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B. J. GREENBLOTT ET AL

3,140,089

SHEET HANDLING APPARATUS

Filed Dec. 20, 1961

4 Sheets-Sheet 1

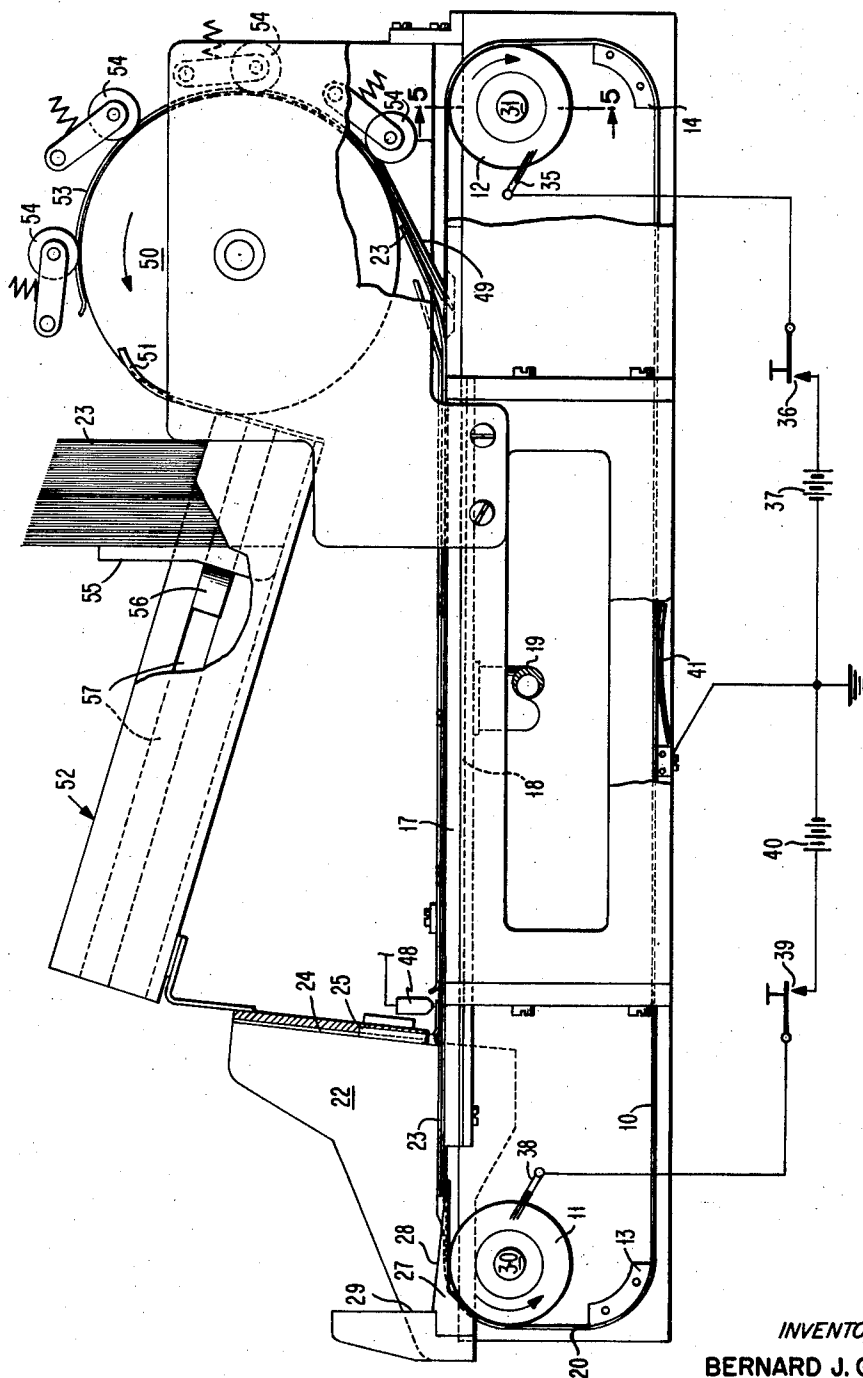


FIG. 1

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4 Sheets-Sheet 2

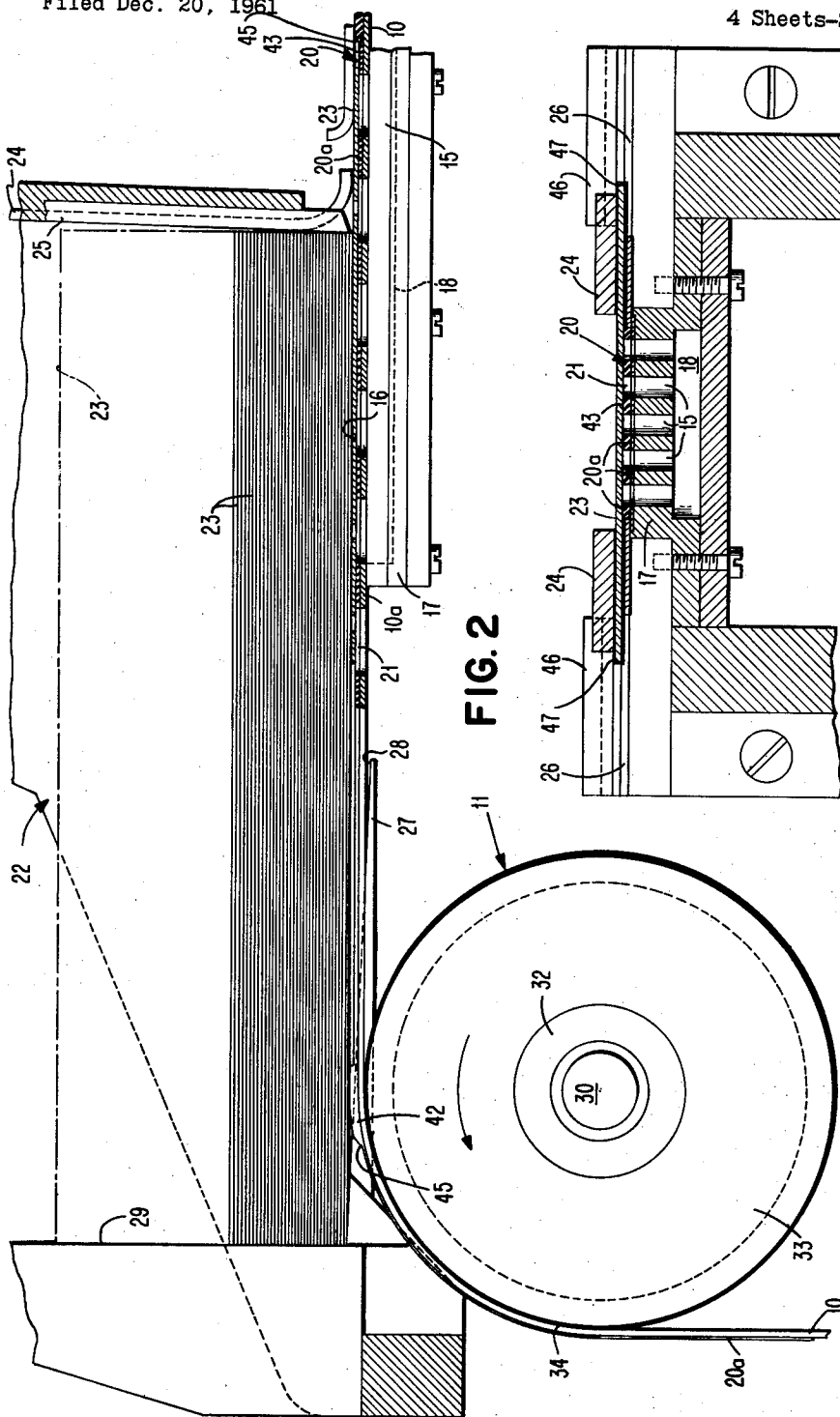


FIG. 4

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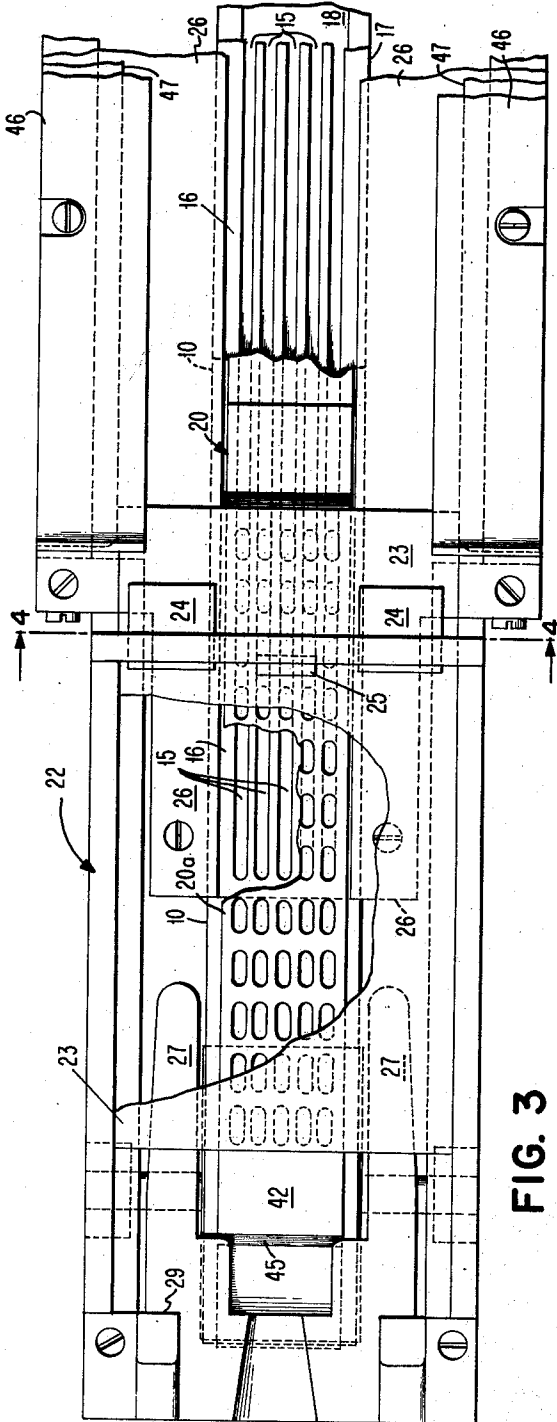
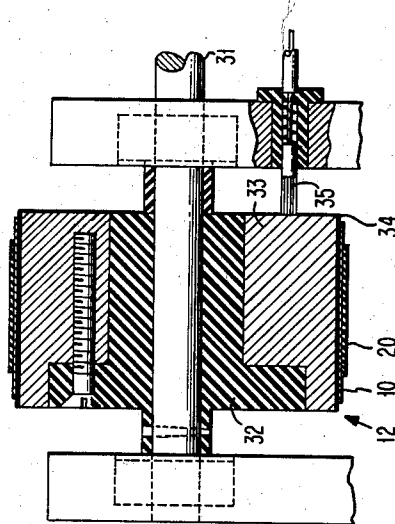
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SHEET HANDLING APPARATUS

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16 Claims. (Cl. 271—5)

This invention relates to apparatus for handling sheets, such as tabulating cards, and more particularly relates to such apparatus comprising a high-speed low-inertia two-directional sheet feeding means.

It is known to use picker belts or picker knives to advance successive endmost cards from a stack in a hopper through a stationary throat and into succeeding sets of feed rolls that drive the card along a prescribed transport path toward a stacker. It has also been proposed to provide suction openings in a stationary bed plate near the stationary throat to attract the endmost card to the bed plate so it can be driven through the throat by a picker knife which may also have suction ports forward of its picker knife edge. However, these previously proposed arrangements are not suitable for selective two-directional or incremental feeding of cards or other cut sheets at high speeds.

One object of this invention is to provide a sheet handling apparatus with a low-inertia high-speed endless feed member having a perforate portion for registry with stationary suction openings to attract the endmost sheet from a stack, and also having imperforate portions ahead of and to the rear of the perforate portion to seal off and inhibit leakage through the openings ahead of and to the rear of the sheet.

Another object is to provide a sheet handling apparatus including a reversible low-inertia endless feed member having a sheet-accommodating recess and capable of feeding sheets from a receiver and returning them to the receiver without jams or damage.

According to these objects, the sheet handling apparatus embodying the invention comprises a low-inertia endless movable member. This member rides over a guide surface having suction openings extending longitudinally rearward and forward of a throat knife provided adjacent the leading edge of a stack of sheets contained in a receiver or hopper. The member has at least one perforate portion, each of which provides a sheet-accommodating recess. The member has an imperforate portion that extends ahead of and to the rear of each perforate portion.

As the perforate portion of the member approaches the throat knife, the imperforate portion ahead of the recess will elevate the stack somewhat and prevent the endmost sheet from being fed past the throat knife. However, by the time the leading edge or end of the recess reaches the throat knife, a considerable part of the perforate portion will overlie the suction openings and assure that the endmost sheet of the stack will be sucked promptly into the recess. The endless member will then advance the nested sheet past the throat knife and into a predetermined transport path. The imperforate portion of the member ahead of and to the rear of the perforate portion tends to seal off and inhibit leakage of air at atmospheric pressure into those suction openings or parts thereof which are not yet aligned with the attracted sheet.

The endless member is movable reversely so that, if desired, a sheet can be returned toward or to the receiver or hopper. This permits reading of fields of a sheet or card in any randomized sequence, or complete rereading of an entire sheet or card. To facilitate return of the sheet into the hopper and prevent jams at the throat, the perforate portion has an inclined rear edge that acts as a

camming surface to push the stack away from the member and thus create a space to receive the returned sheet. Also, stationary camming fingers straddle the endless member and intersect its path at a slight angle to divert the incoming edge of a returned sheet away from the member.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of preferred embodiments thereof, as illustrated in the accompanying drawings, wherein:

FIG. 1 is a side elevation view, partly diagrammatic, of a sheet handling apparatus constructed according to one embodiment of the invention;

FIG. 2 is a side elevation view, to enlarged scale, of a portion of a hopper and associated feed mechanism shown in FIG. 1;

FIG. 3 is a plan view, partially cut away, of a portion shown in FIG. 2, but with the sheets shown removed from the hopper for clarity;

FIG. 4 is a section along the line 4—4 of FIG. 3;

FIG. 5 is a section taken along the line 5—5 of FIG. 1, to show the structure of an electrostatic clutching means employed in the illustrated embodiment;

FIG. 6 is a fragmentary view, to a further enlarged scale, showing the relationship between a throat knife and the imperforate and recessed perforate portions of a friction pad forming part of an endless sheet feeding member that is shown to smaller scale in FIGS. 1 and 2; and

FIG. 7 is a view, similar to FIG. 6, showing a modified form of friction pad constituting a variation of the invention.

Description

As shown in FIGS. 1 to 6, the sheet handling apparatus constructed according to this embodiment of the invention comprises a band 10 which moves in a generally rectangular closed path around two spaced rotatable drive elements 11, 12 and two stationary guides 13, 14. In moving between elements 11, 12, the band passes over suction openings, such as longitudinally extending parallel slots 15, provided through a substantially flat guide surface 16 (FIGS. 3, 4) of a stationary guide plate 17. Suction is applied to the slots 15 via a vacuum manifold 18 that is connected by way of a vacuum pipe 19 (FIG. 1) to a vacuum source (not shown).

As illustrated, a friction pad 20 of somewhat narrower width than the band 10 is mounted about the entire perimeter of, and suitably secured to, the central portion of the band, such that the composite endless member 10, 20 is of greater height or thickness in the center than adjacent its outer edges. This endless member 10, 20 is imperforate except for recessed perforate portions 20a which are uniformly spaced around the perimeter of said member. Each portion 20a is defined by elongated holes 21 that are formed in the pad and are aligned with suitable corresponding holes in band 10 and ride over the slots 15.

Guide surface 16 is within the closed path of band 10. Outside this closed path and overlying the rotatable element 11 and the adjacent end of the guide plate 17 is a hopper or receiver 22 containing a stack of sheets, such as tabulating cards 23. Two transversely spaced strips 24 having forwardly extending rounded lower ends define the front or leading wall of the receiver. Disposed between and suitably supported by these strips 24 is a throat knife 25 that cooperates with the upper surface of recessed perforate part 20a of pad 20 to define a throat. This throat knife 25 is vertically adjustable to permit precise adjustment of the throat to a selected height that is somewhat more than the maximum thickness of one card and yet less than the minimum thickness of two cards.

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Since throat adjustment is so critical and the recessed part of pad 20 defines the lower side of the throat, the position of the pad and band must be accurately maintained. This is done by having the outer edges of the band 10 retained under overlying support and guide plates 26 (FIGS. 3, 4), which extend rearwardly of the throat knife 25. Thus, the front part of the stack is urged (such as by gravity, in the arrangement illustrated) toward contact with member 10, 20.

Two stationary fingers 27 straddle endless member 10, 20 and the drive element 11. These fingers provide camming and support surfaces 28 that extend downwardly and forwardly toward the throat knife 25 from a point near the rear wall 29 of the receiver 22 and traverse the feed path of the endless member 10, 20 at a slight angle. These fingers 27 hold the rear of the card stack out of contact with the member 10, 20.

The drive elements 11, 12 for driving band 10 and hence the composite endless member 10, 20 may be controlled in any suitable manner. In the embodiment illustrated, the band 10 is formed of electrically conductive material (preferably steel); and the friction pad 20 that overlies the band is formed of material (such as rubber or polyurethane synthetic material), having a coefficient of friction greater than the maximum friction between cards and between a card and the support plates 26. The band 10 is adapted to be electrostatically clutched to either or both of the drive elements 11, 12.

As viewed in FIG. 1, element 11 is constantly driven counterclockwise by suitable means, such as a pulley drive (not shown) and a shaft 30; and, in similar manner, element 12 is constantly driven clockwise by a similar drive and a shaft 31. Thus, band 10 will be driven clockwise or counterclockwise according to whether it is electrostatically clutched to element 12 or element 11, respectively. The band 10 is stopped when one driving element 11 or 12 is de-energized and the other driving element 11 or 12 is energized for a short predetermined period of time to furnish a braking force capable of rapidly discontinuing motion in either direction. The band preferably is not clutched to both elements concurrently, although a small overlap of voltage pulses to the two clutch elements 11 or 12 may occur.

Referring now to FIG. 5, this electrostatic clutching is effected in the following manner. Rotatable element 12 (and similarly element 11) comprises an annular insulating member 32 mounted on shaft 31 and having a hub keyed to the shaft so that the member will be driven thereby. An electrically conductive ring 33, preferably of brass, is secured about the insulating member 32. The periphery of ring 33 is coated with a layer 34 of a "semi-conductive" material, such as conductive varnish; this term "semi-conductive" being used to connote material with a resistivity of the order of 10^6 to 10^7 ohms per cubic centimeter. As the conductive steel band 10 passes around the periphery of the varnish layer 34, it is isolated by this semi-conductive material from the conductive brass ring 33. A suitably supported contact brush 35 wipes the side of brass ring 33.

Referring now to FIG. 1, it will be seen that brush 35 is connected through a switching means, indicated illustratively as an on-off switch 36, to a source of potential, illustrated as a battery 37. Similarly, a contact brush 38 (corresponding to brush 35) rides on a brass ring forming part of rotatable element 11. Brush 38 is connected through a switching means, also illustratively indicated as an on-off switch 39, to a corresponding source of potential, illustrated as a battery 40. The negative terminals of these batteries are connected to ground, as is a grounded leaf spring 41. Spring 41 impinges on the lower run of band 10 to provide an electrical reference for the band and also tend to maintain the band taut.

Thus, when switch 36 is closed, the conductive brass ring 33 (FIG. 5) will be connected via brush 35 to the positive terminal of the source 37 of electrical potential.

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Since the conductive band 10 is grounded, a potential will exist across the "semi-conductive" varnish layer 34. This will create an electro-adhesive effect whereby the band is attracted to the layer 34 and hence to ring 33, for causing the band to be electrostatically clutched to and driven by rotatable element 12. In similar manner, the band will be clutched to rotatable element 11 upon closure of switch 39.

To reduce wear, a dielectric lubricant, such as one of the silicone oils, is administered between the band 10 and varnish layer 34 by a suitable oiling device (not shown).

Operation

Assume initially that switch 36 is closed to electrostatically clutch the band 10 to rotatable element 12 and thereby drive the endless member 10, 20 clockwise as viewed in FIGS. 1 and 2.

Referring to FIGS. 1 to 6, as each particular perforate portion 20a of member 10, 20 moves toward and then over the guide plate 17, the imperforate portion 42 just ahead of that perforate portion will cam the stack slightly upward and away from the support plates 26. Just rearward of each imperforate portion 42 is a card-accommodating recess 43 which is slightly longer in length and substantially equal in depth to the length and thickness, respectively, of a single card 23. It is this recessed part of the endless member 10, 20 that has the holes 21.

Meanwhile, as the imperforate portion cams the bottommost card 23 of the stack out of registry with the throat and approaches the throat knife, an increasing number of the holes 21 in the pad will register with the slots 15 in the guide plate 17. This will cause a corresponding increase in the degree of suction applied from the manifold 18 to the under side of the bottommost card 23 of the stack. The leading edge of recess 43 is defined by a downwardly and rearwardly beveled camming surface 45 which also defines the rear edge of the imperforate portion 42 just ahead of that particular recess. Hence, as soon as surface 45 passes under the throat knife 25, the leading portion of the bottommost card 23 will be promptly and positively sucked toward the member 10, 20 and into a nested position within the recess 43.

As best shown in FIG. 6, the base of recess 43 is slightly above the support plates 26 to permit the card to be effectively sucked into the recess and held against the perforate part of pad 20. In other words, if the base of recess 43 were below the upper surface of plates 26, then the card would be attracted toward the member 10, 20 but would actually contact the plates 26; and this would undesirably prevent the card from being positively held against the pad 20.

Thus, as the perforate portion of the endless member 10, 20 continues to move clockwise, it will carry the bottommost card 23 under the throat knife 25 (see FIG. 2). This throat knife will, of course, retain in the receiver 22 the other cards in the stack, since there is insufficient clearance for two cards to concurrently pass through the throat. Also, the imperforate portion 42 to the rear of the recess 43 will cam up the stack out of registry with the throat because all parts of said portion extend upwardly above the top of plates 26.

As previously noted, the endless member 10, 20 is imperforate, except for the holes 21 in the recessed part of the pad 20 and the openings in band 10 which are aligned with said holes at each perforate portion of the member. Consequently, the imperforate portions of the member 10, 20 ahead of and to the rear of the recess 43 desirably tend to seal off those portions of the slots 15 in the guide plate 17 which are not actually applying suction effectively to a card. This arrangement thus inhibits leakage of air at atmospheric pressure into the vacuum manifold 18 and thus desirably conserves the suction which can be applied effectively to the card through the slots 15.

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Meanwhile, as a card is being advanced past the throat knife 25, it passes under overlying guide strips 46 (see FIGS. 3, 4). These strips 46 help to hold down the parts of the card which overlap the edges of the pad. They also help to maintain the card registered between parallel aligning surfaces 47 (see FIG. 4).

As the card is thus moved past the throat knife and into the transport path in part defined by surface 16 of guide plate 17, it will be carried past a sensing station 48 (FIG. 1). This sensing station may be of any well-known type to read bits of information from the card. As illustrated, these bits of information are in the form of punched holes in the cards. Hence, the sensing station 48 may embody means, already known in the art, for sensing punched holes by the reflected light technique.

After the card passes the sensing station 48, it will normally be advanced by the band to a pair of stripper fingers 49 (only one of which is shown). These fingers extend upwardly and forwardly across the feed path in straddling relation to band 10 at a point beyond the guide plate 17. Thus, those outer parts of the card which normally passed under the guide strips 46 and over support strips 26 will now ride up onto the stripper fingers 49 and thus divert the card away from pad 20 and onto a stacker drum 50. Of course, at the time of such diversion the holes 21 will have passed beyond slots 15; hence, there will be no suction acting on the leading part of the card as it is diverted.

The stacker drum 50 drives the cards around a curved path to a set of stripper fingers 51 that straddle the drum and divert the cards into a stacker 52. As illustrated, a curved guide 53 extends around the periphery of drum 50. Guide 53 has cutouts to permit spring-biased rockable idler rolls 54 to resiliently urge cards against the moving drum surface. The drum 50 is preferably rotated at a rate such that its peripheral velocity will be less than the lineal velocity of band 10, to decelerate the cards before they are delivered by the drum to the stacker. This will cause some shingling of the cards, as shown in FIG. 1. However, the original order of the stack will be maintained; and the rolls 54 will yield as necessary to permit passage of the shingled cards around the drum and through the relatively wide space between the drum and curved guide 53.

As illustrated, the stacker 52 is of the inclined ramp or tray type wherein cards are stacked upright on their short edges. As the thickness of this stack increases, a card support 55 will be shifted up along the ramp as necessary to accommodate additional cards. Suitable means, such as leaf springs 56 projecting laterally from the rear of the support 55, exert a predetermined lateral pressure against the sides of the tray and have guided movement in channels 57 to assure that the support will yield in a controlled manner as the stack increases in thickness.

Assume now that, instead of feeding a card directly from the receiver 22 to the stacker 52, it is desired to return the card to the receiver after all or a part of the card has been sensed. By way of example, this would be desirable if the cards are of the so-called "tri-deck" type disclosed in U.S. Patent 2,970,751, granted February 7, 1961, to Daly et al. and assigned to the assignee of the present invention. With cards of this tri-deck type, and as more fully described in the patent just mentioned, the four rows of one deck or field of the card are read serially (i.e., from column 1 to column 80), then the full 80 columns of four more rows constituting the second deck, and finally the full 80 columns of the remaining four rows constituting the third deck. If, as illustrated, the sensing station 48 is very close to the throat knife 25, the cards would have to be returned fully into the receiver 22 to permit such reading of the full 80 columns of the second and third decks.

To return, to the receiver 22, a card 23 that is already nested in the recess 43 of the friction pad 20, the switch 39 (FIG. 1) is closed and the switch 36 is opened. The

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band 10 will now be electrostatically clutched to rotatable element 11 and thus be driven counterclockwise. As pad 20 moves toward the receiver 22, the beveled camming edge 45 (FIG. 2) will move past throat knife 25 and push the stack away from the endless member 10, 20. This will create a space to receive the card being returned by the pad. As the surface 45 continues to move back past the camming fingers 27, the parts of the card projecting beyond the outer edges of band 10 will be driven up onto surface 28 to strip the returned card from the pad. The returned card will come to rest in contact with the rear wall 29 of the hopper.

Thus, the cards may be driven in either direction; i.e., from the receiver 22 or back toward or into the receiver. It will be apparent that, if desired, cards may be moved stepwise or incrementally past the sensing station 48, by leaving switch 36 closed and periodically closing switch 39 each time stoppage of the forward motion of the card is desired. It will also be obvious that, in order to take advantage of the high feeding speeds possible with electrostatically clutched low-inertia sheet feed elements, like band 10, the switches 36, 39 can and undoubtedly would be replaced by electronic switching means. Also, if desired, the band 10 may be perforated throughout its length to improve lubrication and electrostatic clutch action; and the imperforate portions 42 of endless member 10, 20 may be provided by imperforate parts of the friction pad 20.

If desired, movement of the endless member may be controlled by stepping motors, or slip-type clutches, or some other means other than an electrostatic clutch means.

Also, while the endless member 10, 20 has been illustrated as feeding the bottommost card 23 from the stack in the receiver, it will be obvious that the orientation of the receiver and member may be changed. For example, the cards 23 may rest on their long edges on a flat table surface and be pushed as a stack horizontally toward a sheet-feeding endless member that is driven by rotatable elements supported on shafts having vertical (rather than horizontal) axes, thereby in effect reorienting the apparatus ninety degrees. Thus, the term "endmost," as hereinafter used, is intended generically to cover an arrangement wherein the band picks the "endmost" card of a stack, whether or not it be the "bottommost" card of the stack.

In the embodiment illustrated in FIGS. 1 to 6, the plates 26 extend rearward of throat knife 25 only to guide the band 10 and constrain it in the desired path. In other words, plates 26 are not needed to support the leading part of the stack because the imperforate portions 42 hold the bottommost card 23 out of registry with the throat until the leading end 45 of the recess 43 reaches the throat knife 25. However, in the modified arrangement illustrated in FIG. 7, the plates 26 do support the leading part of the stack.

The arrangement shown in FIG. 7 is desirable when successive cards are to be fed from the receiver 22 by reciprocation rather than by continuous clockwise movement of the endless member 10, 20. As shown in FIG. 7, a modified friction pad 120 provides a camming edge 145 (similar to edge 45 of FIG. 6) to cam up the stack during the return stroke of the pad. This return movement is effected by counterclockwise movement of the endless member and retracts a "picker edge" 145a behind the rear wall 29 of the receiver 22, permitting the bottommost card to drop onto a recess 143 in pad 120. The base of recess 143 is slightly above the level of plates 26, which support the stack when the band 10 passes with clearance below the stack. During the next succeeding forward stroke, the card will be carried through the throat, with the picker edge 145a assisting the suction through openings 121 in maintaining the card registered against the pad. Thus, the plates 26 extend rearward of the throat knife 25 and the base of recess 143 is slightly above the top of said plates; however, the edge 145 of pad 120

extends downwardly and rearwardly below the level of plates 26 and to the band 10. The single pad 120 thus extends for only a fraction of the perimeter of the band; and the guide plate 26 therefore serve to support the leading part of the stack except when pad 120 is under the stack and pushing the stack off the plates.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. In combination, a receiver containing a stack of sheets; a movable low-inertia endless member; stationary means adjacent the leading edge of the stack; a sheet-accommodating recess in said member cooperating with said stationary means to provide a throat through which a single sheet may be fed by the member when such sheet is nested in the recess; and means effective when the leading end of said recess reaches the throat to attract the endmost sheet of the stack to said recess so the member can feed it through the throat.

2. In combination, a receiver containing a stack of sheets; a movable endless member having an elongated run at least part of which is substantially parallel to and runs along one end of the stack; means, including a stationary element adjacent the leading edge of the stack and a sheet-accommodating recess in said member, providing a throat through which the member may feed a single sheet only when nested in the recess; and means effective immediately after the leading end of the recess passes beyond the leading edge of the endmost sheet of the stack to urge such sheet into the recess so the member can carry it through the throat.

3. In combination, a receiver containing a stack of sheets; an endless member movable for feeding sheets from the stack; means, including a stationary element adjacent the leading edge of the stack and the base of a sheet-accommodating perforated recess in said member, providing a throat; and means providing stationary suction openings extending forwardly and rearwardly of the element and within the endless path of said member, suction from said openings being effective, after the leading end of said recess passes beyond the leading edge of the endmost sheet of the stack to attract such sheet flatwise to said base so the member will feed such sheet past the element and through the throat.

4. The combination according to claim 3, wherein the member is substantially imperforate forward and rearward of said perforated recess, thereby to tend to seal off and inhibit leakage through those portions of the suction openings ahead of and to the rear of the sheet in said recess.

5. The combination according to claim 3, wherein the portion of the member ahead of said recess holds the stack out of registry with the throat until said portion passes out of contact with the endmost sheet and enables it to be attracted into the recess.

6. In combination, a receiver containing a stack of sheets; a low-inertia endless member; means, including a stationary element adjacent the leading edge of the stack and a sheet-accommodating recess in said member, providing a throat through which a single sheet may be fed by said member; means for selectively moving the member one way to feed the endmost sheet from the stack and the opposite way to carry a sheet to the stack; means for urging the endmost sheet into the recess when the leading end of said recess passes beyond the leading edge of the stack; and means adjacent the rear end of the recess to urge the stack away from the member when a sheet is carried to the stack thereby to create a space for receiving such sheet.

7. The combination according to claim 6, including camming means straddling the member and angularly

traversing its path to divert from the member a sheet being carried into the receiver.

8. In combination, a receiver containing a stack of sheets, means providing a throat adjacent the leading edge of the stack, a reversely movable low-inertia endless member having a run which is spaced a slight distance from the flat side of the endmost sheet and extends downpath of the stack, means for holding successive endmost sheets to a preselected area of the member, and camming means associated with the member immediately forward and rearward of said area, whereby when the member moves forward the forward camming means pushes the stack away from the member and delays operation of said holding means until the forward end of said area reaches the throat, and during return movement the rear camming means pushes the stack away from the member to permit return of a sheet into the stack.

9. The combination according to claim 8, including camming fingers which straddle the member and traverse the path of said run at a point within the receiver, thereby to separate a returned sheet from the member as it approaches the rear wall of the receiver.

10. The combination according to claim 8, including support plates interposed between the run and stack for a preselected distance rearward of the throat-providing means to support the leading portion of the stack away from the endless member, and wherein the preselected area of said member is disposed between said plates and projects beyond the stack-engaging surface thereof so the endmost sheet can be held to said area without interference from said plates, said plates preventing portions of the member forward and rearward of said area from grazing and abrading the stack.

11. The combination according to claim 8, wherein the holding means includes stationary suction openings within the endless path of the member and extending forward and rearward of the throat, and wherein said preselected area is perforated for applying suction to a sheet when such perforations register with said openings.

12. The combination according to claim 11, wherein the portions of said member forward and rearward of said area are substantially imperforate to tend to seal off and inhibit leakage of ambient air into the parts of the suction openings forward and rearward of said area.

13. Apparatus for feeding the endmost sheet of a stack through a throat and into a feed path, the combination of an electrically conductive band extending from a point opposite such endmost sheet to a point downpath of the stack and throat, two spaced electrostatic clutch means around and between which said band extends, means for urging the endmost sheet flatwise onto a preselected area of the band for advancement thereby, camming means associated with the band forward and rearward of said area, and means for selectively energizing one or the other of said clutch means to drive said band reversely, such that when the band is driven one way the stack is cammed away from the band until the forward end of said area arrives at the throat and enables the endmost sheet to be attracted for advancement from the stack through the throat, and when driven the other way the stack is cammed away from the band to create a space permitting return of a sheet into the stack.

14. Sheet handling apparatus comprising a hopper containing a stack of sheets, means including an endless member and two spaced rotatable elements operable to drive the endmost sheet from the stack into a transport path or the opposite way back toward the stack, and means providing suction openings extending between the rotatable elements and within the closed path of the endless member, said member having a perforate portion which when aligned with said openings causes the endmost sheet to be attracted to the endless member, said member adjacent said perforate portion being imperforate so as substantially to seal off and inhibit leakage through those openings which are not in registry with

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said perforate portion, whereby as each sheet is advanced into said path it will be subjected to a progressively increasing amount of suction as such degree of registry increases to a maximum corresponding to the over-all length of said perforate portion.

15. In combination, a receiver containing a stack of sheets; a low-inertia elongated band-like endless member; means for selectively driving said member in forward and reverse directions; supporting means supporting the rear edge of the stack and inclined forwardly in a straddling relation across the feed path of the endless member; said member having at least one thickened outwardly projecting portion which periodically contacts the endmost sheet of the stack to advance it forwardly through a throat during forward movement of the member and cams the stack away from the member during reverse movement of the member to permit a sheet to ride up onto the inclined support means and be withdrawn from the member and returned into the receiver; and a pair of spaced plates interposed between the remaining portion of the member and the stack to prevent the endmost sheet from being advanced through the throat by said remaining portion, each thickened portion extending between said plates and projecting beyond the sheet-contacting surfaces thereof.

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16. In combination, a receiver containing a stack of sheets; a low-inertia endless member having at least one thickened outwardly projecting portion provided with a sheet-accommodating recess; a pair of spaced plates interposed between the remaining portion of the member and the stack to prevent the endmost sheet from being advanced through a throat by said remaining portion; and means for urging the endmost sheet into said recess when the leading end of said recess passes beyond the leading edge of the stack, each thickened portion extending between said plates such that the base of the recess as well as the ends thereof project beyond the sheet-contacting surfaces of said plates.

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