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SCREEN TAKE UP CONTROL MECHANISM

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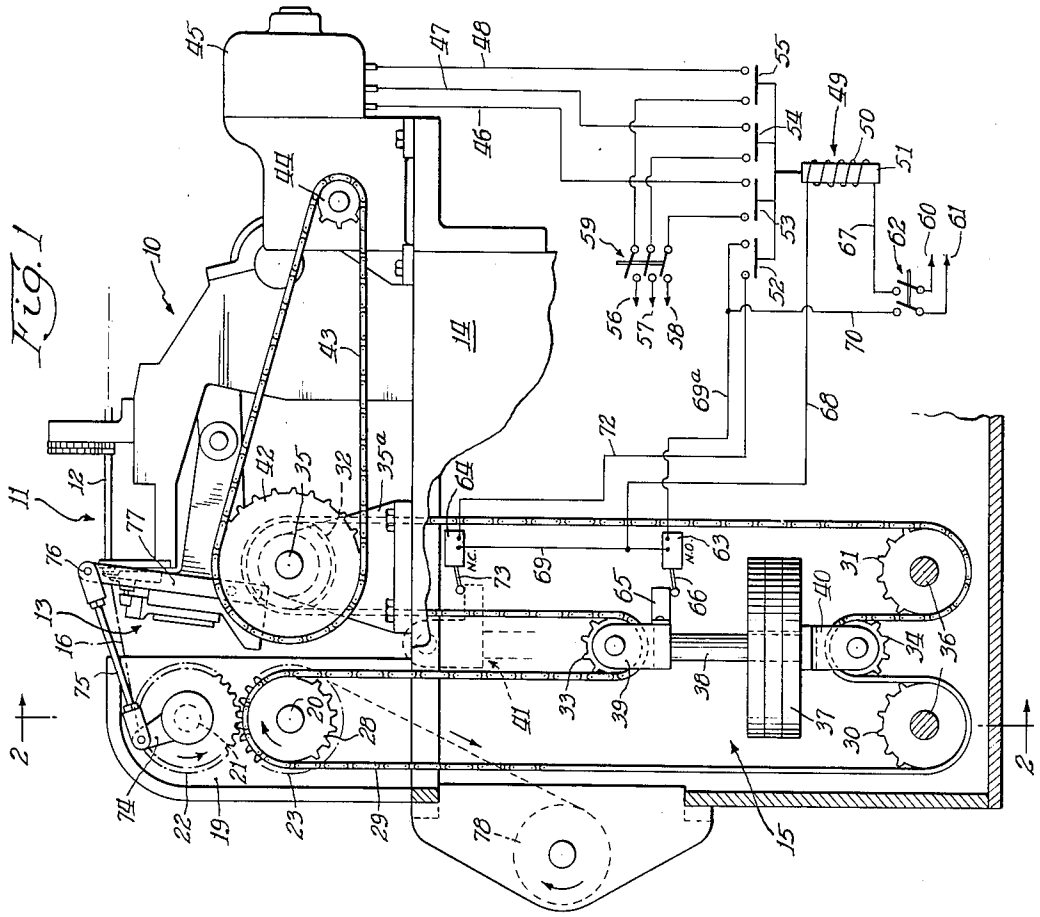


Fig. 1

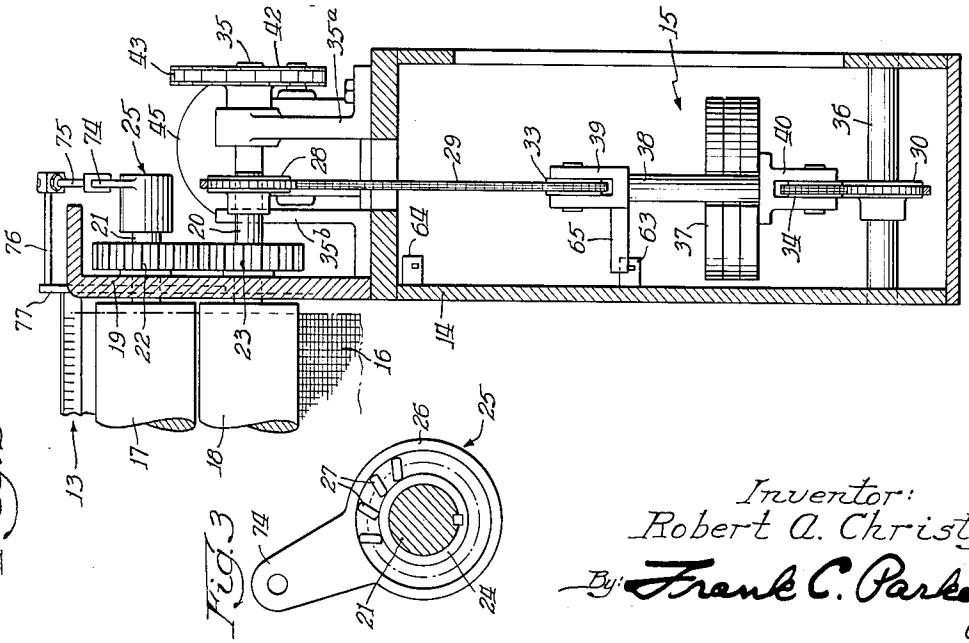


Fig. 2

Fig. 3

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SCREEN TAKE-UP CONTROL MECHANISM

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The present invention relates generally to web tensioning devices and finds particular utility as a tensioning device for a woven wire fabric of the general type made by a wire fabric weaving machine such as is disclosed in the patent to W. B. Ewing 2,223,317.

In the manufacture of wire fabric of the type disclosed in the above-mentioned Ewing patent, it is essential that the fabric be held under a substantially constant tension as it leaves the weaving machine in order that the warp or louver wires which extend laterally of the fabric will be equally spaced from each other and in order to produce a satisfactory and neat appearing finished product. In weaving machines of the above-referred to type, the woven fabric is intermittently advanced out of the machine by incremental amounts and the problem of tensioning the fabric is accordingly rendered more difficult.

It has been conventional practice to utilize a pair of pressure rollers which receive the wire fabric as it leaves the fabric forming machine and to tension the fabric by means of a weight which applies a substantially constant torque to the pressure rollers. The fabric is woven in widths of the order of 6 to 10 feet and it requires a rather heavy weight in order to maintain a sufficient tension on the completed fabric protruding from the weaving machine. It has been found that with such an arrangement for tensioning the fabric, during the intervals while the fabric is actually being advanced out of the machine, the weight is incapable of driving the pressure rollers at a sufficient rate of speed to immediately compensate for the additional incremental length of fabric being fed out of the machine. It is therefore a principal object of the present invention to provide means for positively driving the pressure rollers while the fabric is being fed out of the machine and then holding the fabric in its advanced position momentarily until the weight drops sufficiently to again apply the necessary torque to the pressure rollers for tensioning the fabric.

It is a further more detailed object of the invention to provide a one-way clutch having a driven element rotatable in unison with one of the pressure rollers and having a driving element which is positively reciprocated by that portion of the weaving machine which functions to feed out the completed fabric. In this connection, the one-way clutch engages automatically as the fabric is fed out of the machine and functions to drive the pressure rollers at this time so as to maintain the fabric under tension until sufficient time has elapsed to allow the weight to drop and again apply torque to the rollers. Thereafter, the driving element of the one-way clutch is retracted, preparatory to the next feeding cycle.

The weight and its associated mechanism comprise a gravity motor and it is another object of the invention to provide an auxiliary motor for winding up the gravity motor whenever the gravity motor becomes unwound. In this connection, the weight is adapted to fall slowly from an upper to a lower vertically spaced position as the gravity motor unwinds. When the gravity motor becomes unwound, as when the weight reaches the lower of the

two vertically spaced positions, a normally open switch is closed and the closure of this switch completes an actuating circuit for operating the auxiliary motor. A holding device then becomes effective to maintain the actuating circuit completed. The auxiliary motor continues operating, winding up the gravity motor, until the weight reaches its upper position. At this time, a second switch, which is normally closed and which is connected in series with the holding device, is opened and this breaks the actuating circuit for the auxiliary motor.

With the above general concepts in mind, other objects and advantages of the present invention will become apparent from the following detailed description when read in conjunction with the accompanying drawing, wherein:

Fig. 1 is a more or less schematic side elevational view of a weaving machine having a tensioning device constructed in accordance with the principles of the present invention;

Fig. 2 is a sectional view taken substantially along the line 2—2 in Fig. 1 and looking in the direction of the arrows; and

Fig. 3 is a detailed view of the one-way clutch utilized for positively driving the pressure rollers when the fabric is fed out of the weaving machine.

With reference to the drawing, wherein like reference numerals have been utilized in each of the different views in order to identify identical parts, the invention includes, in general, a weaving machine 10 having a weaving head 11. The weaving head 11 comprises a plurality of individually rotatable quills 12 and a reciprocable comb 13.

The weaving machine 10 is stationarily mounted on a fixed supporting member 14 and the member 14 also supports a gravity motor, indicated generally by reference numeral 15. The weaving machine 10 includes a driving mechanism (not shown) which functions to rotate the quills 12 and reciprocate the comb 13 in timed sequence. In operation, the quills 12 each rotate through 360° during each operation of the machine, in order to twist together a plurality of pairs of warp wires so as to hold each louver wire in place in the completed fabric 16.

The comb 13 is reciprocable between the position shown in Fig. 1 and a position slightly to the left, the comb 13 moving to the latter position as the fabric is intermittently fed out of the machine by incremental amounts. The weaving machine of the general type with which the present invention is particularly applicable is disclosed in detail in the above-referred to Ewing patent, and further description of the weaving machine is not deemed necessary for the purpose of the present disclosure and the tensioning mechanism per se will now be described.

The tensioning mechanism, besides the gravity motor 15, also includes a pair of pressure rollers 17 and 18. The pressure rollers 17 and 18 are each provided with a resilient peripheral surface which may comprise any suitable material, such as a layer of felt, which permits the wire fabric 16 to be received therebetween and provides sufficient friction between the rollers and the wire fabric to prevent slippage therebetween. Each of the rollers is rotatably mounted by means of mounting shafts 20 and 21 respectively provided for the rollers and which shafts extend through a pair of stationary vertically extending plates 19 (only one of which is shown). The mounting shafts 20 and 21 for each of the rollers are provided respectively with meshing pinion gears 22 and 23 which serve to drivingly connect the rollers 17 and 18 together so that when one of the rollers rotates the other does likewise.

As viewed in Fig. 2, the mounted shaft 21 for the pressure roller 17 is provided, on the right end thereof, with an annular race 24 which comprises the driven element of the one-way clutch 25, disclosed in detail in Fig. 3.

The one-way clutch 25 comprises an outer cylindrical race 26 which serves as the drive or input element of the one-way clutch 25. Disposed between the races 24 and 26 are a plurality of wedging devices or sprags 27 which are adapted to tilt into wedging engagement with the races 24 and 26 in order to effect rotation of both races 26 and 24. The one-way clutch 25 also includes an energizing spring which may be of the coiled spring or leaf spring type for continuously biasing each of the sprags 27 in a counterclockwise direction about their individual axes into wedging engagement with the races 24 and 26. As viewed in Figs. 1 and 3 rotation of the outer race 26 in a counterclockwise direction permits the sprags 27 to wedgingly engage both races 24 and 26 and the sprags then serve to transmit a drive from the outer race 26 to the inner race 24. Upon rotation of the outer race 26 is a clockwise direction, the sprags 27 tend to become disengaged from the races, with the inner race 24 remaining relatively stationary and the outer race 26 being free to move in a clockwise direction. For a more detailed description and thorough understanding of the one-way clutch 25, reference should be had to the copending E. A. Ferris application, S. N. 202,385 filed December 12, 1950, which shows a one-way clutch of a type which may be used herein.

The shaft 20, on which the pressure roller 18 is mounted, is provided with an extension on which a sprocket 28 is fixedly secured. The sprocket 28 is adapted to have a chain 29 wrapped around it and the chain also passes around a plurality of other sprockets 30, 31, 32, 33 and 34. The sprocket 32 is mounted on a shaft 35 rotatably supported by means of a pair of stationary flanges 35*a* and 35*b* secured to the stationary supporting portion of the machine. The sprockets 30 and 31 are idler sprockets mounted on a pair of shafts 36 which are suitably carried by depending portions of the machine frame.

The gravity motor 15 includes a plurality of weights 37, each of which has an aperture therethrough for receiving a rod 38. The rod 38 has a pair of bifurcated members 39 and 40 fixed thereto and the bifurcated members 39 and 40 respectively rotatably mount the sprockets 33 and 34. An inspection of Fig. 1 will reveal that even though sprockets 28, 30, 31 and 32 are rotatably mounted on stationary axes, the weight 37 will tend to drive the sprocket 28 and roller 18 in a clockwise direction. Thus, as the fabric 16 is fed by the weaving machine, the weights 37 may move downwardly from the dotted position 41 to the position shown, continuously exerting a substantially constant clockwise torque on the roller 18 and thereby maintaining the fabric 16 under a substantially constant tension. The present invention includes means for driving the sprocket 32 clockwise after the weights have dropped to the position shown so as to raise the weights 37 to the dotted position 41.

Also secured to the shaft 35 is a sprocket 42 which receives a chain 43 therearound, the chain 43 also passing around a smaller driving sprocket 44 which is driven by an auxiliary motor 45. The auxiliary motor 45 has three power leads 46, 47 and 48 for supplying electrical current for the motor.

An actuating circuit for the auxiliary motor 45 and the controls for this circuit will now be described. A solenoid 49 having a winding 50 and a reciprocable core 51 is adapted to control a plurality of switch blades 52, 53, 54 and 55. Upon energization of the winding 50, the core 51 moves upwardly to cause the switch blades 52-55 to bridge their associated contact terminals. Under this condition, electric current from three power lines 56, 57 and 58, assuming that the control switch 59 is closed, is extended to the leads 46 47 and 48, for effecting operation of the motor 45. The electrical power for energizing the coil 50 is received from a pair of power lines 60 and 61 upon the closure of a switch 62.

A pair of microswitches 63 and 64 are stationarily

mounted on a stationary supporting portion of the machine and are adapted to be controlled by an arm 65 which is movable with the weights 37. The microswitch 63 is normally open and when its actuating arm 66 is engaged by the arm 65, the microswitch 63 is closed and assuming that the switch 62 is closed at this time, an energizing circuit for the coil 50 is completed from the leads 60 and 61 through the switch 62, over a lead 67, through the coil 50, over a lead 68, over a lead 69, through the microswitch 63, over a lead 69*a*, and over a lead 70. As stated heretofore, the energizing circuit for the coil 50 effects closure of the blades 52—55 and the closure of the blade 52 against its associated terminals completes a holding circuit for the coil 50 which extends from the lead 60 through the coil 50, over the leads 68 and 69, through the microswitch 64 which is normally closed, over a lead 72 through the blade 52 and over the lead 70 to the power line 61. The auxiliary motor 45 continues to drive the winding sprocket 32 and thereby effect a lifting of the weights 37 until the weights reach a position such that the arm 65 engages an operating arm 73 for the microswitch 64 and effects opening of this switch. When the switch 64 is opened, the holding circuit for the coil 50 is broken and the blades 52—55 retract from engagement with their associated terminals and the actuating circuit for the motor 55 is thereby broken.

The outer race 26 of the one-way clutch 25 is provided with an arm 74 and this arm is pivotally connected to a link 75, which in turn is pivotally connected by means of a pivot shaft 76 to a lever 77 which is adapted to be reciprocated with the comb 13. It will be recalled that the comb 13 moves slightly to the left intermittently and during this movement of the comb, the link 75 moves in the same direction thereby causing the outer race 26 of the clutch 25 to rotate counterclockwise slightly. Such movement of the outer race 26 effects engagement of the clutch 25 and causes the pressure roller 17 to be rotated counterclockwise through a slight angular distance, and the roller 17, being drivingly connected to the roller 18 by means of pinions 22 and 23, functions to maintain the woven wire fabric 16 under tension during the feeding out of the fabric from the weaving machine.

The wire fabric 16 is actually fed out of the machine at a higher rate of speed than the weights 37 are capable of rotating the rollers 17 and 18. This is due to the fact that the weights 37 are normally substantially stationary and accordingly require a certain interval of time in order to fall a predetermined distance. The comb assembly 13 remains in its advanced position for a sufficient interval of time to permit the weights 37 to drop sufficiently so that they are effective to tension the fabric 16 prior to the rearward movement of the comb 13.

It has been found to be undesirable to have the wire fabric 16 substantially locked in its advanced position during the rearward movement of the comb assembly 13 and the present invention overcomes this undesirable operation of previous tensioning devices of the present general type, due to inherent characteristics of the one-way clutch 25. It will be noted that during the return movement of the comb 13 from its leftward position to the position shown, the outer race 26 of the clutch is effectively disconnected from the inner race 25 due to the fact that the outer race is actually moving in a clockwise direction. This permits the wire fabric 16 to recede slightly, the weights 37 providing the only force tending to prevent the receding of the wire fabric.

As is obvious, with each successive advance of the wire fabric 16, the weights 37 drop slightly until the arm 65 strikes the actuating lever 66 of the microswitch 63. When the actuating arm 66 is moved, the switch 63 is closed and this completes the actuating circuit for the auxiliary motor 45. The motor 45 continues to operate until the weights 37 are raised to a position wherein the arm 65 engages the switch arm 73 and effects an opening of the microswitch 64. It will be noted that even

though the auxiliary motor **45** is functioning to raise the weights **37** to wind up the gravity motor **15**, substantially the same mass acts to apply a torque to the pressure roller **18** as when the weights **37** are stationary. Due to this factor the gravity motor **15** functions more satisfactorily as a device for maintaining the proper tension in the completed woven wire fabric **16**.

An additional roller **78**, suitably rotatably mounted on the frame of the machine, is provided for storing the wire fabric after it proceeds around the lower pressure roller **18**. It is contemplated that the roller **78** may be driven by means of a manually operated crank whenever sufficient fabric has been formed to start the formation of a loop between the roller **18** and the roller **78**.

The present invention provides an efficient tensioning mechanism for maintaining a web, such as a web comprising a woven wire fabric, under a substantially constant tension at all times. By providing the one-way clutch which is actuated by the web advancing mechanism of the weaving machine the web is properly tensioned during the intervals when it is actually being advanced and by using the gravity motor a substantially constant tension is maintained on the web at all other times. It is contemplated that numerous changes and modifications may be made in the present invention without departing from the spirit or scope thereof.

What is claimed is:

1. A device for tensioning a web which is intermittently advanced by incremental amounts out of a web forming machine, the combination of a pair of pressure rollers adapted to receive the web therebetween and to prevent slippage of the web between the rollers due to friction between the web and the rollers, said rollers being drivingly interconnected with each other, a gravity motor for exerting a substantially constant driving torque on said rollers and normally effective to tension the web, the web forming machine being adapted to incrementally feed out the web at a higher rate of speed than said gravity motor is capable of driving said pressure rollers, and means including a one-way clutch having a driving member actuated by said forming machine when the machine functions to intermittently advance the web for positively driving said rollers so as to tension the web during each advancing movement thereof, said last-named means being effective to tension the web and to hold the web in each advanced position momentarily until said gravity motor is again effective to tension the web.

2. A device for tensioning a web which is intermittently advanced by incremental amounts out of a web forming machine, the combination of a pair of pressure rollers adapted to receive the web therebetween and to prevent slippage of the web between the rollers due to friction between the web and the rollers, said rollers being drivingly interconnected with each other, a gravity motor for exerting a substantially constant driving torque on said rollers and normally effective to tension the web, the web forming machine being adapted to incrementally feed out the web at a higher rate of speed than said gravity motor is capable of driving said pressure rollers, means including an arm adapted to be reciprocated by the forming machine as it feeds the web therefrom, and a one-way clutch having a driven member drivingly connected with one of said rollers and a driving member operably connected with said arm, whereby said arm and one-way clutch function to positively drive said rollers during each incremental advance of the web from the forming machine so as to tension the web momentarily until said gravity motor is again effective to tension the web.

3. In combination, a machine for weaving a fabric and intermittently advancing the fabric therefrom by incremental amounts, said machine including a reciprocable member adapted to move in the general direction of advance of the fabric upon each incremental advance of the fabric, a pair of pressure rollers for receiving the fabric therebetween as it leaves said machine, said rollers being drivingly interconnected, a gravity motor for applying a substantially constant torque to said rollers for maintaining the fabric under tension, the rate of advance of the fabric during the intervals when it is incrementally advanced by said machine being greater than the rate at which said gravity motor is capable of driving said pressure rollers, and means actuated by said reciprocable member as it moves in the general direction of advance of the fabric for positively driving said rollers so as to tension the fabric until said gravity motor is again effective to tension the fabric.

4. In combination, a machine for weaving a fabric and intermittently advancing the fabric therefrom by incremental amounts, said machine including a reciprocable member adapted to move in the general direction of advance of the fabric upon each incremental advance of the fabric, a pair of pressure rollers for receiving the fabric therebetween as it leaves said machine, said rollers being drivingly interconnected, a gravity motor for applying a substantially constant torque to said rollers for maintaining the fabric under tension, the rate of advance of the fabric during the intervals when it is incrementally advanced by said machine being greater than the rate at which said gravity motor is capable of driving said pressure rollers, and means including a one-way clutch having a driven member drivingly connected with one of said rollers and a driving member actuated by said reciprocable member as it moves in the general direction of fabric advance for positively driving said rollers so as to tension the fabric until said gravity motor is again effective to tension the fabric.

5. In combination, a machine for weaving a fabric and intermittently advancing the fabric therefrom by incremental amounts, a pair of pressure rollers for receiving the fabric therebetween as it leaves said machine, said rollers being drivingly interconnected, a gravity motor for applying a substantially constant torque to said rollers for maintaining the fabric under tension, the rate of advance of the fabric during the intervals when it is incrementally advanced by said machine being greater than the rate at which said gravity motor is capable of driving said pressure rollers, and a one-way clutch having a driven member connected with one of said rollers and a driving member actuated by said machine upon each incremental advance of the fabric for positively driving said rollers so as to tension the fabric until said gravity motor is again effective to tension the fabric.

6. In combination, a machine for weaving a fabric and intermittently advancing the fabric therefrom by incremental amounts, a pair of pressure rollers for receiving the fabric therebetween as it leaves said machine, said rollers being drivingly interconnected, a gravity motor for applying a substantially constant torque to said rollers for maintaining the fabric under tension, the rate of advance of the fabric during the intervals when it is incrementally advanced by said machine being greater than the rate at which said gravity motor is capable of driving said pressure rollers, said gravity motor comprising a weight movable between two vertically spaced positions and a chain driven by said weight and drivingly connected with the pressure rollers, and a one-way clutch having a driven member connected with one of said rollers and a driving member actuated by said machine upon each incremental advance of the fabric for positively driving said rollers so as to tension the fabric until said gravity motor is again effective to tension the fabric.

7. The combination as set forth in claim 6, wherein the chain is continuous and passes over a plurality of sprockets, a first one of which is fixed to one of said rollers, a second one of said sprockets being adapted to be driven by an auxiliary motor for winding up the gravity motor, third and fourth ones of said sprockets being idlers disposed respectively beneath said first and second sprockets, and fifth and sixth ones of said sprockets being idlers rotatably carried by the weight.

8. In a device for tensioning a web which is intermittently fed out of a web forming machine, the combination of a pair of pressure rollers for receiving the web therebetween and adapted to prevent slippage between the web and rollers due to friction between the rollers and web, a gravity motor for applying a substantially constant torque to said rollers so as to maintain a substantially constant tension on the web, said gravity motor comprising a weight, a continuous chain and a plurality of sprockets, a first one of said sprockets being fixed to rotate with one of said rollers, a second one of said sprockets comprising a gravity motor winding sprocket, third and fourth ones of said sprockets comprising idlers disposed vertically beneath said first and second sprockets, fifth and sixth ones of said sprockets comprising idlers carried by said weight, said weight being movable between two vertically spaced positions and at all times acting on said rollers through said chain so as to apply said torque to the rollers and said weight dropping by incremental amounts with each intermittent advance of the web, and an auxiliary motor rendered operative when the weight reaches the lower one of said positions for driving said second sprocket so as to wind up the gravity motor until the weight rises to the upper one of said positions.

9. A device in accordance with claim 8 and including an actuating circuit for said auxiliary motor, said circuit including a pair of control switches one of which is disposed so as to be actuated when said weight reaches its lower position and the other of which is disposed so as to be actuated when said weight reaches its upper position, said one switch being effective upon being actuated to start said auxiliary motor when the gravity motor becomes unwound and said other switch being effective upon being actuated to stop said auxiliary motor when the gravity motor becomes wound up.

10. A device in accordance with claim 8, and including

an actuating circuit for said auxiliary motor, said circuit including a pair of switches responsive to the position of said weight, one of said switches being normally opened and adapted to be closed for completing said circuit when the weight reaches its lower position, the other of said switches being normally closed and adapted to be opened for breaking said circuit when the weight reaches its upper position and a holding device rendered operable upon the closure of said one switch and connected in series with said other switch for maintaining said circuit completed until the opening of said other switch.

11. A device in accordance with claim 8 and including an actuating circuit for said auxiliary motor, said circuit including a pair of switches responsive to the position of said weight, one of said switches being normally opened and adapted to be closed for completing said circuit when the weight reaches its lower position the other of said switches being normally closed and adapted to be opened for breaking said circuit when the weight reaches its upper position and a holding solenoid rendered operable upon the closure of said one switch and connected in series with said other switch for maintaining said circuit completed until the opening of said other switch.

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