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TAKEUP MECHANISM

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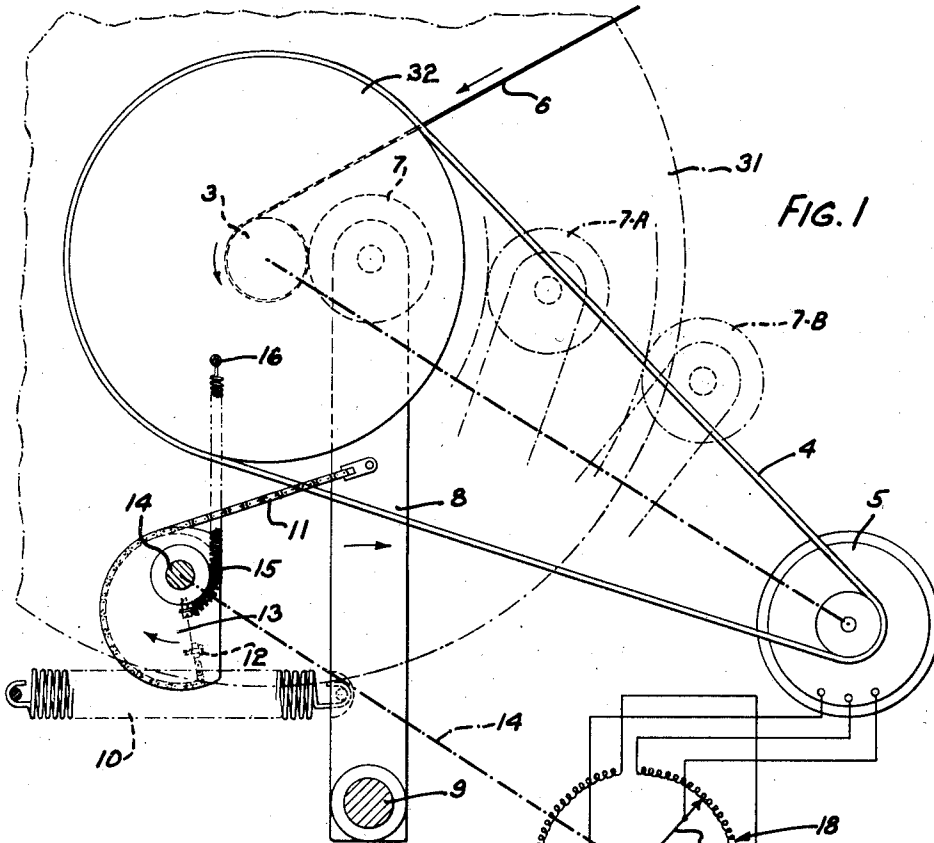


FIG. 1

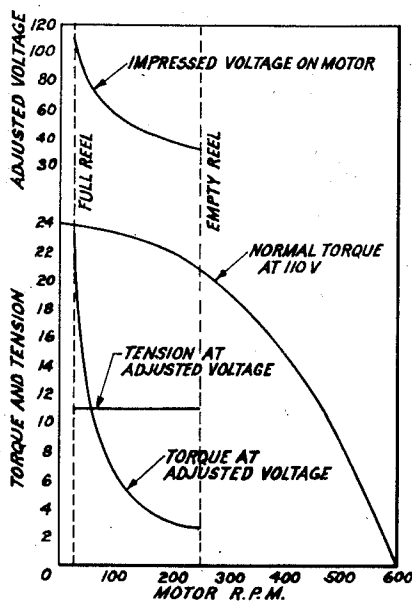
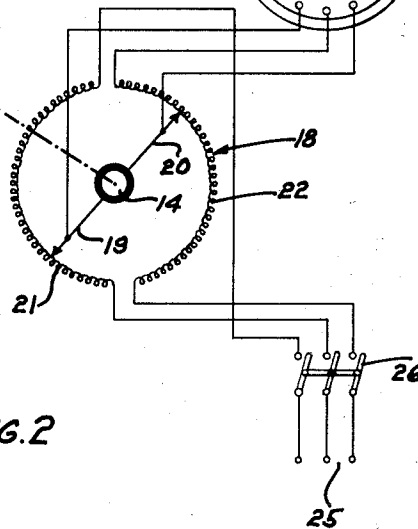


FIG. 2



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TAKE-UP MECHANISM

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8 Claims. (Cl. 242—75)

This invention relates to takeup mechanisms and more particularly to an apparatus for maintaining a uniform tension in strand material fed to a takeup reel at a constant rate where the radius of application of the material to the reel changes constantly.

It is an object of the present invention to provide a simple and efficient apparatus for obtaining a uniform tension in strand material being wound on a takeup reel.

In accordance with one embodiment of the invention as applied to a takeup device, wherein the radius of application of strand material to the takeup spool is constantly increasing, the driving torque is changed in proportion to the change in radius of application by regulating the primary voltage of an induction motor having a high resistance secondary circuit and serving as the driving motor of the takeup reel. This is accomplished by regulating the primary voltage (and thereby the torque on the takeup member) of the driving motor through a voltage regulator actuated by an arm which changes its position as the strand material is being taken up by the takeup spool or reel and through a cam arm which controls the voltage regulator. In this manner, the torque is varied directly as the arbor fills up to change the normal speed torque characteristic of the motor and exert a uniform tension on the material from an empty spool to a full one.

A better understanding of the invention may be had by reference to the accompanying drawing, wherein

Fig. 1 shows, diagrammatically, an apparatus for varying the torque of the takeup motor in response to the change in radius of application of strand material to a takeup spool driven by the takeup motor, and

Fig. 2 is a chart showing, diagrammatically, the relation of the torque of the motor at the adjusted voltages, and consequent tension on the strand material, as compared with the torque that would be obtained at the normal or rated voltage of the motor.

In the drawing, a takeup spool 31, which is shown in dot and dash lines, is shown equipped with a driving sheave 32 fixed to its drum 3. The sheave 32 is driven through a belt 4 by an induction motor 5, having a high resistance secondary circuit for winding a strip of material 6 on to the spool 31. The material 6 is fed in the direction of the arrow at a constant rate of speed from a processing apparatus and is adapted to be wound on the spool 31. An idler roller 7, which bears against the material on the drum 3, is

mounted on the free end of a pivotally supported lever 8, which is free to pivot about a stud shaft 9 and which is urged about the shaft 9 in a counter-clockwise direction by a contractile spring 10. The motor 5, being an induction motor having a high resistance secondary, may be operated on the portion of its speed torque curve shown between the dotted lines in Fig. 2 without damage to the motor.

Attached to the lever 8, intermediate its ends, is a chain 11, which has its opposite end fixed at 12 to a cam 13. The cam 13 is mounted on a shaft 14 and has fixed to it a contractile spring 15, the opposite end of which is fixed to a pin 16. The spring 15 normally tends to rotate the shaft 14 and cam 13 to the position shown in the drawing and when the lever 8 is moved in a clockwise direction, as indicated by the arrow, the cam 13 will also be rotated in a clockwise direction, as indicated by the arrow on it to rotate the shaft 14 with it. The shaft 14 constitutes the control shaft of an auto-transformer 18, the output voltage of which may be varied in very small increments by rotating its control shaft 14.

Mounted on and insulated from the shaft 14 are a pair of brushes 19 and 20, which are connected directly to the primary winding of the motor 5 and which are adapted to pass over and make contact with successive portions of the windings 21 and 22, respectively, of the transformer 18. The windings 21 and 22 of the transformer 18 may be connected to a source of current 25 through a switch 26 and when so connected, the position of the arm 8 and the resulting position of the cam 13 will determine the voltage output of the transformer to the primary winding of the motor 5. As the takeup spool or reel 31 fills up with material, the idler roller 7 will be moved to the positions shown at 7A and 7B, gradually being moved to these positions as the reel fills up with material. In moving to these positions, the lever 8 will be rocked about its pivot 9 and will impart rotation to the shaft 14. The configuration of the cam 13 is such that a gradual increase in voltage impressed on the primary winding of the motor 5 will be effected and this increase will be proportional to the increase in torque of the motor which is necessary to maintain the tension constant. If, for example, the radius of application of the tape to the drum gradually doubles, it will be necessary to gradually double the torque and the cam 13 will be shaped accordingly. This increase is illustrated in Fig. 2, where the voltage impressed on the motor when the reel 31 is rotating at ap-

proximately 250 R. P. M. is shown as approximately 36 volts and the torque output of the motor is shown as approximately 2.4 inch-pounds.

As the reel 31 fills up, the voltage will be increased from approximately 36 volts to 110 volts and the torque output of the motor will increase from 2.4 inch-pounds for an empty spool rotating at 250 R. P. M. to 24 inch-pounds for a full spool rotating at 25 R. P. M., whereas the horsepower of the motor will remain constant and, consequently, the tension will remain constant at approximately eleven pounds. In this manner, a uniform tension will be exerted on the material from an empty to a full reel. If it is desired, for any reason, to apply the material to the reel under various tensions during the winding thereof, the cam 13 may be shaped to accomplish this function.

Although a specific embodiment of the invention has been described hereinbefore, it is to be understood that many changes and modifications may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A takeup mechanism for taking up material delivered at a predetermined speed comprising a takeup reel, an induction motor having a high resistance secondary circuit for driving said reel, and means responsive to an increase in material on the takeup reel for automatically varying the primary voltage applied to said motor to increase the motor torque in direct proportion to the decrease in reel speed.

2. A takeup mechanism for taking up material delivered at a predetermined speed comprising a takeup reel, an induction motor having a high resistance secondary circuit for driving said reel, and means responsive to the amount of material on the takeup reel for automatically varying the primary voltage applied to said motor to increase the motor torque in a predetermined ratio to the decrease in the reel speed.

3. A takeup mechanism for taking up material delivered at a constant rate of speed comprising a reel, an induction motor having a high resistance secondary circuit for driving said reel, means responsive to the amount of material wound on the takeup reel for controlling the torque of the takeup motor comprising a variable transformer for supplying current to the primary winding of the motor, means movable by the material on the reel as the reel fills up, and means under control of the last mentioned means for varying the voltage output of said transformer in accordance with the amount of material on the reel.

4. A takeup mechanism for taking up material delivered thereto at a constant rate of speed, comprising a takeup reel, an induction motor having a high resistance secondary circuit for driving said takeup reel, a lever movable in response to increases in material on the reel, a cam rotatable by said lever in its movement, a shaft for supporting said cam and a transformer

in the motor circuit having brushes in contact with its windings and driven by said cam for varying the voltage output of said transformer to the primary circuit of said motor.

5. A takeup mechanism for taking up material delivered thereto at a constant rate of speed comprising a takeup reel, an induction motor having a high resistance secondary circuit for driving said takeup reel, and means for increasing the motor torque as the reel speed decreases comprising a lever movable in response to increases in material on the reel, a cam rotatable by said lever, and a transformer in the motor circuit having brushes in engagement with its windings and driven by said cam for varying the voltage output of said transformer to the primary circuit of said motor.

6. A takeup mechanism for taking up material delivered at a predetermined rate of speed comprising a reel having an initially small radius of application and adapted to receive a large amount of material whereby the reel will have a large radius of application when full, an induction motor having a high resistance secondary circuit for driving said reel, means for controlling the primary voltage applied to said induction motor including means bearing upon the material on the takeup reel and movable in response to increases in the diameter of the material on the reel, a transformer having brushes engaging its windings and connected to said motor, and means interconnecting the means responsive to the amount of material on the reel and said brushes for varying the voltage output of said transformer to said motor.

7. A takeup mechanism for taking up material delivered at a predetermined rate of speed comprising a reel having an initially small radius of application and adapted to receive a large amount of material whereby the reel will have a large radius of application when full, an induction motor having a high resistance secondary circuit for driving said reel, means for controlling the primary voltage applied to said induction motor including means bearing upon the material on the takeup reel and movable in response to increases in the diameter of the material on the reel, an adjustable transformer, and means interconnecting the means responsive to the amount of material on the reel and the transformer to adjust the transformer for varying the primary voltage supplied to the motor.

8. A takeup mechanism for a web delivered thereto at a constant speed comprising a takeup reel, an induction motor having a high resistance secondary circuit for driving said reel, and means responsive to an increase in the amount of web material on the takeup reel for automatically increasing the motor torque as the reel speed decreases by varying the primary voltage applied to said motor to maintain a constant tension in the web.

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