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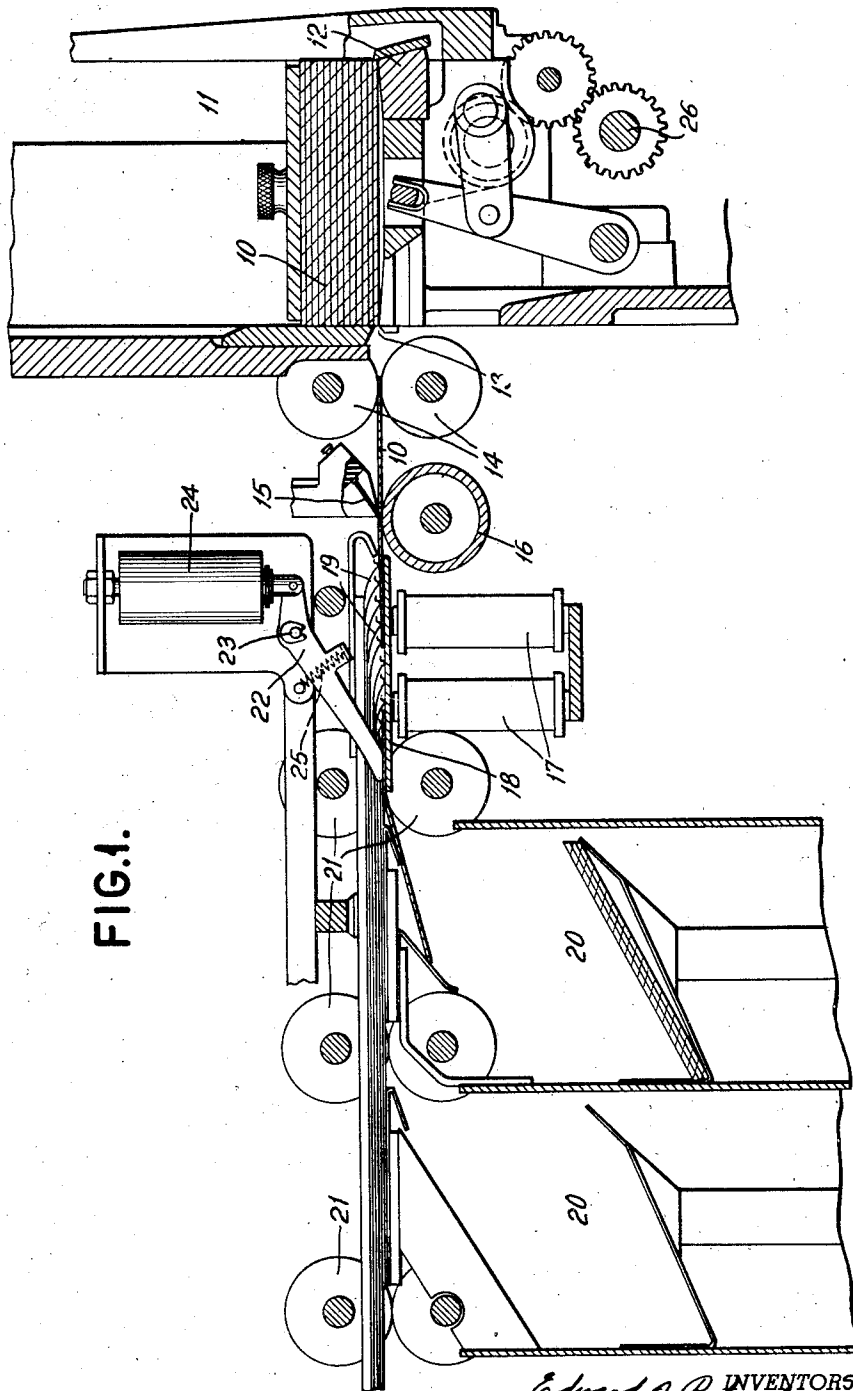
2,403,550

SORTING MACHINE

Filed Dec. 24, 1942

2 Sheets-Sheet 1

FIG. 1.



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2 Sheets-Sheet 2

FIG.2.

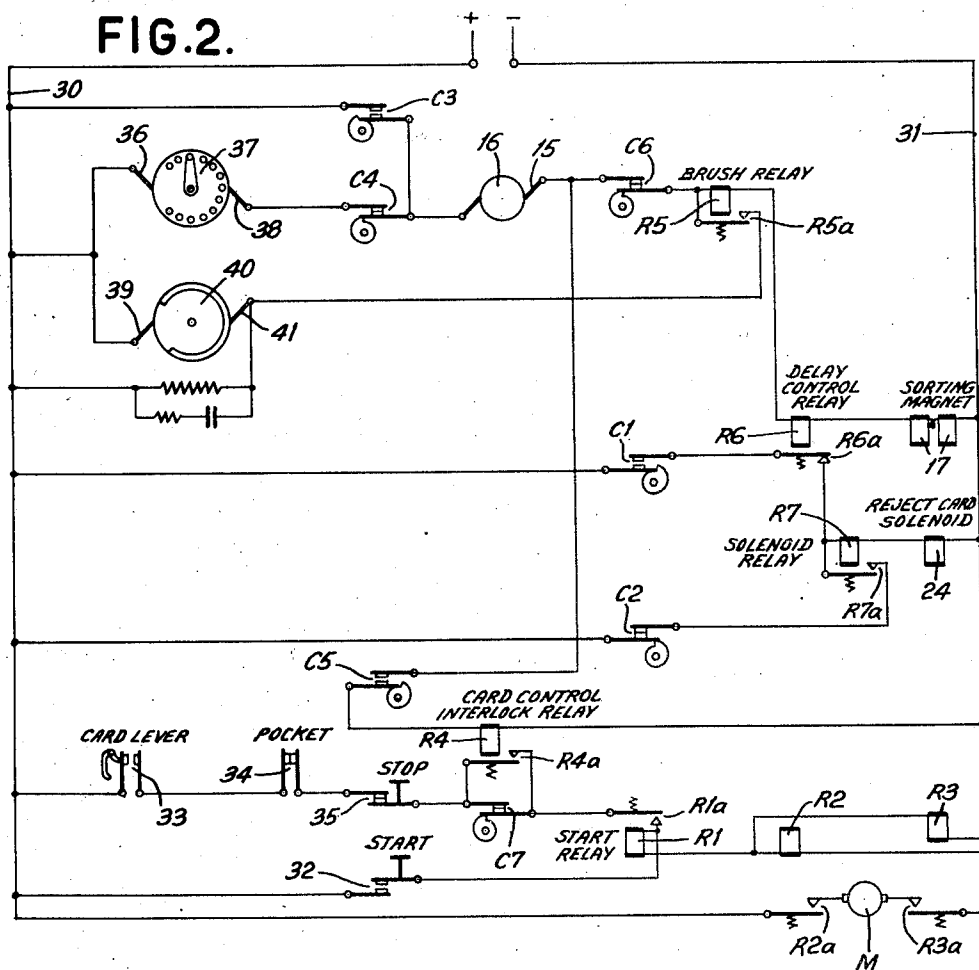
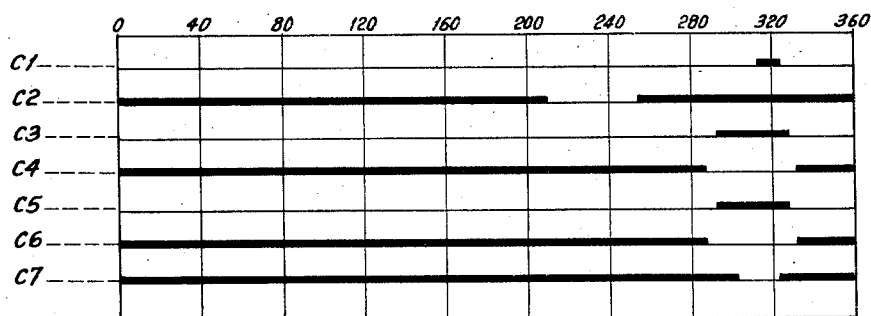


FIG.3.



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SORTING MACHINE

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4 Claims. (Cl. 209—110)

1

This invention relates to card sorting machines and more particularly machines for sorting well known perforated record cards known as "Hollerith" cards.

The principal object of the invention is to provide improved protection devices responsive to stop the machine in the event of any irregularity in the feeding of the cards to thereby prevent so-called "jamming" and consequent damage to the delicate parts of the apparatus.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a central section through the essential operating devices of a well known form of sorting machine.

Fig. 2 is a wiring diagram of the electrical circuits of the machine.

Fig. 3 is a timing diagram of certain cam controlled contracts utilized in carrying out the objects of the invention.

The type of sorting machine to which the invention has been applied is that of Patent 1,741,985 to E. A. Ford dated December 31, 1929, and a brief explanation will first be given to set forth the manner of operation of such machine. Record cards generally designated 10 (Fig. 1) are placed in magazine 11, from the bottom of which reciprocating picker mechanism 12 advances the lowermost card through a throat 13 to a pair of feed rollers 14 which advance the card past the sorting brush 15. As the card passes the brush, electrical connection is made through a perforation therein with the common contact roller 16 which completes a circuit to the sorting magnet 17. The action of the sorting magnet will draw downwardly on its armature 18. Lying on top of the armature are the ends 19 of a group of sorting blades of different lengths as indicated, which run back to the different sorting pockets 20, two of which are shown in Fig. 1.

The spaces between the blades form passages which extend back to the several pockets, so that a card entering into any passage will be conveyed by the guide rollers 21 to the appropriate pocket. Selection of the particular passageway is controlled by the record card 10 and is determined by its position with respect to brush 15, at the time when the circuit through a perforation is completed to energize magnet 17. To

2

illustrate, if a circuit is completed through a perforation at the time card 10 is in the position shown in Fig. 1, armature 18 is drawn downwardly and the blades 19 to the left of the leading edge of the card will drop down with the armature, while the remaining blades are held up by the record card itself, so that continued movement of the record card will cause it to enter the passage thus opened by the relative movement of the blades 19.

This briefly describes the operation of the well-known sorting mechanism, and the record cards as usually fed through the machine have a thickness of about .007 of an inch. For particular kinds of accounting, a card of about .021 of an inch in thickness is employed and such card has greater rigidity than the usual tabulating cards.

A special device has been provided in the machine which is in the form of a lever 22 pivoted at 23, whose lower end normally lies slightly above the record cards as they pass through the machine. This lever is rocked counterclockwise by solenoid 24 against the action of spring 25 whenever a record card is fed into the first sorting pocket 20, which is known as the "reject" pocket. It will be noted that a card is directed into the reject pocket when no perforation is sensed by the brush 15, so that the card passes beneath all of the blades 19 and is deflected into this first pocket. The point at which deflection occurs is at the first pair of feed rollers 21, and with the thicker card of greater rigidity the tendency of the card is to remain flat so that the trailing end thereof bears upwardly against one or more of the blades 19, which is undesirable as this would open an erroneous passage for the next following record card.

Accordingly, through a circuit arrangement which will presently be explained, the solenoid 24 is energized whenever it is determined that the card passing the brush 15 is to go to the reject pocket. This will rock lever 22 counterclockwise about its pivot 23 and cause the lower end of the lever to bear down on the card until it has passed the extremity of the lever. The effect of this is to hold the trailing edge of the card in a horizontal plane and prevent lifting of such end as the forward end of the card is deflected downwardly into the reject pocket 20.

At the right end of Fig. 1 is shown a shaft 26 suitably geared to the main shaft of the machine and upon which several contact operating cams are mounted and timed to make one revolution for each card fed through the machine. The contacts controlled by these cams are shown in

the diagram (Fig. 2) and their time of operation with respect to a card feeding cycle is shown in Fig. 3.

Referring to Fig. 2, current is supplied to left side of the line 30 and right side of the line 31. Closure of the usual start key contacts 32 completes a circuit from line 30, contacts 32, start relay R1, relays R2 and R3 in parallel to line 31. Relays R2 and R3 close their contacts R2a and R3a, respectively, to complete a circuit through the driving motor M of the machine. This motor in the usual way operates the picker mechanism and the card feed rollers, so that a card is advanced from the stacker 11. As the card advances toward brush 15, the usual card lever contacts 33 are closed so that a holding circuit is completed from line 30, card lever contacts 33, the "full pocket" contacts 34, stop key contacts 35, normally closed pair of contacts C7, contacts R1a of relay R1, relays R2 and R3 to line 31. Through this holding circuit motor M is maintained in operation after the start key contacts 32 are permitted to reopen.

The contacts C7 are timed to open once during each cycle of the machine after a card has been sensed and before the next card arrives at the brush, that is, during the interval the space between adjacent edges of two cards is in line with the sorting brush. This opening of contacts C7 would break the holding circuit and stop operation of the machine. Provision is made, however, for closing a shunt circuit around these contacts through contacts R4a of a relay R4, which is energized through the following circuit completed by cam contacts C3 and C5 which, as shown in Fig. 3, close just before contacts C7 and open again after contacts C7 have reclosed. This circuit is traceable in Fig. 2 from line 30, contacts C3, contact roller 16, sorting brush 15 (there being no card insulating brush 15 from roller 16 at this time), contacts C5, relay R4 to line 31. If for any reason a record card has become misaligned, that is, retarded so that at the time contacts C7 open the brush 15 is separated from the contact roller 16 by the record card material, relay R4 will not be energized so that the motor control circuit is broken, and the machine will stop immediately.

The arrangement just explained is commonly known as a "non-jamming" device and is provided to stop the machine at the earliest possible time, especially where the thicker and more rigid cards are used, to prevent injury to the delicate sorting blades of the apparatus.

The normal sorting circuit is traceable from line 30 to the usual commutator brush 36, the commutator 37, brush 38, cam contacts C4, which are closed while the card is traversing the brush 15, contact roller 16, perforation in the record card, brush 15, contacts C5 (whose timing is the same as that of contacts C4) (see Fig. 3), brush relay R5, a so-called "delay" control relay R6, sorting magnet 17 to line 31. Through this circuit the sorting magnet 17 is energized at the time a perforation is sensed to select the proper passage of the record card. The usual holding circuit is provided to maintain the magnet 17 energized for a period of time, which circuit is traceable from line 30, brush 39 of the holding commutator 40, brush 41, contacts R5a, relay R5, relay R6, magnet 17 to line 31. Whenever a perforation occurs in a card passing brush 15, these circuits are completed and contacts R6a are opened as a result. When the sorting circuit is not completed, that is, when no perforation is sensed, the card

is to go to the reject pocket and under such circumstances the solenoid 24 is to be energized to hold the trailing edge of the card in its horizontal position as the card passes to the pocket.

To bring this about, cam contacts C1 are provided which are timed to close a short period after all perforation positions of the card have passed the brush 15 and, if contacts R6a have not been opened, a circuit will be completed from line 30, contacts C1, contacts R5a, relay R7, solenoid 24 to line 31. Relay R7 closes its contacts R7a to complete a holding circuit from line 30, cam contacts C2, contacts R7a, relay R7, solenoid 24, to line 31. As seen from Fig. 3, this holding circuit is held through the remainder of the cycle and well into the next following cycle.

It is thus seen that the deflecting solenoid 24 is brought into action only when the card is to be rejected or fed into the nearest pocket. It is seen also that the sorting brush 15 is provided with a double function, one function being that of controlling the sorting magnet 17 to select a sorting pocket for the card, while the latter is passing the brush and the other being to serve as a detecting device during the interval between cards so as to interrupt the continued operation of the machine if a card is at the brushes at this detecting or testing time.

The card distributing system and the special controls therefor to operate the solenoid 24 are not claimed herein but are claimed in a divisional application Serial No. 504,386, now Patent No. 2,350,531, granted June 6, 1944.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention therefore to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In a cyclically operable record card sorting machine, a record card sensing device, sorting means, means for feeding record cards past said device in spaced succession, one card being fed for each cycle of operation of the machine, said sensing device being effective during the passing of cards thereby for controlling said sorting means, an operating control circuit for the machine, means timed to cyclically open said circuit after each card has passed said sensing device and before the next card passes said sensing device, means for completing a second circuit through said sensing device at said cyclic time, and means included in said second circuit for rendering the opening of said operating control circuit ineffective.

2. In a cyclically operable record card sorting machine, a record card sensing device, sorting means, means for feeding record cards past said device in spaced succession, one card being fed for each cycle of operation of the machine, said sensing device being effective during the passing of cards thereby for controlling said sorting means, an operating control circuit for the machine, means timed to cyclically open said circuit after each card has passed said sensing device and before the next card passes said sensing device, means including said sensing device and operative at said cyclic time for testing whether a card is present at the sensing device,

5

and means controlled thereby when no card is present for rendering the opening of said operating control circuit ineffective.

3. In a cyclically operable record card sorting machine, a record card sensing device, means for feeding perforated record cards past said device in spaced succession, a sorting magnet, a control magnet, means for electrically connecting said sorting magnet to said sensing device as the card is passing the device and for electrically connecting the control magnet to said sensing device in the interval when no card is passing to said sensing device, an operating circuit for the machine, means for opening said circuit following each card sensing, and means controlled by said control magnet for rendering said opening ineffective or effective depending upon whether the control

6

magnet is energized or not energized at the time of its connection to the sensing device.

4. In a cyclically operable sorting machine, a sorting brush, means for feeding record cards past the brushes in succession, a sorting magnet, a machine control circuit, devices for associating the brush with the sorting magnet during one part of each cycle of operation of the machine to control sorting of the cards, and means for associating the brush with the control circuit during another part of the cycle to cause continued operation or interrupt the operation in accordance with the relative position of the card and brush during such other part of the cycle.

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