May 2, 1933. H. W. BRADLEY ET AL 1,907,142

OPERATING DEVICE FOR CONVEYERS AND THE LIKE

Filed Jan. 11, 1932 3 Sheets-Sheet 1

Fig. 3.

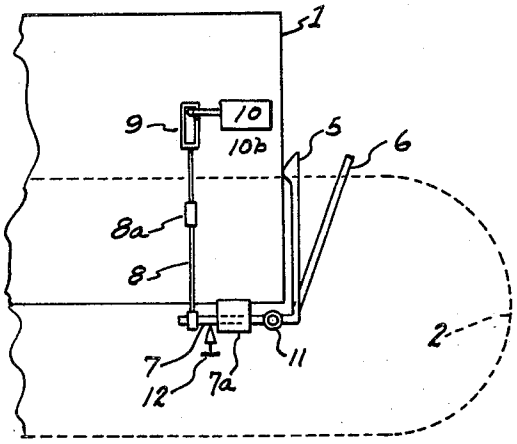
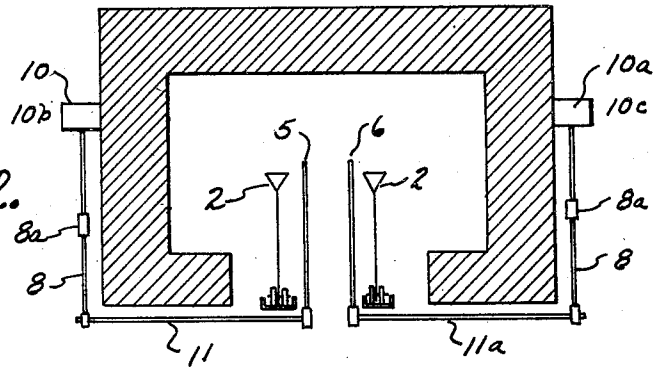


Fig. 2.



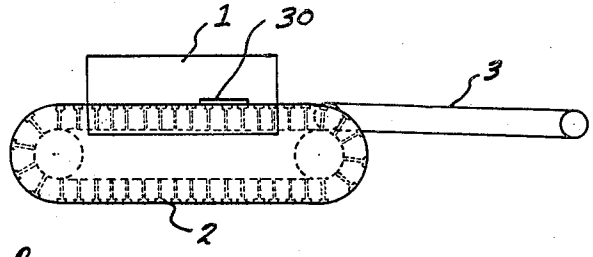




Fig. 1.

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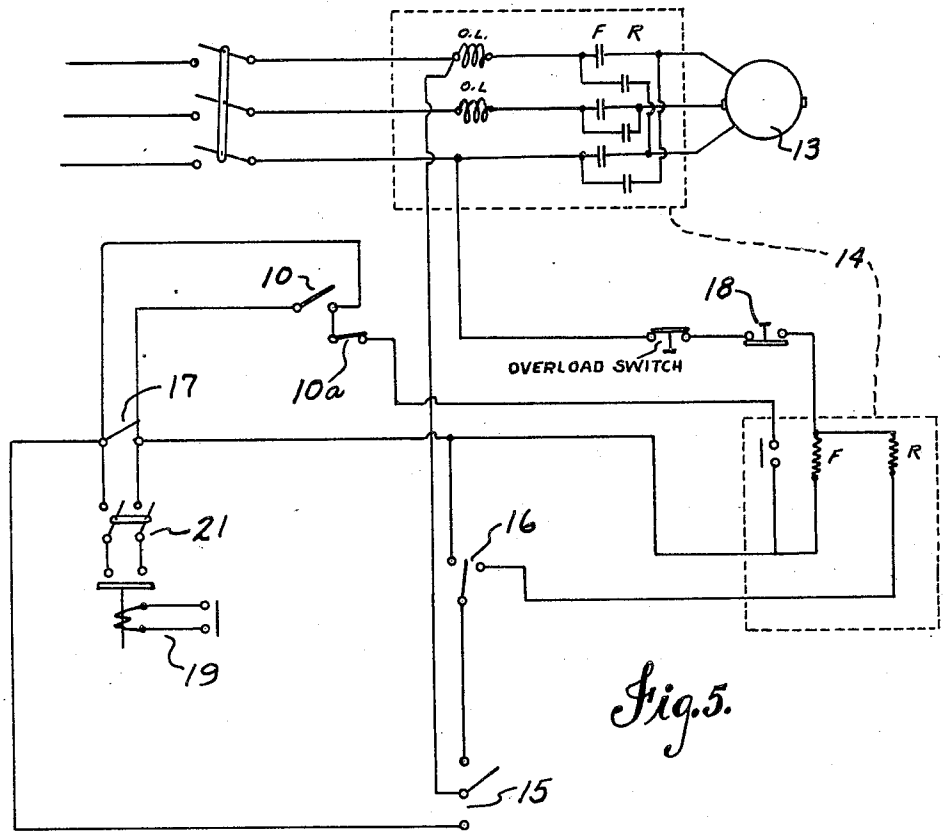


Fig. 5.

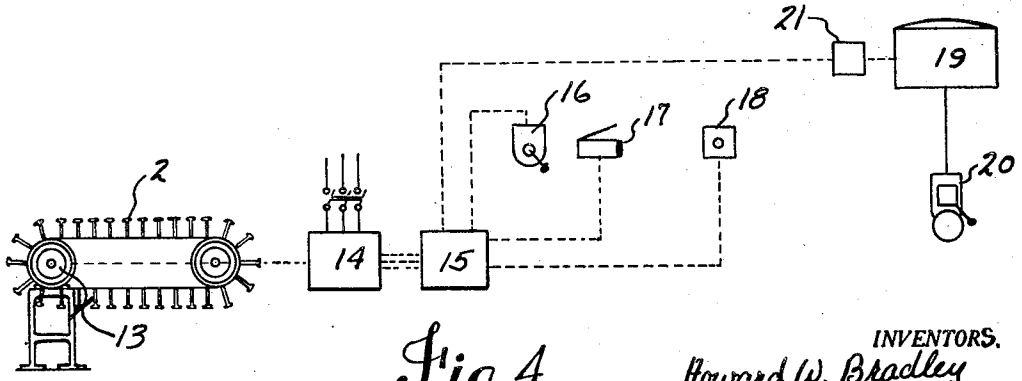


Fig. 4.

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Filed Jan. 11, 1932 3 Sheets-Sheet 3

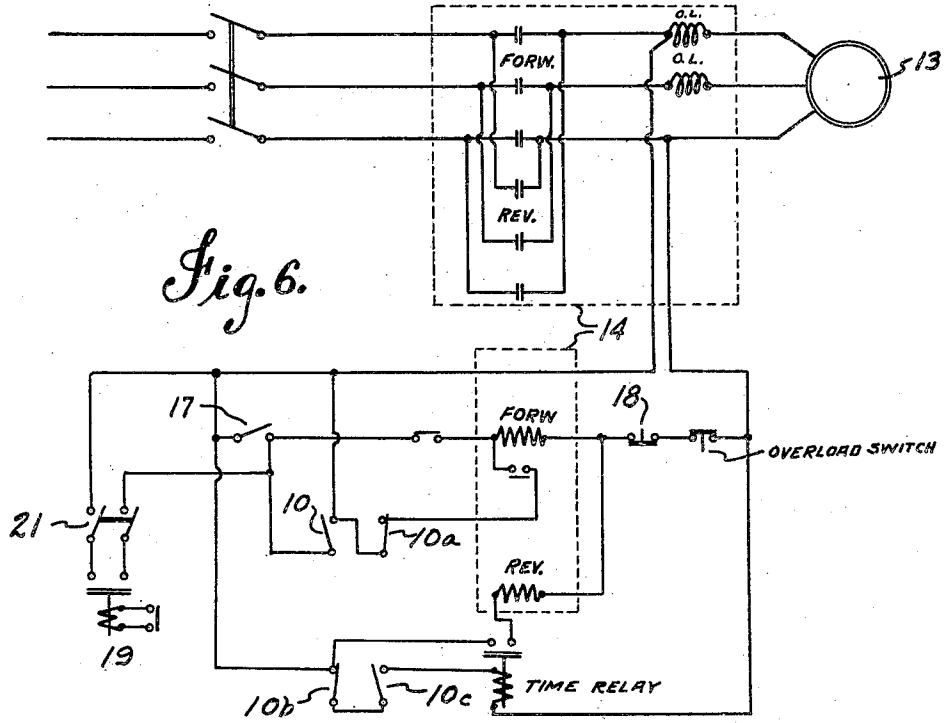


Fig. 6.

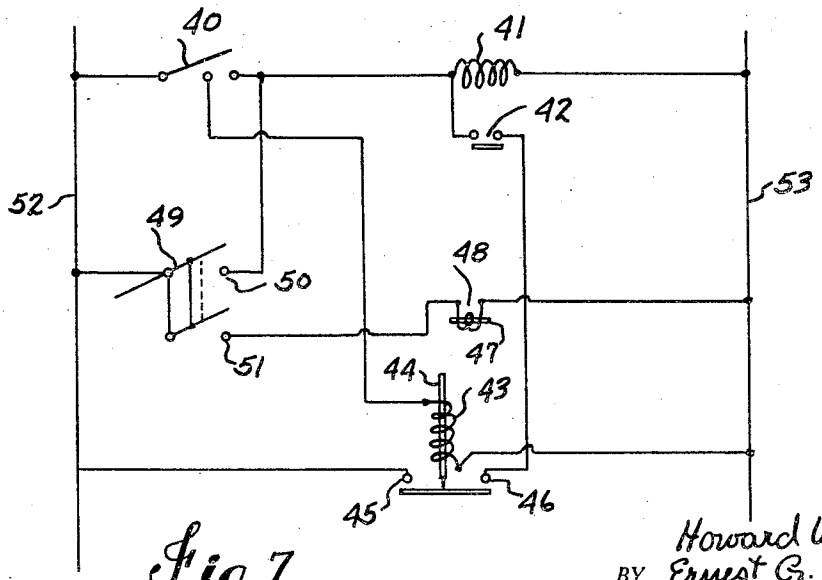


Fig. 7.

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UNITED STATES PATENT OFFICE

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OPERATING DEVICE FOR CONVEYERS AND THE LIKE

Application filed January 11, 1932. Serial No. 585,932.

Our invention relates to mechanism for the automatic or semi-automatic actuation particularly of conveyer mechanisms, and while it will be applicable to a variety of machines to be controlled, its nature will be understood from the following disclosure, wherein we have described in connection with an exemplary embodiment for the delivery of sheets or packs or metal pieces from a furnace.

In connection with the exemplary embodiment; that is to say, the delivery of metal pieces from the furnace, the problem is to provide for the automatic or semi-automatic delivery of these pieces from the furnace to a man operating a rolling mill or the like, to whom we shall hereinafter refer as the roller. Heretofore in commercial operation the control of the delivery end of the furnace has been the separate employment of another man, and the roller himself has not been able to give his attention both to the passing of sheets or packs through the mill to the catcher and to the operation of the furnace delivery mechanism.

An object of our invention is to make the delivery of metal pieces from the furnace either fully automatic or semi-automatic in the sense that the roller, as he finishes the last pass with a previous sheet or pack, may start into operation a series of automatic actions which will deliver the next sheet or pack to him from the furnace.

Another object of our invention is the provision of means of this character which will take care of pieces of different size and character without individual adjustment, so that a run may be made including various kinds of pieces, or a change may be made from a run of one kind to a run of another without changing over the mechanism.

Ancillary objects of our invention may comprise the provision, in means of this character, of selective mechanism for the control of the several devices, together with means affording safety factors as may be desired.

These and other objects of our invention, which will be set forth hereinafter or will be apparent to one skilled in the art upon reading these specifications, we accomplish by that certain construction and arrangement of parts of which we shall now describe the aforesaid exemplary embodiment, reference being had to the drawings which form a part hereof.

In the drawings:

Figure 1 is a diagrammatic elevation of a furnace arranged to deliver heated sheets, packs, or pieces to a pair of rolls.

Fig. 2 is a semi-diagrammatic end view of a furnace showing portions of our controlling mechanism.

Fig. 3 is an elevation of the end of a furnace showing features of our controlling mechanism.

Fig. 4 is an arrangement diagram in which are indicated the conveyer and prime mover and the several controlling and selective mechanisms not including, however, those which are actuated by the pieces being conveyed.

Fig. 5 is a circuit diagram of an exemplary apparatus embodying our invention.

Fig. 6 is a circuit diagram in which reversing means is employed.

Fig. 7 is a circuit diagram of a type of apparatus employing but one trigger, and a latching device.

In Figure 1, we have indicated a furnace 1, equipped with a conveyer 2, arranged to carry metal pieces 30 or the like, therethrough. The conveyer 2 is arranged at its delivery end to transfer the pieces to a supplementary conveyer or run out table 3, whence the roller may transfer them to a rolling mill indicated diagrammatically at 4.

The character of the furnace, the conveyer, run out table, and the mills, are not limitations upon our invention. Our invention is equally adapted to the control of or delivery of materials to a wide variety of types of these instrumentalities. Accordingly, we have indicated them only diagrammatically.

The conveyer 2, shown in Figs. 1, 2 and 4, is a chain conveyer of the type having upwardly extending projections or feet of heat resisting alloys which contact the sheets or packs as they move through the furnace. As shown in Figure 4, the conveyer 2 is actuated by a prime mover 13, which may be an electric motor. It has been indicated

as such in this embodiment, and the several controls as electric switches, relays, and the like. The motor 13 has a starting box or controller 14 preferably of a type which provides for starting and stopping the motor in forward or reverse directions, since it may be desirable in some instances to run the furnace conveyer backwards.

Heretofore an extra man has had to be stationed where he could watch the rolling operation and have access to the various starting and controlling buttons connected with the starting box or controller 14. At or near the end of a rolling operation this man would then start the conveyer to the end of delivering a piece to the run out table 3, stopping the conveyer as soon as this was accomplished. Possible variations in the length of piece or differences in the length of pieces as between runs have hitherto made it appear all the more necessary to provide this extra man.

In our invention we obviate this necessity, and we provide in one phase of our invention a control button indicated at 17 in Figure 4, which may be located where the roller himself can get at it conveniently. This button or switch may, if desired, be in the form of a foot treadle mechanism which the roller may actuate, even while he is occupied in giving the sheet or pack the final pass in the mills 4. Our invention provides means whereby, upon the actuation of the starting switch 17, the necessary sequence of operations thereupon becomes automatic irrespective of any variation in the length of the pieces, and irrespective of any variation in the spacing between the pieces upon the conveyer.

To this end, one provision is that the piece itself actuate controlling mechanism for stopping the conveyer at the right point, and also means whereby the piece itself may control the duration of the starting current impulse so that the length of time the roller keeps his foot on the treadle switch 17 becomes unimportant. In other words, we provide in our invention means whereby, as soon as the roller has initially actuated a suitable starting switch, the duration of operation of the conveyer and the stopping thereof become fully automatic, and are determined by the characteristics of the piece being delivered.

In the embodiment shown, switch 17 is a single pole switch which makes a controlling circuit. If this were released and no other means provided for holding the starting circuit, the conveyer would stop. Hence we provide means whereby the piece, as it leaves the furnace, operates a holding circuit or closes a main circuit of the controller 14, as the case may be.

Located in the path of the sheet or pack, we have provided a trigger 5, attached non-rotatably to a shaft 11. A counterweight arm or lever 7 is also attached to the shaft, the counterweight being indicated at 7*a*. The arm 7 is connected through a rod 8, to a limit switch 10, located upon some suitable support. A turn buckle 8*a* may be provided in the rod, and the upper end of the rod is preferably provided with a slotted member 9 which allows some play in the parts, whereby the trigger 5 may follow irregularities or variations in flatness in the pack or piece 30 without affecting the limit switch 10.

Upon the actuation of the foot treadle 17, the motor 13 is started, and the pack 30 moves toward the run out table 3. The pack as it leaves the furnace, strikes the trigger 5, and through the mechanism just described, operates the limit switch 10.

A second trigger at 6 is provided, also located in the path of the sheet or pack and connected with a shaft 11*a*, arranged through mechanism similar to that described in connection with the shaft 11 to operate a second limit switch 10*a*, shown for the purpose of illustration as located upon the opposite side of the furnace.

We have indicated the trigger 6 as located somewhat behind the trigger 5 so that the pack 30, as it moves from the furnace, will first actuate the trigger 5, and subsequently the trigger 6. A stop 12 is shown as co-operating with the lever arm 7 to limit the motion of this lever arm and to absorb the energy of motion of the trigger 5 and connected mechanism when it moves back into operating position as the pack leaves it.

The limit switch is first actuated by the pack striking the trigger 5. In this embodiment the limit switch 10 closes the main circuit of the starter 14. There is a holding circuit for this starter in our preferred embodiment, which holding circuit provides for the continuous actuation of the motor circuit for the forward position as soon as the foot treadle switch 17 is depressed.

This provides for the continuous actuation of the motor until otherwise stopped, even though the foot treadle 17 be instantly released. Otherwise it would be necessary for the roller to keep his foot upon the treadle switch 17 until the pack 30 had depressed the trigger 5, and through the limit switch 10 closed the main circuit of the starter. Our mechanism may be operated in this way if desired; but the attention of the roller would have to be directed to the position of the piece, as will be obvious. In our preferred embodiment the limit switch 10*a* is arranged, upon actuation of the trigger 6, to open the holding circuit of the motor controller or starting box 14.

The sequence of operations, therefore, is as follows: The treadle switch 17 is actuated by the roller, whereupon the motor is started in the forward direction, and a holding cir-

cuit connected with the controller 14 maintains this operation, even though the treadle switch be instantly released. The conveyer being started, the pack 30 first strikes the trigger 5, closing the main circuit of the controller 14. Next it strikes the trigger 6 and opens the holding circuit of the controller. The operation is now being maintained by the main circuit of the controller through the limit switch 10, and will be maintained as long as the trigger 5 is held depressed by the passage of the piece or pack thereover.

It will be clear that variations in the length of the piece or pack make no difference in this operation, and as long as a pack is being fed from the furnace, irrespective of its length, the trigger 5 will be held depressed, and the operation of the conveyer in the forward direction will be maintained by the main circuit of the starting box or controller 14. When the piece has passed the trigger 5, this trigger, actuated by the counterweight 7, will return to its original position, opening the main circuit of the controller through the limit switch 10, whereupon the conveyer stops.

The piece will, however, be carried beyond the trigger 6, allowing this trigger to return to its first position, closing the holding circuit of the controller and making ready for a subsequent cycle of operations as just described. The making of the holding circuit will not, of course, start the motor 13 again, but will arrange the circuits so that the subsequent actuation of the treadle switch 17, or some other switch in parallel therewith, will again start the cycle.

Under some circumstances it may be desirable to arrange for the full automatic operation of the conveyer; that is to say, the timed delivery of pieces from the furnace 1. This can be accomplished by substituting for or connecting in parallel with the switch 17, any suitable timing device, such as a time relay, a clock mechanism, or the like, which will close the circuit.

We have indicated in Figures 4 and 5 a selector switch 15, which is of the double-throw type and may be used to change the system over from actuation by the foot treadle switch 17 to actuation by a timer 19, which may be of the character just described. A cut out switch 21, Figure 4, may be placed in the circuit of the timer if desired, and also, since with full automatic operation a signal to let the roller know the time of delivery of pieces from the furnace 1 may be desirable, we have shown a bell or other signalling device 20 connected in a suitable way to the timer 19.

In the full automatic operation however, as started for each cycle by the timer 19, we still have the advantage of a control of the cycle by the length of the piece being delivered, so that automatic operation and the timed delivery of pieces is not interrupted by changes in their length. The mechanism controlled by the triggers 5 and 6 is thus arranged to be effective in connection with cycles started by the automatic timer 19, which in the particular circuit shown, is a substitute for the foot treadle switch 17. In a system of this character designed for the delivery of heated sheets or packs from a furnace, occasion may arise for a stopping of the conveyer at a time intermediate the beginning and end of the cycle, consequently we have provided a stopping switch indicated at 18.

Again, conditions may require a reversal of the furnace conveyer mechanism, for which reason we have provided a reversing switch 16. The complete circuit of our exemplary embodiment as herein described is shown in Figure 5 in detail. Particular description of this circuit will not be necessary, since with different types of starting and controlling boxes or panels, or with different types of switches, different appropriate circuit connections may be employed without departing from the spirit of our invention.

It is frequently desirable to provide for the reverse movement of the conveyer at the end of a cycle of operations. The reason for this has hitherto been made clear and may be restated in this way:—that after the delivery of a piece from the furnace the next succeeding piece may be carried either partly outside the furnace, or at least outside the zone of proper heating. Consequently, a reversal of the furnace sufficient to carry such piece back into the proper heating zone is desired. Manual provision for this has been made in the organization shown in Fig. 4, namely the switch 16, but an automatic operation may be provided for, as shown in Fig. 6. A statement of operation will be sufficient to make this wiring diagram comprehensible.

As a piece is delivered from the furnace and strikes trigger 5, connected with limit switch 10*b*, this switch will be opened. As the sheet next strikes trigger 6, connected with limit switch 10*c*, this switch will be closed. Switch 10*c* is connected with a time release so marked, but the circuit at this stage will still be open by reason of the opening of the switch 10*b*. The normal cycle hereinabove described is next carried on through limit switches 10 and 10*a*, and does not require special description. As the end of the sheet, however, releases trigger 5, it will close the circuit to the time relay through limit switch 10*b*, and the time relay will be energized. Almost simultaneously the sheet in releasing trigger 6 stops the forward cycle, and through limit switch 10*c* opens the circuit to the timing relay. This relay, however, keeps its contact closed for a predetermined time. This starts the reversing cycle of the conveyer and continues it until the

time relay re-sets itself, as will be readily understood.

Provision might also be made for causing the energizing of the time relay to stop the final cycle through an extra pair of normally closed contacts on said relay.

Again, it is possible to actuate reversing switches by mechanical devices driven from the conveyer drive.

Finally, it is possible to provide means whereby a single trigger will carry through the cycle described in connection with Fig. 5. In Fig. 7, 40 represents a double-pole treadle switch, or other suitable manual or automatic starting device. 41 is the coil of the magnetic contactor of a starting box. When this coil is energized, the motor will be started by mechanism well understood but not shown. 42 is an auxiliary switch which is connected to the magnetic contactor in such a way that its contacts are open when the magnetic contactor is open, and vice versa. 43 is the coil of the relay of the latching type. When this coil is energized the plunger 44 will move, making contacts between members 45 and 46. The plunger will also be held in contact making position by a latching device as known in this type of relay. The latching device is released by a plunger 47, actuated by a coil 48. The un-latching of the plunger will, of course, open the circuit between contacts 45 and 46. 49 represents a single trigger located in the path of the moving sheets, or other objects. It has two contacts, or is connected to two limit switches 50 and 51. The remaining connections of these devices to each other and to power lines 52 and 53 will be clear from Fig. 7.

When switch 40 is actuated by the roller, coils 41 and 43 are both energized. Mechanism connected with coil 41 starts the motor, and coil 43 makes the circuit between contact points 45 and 46. When the foot switch is released, coil 41 remains energized through a circuit comprising the contact points 45 and 46, and the switch 42. The motor, of course, runs. During the travel of the conveyer, the front end of the sheet or object hits the trigger 49, closing switches 50 and 51. Through switch 50 there is thus established a parallel circuit through coil 41. The closing of switch 51 makes a circuit through the coil 48 of the latching member. This, of course, actuates plunger 47 and the latch connected therewith, releasing plunger 44. Contact is broken in the circuit comprising contact points 45 and 46, but coil 41 remains energized through switch 50 until the rear end of the sheet or object releases trigger 49. At this time also the circuit will be broken through switch 51, and the latching mechanism will be re-set for the next cycle.

Having thus described our invention in an exemplary embodiment, what we claim as new and desire to secure by Letters Patent, is:—

1. In combination with conveyer mechanism, a prime mover comprising an electric motor, controlling means for said electric motor, said controlling means having a main circuit and a holding circuit, means for starting said motor, said means comprising a switch, and means actuated by an article on said conveyer first to close said main circuit and open said holding circuit and to close said holding circuit after said article has passed a predetermined point.

2. In combination with conveyer mechanism, an electric motor, controlling means therefor comprising a main circuit and a holding circuit, means for starting said motor, comprising means for rendering said holding circuit effective, and means actuated by an article on said conveyer for closing said main circuit and opening said holding circuit and opening said main circuit in sequence.

3. In combination with conveyer mechanism, an electric motor, controlling means therefor comprising a main circuit and holding circuit, means for starting said motor, comprising means for rendering said holding circuit effective, and means actuated by an article on said conveyer for closing said main circuit and opening said holding circuit and opening said main circuit in sequence, said means comprising triggers lying in interspaced position in the path of said article, said triggers operatively connected with switches.

4. In combination with conveyer mechanism, an electric motor, controlling means therefor comprising a main circuit and a holding circuit, means for starting said motor, comprising means for rendering said holding circuit effective, and means actuated by an article on said conveyer for closing said main circuit and opening said holding circuit and opening said main circuit in sequence, said means comprising triggers lying in interspaced position in the path of said article, said triggers operatively connected with switches, and an automatic timing mechanism connected in parallel with said starting means.

5. In combination with conveyer mechanism, an electric motor, controlling means therefor comprising a main circuit and a holding circuit, means for starting said motor, comprising means for rendering said holding circuit effective, and means actuated by an article on said conveyer for closing said main circuit and opening said holding circuit and opening said main circuit in sequence, said means comprising triggers lying in interspaced position in the path of said article, said triggers operatively connected with switches, and an automatic timing mechanism connected in parallel with said starting means through a selector switch.

6. In combination with conveyer mechanism, an electric motor, controlling means therefor comprising a main circuit and a holding circuit, means for starting said motor, comprising means for rendering said holding circuit effective, and means actuated by an article on said conveyer for closing said main circuit and opening said holding circuit and opening said main circuit in sequence, said means comprising triggers lying in interspaced position in the path of said article, said triggers operatively connected with switches, an automatic timing mechanism connected in parallel with said starting means through a selector switch, and a signalling means connected with said automatic timing means.

7. In combination with conveyer mechanism, a motor, controlling means for said motor comprising a main circuit and a holding circuit for forward operation, a stop switch, a reversing switch, a switch for rendering said holding circuit effective, switch operating means lying in the path of an article on said conveying means, and comprising first a switch for closing and opening said main circuit and interspaced therefrom in the direction of travel of said article, a switch for opening and closing said holding circuit, an automatic timing device, and a selector switch for connecting said starting switch and said automatic timing device preferentially to actuate said holding circuit.

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