July 19, 1955 G. D. AYDLETT 2,713,486

DIFFERENTIAL FRICTION FEEDER FOR DISCRETE SHEETS

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Fig. 1

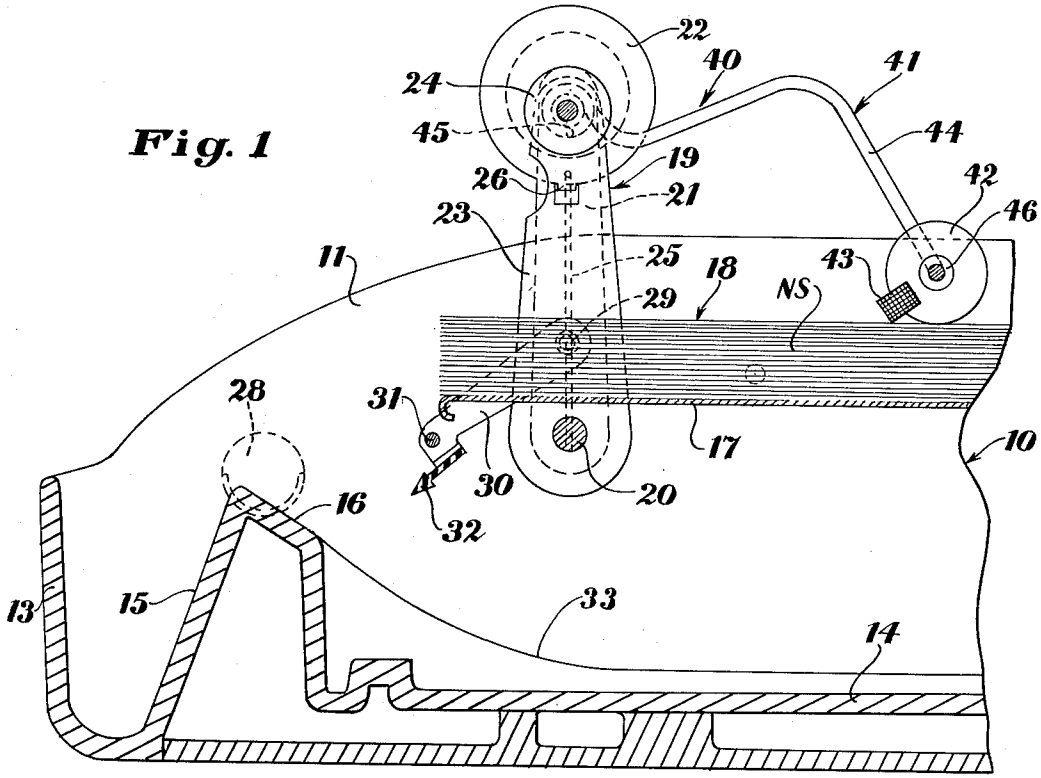
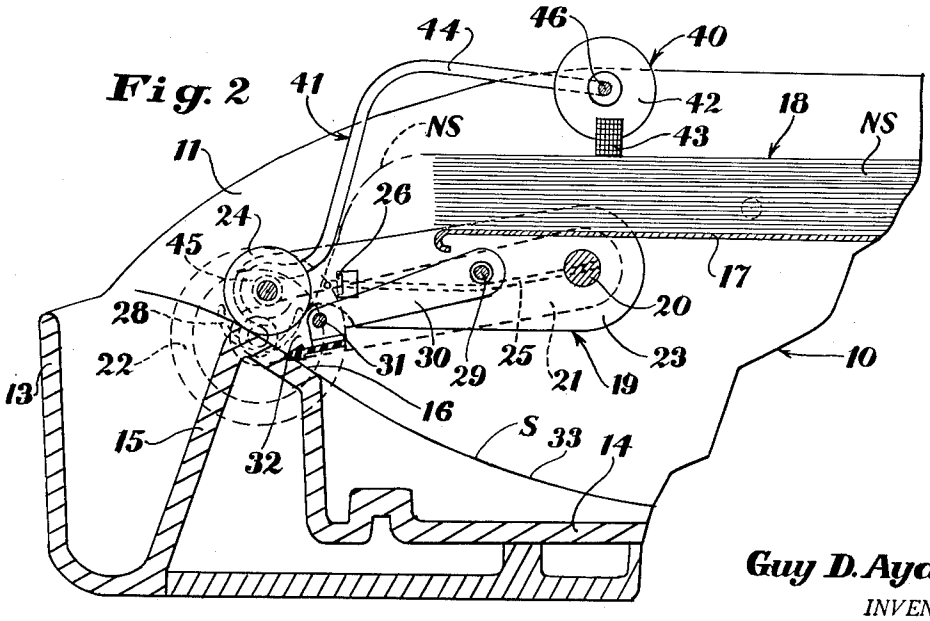


Fig. 2



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Fig. 3

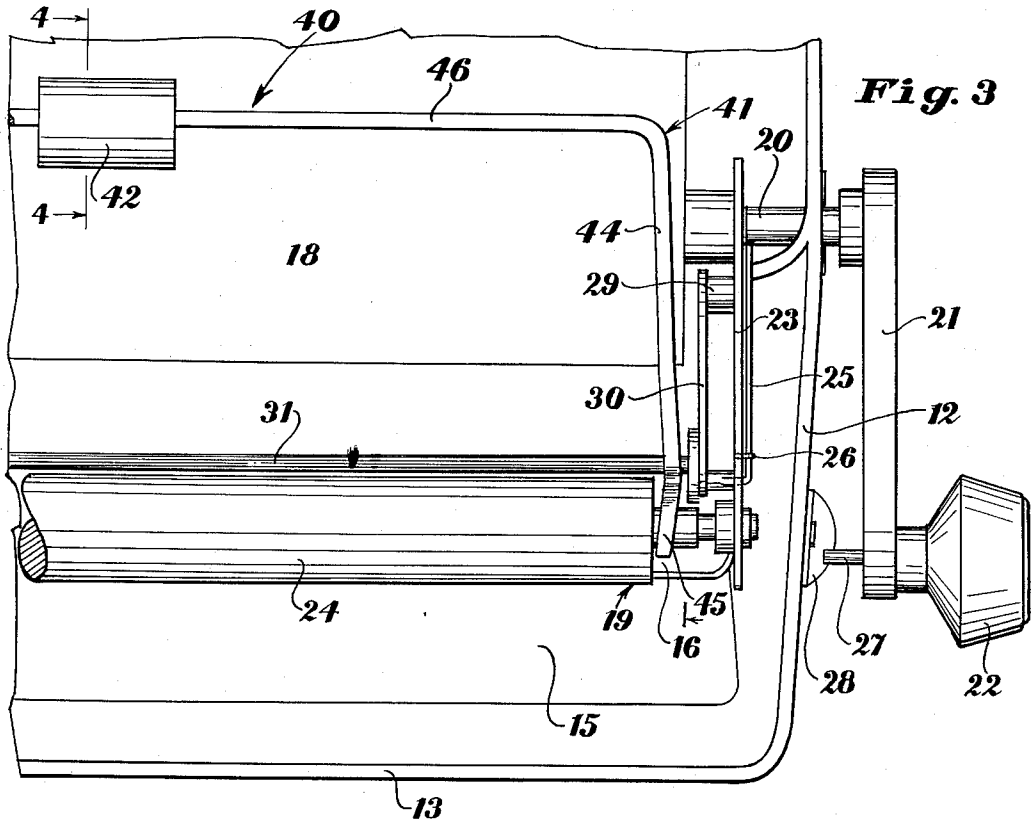


Fig. 4

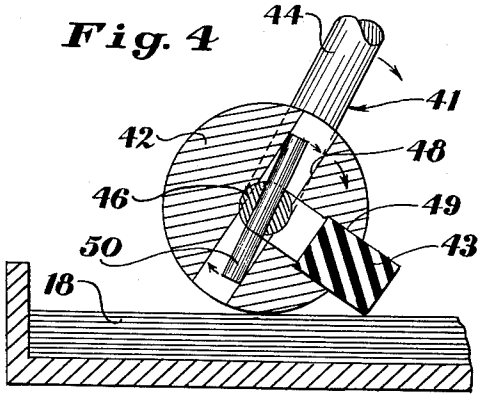
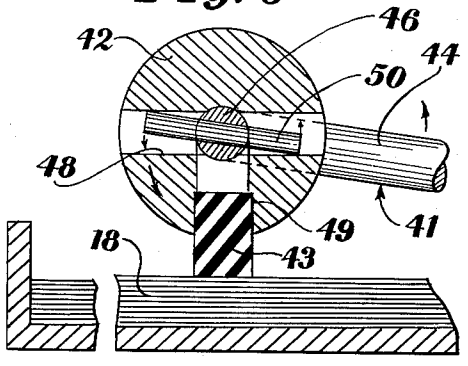


Fig. 5



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DIFFERENTIAL FRICTION FEEDER FOR DISCRETE SHEETS

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Application August 14, 1952, Serial No. 304,371

3 Claims. (Cl. 271—42)

This invention relates to a device for removing discrete sheets from a stack and more particularly to a device in which the feeding member comprises two elements having different coefficients of friction and is continuously in contact with the stack as it is reciprocated thereover.

In a copending application Serial No. 262,778 which was filed December 21, 1951, in the name of Henry C. Yutzy and Guy D. Aydlett, now Patent No. 2,666,384, a photographic processing and image-transfer device is disclosed whereby an exposed sensitized photographic sheet may be processed in a suitable liquid and withdrawn in contact with a second sheet, which is non-sensitized, to cause transfer of an image from the first sheet to the second sheet. In this device it is essential that the second sheet be removed from a stack of sheets arranged above the first sheet and brought into intimate contact therewith. To provide a simple and efficient device for removing the second sheet from the stack, a roller, which is continuously in engagement with the uppermost sheet on the stack, is reciprocated over the stack and at the same time rotated to bring a member into contact with the sheet having a high coefficient of friction so that the uppermost sheet is advanced thereby with respect to the stack.

The primary object of the invention is, therefore, to provide a device for advancing discrete sheets in which the feeding member is reciprocated over the stack and is rotatable with respect to the stack to permit a portion thereof having a high coefficient of friction to engage the sheet for advancing it when moved in one direction and to permit another portion thereof having a low coefficient of friction to be moved over the sheet when moved in the opposite direction.

Another object of the invention is to provide a device for advancing discrete sheets in which the feeding member is reciprocated over the stack and is rotatable with respect to the stack and is comprised of portions having different coefficients of friction whereby the portion having a high coefficient of friction is utilized to advance the sheet and the portion having a low coefficient of friction is merely moved over the sheet and in engagement therewith.

And yet another object of the invention is to provide a device for advancing discrete sheets in which the feeding member is reciprocated over the stack and is rotatable with respect to the stack, the rotation of the feeding member being limited by a member fixed to the bail member carrying the feeding member and engaging a diametrical aperture in the feeding member.

Other objects and advantages will be readily apparent to those skilled in the art by the description which follows.

In the present invention an operating member is pivotally mounted on a frame which includes a stack supporting member, the operating member being movable between an inoperative position and an operative position. A bail member, which is pivotally connected to the operating member at a point spaced from the pivot point

thereof carries a metallic roller which is rotatable on the bail and movable over the stack upon movement of the operating member. The roller is provided with a rubber insert which extends beyond the periphery of the roller, the roller and insert engaging the uppermost sheet on the stack when the operating member is in the inoperative position, the roller being rotated in one direction upon movement of the operating member to its operative position whereby only the insert engages the uppermost sheet for advancing it with respect to the stack, and the roller being rotated in the opposite direction upon movement of the operating member to its inoperative position whereby only the roller engages the uppermost sheet as it is moved thereover. A pin carried by the bail member engages an aperture in the roller for limiting the rotational movement of the roller during movement of the operating member.

Reference is now made to the accompanying drawings wherein like reference numerals designate like parts and wherein:

Fig. 1 is a vertical section through a portion of an apparatus embodying the invention and showing the various elements with respect to each other in their normal inoperative position;

Fig. 2 is a vertical section similar to Fig. 1 and showing the operating member in its operative position, the insert in engagement with the uppermost sheet on the stack, and the sheet advanced with respect to the stack;

Fig. 3 is a partial plan view of the apparatus as shown in Fig. 1 and showing the arrangement of the feed roller and bail member with respect to the operating member;

Fig. 4 is a vertical section taken substantially on line 4—4 of Fig. 3 and showing the member carried by the bail member which engages the aperture in the roller for limiting the rotation of said roller in its normal position; and

Fig. 5 is a section similar to that of Fig. 4 and showing the relation of the limiting pin to the roller and of the roller and insert to the stack of sheets.

In the embodiment of the invention disclosed and illustrated in conjunction with the processing and image-transfer device referred to above, the frame **10** of said device comprises side walls **11** and **12**, a front wall **13**, a bottom wall **14** and an upstanding portion **15** having a squeegeeing surface **16** which extends substantially between the side walls and is spaced from the front wall, see Figs. 1, 2 and 3. A plate **17** arranged between side walls **11** and **12** and spaced from bottom wall **14** supports the stack of sheets **18**. Shaft **20** extends transversely of frame **10** and is journalled in side walls **11** and **12**. Fixed to shaft **20** at each extremity thereof and beyond walls **11** and **12** are the arms **21** having handles **22** and which normally assumes an inoperative position as shown in Fig. 1. Freely mounted on shaft **20** inside of walls **11** and **12** are the arms **23** which carry therebetween and at the extremities thereof a squeegee roller **24**. Resilient members **25** connect arms **23** and shaft **20** by having one end thereof fixed to shaft **20** and the other end secured to the lug **26** formed on each of arms **23**. In this way arms **21** and **23** are resiliently connected and with roller **24** arranged between arms **23** the arms and roller form a single unit, or operating member broadly designated by the numeral **19**, which is movable by handles **22** to an operative position, as shown in Fig. 2. The resilient connection between the arms permits arms **21** to be moved beyond arms **23**, as shown in Fig. 2, to insure intimate contact between roller **24**, the sensitized sheet S, the non-sensitized sheet NS and the surface **16**. On the inner side and at the extremity of arms **21**, a pin **27** is secured and serves to engage the stop members **28** on side walls **11** and **12** for limiting the movement of arms **21**. Pivotally mounted on arms **23** at **29** are

squeegee arms 30 which are joined at the forward end by rod 31 and support therebelow squeegee 32.

In the illustrated embodiment of the invention, the exposed-sensitized sheet is positioned in a liquid contained in the bottom of the frame and lies on a plurality of ribs or rails 33. This sheet is then brought forward until the leading edge extends beyond the forward end of surface 16. A sheet of non-sensitized material is then moved from stack 18 so that the leading edge thereof is aligned with that of the sensitized sheet. Roller 24 and squeegee 32 are then moved into the position shown in Fig. 2, squeegee 32 wiping the excess liquid from sheet S and roller 24 maintaining the sheets S and NS in intimate contacts as the two sheets are manually withdrawn from beneath roller 24. This brief description sets forth the purpose and function of the device incorporating the invention about to be described.

To provide means for automatically advancing the uppermost sheet on stack 18 with respect to the stack, a feeding device 40 is utilized which comprises a bail member 41 and a roller 42 having an insert 43 extending axially of said roller and beyond the periphery thereof. Bail member 41 comprises formed portions 44 which are pivotally mounted on roller 24 at 45 and extend rearwardly in substantially parallel relationship and which are integral with an intermediate portion 46 extending transversely of stack 18, as shown in Fig. 3. The intermediate portion 46 carries roller 42 which is rotatable thereon within limits defined by means to be described hereinafter. With reference to Figs. 4 and 5, roller 42 is provided with a diametrical aperture 48 and an axial recess 49. Portion 46 of bail member 41 has fixed thereto a pin 50 which is smaller in diameter than aperture 48 and is arranged within aperture 48 to provide a means for limiting the rotation of roller 42 in either direction. Insert 43 is preferably of rubber and is adapted to be received by recess 49 for advancing the uppermost sheet on the stack with respect thereto. Although insert 43 is shown as being rectangular in cross section, it can assume most any shape provided recess 49 is made complementary thereto.

As shown in Figs. 1 and 4, the operating member 19, bail member 41, roller 42 and insert 43 are shown in their normal, or inoperative position. In this position roller 42 and insert 43 are in engagement with the uppermost sheet on stack 18. As the operating member is moved toward an operative position, see Fig. 2, pin 50 during the first portion of the movement prevents rotation of roller 42 because the ends of said pin are in engagement with aperture 48. However, insert 43 because of its high coefficient of friction starts to move the uppermost sheet forward. Although bail member 41 is pivotally connected to operating member 19, portion 46 of bail member 41 and pin 50 are rotated in a clockwise direction as viewed in Fig. 4, so that insert 43 tends to rotate roller 42 in the same direction. As this occcurs, roller 42 is moved out of engagement with stack 18. Pin 50 also serves to rotate roller 42 in the event insert 43 does not rotate it fast enough to maintain aperture 48 ahead of pin 50. Continued movement of operating member 19 brings insert 43 into the position shown in Fig. 5, in which position the weight of the roller is applied directly to the insert for insuring intimate contact between insert 43 and the sheet being advanced. As the sheet is advanced by insert 43, it is moved into the path of roller 24 which deflects it downward toward surface 16 and at the time roller 24 has reached the end of its travel, the leading edge of the sheet NS is aligned with that of sheet S. When the two sheets are gripped and withdrawn together from under roller 24 in order to transfer the image from sheet S to sheet NS, operating member 19 is held in its operative position so that pressure is applied to roller 24. Since pin 50 is in engagement with aperture 48, as shown in Fig. 5, and bail member 41 is maintained in this position during withdrawal of the sheet from under insert 43, pin 50 prevents rotation of roller 42 in a counterclockwise direction. When operating member 19 is moved in a reverse direction and to its inoperative position, the movement of bail member 41 rotates pin 50 which permits roller 42 to be rotated into a position in which it engages the uppermost sheet on the stack as it is moved rearwardly to its normal position. Because of the relative movement which is permissible between roller 42 and pin 50 due to the size of aperture 48 with respect to pin 50, insert 43 assumes a position in which it does not contact the stack on the rearward motion of roller 42.

From the foregoing description and drawings it can readily be noted that roller 42 and insert 43 are in contact with the stack only when the operating member is in its inoperative position, that insert 43 serves to advance the sheet during the interval that the operating member is moved toward its operative position at which time roller 42 is rotated to a position in which it does not engage the stack, and that only roller 42 engages the stack when the operating member is moved to its inoperative position. In order to obtain the best results, it has been found that roller 42 should preferably be of a material having a low coefficient of friction, such as metal, nylon, etc., and that insert 43 should preferably be of a material having a high coefficient of friction, such as rubber. This difference in frictional values then gives the optimum result of advancing the sheet and for moving roller 42 over the stack without disturbing the sheets. It is also evident that pin 50 within aperture 48 provides a means for limiting the rotation of roller 42 in either direction during movement of operating member 19.

While the feeding or advancing device is disclosed in conjunction with a photographic processing device, it is equally adaptable to any other apparatus in which discrete sheets are to be advanced from a stack. The operating member which is shown as being manually operable can be oscillated between the inoperative and operative positions by any suitable mechanism. Such feeding or advancing of the sheet can also be utilized with feed rollers which will serve to withdraw the sheet automatically from the stack rather than manually as in the present device. Since many applications of the disclosed invention as well as modifications thereof will be suggested and apparent to those skilled in the art, the scope of the invention is pointed out in the appended claims.

Having now particularly described my invention, what I claim and desire to secure by Letters Patent of the United States is:

1. In a device for removing discrete sheets from a stack, the combination comprising a frame having a surface spaced from the stack for receiving each discrete sheet, a first bail member pivotally mounted in said frame and including a roller rotatably mounted thereon for movement therewith between a normal position above and transversely of said stack and a clamping position in which said roller maintains the uppermost sheet on said surface as it is drawn thereunder, a second bail member pivotally connected to said first bail member adjacent the ends of said roller and including a roller provided with a diametrical aperture and rotatably mounted thereon for normally engaging the uppermost sheet on said stack when said first-mentioned roller is in said normal position and as said first-mentioned roller is moved from said clamping position to said normal position, a non-metallic insert carried by and extending axially of and beyond the periphery of said second-mentioned roller and having a coefficient of friction substantially greater than that of the roller for engaging and advancing the uppermost sheet on said stack only when said first-mentioned roller is moved from said normal position to said clamping position, a member fixed to said second bail member for engaging said aperture to rotate and limit the rotational movement of said second-mentioned roller and insert and for positioning said insert with respect to the uppermost sheet upon movement of said second bail member,

and an actuating means operatively connected to said first bail member for moving said bail members simultaneously to position said first-mentioned roller on said surface and the leading portion of the uppermost sheet on said surface and beneath said first-mentioned roller.

2. A device in accordance with claim 1 wherein said first-mentioned roller directs the leading edge of the sheet being advanced by said second roller thereunder and toward said surface during the latter portion of the movement of said first-mentioned roller toward said surface.

3. In a device for removing discrete sheets from a stack, the combination comprising a frame having a surface spaced from the stack for receiving each discrete sheet, a first bail member pivotally mounted on said frame and including a roller rotatably mounted thereon for movement therewith between a normal position above and transversely of said stack and a clamping position in which said roller maintains the uppermost sheet on said surface as it is drawn thereunder, a second bail member pivotally connected to said first bail member adjacent the ends of said roller and including a metal roller provided with a diametrical aperture and an axial recess and rotatably mounted thereon for normally engaging the uppermost sheet on said stack when said first-mentioned roller is moved from said clamping position to said normal position, a rubber insert positioned in said recess and extending beyond the periphery of said second roller for engaging and advancing the leading portion of the uppermost sheet on said stack to said surface when said first-mentioned roller is moved from said normal position to said clamping position, said roller and insert normally contacting the uppermost sheet on said stack when said first-mentioned roller is in said normal position, a pin having a diameter smaller than said aperture and fixed to said second bail member for engaging said aperture to limit the rotation of said second roller during movement thereof, and actuating means operatively connected to said first bail member for moving both of said rollers simultaneously to position said first-mentioned roller on said surface and the leading portion of the uppermost sheet on said surface and beneath said first-mentioned roller.

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