The invention relates to material handling devices and more particularly to improved means for reversing the facing position of a record while it is advancing at a rapid rate. In billing printing it is sometimes necessary to post billing data on one side of a document in its initial run through a printer, and to post address data on the opposite face of the document in a second run, hence the need for reversing or tumbling the document prior to the second printing operation. Then there are also times when a particular kind of stacker may operate in such a fashion as to reverse the facing position of cards advanced to it from the magazine, when it is not desired to have such a reversal. For the last-mentioned set of conditions the reverser acts to preserve the arrangement of the cards by tumbling them before the stacker tumbles them, with the net result of maintaining the original card file arrangement.

The device comprises a curved pocket into which a card is directed and ejected. As the card enters the pocket it is bent and, in the process of straightening, has its trailing edge displaced to be grasped and become the leading edge. Pairs of feed rollers are at the entering and exiting edges of the pocket and between such pairs of rollers is a single nylon roller against which the trailing card edge impinges and is rapidly displaced toward the exiting roller where it becomes the leading edge. At the bottom of the pocket is a spring finger which yields upon impact by the card and then reacts to aid in rapid ejection.

A number of advantages are provided by the present and reversal structure. It is a more economical form of construction than the prior art involving swinging frames and reversing gears. It is faster and without the noise of moving parts. It is operative in any position and does not require gravitational pull for any part of the card movement.

An object of the invention is the provision of improved record feeding reversing devices.

Another object of the invention is the provision of an advanced form of record feeding and stacking devices wherein the records are stacked facing opposite to the way of facing when initially fed.

Another object of the invention is the provision of a selectable reversal device which deflects and reverses records only when so set by the operator of the machine. Two card paths are provided, with only one of them including the reversal device. By setting a deflector to guide a card along a straight path, the operator causes the card to by-pass the reversal device.

Another object of the invention is the provision of devices for flexing or bending record material and using the reaction therefrom for record feeding and reverse feeding purposes. A curved guide or pocket acts to divert a leading portion so that a trailing portion is bowed to snap out of one set of feed rollers and into another set of feed rollers as assisted by an intermediate nylon roller.

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 sectional elevation view of an entire card feeding means including the reversal devices of the present invention. A card is shown in the position in which it enters the reversing pocket 50.

Fig. 2 is a detail sectional view showing the reversing devices with the card therein and in a position where it is about to be reversed and advanced with the trailing end foremost.

Fig. 3 is a sectional detail view taken a moment later than Fig. 2 and showing how the trailing end of the card is ejected out of the reversing mechanism and grasped by feed rollers to advance it in the reverse of the incoming facing position.

Fig. 4 is a sectional elevation view showing the curved guide and the other feeding instrumentalities at the card reversing station.

Fig. 5 is a front elevation view showing the deflector blades and the various feed rollers for conveying the cards into and out of the reversing station. A general idea may be formed of how the card reversing device plays a part in the printing and stacking of record forms by reference to the general view Fig. 1. There it is seen that the cards C are held in a magazine M and advanced therethrough successively by the usual picker mechanism 21. When the front end of a card appears outside the magazine, it is grasped by the first feed rollers 22 and advanced under the sensing brushes 23 which cooperate with a contact roller 24. Beyond the sensing brushes the card is directed through feed rollers 25 and 26 and the presence of it in the card path is sensed by the card lever 27 and the contacts associated therewith. The card is carried further by another pair of feed rollers 28 and 29 which direct the card around the platen P where it is held by small feed rollers 30 cooperating with the under side of the platen. A sheet guide 31 serves to confine the leading edge of the record around the platen and direct it under the upper guide rollers 33. While the card C is held on the platen P, printing takes place through the impression of type on the printing wheels W which are adjusted and thrown against a ribbon which is held in front of the card.

After all the printing and line spacing operations are effected, the card is advanced upward and brought under control of other feed rollers 34 and 35 which direct it further upward into feed rollers 37 and 38. When long sheets are used instead of cards, the guide 36 comes into use for directing such a sheet to the under side of the platen P and around the platen in the same fashion as already described with reference to card feeding.

Directly above the feed rollers 37 and 38 there is provided a deflector composed of a pair of deflector blades 40 assembled on a shaft 41 and provided with a manipulative arm 42 which is assembled on shaft 41 outside the main frame as indicated by the dotted lines in Fig. 4. Referring again to Fig. 1, it is noted that when the blades 40 are in the dotted position, a card C passing through the feed rollers 37 and 38 is allowed to proceed almost directly upward and by-pass or detour around the reversing mechanism by moving straight up to the lower guide 43 which is underneath the upper feed rollers 45 and 46 that serve to advance the card onto the stacker drum 5D, where it is carried through an arc of about 180° before being deposited in a stacker S.

When the deflector blades 40 are positioned as shown by the full lines, the upwardly spacing card C is deflected to the left and then rides between the feed roller 47 and a splined nylon feed roller 48 which is located-to
be in cooperation with and driven by gearing between the two feed rollers 45 and 47. As the card C is advanced rapidly upward between the feed rollers 47 and 48, it is thrown toward the left and into the V-shaped curved pocket 50 that is a sort of dead end portion of the feed path of the pocket of which it may be a part of the reversing mechanism. The leading edge of the card strikes the inner curved face of the upper portion of the pocket and is bent thereby to temporarily assume the shape shown in Fig. 2 where it is seen that the leading edge of the card is near the bottom of the pocket and there a deflected a thin leaf spring 51 which is mounted as shown in Fig. 4 with the upper end secured to a portion 52 of the machine casting.

Turning back to Fig. 2, it is noted that, even though the card is beyond the height of the rollers 47 and 48, the trailing end thereof is impinging against the rapidly rotating surface of the splined nylon roller 48 which is rotating in a clockwise direction and thereby carries the trailing end of the card upward to the position shown. Meanwhile, the card has assumed the arched shape shown in Fig. 2 and has also compressed the leaf spring 51 so that there are a pair of influences tending to eject the card toward the right. Since the card is advancing rapidly, this tendency of the card to straighten and be shoved to the right by the spring does not take effect immediately but comes into play at about the time when the card is positioned as shown in Fig. 2. Then as the spring 51 reacts and shoves the card toward the right, it assumes the secondary position shown in Fig. 3 where the trailing edge of the card has started to pass between the feed rollers 45 and 48, and in this fashion the trailing end of the card then becomes the leading or advancing portion of the card. It is at this time that the upper curved portion of the deflector 43 comes into use to keep the card confined around the periphery of roller 45 so that the advancing portion of it is directed into the height between the rollers 45 and 46 so that the former trailing end is the advance portion which is grasped by the clips on the stacker drum SD.

Reference to Fig. 4 shows that the feed rollers 45 and 46 there is a guide plate 55 which helps to direct the upwardly moving card onto the stacker drum. In the same view it is shown how the four shafts 54, 55, 56 and 57 are the means which support the feed rollers 45, 46, 47 and 48, respectively. A front elevation view of these shafts and feed rollers is shown in Fig. 5. There it is also seen how the drive gears 68, 61 and 62 are assembled on the ends of the shafts 54, 56 and 57, respectively, to form driving connections between the shafts supporting the feed rollers 45, 47 and 49. With such driving connections, the three sets of rollers are in constant cooperation and serve to keep the middle roller 48 rotating in a clockwise direction and ready at all times to change the direction of the trailing end of a card so that it leaves the reversing mechanism in a facing condition opposite to that in which it appeared.

Fig. 5 also shows the location of the deflecting blades 40 as they are mounted on shaft 41 underneath the feed rollers associated with the reversing mechanism.

The general control and driving devices of a feeding mechanism such as that of Fig. 1, although not shown in their entire they, are of a well known type and reference may be made to Patent 2,573,313 issued on October 30, 1951.

It may be noted with reference to Fig. 4, that the card handling and reversing portions of the mechanism are positive in their control over the card in all portions of the operation. In other words, there is no reliance on gravity in part of the reversing operation. Therefore, the mechanism as shown, although illustrated in a substantially horizontal position, may be placed in any position and it will be operative to reverse the position of the card whether it comes into the reverser from the bottom, either side, or from the top.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated in and 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. A device for turning a sheet comprising sheet feeding means with a sheet having a dead end portion wherein said sheet feed movement is reversed, said feeding means including a pair of feeding devices located in said path and about a sheet's length short of said dead end, one of said devices for advancing the sheet into said dead end portion in one facing position and the other of said devices for taking the sheet out of said dead end portion after it rebounds off said face, said feeding devices moving the sheet into said dead end portion in one facing position to be bowed, and a roller engaged by the trailing end of said sheet while it is straightening, said trailing end being transported by said roller from said one feeding device to the other feeding device which then takes the straightened sheet out of said dead end portion in the other facing position.

2. A device for turning a sheet comprising sheet feeding means with a sheet path having a dead end portion wherein said sheet feed movement is reversed, said dead end portion including a curved pocket wherein said sheet is first bowed and then allowed to straighten, a leaf spring with a free end extending into the bottom of said curved pocket to be flexed by the advancing end of said sheet and aid in reversing its direction, said feeding means including a pair of feeding devices located in said path and about the length of a sheet short of said dead end, one of said devices serving to advance the sheet into said dead end portion in one facing position to be bowed, and a roller engaged by the trailing end of said sheet while it is straightening, said trailing end being transported by said roller from said one feeding device to the other feeding device which then takes the straightened sheet out of said dead end portion in the other facing position.

3. The combination set forth in claim 2 including drive connections provided between said feeding means and said roller to drive the roller for rapid rotation in the direction to transport the sheet end.

4. The combination set forth in claim 2, wherein said sheet path includes a detour path around said dead end portion, a sheet deflecting means in said sheet path, and selective means for operating said deflecting means to direct a sheet into said dead end portion or into said detour path, whereby the sheet is turned or not turned selectively.

5. In a card reversing device, means for advancing a card along a record path, two pairs of feed rollers arranged in closely spaced formation in said card path, a single roller between said pairs of feed rollers and driven therewith, a curved card guide pocket arranged substantially at right angles to said card path with the open end of said pocket adjacent to said roller, said pocket receiving an advancing card as it passes between the first of said sets of feeding rollers and the roller and discharging the same card with the trailing edge becoming the advancing edge and going between the roller and the second of said sets of feed rollers, and a flexible leaf spring located at the bottom of said pocket, said spring having a flexible portion against which the leading edge of the pocketed card impinges and is thrown back as part of the last-mentioned feeding operation.

6. In a card reversing device, means for advancing a card comprising sets of feeding rollers, a card guide between said rollers, said guide having a closed end, a leaf spring mounted at said closed end and having a flexible portion therein whereby the advancing card abuts against said flexible portion and has its direction changed
abruptly, and a diversionary means associated with said guide and placed between said sets of feed rollers to carry the card back into the card path after its direction has been changed and its position reversed.

7. A device of the kind set forth in claim 6, wherein said diversionary means comprises a small nylon roller rotating at high speed and against which the trailing edge of the card is engaged and transported from an entering position into a reversed ejected position.

8. A method of advancing and reversing the facing position of sheets comprising the steps of bowing a sheet from a flat to a curved condition, wherein the sheet tends to straighten out from the curved to a straightened condition, shifting the trailing end of the sheet by said straightening action, engaging the trailing edge of the sheet and reversing its position and transporting it towards a reversed ejecting position, and ejecting the sheet in a reverse position.

9. In a card reversing device, means for advancing a card along a record path, two pairs of feed rollers arranged in closely spaced formation in said card path, a single roller between said pairs of feed rollers and driven therewith, and a curved card guide pocket arranged substantially at right angles to said card path with the open end of said pocket adjacent to said roller, a leaf spring with a flexible portion in said pocket and beyond said open end, said pocket receiving an advancing card as it passes between the first of said sets of feeding rollers and the roller and discharging the same card after it rebounds off said spring portion with the trailing edge becoming the advancing edge and going between the roller and the second of said sets of feed rollers, whereby the card continues advancing in said record path in a reversed facing position.

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