This invention relates to an improved circuit controlling switch and its actuating means as used in association with the electric driving motor of a belt conveyor for the conveyance thereby of articles of substantial weight.

More particularly, the present invention relates to what has herein been designated as a "Segmented Deflection Switch" for controlling the circuit of an electric motor for the driving of a conveyor belt on which heavy rolls of paper or the like are moved; this switch actuating mechanism, as presently employed, being so deflected incident to the advancement on the conveyor belt of a paper roll over a designated point in its line of travel, so as to actuate the switch to stop the belt driving mechanism.

It is an object of this invention to provide a switch actuator that is sensitive to depression by a weighted object at any point on the actuator so as to disengage the switch, and an actuator that will maintain the switch disengagement regardless of whether the weighted object moves back and forth across the width of the actuator.

It is also an object of this invention to provide a switch actuator that is characterized by a flexible shaft designed to be mounted transversely of the conveyor belt and immediately below it, by opposite end supports in which it fulcrums when downwardly deflected by the passing of a conveyed paper roll thereover and by reason of such deflection, will effect the opening of the controlled switch to thereby stop the motor and travel of the conveyor belt for "kicker" displacement of the roll therefrom.

It is a further object of this invention, in a readily accessible position of use, to provide for mounting the switch which is to be controlled adjacent one side of the conveyor belt and to extend the end of the flexible shaft at the side through and beyond its corresponding end support, so that the deflection of the belt supporting portion of said shaft caused by the weight of the paper roll as conveyed across it, will result in the associated switch being automatically de-actuated to open position by movement of that end portion of the deflection shaft that extends beyond that end support.

It is a further object of the invention to provide a switch actuator which in itself is not affected by translation movement of the heavy weight across it, and a switch actuator which will not interfere nor obstruct the object moving over it. This invention provides a flexible shaft thereon between its opposite end supports, for the easy travel and support of the conveyor belt thereon.

Further objects and advantages of the invention resides in the various objects of construction of parts and in their relationship in the present combination and as incorporated in the present conveyor control system.

In accomplishing the above mentioned and other objects, I have provided the improved details of construction, arrangement and mode of operation of its parts, as illustrated in the accompanying drawings, wherein—

FIG. 1 is a plan view of a paper roll conveyor belt as associated with a roll "kicker" for displacing a conveyed roll from the belt, and with which the present switch and its actuator are associated.

FIG. 2 is an enlarged, cross-sectional view taken on the vertical plane 1—1 in FIG. 1, showing the relationship of conveyor belt, its supporting rollers and the position of a paper roll as conveyed on the belt.

FIG. 3 is a fragmental plan view of parts of the conveyor system that are located in the area of the present switch actuator.

FIG. 4 is an enlarged, vertical cross-sectional view taken on line 5—5 in FIG. 3, showing the control switch and its actuator.

FIG. 5 is a wiring diagram of the present electrical control system.

Referring in more detail to the drawings:

In the plan view of parts shown in FIG. 1, a continuous conveyor belt 10 is shown to be supported between its ends for travel of its top run on a succession of small diameter rolls 11 supported transversely and in parallel relationship between laterally spaced opposite side beams 12—12' of a conveyor frame structure as well shown in FIG. 2.

The rollers 11, as thus mounted by and between the side beams 12—12', are alternately inclined in opposite directions to the same degree, thus, together, to provide a slightly roughened support in which the top run of belt 10 travels, as shown in FIG. 2.

In FIGS. 3 and 4, it has been shown that in its conveyance, on the belt 10 across the alternately inclined rollers, the paper roll, designated in FIG. 4 by numeral 13, is centered on and longitudinally of the belt, and it is further to be observed by reference to FIG. 1, that the conveyor belt will convey each roll of paper as thus placed thereon, across, and will deflect and de-actuate the present switch controlling means.

The switch here to be controlled is designated by reference numeral 17. It is shown in FIG. 4 to be fixedly mounted outwardly from the face of side beams 12 by a bracket 18 for its actuation by a push button type actuator 19 directed upwardly therefrom as seen in FIG. 4.

The switch controlling means as best shown in FIG. 4, comprises a resilient cross-shaft 20 that has opposite end portions supported in holes 21—21', provided to receive them in the opposite side beams 12—12' of the conveyor frame. That end portion of the cross-shaft 20 that is to engage and actuate the switch control button 19 extends substantially beyond the side beams 12 and has a downwardly tilted portion 20' in vertical alignment with and for engaging against the top end surface of the switch actuator button 19' as shown in FIG. 4.

It is also to be observed that between the laterally spaced beams 12—12', the cross-shaft 20 mounts a succession of rollers 22, all of which is free and independent rotation on the shaft 20, and these rollers, support the belt 10 at this particular location of its travel, at a higher level than is normally supported by the cross-rollers 13, but with the passing of a paper roll over the cross-shaft 20 and rollers 22 as applied thereto, that portion of the cross-shaft that is between the beams 12—12' will be downwardly deflected to some extent, as in FIG. 4, thus to cause its extended end portion to be moved slightly upward to allow the downturned shaft end 20' to be automatically opened and thereby to open the motor circuit to temporarily stop the conveyor driving operation. Then, with the displacing of the paper roll from the conveyor belt, the resilient shaft will again straighten, thus to bring its extended end portion 20' back to normal position, to cause the switch 17 again to be actuated.

In the present operation, the particular means for the displacement of the paper roll from the belt 10 is here shown to be a "kicker" device, designated in its entirety in FIG. 1 by reference numeral 25. In this view, the "kicker" is shown in retracted position. When energized, it is caused to be extended and displaces the roll 13 laterally from the belt 10 as indicated. The kicker is controlled by two switches 26 and 37 disposed as seen in retracted position. When energized, it is caused to be
3. extended and displaces the roll 13 laterally from the belt 10 as indicated. The kicker is controlled by two switches 26 and 27 disposed as seen in FIG. 1. In the diagram of the electrical system seen in FIG. 5, power lines for the system are designated, respectively, by reference characters A and B. These lines are joined as shown by circuit wires designated by reference characters C, D and E. Circuit lines C and D are joined at points between their ends by a connecting wire F. Likewise, circuit line E is connected by a wire K with power lines B and a wire G leads from line E to power line B.

Interposed in circuit line C at a point between its connection with power line A and the wire F, is a switch 30 and at the other side of line F, a control relay 31 is interposed. Likewise, interposed in line D between its connections with power line A and line F, is the kicker retracting control switch 26 and a control relay 33. At the other side of its connection with line F, a control switch 34 and a control relay 35 are interposed. Interposed in connecting line E adjacent power line A is the "kicker" out switch 27, and at the other side of the connection with line K, is a control relay 36 and a "kicker out" contactor 37.

Lines E and K are connected between control switch 34 and contactor 37 by a line L and in line K at opposite sides of the connecting point of line L is a kicker out contactor 38 and kicker out valve 39.

Interposed in line G, that connects with power line is a motor starter 41.

Starting operation with the kicker 25 retracted and its retracting switch 26 closed, the functioning of the electrical system is as follows.

In the conveyance, on belt 10, of a paper roll 13 across the switch actuator, the switch 17 is permitted, due to the downward deflection of a cross-rod 20 under weight of the paper roll on belt 10, to be opened. This causes closing of switch 30 and the opening of switch 34, causing the energization of control relay 35, closing the contactor, holding it through switch 26.

When the roll 13 has passed over the control switch actuator, switch 34 closes, energizing the second control relay 35, closing the contact 35. At the same time, a normally closed contact from 35 in the motor circuit for the conveyor opens, stopping the conveyor. With the closing of contact 33, it energizes the "kicker out" contactor 37 and the kicker out valve 39, closing the contact 37, holding it in through the switch 27. The kicker will now move out, dropping out 31 and 35 and the kicker will move, pushing the roll 13 from the conveyor, until the kicker actuator switch 27 is actuated, which will drop out 38 and valve 39 returning the kicker to its retracted position and reclosing switch 26. The conveyor will restart and the conveyor is then ready to receive another roll 13.

The motor circuit for driving the conveyor would also have a contact from a relay which would prevent driving the conveyor belt 10 during travel of the kicker and keep any roll on the conveyor from striking the kicker.

In the use of the present form of switch actuator, the switch will stay actuated as long as the roll 13 is in the vicinity of the switch 17 and the switch will not become deactuated even though the roll 13 may rock back and forth on the conveyor belt. This is very important in conjunction with the presently used centering device.

What we claim to be new is:

1. In combination with a motor driven conveyor belt on which a weighted object is disposed for conveyance, and a switch for controlling flow of electrical energy to said belt driving motor; a switch actuator comprising a resilient rod mounted transversely of said belt for travel of said belt thereacross and for supporting it, at that point, above its normal level of travel; said rod being downwardly deflectable by movement of the weighted object on the belt thereacross, and by such deflection actuate the switch to effect its deactivation.

2. A combination according to claim 1 wherein said resilient rod has fulcrum supports at its ends adjacent opposite side edges of the conveyor belt and with one end portion thereof extended beyond its supporting fulcrum in a position for operative engagement with said switch for its deactivation incident to downward deflection of the rod between its supports.

3. A combination according to claim 2 wherein said conveyor belt is supported along the length of its object conveying travel by transverse supporting rollers, so positioned as to give the belt a troughed formation, and wherein the resilient switch actuator rod is disposed transversely of the belt at a level designed to support it, at the point of its engagement therewith, at a level above its normal travel level, and wherein said switch is mounted adjacent one edge of said belt and beneath the said extended end portion of the rod for its deactivation thereby and is adapted to automatically return to activated setting when the rod end is disengaged therefrom.

4. The combination with a belt mounting frame structure including spaced parallel side beams and belt supporting rollers extended beyond the conveyor belt mounted for travel between said beams on said rollers for the conveyance of weighted objects at spaced intervals thereon, an electric motor driving said belt and a switch mounted on one of said beams for controlling flow of electrical energy to said motor; of a switch actuator comprising a resilient cross-rod extended between and through said beams with fulcrumming supports therein and with one end portion thereof normally projecting from the beam over said switch for its activation; said rod serving as a support for the belt in its travel thereover, and at that point, to support it at a level that is above its normal plane of travel; said rod being downwardly deflectable between its points of support by the passing of each weighted object thereover and its extended end portion thereby caused to operatively engage and effect deactivation of said switch.

5. A combination according to claim 4 wherein said resilient rod mounts a plurality of wheel-like rollers rotatably thereon, in spaced relation between its points of support for their rolling support of the belt in its passage thereover.

6. A combination, as recited in claim 4, including a "kicker" mechanism, disposed at one side of said belt for the displacement of weighted objects from the belt as brought to discharge position by said belt, and means that is actuated incident to the deactivation of said switch and belt stoppage to energize the kicker to cause displacement of the weighted object from the belt.

References Cited by the Examiner

FOREIGN PATENTS

811,935 8/51 Germany.

SAMUEL F. COLEMAN, Primary Examiner.