably with each of the output rolls, a chain engaging the sprockets for causing the output rolls to rotate synchronously, means for guiding the tapes from the output rolls into meshing relation, and means for each driver, responsive to the size of the respective loops for controlling the speed thereof.

6. A device for automatically corrugating and meshing two advancing tapes comprising first and second pairs of corrugating rolls, drivers for the rolls, a speed control loop for each of the tapes, each loop having at least a movable tape engaging roll and a rotatable output roll with spaced teeth for engaging successive corrugations of the advancing tape, means responsive to the position of the movable rolls for determining the speed of the respective driver, a weight for applying a force on the movable roll to tension the tape formed in a loop over the rolls, chain sprockets mounted rotatably with each of the output rolls, a chain engaging the sprockets for causing the output rolls to rotate synchronously, means for guiding the tapes from the output rolls into meshing relation, and means for indicating differences in the rates the corrugations are formed in the two tapes.

7. In a device for automatically meshing two laterally corrugated tapes, a driver for each of the tapes a tensioning loop for each of the tapes, each loop having an input member, a rotatable output roll with spaced teeth for engaging successive corrugations of the tape, and a movable roll located between the input member and the output rolls, means for guiding the tapes from the output rolls into meshing relation, means for applying a force on the movable roll to tension the tape formed in the loop to a point slightly less than that required to permanently elongate the respective corrugated tapes, means interconnecting the output rolls to cause them to rotate synchronously and for transmitting a force from one of the tensioning means to the output roll of the other when the number of corrugations per unit length in the tape entering said out-

put roll exceeds those of the other tape, and means for each of the drivers, responsive to the location of the movable rolls in the respective loops for controlling the speed thereof.

8. In a device for automatically meshing two laterally corrugated advancing tapes, one being more easily stretched than the other, a driver for each of the tapes, a tensioning loop for each of the tapes, each loop having an input member, a rotatable output roll with spaced teeth for engaging successive corrugations of the tape, and a movable roll located between the input member and the output rolls, a weight for applying a force on the movable roll to tension the tape formed in the loop to a point slightly less than the elastic limit for the respective corrugated tapes, chain sprockets mounted rotatably with each of the output rolls, a chain engaging the sprockets for causing the output rolls to rotate synchronously, whereby said chain transmits a relatively large force to the output roll of the more easily stretched tape from the weight in the loop of the other tape to stretch the more easily stretched tape as it leaves the output roll when its number of corrugations per unit length exceeds those in the other tape, means for guiding the tapes from the output rolls into meshing relation, and means for each of the drivers, responsive to the location of the movable rolls in the respective loops for controlling the speed thereof.

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