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APPARATUS FOR HANDLING MATERIAL

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FIG. 1

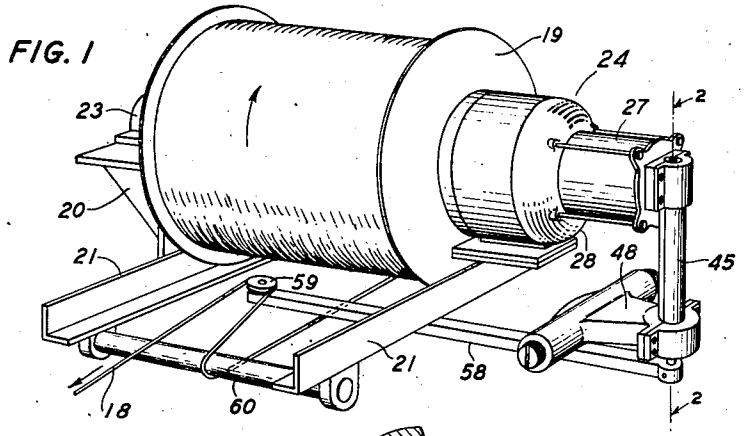


FIG. 2

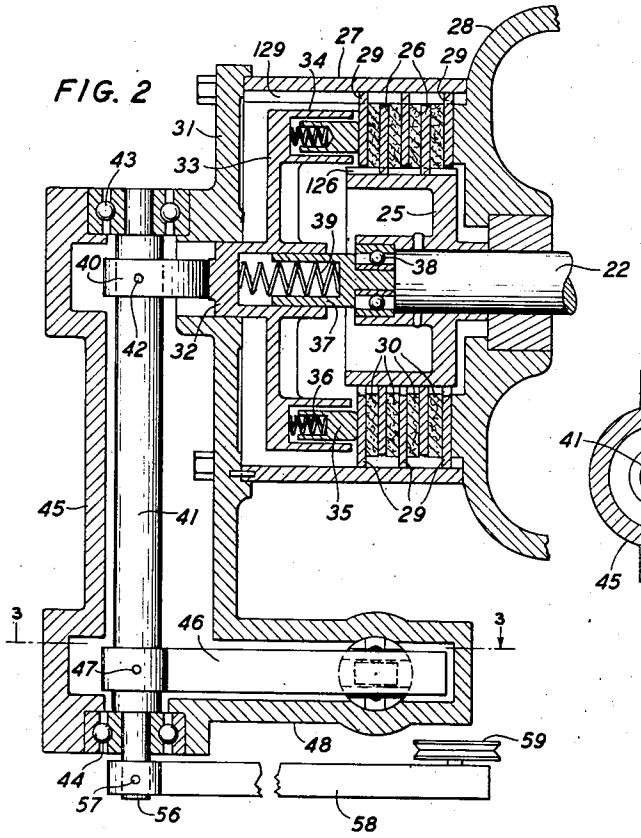
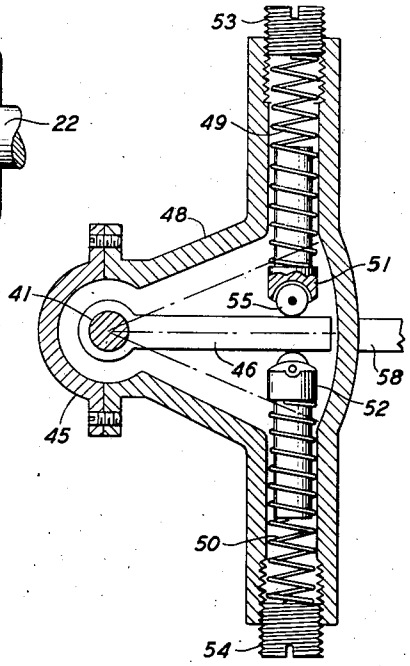


FIG. 3



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APPARATUS FOR HANDLING MATERIAL

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14 Claims. (Cl. 242—45)

This invention relates to apparatus for handling material and more particularly to a supply reel from which strands are to be drawn, together with braking means therefor.

There are many kinds of processes and apparatus for handling and operating upon material in strand form, in a great number of which the strand to be operated upon is wound on spools or reels or the like, from which the strand is drawn by the normal operation of the apparatus involved. In connection with such supply reels it becomes of great importance to control adjustably and yet with considerable accuracy, the resistance afforded by the reel to the withdrawal of strand therefrom. It is ordinarily essential that this resistance, which imposes a tensional stress upon the strand being withdrawn, shall be maintained constant and shall be adjustable to conditions imposed in part by the nature of the strand and in part by the nature of the apparatus which withdraws the strand from the reel. These conditions become particularly important when the strand itself is fine and not of great strength in comparison with the mass of the reel and the strand content thereon, which ordinarily is put in rotation and maintained therein by the withdrawal of the strands.

An object of the present invention is to provide an apparatus or device for mounting a material containing reel with means for driving the same to assist the withdrawn strand to rotate the reel, and to provide adjustable and accurately self-compensating means whereby to impose an adjustable and accurately constant tension upon the strand being withdrawn.

With the above and other objects in view, one embodiment of the invention may present a shaft or spindle upon which a supply reel may be removably mounted, the shaft having the rotor of an electric motor and the rotary member of a rotary brake mounted thereon, the stationary member of the brake being conveniently housed in a casing supported on the stationary stator housing of the motor, all in combination with actuating means for the brake arranged to be controlled by the strand being withdrawn from the reel, the motor under control of the brake operating to drive the reel in the unwinding direction at a speed sufficiently less than actual unwinding speed to create the desired tension in the strand.

Other objects and advantages of the invention will appear from the following detailed description of one embodiment thereof taken in connection with the accompanying drawing in which the same reference numerals are applied to identical parts in the several figures, and in which:

Fig. 1 is a perspective view of a supply reel supporting and driving device constructed in accordance with the invention;

Fig. 2 is a broken enlarged sectional view on the line 2—2 of Fig 1; and

Fig. 3 is a sectional view on the line 3—3 of Fig. 2.

The apparatus herein disclosed is an illustrative embodiment of the invention and has a supporting bracket 20 of any suitable form by means of which the device may be supported in connection with whatever strand handling apparatus it is to be used. Upon the bracket 20 is supported in any suitable fashion a pair of horizontal rails 21, 21 along which a reel 19, containing a supply of strand 18 wound thereon, may be conveniently rolled to or from the operative position shown in the drawing. The reel 19 is supported in this operative position upon a shaft 22 not shown in Fig. 1 but shown in Fig. 2 and upon any suitable stub shaft or other similar device 23. The reel 19 is placed in position upon, secured to, and detached from the members 22 and 23 in any convenient well known manner of removably supporting a reel upon such rotatable members. It is thought that such means for removably and interchangeably supporting reels are too familiar in the art to require detailed description here.

Upon the shaft 22 is also mounted the rotor of an electric motor, generally indicated by the numeral 24, to drive the reel in the direction indicated by the arrow. The motor 24 may be of any well known or suitable construction, it being found that a particularly suitable form of motor is a direct current shunt wound motor with a high internal resistance, such that the motor may be stalled while energized without material injury. There is also mounted on the shaft 22 and rigidly keyed thereto a drum shaped member 25 upon the outer periphery of which are secured one or more brake members 26 slidable axially on the drum but held against rotation thereon by a key 126 which have the form of thin annular flanges surrounding the drum 25 and outstanding therefrom at spaced intervals. A housing 27 surrounds the brake member 26 and is conveniently rigidly secured to the stationary housing 28 of the motor. The housing 27 is generally cylindrical in form and coaxial with the shaft 22. Against the inner surface of the cylindrical wall of the housing 27 one or more annular brake members 29 are slidably and non-rotatably guided by a key 129. These are in spaced intercalated relation

to the members 26. The spaces between the members 26 and the members 29 are filled with friction rings 30 of felt, asbestos fabric or other suitable material. The outer end wall 31 of the housing 27 has a central bore coaxial with the shaft 22. A stub shaft 32 longitudinally slidable in this bore carries a drum 33 having a coaxial flange 34 integral therewith extending toward the exterior left hand brake member 29. Flange 34 is coaxially grooved at its outer end, providing a recess within which is housed a ring 35 which presses against the outer left hand brake member 29. The ring 35 is provided on its left hand side with a plurality of bores within which are housed the respective members of a corresponding plurality of compression springs 36 which together urge the ring 35 against the left hand brake member 29. The stub shaft 32 is axially counter-bored at its right hand end to be slidable longitudinally upon a stub shaft 37 supported at its right hand end in a ball bearing 38 mounted on the left hand end of the shaft 22. The shaft 37 is counter-bored axially at its right hand end and a compression spring 39 is located in the two counter bores of the two shafts 32 and 37 and tends to move these two shafts axially apart, thus tending to drive the shaft 32 to the left, carrying the ring 35 away from the brake members. The left hand end of the shaft 32 abuts against a cam 40 mounted upon a vertical shaft 41 and rigidly secured thereto as by a pin 42. The shaft 41 is preferably journalled in and carried by ball bearings 43 and 44 supported in a housing 45 mounted on or integral with the housing 27. Near the lower end of the shaft 41 a horizontal lever 46 is rigidly secured thereto, as by a pin 47, and extends horizontally into a suitably shaped housing 48 which may be integral with or attached to the housing 45. A pair of opposed compression springs 49 and 50, here shown as coaxially positioned helical coil springs, is mounted in the housing 48 in such fashion that the adjacent ends of the compression springs 49 and 50 are brought to bear against opposite vertical faces of the lever 46 by means of suitably interposed contact blocks 51 and 52. The outer ends of the springs 49 and 50 are abutted against and supported by suitable screw plugs 53 and 54 in the housing 48. Preferably the blocks 51 and 52 will be provided with means such as a contact roller or ball 55 to minimize friction between the block and the lever.

The shaft 41 has an extension 56, below the bearing 44 and outside of the housing, upon which is rigidly secured, as by a pin 57, a horizontal lever 58 upon the outer end of which a sheave 59 is mounted to be freely rotatable about a vertical axis. A roller 60 is mounted as shown under the rails 21, 21 so that the plane of the groove of the sheave 59 is tangent to the top of the roller.

In operation it is to be presumed that the device as shown is mounted as part of some machine or apparatus which is drawing the strand 18 from the reel 19. It is further to be presumed that the strand is being drawn at a substantially constant and predetermined rate of speed. In many such instances it may be desired to have a very great length of strand on the supply reel 19 and the strand may be fine and relatively fragile. For example, in some operations in connection with the manufacture of electrical conductor cable, especially such as is used in the telephone and other communications arts, the weight of the reel and the strand thereon when the reel is full may be of the order of twenty pounds, sixty pounds, or even three hundred pounds, while the strand in question may be annealed copper wire of twenty-four, twenty-six, or twenty-eight gauge or even smaller. It will be evident in such cases that the strand may be stressed beyond its yield point if not broken if the strand alone be relied upon to set the reel in motion and keep it moving at the required speed, especially when it is realized that the winding of the strand on the reel may be irregular to a certain degree so that some coils are looser than others. Hence with the present apparatus the motor 24 is so energized and the brake device is so adjusted that when the lever 46 is in the median position shown in Fig. 3, the motor will drive the reel 19 in the unwinding direction at a velocity a trifle less than that required by the desired constant linear velocity of the strand 18. The strand 18 being pulled off at the desired speed will give the reel the slight additional velocity necessary, and in so doing will be subjected to a small constant tension as desired. The cam 40 is so formed that if the lever 58 moves toward the observer in Fig. 1, which means away from the observer in Fig. 2 and upwardly in Fig. 3, the shaft 32 is permitted to move to the left in Fig. 2, carrying the drum 33 away from the brake members 26 and 29 and thus lessening the pressure of the ring 35 against the left hand member. This diminishes the braking effect between the various elements 26, 29 and 30 and the motor 24 drives the reel with greater velocity. In the same way if the lever 58 moves away from the observer in Fig. 1 the braking effect is increased and the motor is correspondingly less effective to drive the reel. It will be evident by inspection of Fig. 1 that, if the tension upon the strand 18 should increase for any reason, the strand will draw the sheave 59 and therewith the lever 58 toward the observer in Fig. 1. This, as just described, will ease the braking effect and thus permit the motor to drive the reel correspondingly faster and diminish the tension on the strand 18. The springs 49 and 50 are so formed and proportioned, and if necessary so adjusted by means of the screws 53 and 54, that when a strand 18 is under the desired tension the lever 46 will normally lie in the median position shown in Fig. 3. Since the lever 46 thus floats, so to speak, between opposed tensions of the springs 49 and 50 it will be evident that the control of the braking effect by means of the lever 58 and hence by the effect of the strand on the sheave 59 will be very sensitive and responsive to changes in the strand tension.

It will be noted that the roller 60 is so positioned relatively to the sheave 59 that the groove of the sheave is always substantially in a plane tangent to the top of the roller. Hence the strand 18 passes both to and from the sheave 59 over the roller 60 always in the same way, without leading to or from the sheave at such an angle as to rub across the flanges of the groove in the sheave. This results from the facts that the shaft 41, about which the lever 58 turns, is vertical, the axis of the sheave 59 is vertical, and the top of the roller 60 is horizontal. Hence motion of the lever 58 and sheave 59 relatively to the roller 60 cannot bring the strand 18 out of the plane of the groove of the sheave and thus introduce accidental variations into the strand tension due to friction across the sheave flanges.

The embodiment of the invention herein disclosed is illustrative only and may be modified and departed from in many ways without departing from the spirit and scope of the invention as

pointed out in and limited solely by the appended claims.

What is claimed is:

1. In a strand handling device, means to rotatably support a strand supply reel from which a strand is to be drawn at constant predetermined speed by external means, in combination with a motor having its rotor rigidly connected to the reel to drive the reel in the unwinding direction thereof, brake means directly connected to the rotor of the motor and effective to prevent the rotor of the motor and thereby the reel also from running at the speed required by the predetermined constant strand speed, and means controlled by the strand and responsive to the tension of the strand to vary the effectiveness of the brake means.

2. In a strand handling device, means to rotatably support a strand supply reel from which a strand is to be drawn at constant predetermined speed by external means, in combination with a motor having its rotor rigidly connected to the reel to drive the reel in the unwinding direction thereof, rotary brake means directly connected to the rotor of the motor and effective to prevent the rotor of the motor and thereby the reel also from running at the speed required by the predetermined constant strand speed, and means controlled by the strand and responsive to the tension of the strand to vary the effectiveness of the brake means, the rotor of the motor and the rotary member of the brake means being both rigidly mounted on a common shaft.

3. In a strand handling device, means to rotatably support a strand supply reel from which a strand is to be drawn at constant predetermined speed by external means, in combination with a motor to drive the reel in the unwinding direction thereof, brake means effective to prevent the motor from running at the speed required by the predetermined constant strand speed, means controlled by the strand and responsive to the tension of the strand to vary the effectiveness of the brake means, the strand controlled means comprising a member having a sheave thereon to receive a loop of the strand, a pair of opposed springs between which the member normally floats, and means connected to the member to vary the effectiveness of the brake means.

4. In a strand handling device, means to rotatably support a strand supply reel from which a strand is to be drawn at constant predetermined speed by external means, in combination with a motor to drive the reel in the unwinding direction thereof, brake means effective to prevent the motor from running at the speed required by the predetermined constant strand speed, means controlled by the strand and responsive to the tension of the strand to vary the effectiveness of the brake means, the strand controlled means comprising a lever having a sheave thereon to receive a loop of the strand, a pair of opposed springs between which an arm of the lever normally floats, and means connected to the lever to vary the effectiveness of the brake means.

5. In a material handling device, means to rotatably support a material containing reel, adjustable brake means operating to oppose rotation of the reel, a member over which material passes to or from the reel and movable responsively to changes in tension in the material, opposed springs between which the member normally floats, and means actuated by the member to vary the effectiveness of the brake means.

6. In a strand supply device, means to rotatably support a strand supply reel from which a strand is to be drawn, adjustable brake means operating to oppose rotation of the reel, a member having a sheave thereon to receive a loop of the strand being withdrawn from the reel to move the member responsively to changes in tension in the strand, opposed springs between which the member normally floats, and means actuated by the member to vary the effectiveness of the brake means.

7. In a strand supply device, means to rotatably support a strand supply reel from which a strand is to be drawn, adjustable brake means operating to oppose rotation of the reel, a lever having a sheave thereon to receive a loop of the strand being withdrawn from the reel to move the lever responsively to changes in tension in the strand, opposed springs between which the lever normally floats, and cam means actuated by the lever to vary the effectiveness of the brake means.

8. In a strand supply device, means to rotatably support a strand supply reel from which a strand is to be drawn, a motor to drive the reel in the unwinding direction thereof, adjustable brake means operating to oppose rotation of the reel, a member having a sheave thereon to receive a loop of the strand being withdrawn from the reel to move the member responsively to changes in tension in the strand, opposed springs between which the member normally floats, and means actuated by the member to vary the effectiveness of the brake means.

9. In a strand supply device, means to rotatably support a strand supply reel from which a strand is to be drawn, a motor to drive the reel in the unwinding direction thereof, adjustable brake means operating to oppose rotation of the reel, a lever having a sheave thereon to receive a loop of the strand being withdrawn from the reel to move the lever responsively to changes in tension in the strand, opposed springs between which the lever normally floats, and cam means actuated by the lever to vary the effectiveness of the brake means.

10. In a strand supply device, means to rotatably support a strand supply reel from which a strand is to be drawn, adjustable brake means operating to oppose rotation of the reel, a member having a sheave thereon to receive a loop of the strand being withdrawn from the reel to move the member responsively to changes in tension in the strand, opposed springs between which the member normally floats, means actuated by the member to vary the effectiveness of the brake means, and means to guide the strand to and from the sheave in the plane of the groove of the sheave.

11. In a strand supply device, means to rotatably support a strand supply reel from which a strand is to be drawn, a motor to drive the reel in the unwinding direction thereof, adjustable brake means operating to oppose rotation of the reel, a member having a sheave thereon to receive a loop of the strand being withdrawn from the reel to move the member responsively to changes in tension in the strand, opposed springs between which the member normally floats, means actuated by the member to vary the effectiveness of the brake means, and means to guide the strand to and from the sheave in the plane of the groove of the sheaves.

12. In a strand supply device, means to rotatably support a strand supply reel from which a

strand is to be drawn, adjustable brake means operating to oppose rotation of the reel, a member having a sheave thereon to receive a loop of the strand being withdrawn from the reel to move the member responsively to changes in tension in the strand, opposed springs between which the member normally floats, means actuated by the member to vary the effectiveness of the brake means, and a roller tangent to the plane of the groove of the sheave to guide the strand to and from the sheave in the plane of the groove of the sheave.

13. In a strand supply device, means to rotatably support a strand supply reel from which a strand is to be drawn, a motor to drive the reel in the unwinding direction thereof, adjustable brake means operating to oppose rotation of the reel, a member having a sheave thereon to receive a loop of the strand being withdrawn from the reel to move the member responsively to changes in tension in the strand, opposed springs between which the member normally floats, means actuated by the member to vary the effectiveness of the brake means, and a roller tangent to the plane of the groove of the sheave to guide the strand to and from the sheave in the plane of the groove of the sheave.

14. In a strand supply device, means to rotatably support a strand supply reel from which a strand is to be drawn, a lever having a sheave thereon to receive a loop of the strand being withdrawn from the reel to move the lever responsively to changes in tension in the strand, and a roller tangent to the plane of the groove of the sheave to guide the strand to and from the sheave in the plane of the groove of the sheave.

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