Aug. 4, 1953 H. T. TORNBERG 2,647,966

ELECTRICAL SWITCHING OPERATING DEVICE

Filed Oct. 6, 1951

2 Sheets-Sheet 1

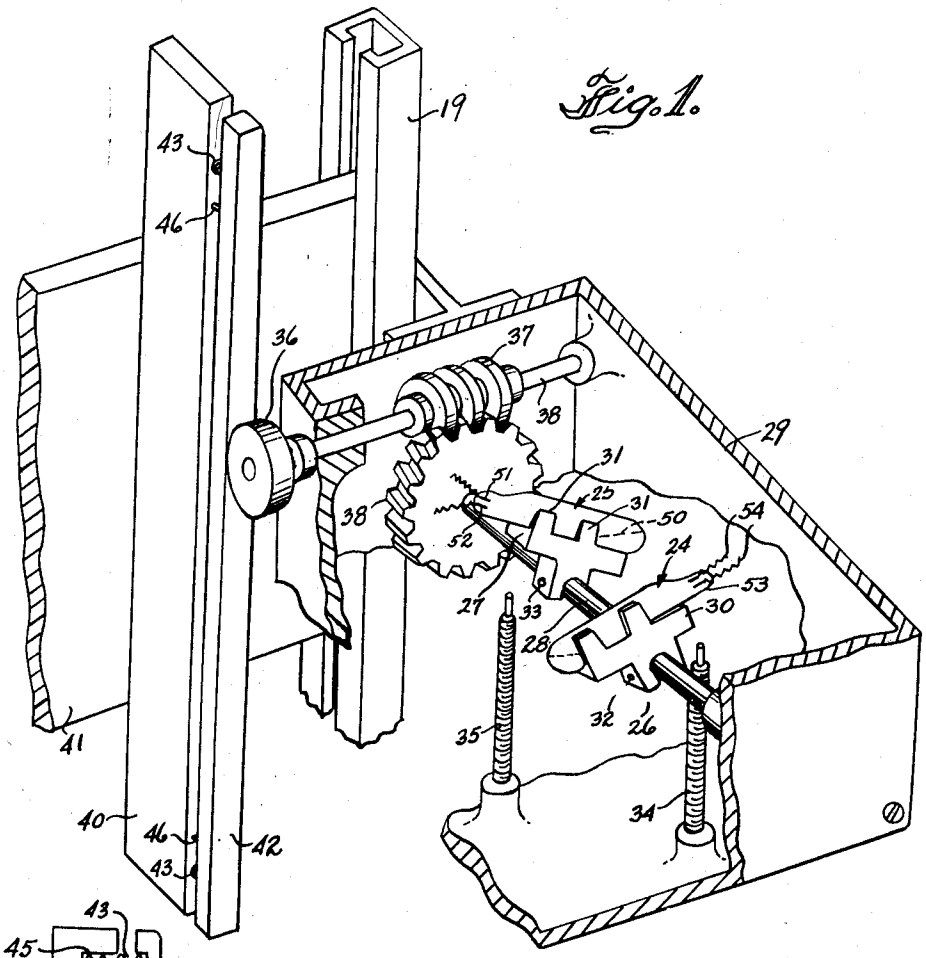


Fig. 1.

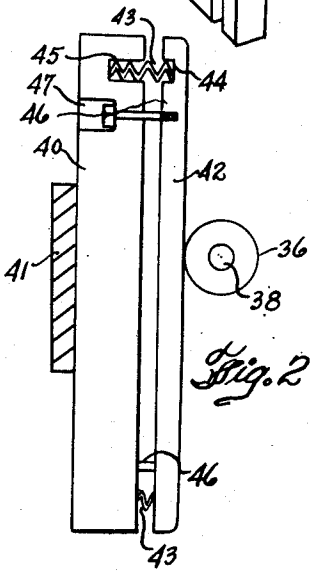


Fig. 2

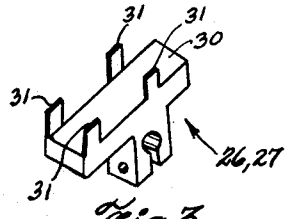


Fig. 3.

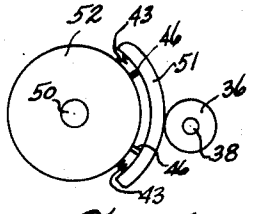


Fig. 6.

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ELECTRICAL SWITCHING OPERATING DEVICE

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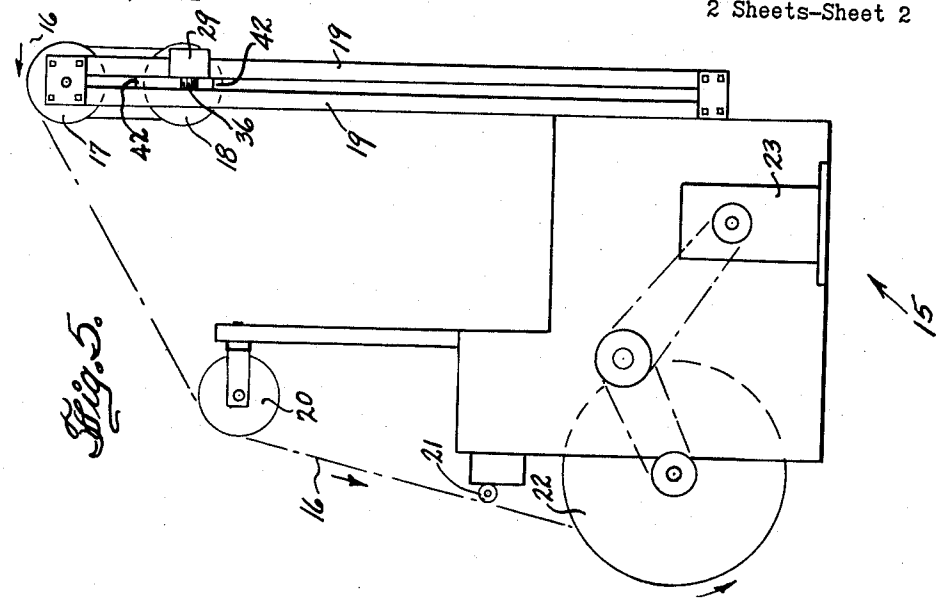


Fig. 3.

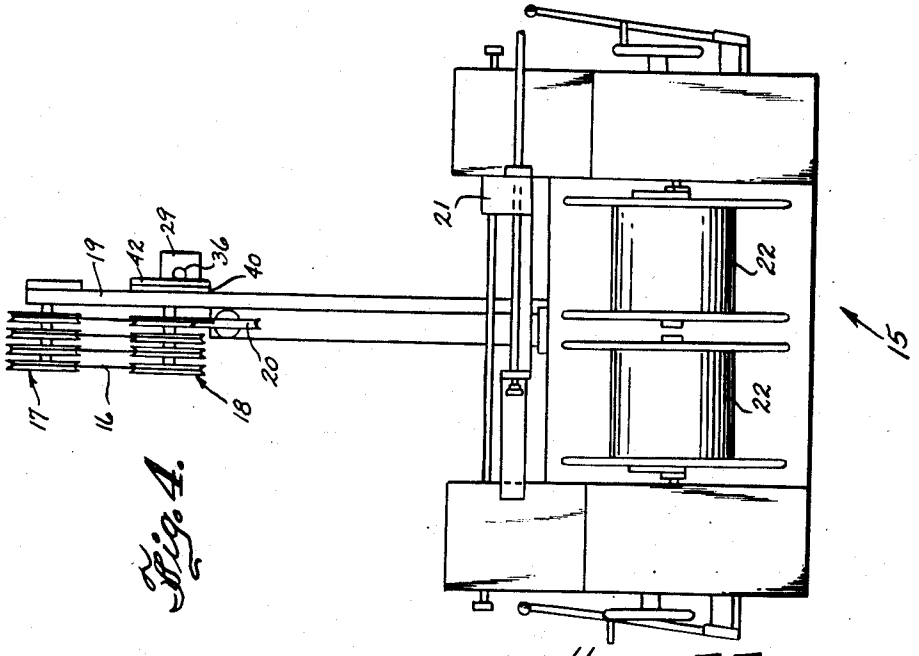


Fig. 4.

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UNITED STATES PATENT OFFICE

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ELECTRICAL SWITCHING OPERATING DEVICE

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Application October 6, 1951, Serial No. 250,048

2 Claims. (Cl. 200—52)

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The present invention relates to a mechanism which may be used in switching structures for the control of electric motors driving machines for winding up wire, rope, paper, cloth and the like on reels and other cores. Many such machines accomplishing wind-up operations employ a unit comprising one or more sheaves, rollers or pulleys on a single fixed axis, depending upon whether the material being wound up is in the nature of a filament or a web, and a "floating" unit similar in character to the first, on another axis positioned free for movement upwardly and downwardly below the first mentioned unit; the filament or web in its travel from feed to wind-up, being supported by the upper unit and supporting the "floating unit." For practical working, the distance between these units should be between prescribed limits. When wind-up is not fast enough in accordance with the feed, the "floating" unit will descend because of the increased accumulation of the material the said units carry. When the amount of such descent brings the "floating" unit below the desired limit for the low position thereof, the motor driving the wind-up means must be speeded up until the distance between said units shall again be within the prescribed limits. Then again, if the wind-up is too fast in accordance with the feed, the "floating" pulley will ascend. When the amount of such ascent brings the "floating" unit above the desired limit for high position therefor, the speed of said motor need be lowered until said "floating" unit is again within said limits.

Various motors are in use on wind-up machinery which include electrical speed control systems employing a pair of manually operated switches. One such switch is manually held in closed position by the operator to speed up the motor when he observes that the "floating" unit has assumed a too low position. The other switch is manipulated when the position assumed by said "floating" unit is too high. The switches are in open condition while the "floating" unit is between the desired limits. Such motors and their control system are for instance those known as U. S. varidrive motors, manufactured by U. S. Electrical Motors Inc., of Milford, Connecticut.

An object of this invention is to provide a novel and improved mechanism shown used in an electrical switching structure embodying a pair of switches whose operation is accomplished automatically and controlled by "floating" unit movement. No claim is made herein to the electrical circuits employed, and such circuits being known, are not shown herein. This invention is only concerned and claims are made only to a novel and improved mechanism employable for the mentioned switching structure. The novel mechanism can be used anywhere else where it is desired to have a shaft revolvable between adjustable limits by a movable member which has possible movement up and back between and beyond other limits. And it is such novel mechanism which this application seeks protection for, and also for the illustrative structures herein shown employing such mechanism.

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Another object of this invention is to provide novel and improved means to control the movement of a shaft between adjustable limits by a reciprocatable body on which no adjustment is made upon any adjustment of said limits.

A further object hereof is to provide a novel and improved mechanism of the character mentioned, which is reasonably cheap to manufacture, and when employed in said switching structure, is easy to adapt for present systems and which is efficient in carrying out the purposes for which it is designed.

Other objects and advantages will become apparent as this disclosure proceeds.

In the accompanying drawings forming part of this specification, similar characters of reference indicate corresponding parts in all the views.

Fig. 1 is a fragmentary perspective view of an electrical switching device embodying the teachings of this invention, shown mounted on the framework of a wire wind-up machine, and includes a shaft carrying a pair of mercury switches, a member carried along on the machine's "floating" unit, and a wheel whose periphery is adapted to be in contact with said member during some part of the travel of said "floating" unit; the mentioned shaft receiving its movement when the said wheel is made to rotate by said member in motion. This view is partly in section.

Fig. 2 is a partial left side view of Fig. 1, shown partly in section. This view particularly shows the wheel and its contacting member which is carried along with the "floating" unit of the machine.

Fig. 3 is a perspective view of one of the brackets for holding a mercury switch on the mentioned shaft.

Fig. 4 is a diagrammatic front view of a wind-up machine shown equipped with the device illustrated in Fig. 1.

Fig. 5 is a diagrammatic side view of said machine.

Fig. 6 is a modified embodiment of the matter shown in Fig. 2. Here the wheel-contacting member is itself a wheel of mechanism to be mentioned. It shows the adoption of this invention where a rotatable member is brought to limits. In the embodiment shown in Fig. 2, it is a reciprocatable slidable member which is brought to limits.

In the drawings, the numeral 15 designates generally a wire-winding machine receiving wire 16 from a source onto and about the fixed sheave

unit 17 and the "floating" sheave unit 18; the latter being mounted to slide along the vertically positioned channels 19. The wire then travels on a swivelled guide pulley 20, thence to the traverse guide 21, and finally onto a wind-up reel 22. A varidrive motor 23 of the type hereinbefore mentioned, drives the said reel, and is provided with its usual electrical control system (not shown) which heretofore included two manually controlled switches, which in the present embodiment are replaced by the mercury switches 24 and 25 respectively.

These switches are respectively mounted on the brackets 26 and 27 carried on a shaft 28 journalled in a casing or frame 29. These brackets have a platform each, as indicated by the numeral 30, on which a mercury switch rests held thereon by the clips 31. The mercury switches are positioned across the line of said shaft 28, and are set in adjustable angular position with respect to each other, by means of the set screws 32 and 33 respectively, which secure the brackets to the shaft 28, after said brackets are turned on said shaft to desired relative position. An adjustable screw 34 threadedly mounted on the frame 29, and a similar screw 35 likewise mounted on said frame, are respectively positioned so that their ends lie in the paths of movement of the said brackets respectively, so as to act as stops thereby limiting the movement of the shaft 28, to a fraction of a revolution, which is of course adjustable as is evident.

It is intended that the shaft 28 shall move upon rotation of the wheel 36, but it is preferred that said wheel shall have a considerably greater scope of movement than that of the shaft 28. Hence, there is provided a suitable reduction drive in the shaft means, as for instance the worm 37 on the wheel's shaft 38, in engagement with the gear wheel 39 on the shaft 28.

The driving member for the wheel 36, comprises the bar 40 which is securely mounted on the carriage 41 holding the floating pulley unit 18. Said bar 40 holds another bar 42 in spaced and resiliently mounted relation thereon. This is accomplished by means of the compression springs 43 between said bars, held in suitable sockets 44 and 45. Headed bolts 46 maintain the assembly so that the said springs are in constantly stressed condition. These bolts are secured in the bar 42, with their shanks free to slide in their holes in the bar 40, and with their heads free within the counterbores 47. The line of movement of the carriage 41 being along the vertical, the bars 40 and 42 which are normally in parallel relation, are mounted lengthwise along the vertical.

The framework 20 which may serve as a casing as shown, is fixed to the channels 19, in such position that the shafts 28 and 38 are horizontal and so that the periphery of the wheel 36 shall be in contact with the bar 42 and further compress the springs 43 while the bar 42 passes said wheel 36. Also, the shaft 38 shall be at such position that the wheel 36 shall be in contact with about the mid-point of the bar 42 when the floating pulley unit 18 is at its median region of desired operating positions.

The length of said bar 42 is somewhat longer than the maximum distance ever to be employed between the extreme limiting positions for the desired working scope of movement of the floating pulley unit 18. Since the operational scope of the shaft 28 is less than one revolution, dimensions of the parts should be so chosen to preferably effect a possible one turn of said shaft 28 or even less, but to such an extent to exceed the maximum scope of movement of said shaft 28 at any time required. The dimension of the parts should also be chosen so that the said wheel 36 shall yet be in contact with the bar 42 after the movement of the shaft 28 has come to a halt due to the action of the stops which are the screws 34 and 35.

An important incident of the described structure, is that upon halt of the movement of the shaft 28 by the stop screws 34 or 35, any continued movement of the carriage 41, with the wheel 36 still in contact with the bar 42, which causes a pressure of the stopped bracket 26 or 27, against the stop screw such bracket is in contact with, the wheel 36 will slip and remain motionless. Upon continued movement of the carriage 41 in the same direction it had moved to bring the shaft 28 to its said stopped position, the bar 42 will disengage the wheel 36. Due to the action of the springs 43, the bar 42 will become a little further spaced from the bar 40. Upon movement of the carriage 41 in the opposite direction, the bar 42 will again contact the wheel 36, turn same, and the shaft 28 will move in the direction opposite to that it had moved before.

The mercury switches 24 and 25, by adjustment of the positions of their respective brackets 26 and 27 on the shaft 28, are in oppositely tilted positions of equal angle with horizontal when the carriage 41 is at median desired working position along the channels 19. The wheel 36 is then in contact with mid-point of the bar 42. Such would be the setting if the distance between desired working limits of the carriage 41, would equal approximately the full length of the bar 42. In such instance, the stop screws 34 and 35 are entirely withdrawn so that they do not interfere with movement of the shaft 28. However, for all practical purposes, such distance as mentioned, is less than said bar length, and should be adjustable, depending upon the nature of the material being wound, to any distance less than said bar length. Hence the need of the stop screws 34 and 35, to be adjusted to proper positions depending upon the extent of the distance between the limits for the desired working positions for the floating pulley unit 18. The extent of the movement of the shaft 28 permitted by said stop screws, is proportional to the distance between the limits for the desired working positions for said floating pulley unit.

It is to be noted that when both mercury switches 24 and 25 are in position where they are tilted equally with horizontal, such switches are in "off" or "open" condition. Upon movement of the shaft 28 in one direction at this time, it will cause one of the switches to assume "on" condition and the other to remain in "off" condition. It is when a switch assumes horizontal position, that its mercury 50 flows and then makes contact with the terminals 51, 52, thereby setting the switch into "on" or "closed" condition. Each of these switches shown, comprise a glass case 53 housing the mercury and a pair of end terminals 51 and 52 having external lead-in wires 54, for connection in place of the hereinbefore mentioned manually operated switches in the motor control apparatus.

Referring to Fig. 1, consider the machine 15 to be in operation performing wind-up on one of the reels 22. The "floating" pulley unit 18 is at a position within its desired limit positions along the channels 19. The switches 24 and 25

are both in "open" condition. The motor **23** is running at a normal operating speed. Should it occur that wire **16** is being fed faster than it is being wound up, the "floating" pulley unit **18** will begin to descend, causing shaft **28** to move clockwise. If such descent continues, mercury switch **24** will "close" and actuate the control apparatus of the varidrive motor **23** to cause a speed up of said motor. This in turn will cause the floating pulley unit **18** to rise and consequently the switch **24** will shift to be in "open" condition again, whereupon the motor speed will again go to normal. Should it occur that wire **16** is being wound-up faster than it is being fed, the floating pulley unit **18** will begin to rise, causing shaft **28** to move counter-clockwise. If such ascent continues, mercury switch **25** will "close" and actuate the control apparatus of the varidrive motor **23** to cause a slow down of said motor. This in turn will cause the floating pulley unit **18** to descend and consequently the switch **25** will shift to be in "open" condition again, whereupon the motor speed will again go to normal. The action to urge the floating pulley unit to positions between certain limits along the channels **19**, is entirely automatic.

It is to be noted that for an appreciable interval of movement of the shaft **28**, both switches **24** and **25** remain in "open" condition, and that only one of said switches can be in "closed" condition at one time. Change in angular relation of the switches **24** and **25**, will change the segment of movement of the shaft **28** during which the said switches will remain both in "open" condition, thus changing the scope of float of the floating pulley unit **18**, during which the motor speed will remain unchanged.

Of course, the floating pulley unit **18** will move along the channels to an extent that bar **42** will leave the wheel **36**. Upon return movement of said pulley unit, said wheel and bar will reengage. The stops **34** and **35** will respectively act to halt movement of the shaft **28**, while the wheel is still in contact with the bar **42**. While said shaft **28** is held against movement, further motion on the part of the floating pulley unit, will only cause said wheel **36** to slip along the bar **42**. If said wheel **36** is still in contact with the bar **42**, or again comes into contact therewith upon reverse movement of the floating pulley unit **18**, the shaft **28** will immediately begin to move away from the stop which held it.

To attain any desired scope of float for the floating pulley unit **18**, adjustments are made with the screws **24** and **25**, and the angular relation of the brackets **26** and **27** is changed. To change the "floating" region along the channels **19**, the position of the casing **29** need be altered, higher or lower, as the case demands.

Where instead of the reciprocable carriage **41**, the body to be controlled is as shown in Fig. 6, the shaft **50** revolving in oscillatory manner, and desired to be kept capable of swing within desired limits, the switching means shown in Fig. 1 may be employed for automatic operation of a control circuit for the mover of said shaft, by having a resiliently mounted ring segment **51** in concentric relation about the periphery of a wheel **52** on said shaft **50**. In this instance, the wheel **36** engages the periphery of the said ring segment, with like incidents of slippage as explained for the embodiment of Fig. 1.

The wheel **36**, bar **42** and the ring segment **51** may be of wood. The springs **43** are chosen of

a strength to accomplish the required traction and permit the required slippage.

This invention is capable of numerous forms and various applications without departing from the essential features herein disclosed. It is therefore intended and desired that the embodiments shown herein be deemed illustrative and not restrictive and that the patent shall cover all patentable novelty herein set forth; reference being had to the following claims rather than to the specific description herein to indicate the scope of this invention.

I claim:

1. In an electrical switching operating device, the combination of a frame, a shaft means carrying electrical switch components; said shaft means including one or more shafts revolvably mounted on the frame and related so that upon the rotation of one shaft, all the shafts will rotate, a wheel secured on such one shaft, a member mounted for oscillatory movement on the frame, adapted during movement to frictionally contact the periphery of the wheel and turn the said wheel and thereby the shaft said wheel is mounted on, adjustable stop means on the shaft means and the frame, to determine the scope of the movement of one of the shafts; the periphery of said wheel and the surface of said member which contacts said periphery being of such nature that the said member shall slip along the periphery of said wheel without turning said wheel while in contact therewith, upon continued movement of said member during the time when movement of the shaft means is halted by the stop means.

2. In an electrical switching operating device, the combination of a frame, a shaft means carrying electrical switch components; said shaft means including one or more shafts revolvably mounted on the frame and related so that upon the rotation of one shaft, all the shafts will rotate, a wheel secured on one such shaft, a slide slidably mounted on the frame, a bar positioned lengthwise along the line of movement of the slide and movably carried thereon for lateral movement towards and away from the slide, means holding said bar and slide in assembled relation whereby the bar moves with the slide, spring means urging the bar away from the slide; said bar being adapted during movement of the slide, to frictionally contact the periphery of the wheel and turn said wheel and thereby the shaft said wheel is mounted on; said bar being moved towards the slide by the wheel upon contact of said bar with the wheel whereupon said spring means is stressed, adjustable stop means on the shaft means and the frame, to determine the scope of the movement of one of the shafts; the periphery of said wheel and the surface of said bar which contacts said periphery being of such nature and the spring means being of such strength that the bar shall slip along the periphery of the wheel without turning said wheel while in contact therewith upon continued movement of the slide during the time when movement of the shaft means is halted by the stop means.

HENNING T. TORNBERG.

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