United States Patent

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[33] **Japan**
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[54] **AUTOMATIC CARD FEEDING DEVICE**
8 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **271/41**
[51] **Int. Cl.** **B65h 3/06**
[50] **Field of Search** 271/10, 4; 271/41

[56] **References Cited**

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ABSTRACT: A card is fed along a card path from a stack of cards by two pairs of feed rollers which may be rotating at different peripheral speeds. At one point in the path a single feed roller advances the card out of contact with the first pair of feed rollers and into contact with the second pair, a leaf spring serving to press the card against the single feed roller and allowing slippage between the card and the single feed roller, whereby tearing or bunching of the card is avoided.

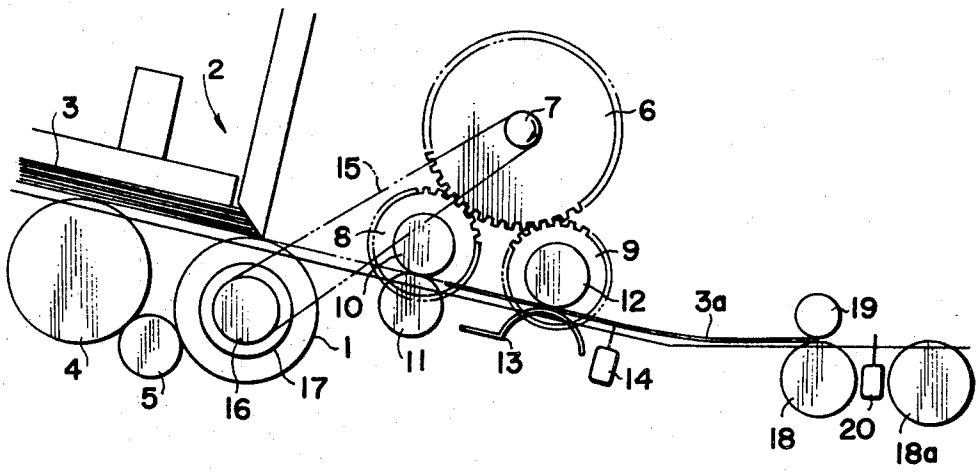


FIG. 1

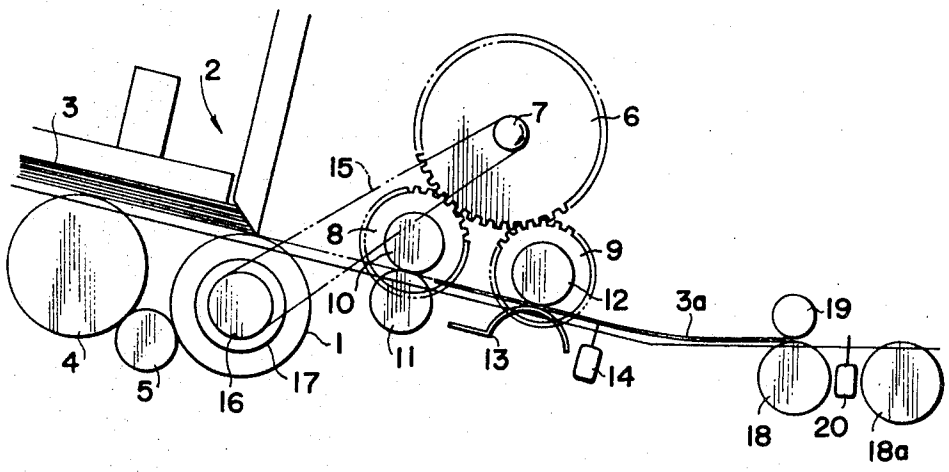
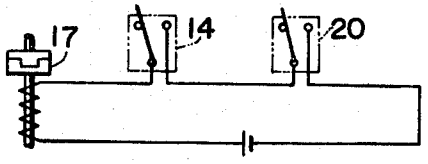


FIG. 2



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AUTOMATIC CARD FEEDING DEVICE

BACKGROUND OF THE INVENTION

The present invention relates to an automatic card feeding device for use with a data processing system.

Many card feeders for use with the data processing systems have been proposed, but there exists a problem of the difference in the card-transporting speeds between an automatic card feeder and a machine having a predetermined function or any other machine as needs demand. That is, when the card transportation speeds are different in newly interconnected equipment and/or when the card feeding timings are different in such equipment, the card is easily susceptible to damage or breakdown or the card feeding or transportation can not be effected.

In view of the above present invention has been made in order to eliminate such problems as those described above.

SUMMARY OF THE INVENTION

According to the present invention, cards which are drawn from a stack one by one by means of a card-drawing roller are advanced toward a forced card feed roller. Thereafter, each card is further advanced or transported toward a card friction roller against which is lightly pressed a spring, such as a leaf spring. Thus, the card is forced to pass through the nip between the friction feed roller and the spring. When the card is forcibly pulled or compressed, the slip between the card and the friction feed roller occurs so that there is no possibility that the card will be torn off or bent. Then, the card is further advanced toward an intermittent feed roller and thereafter toward a readout device, the punching device, etc. of the data processing system. As described above, since slip between the friction feed roller and the card being transported can occur, the card is not subjected to a force which could injure or damage it even if the transportation speed of the intermittent feed roller is faster than that of the friction feed roller.

In order to effect the smooth feeding of the cards by the automatic card-feeding device according to the present invention, the distances between the card-drawing roller and detecting means for detecting whether the card being transported has passed through the friction feed roller or not; between said detecting means and another means for detecting the completion of the function or action of the card; and between feed roller and the intermittent feed roller must be made shorter than the length of one card. On the other hand, the distance between the forced feed roller and the intermittent feed roller must be made longer than the length of one card.

The above and other objects and advantages of the present invention will become apparent from the following description when read in the light of the accompanying drawing.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a partial side view of one embodiment of the present invention,

FIG. 2 is a diagram showing the electrical circuit of the essential control system of the device shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1, reference numeral 1 designates a drawing roller for use in drawing a card from a stack of cards 3 stored at a card storage 2. The cards are drawn one by one by the frictional force of the roller. An auxiliary card-drawing roller 4 is rotated through an intermediate roller 5 in the same direction as the roller 11. A transmission gear 6 is rotated by a pulley 7 which in turn is secured to a motor shaft not shown. Gears 8 and 9 are in mesh with the transmission gear 6. A forced feed roller 10 for forcibly feeding the card is directly connected with the gear an auxiliary roller 11 cooperates with roller 10. A friction feed roller 12 for feeding the card is directly coupled to the gear 8. A spring 13 is attached below the card friction feed roller 12 and has a tendency to press

against the roller 12 in a radial direction in order to impart a weak force to the card 3*a* which has been transported to the intermediate portion of the device. Reference numeral 14 designates a microswitch for controlling a clutch 17 which is disposed coaxially of the card drawing roller 1 and is driven through a belt 15 and a pulley 16. The microswitch 14 is adapted to open and close so as to disconnect from and engage the pulley 7 with the card-drawing roller 1. Reference numerals 18 and 18*a* designate feed rollers, each of which is adapted to rotate intermittently (or continuously at a peripheral speed different from the feed rollers nearer to the card storage). A pressure roller 19 cooperates with a feed roller 18. A microswitch for detecting the completion of the function or action of the fed card is provided in the path of said card. In the device shown in FIG. 1, the distances between the card-drawing roller and the microswitch 14; between the microswitch 14 and the other microswitch 20; and between the friction feed roller 12 and the feed roller 18 are all shorter than the length of the card. On the other hand, the distance between the forced feed roller 10 for forcibly feeding the card and the feed roller 18 is longer than the length of the card.

Next the mode of movement of the card will be described in more detail hereinafter with reference to FIG. 2. Both of the microswitches 14 and 20 are interconnected in series with the clutch 17 and this circuit is closed when no card is present in the device. Therefore, in that case, the clutch 17 is energized so that the card drawing roller 1 is caused to rotate, whereby the card is withdrawn and fed into the nip between the normally rotating roller 10 and auxiliary roller 11, thereby being forcibly transported. When the card reaches the microswitch 14, the microswitch 14 is opened so that the energization of the clutch 17 is stopped, whereby the card-drawing roller 1 is disconnected from pulley 16. The card is withdrawn from the card storage 2 by means of the forced feed roller 10 and the auxiliary roller 11 and is transported forwardly. Because of the distance relations as described above, when the trailing edge of the card has passed through the rollers 10 and 11, the leading edge of the card has not yet arrived at the rollers 18 and 19. After the trailing edge of the card has passed through the rollers 10 and 11, the only force exerting upon the card so as to advance the card is a weak frictional force whose strength is determined by the contact pressure between the friction feed roller 12 and the spring 13, so that even a slight force applied to the card stops the movement of the card.

Since the feed roller 18 is intermittently rotated by a driving system not shown, the card tends to advance thereto by the force exerted thereon from the feed roller 18. Therefore, the card 3*a* which has been transported to the middle portion of the transportation path may advance at a speed which is different from the feeding speed of the friction feed roller. Slip in such a case occurs between the friction feed roller 12 and the card 3*a* being transported, so that there will be exerted no force on the card 3*a* greater than a desired amount. Nor will the feed roller 12 exert a force which compresses (or bends) the card 3*a*.

An advancing card presses down the microswitch 20 (in this instant the microswitch 14 is kept pressed down so that the microswitch 14 is opened) and then a reading out operation, punching, printing or the like of the card may be effected as required. By means of the feed roller 18*a* the card 3*a* is further advanced, and when the trailing edge of the card 3*a* has passed through the microswitch 20, allowing it to close the clutch 17 is actuated again since the microswitch 14 is already closed so that the card drawing roller 1 is connected to the pulley 16 and rotates, whereby the next card is fed into the device.

As described hereinabove, according to the present invention, very smooth transportation or advance of the card can be effected even if the apparatus whose feeding speeds are different from each other are interconnected. Furthermore, the service life of the card can be remarkably increased.

The present invention has been described with particular reference to one embodiment thereof, but it will be clear that

variations and modifications can be effected within the spirit of the present invention as described hereinabove and as defined in the appended claim.

I claim:

1. An automatic card-feeding device comprising:

a card-drawing roller adapted to withdraw a card from a stack of cards stored in a card storage;

a clutch adapted to connect and disconnect said card-drawing roller from means for driving said card-drawing roller;

a forced feed roller for forcibly advancing the card withdrawn by said card-drawing roller along a card path;

a friction feed roller adapted to transport the card from the forced feed roller along the card path with a weak frictional force;

a microswitch adapted to control said clutch; feed rollers in the card path adapted to rotate at a peripheral speed different from that of the forced feed roller; and

another microswitch also adapted to control said clutch,

the distances between said card-drawing roller and said first microswitch; between said first microswitch and said second microswitch; and between said friction roller and said feed roller being less than the length of one card while the distance between said forced feed roller and said feed roller is greater than the length of one card, said clutch being adapted to actuate said card-drawing roller so as to draw a card before the preceding card reaches said microswitch and after said preceding card has passed through said second microswitch; and

said clutch being adapted to rotate without driving the card-drawing roller when a card being transported presses either of said first or second microswitches.

2. A device for feeding a card of a given length along a card path comprising:

a first pair of counterrotating feed rollers defining between them a first nip located in the card path, said first pair of feed rollers having a first peripheral speed and directions of rotation to advance a card along the card path;

a second pair of counterrotating feed rollers defining between them a second nip located in the card path, the second pair of feed rollers having a second peripheral speed differing from the first peripheral speed and directions of rotation to advance a card along the card path, the first nip being separated from the second nip by a distance measured along the card path in the direction of card travel greater than the given card length; and

a friction feed roller having a periphery located at a friction feed roller station in the card path and being rotatable in a direction to advance a card in contact with said periphery along the card path, said friction feed roller station being located between the first nip and the second nip; and

pressing means for resiliently pressing a card in the card path against the periphery of the friction feed roller with a relatively weak contact force whereby the maximum frictional force exerted on a card by the friction feed roller is less than that required to tear or buckle the card in the event that movement of the card at a speed other than that of the periphery of the friction feed roller occurs, whereby in such event slippage occurs between the card and the friction feed roller.

3. The device of claim 2 wherein the pressing means comprises a fixed pressure member.

4. The device of claim 3 wherein the fixed pressure member comprises a leaf spring.

5. The device of claim 2 wherein the distances between the first nip and the friction feed roller station and between the friction feed roller station and the second nip are both less than the card length.

6. The device of claim 5 comprising:

advancing means for advancing, when activated, a card along the card path from a card storage to the first nip;

first detecting means for detecting the presence of a card in the card path at a first detection point, said first detection point being less than a card length from the advancing means as measured along the card path, and being beyond the first nip in the direction of travel of a card in the card path, and for inactivating the advancing means upon detection of a card at the first detection point; and

second detecting means for detecting the presence of a card in the card path at a second detection point, said second detection point being less than a card length from the first detection point as measured along the card path and being beyond the second nip in the direction of travel of a card in the card path, and for inactivating the advancing means upon detection of a card at the second detection point.

7. The device of claim 6 wherein:

the advancing means comprises a drawing roller, a rotating member, and a clutch operable upon receipt of an electric current to connect the drawing roller to the rotating member for rotation therewith; and

the first and second detecting means comprise microswitches movable from a closed to an open position when contacted by a card in the card path;

and wherein said device additionally comprises:

a power source for the electrical current; and

electrical circuit means for connecting in series the power source, first and second detecting means, and the clutch.

8. The device of claim 7 wherein the fixed pressure member comprises a leaf spring.