Dec. 13, 1955 W. M. ANDERSON 2,726,862

SHEET FEEDING APPARATUS

Filed March 20, 1952 2 Sheets-Sheet 1

Fig. 3.

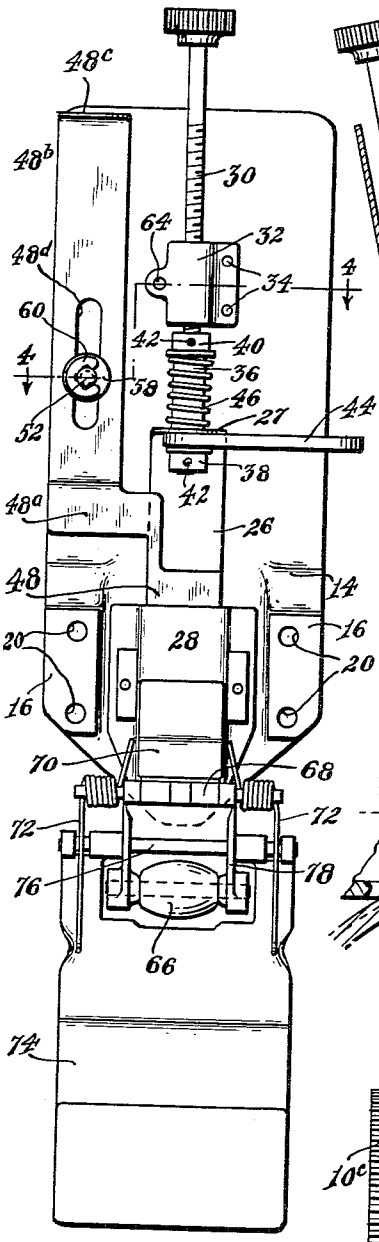


Fig. 4.

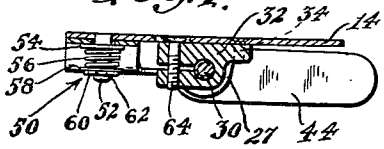


Fig. 5.

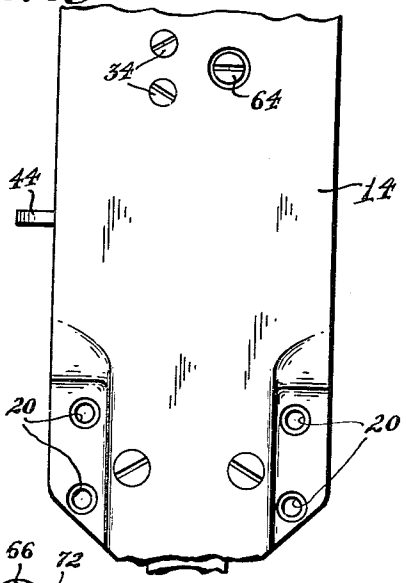


Fig. 1.

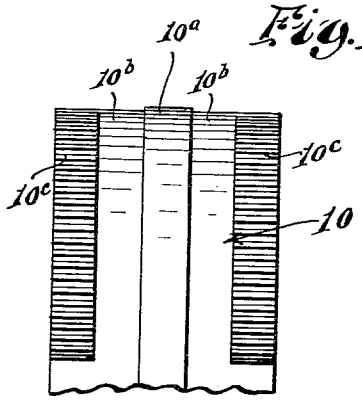


Fig. 2.

INVENTOR.
William M. Anderson
BY his Atty.
John H. McKenna

Dec. 13, 1955 W. M. ANDERSON 2,726,862

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Filed March 20, 1952 2 Sheets-Sheet 2

Fig. 6.

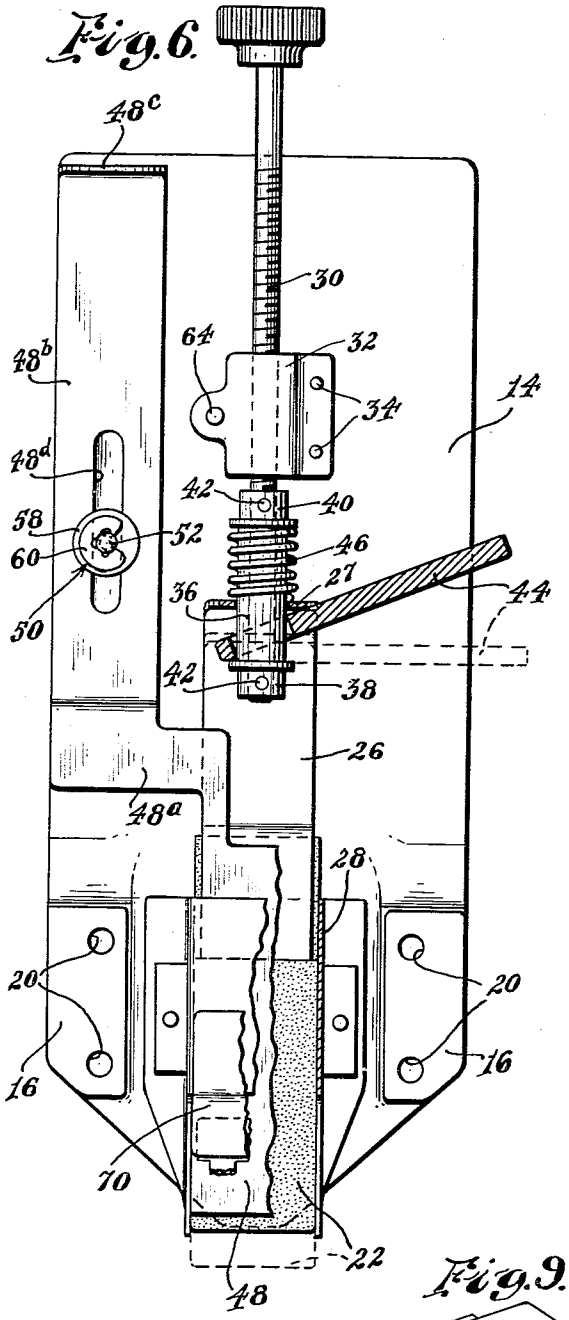


Fig. 7.

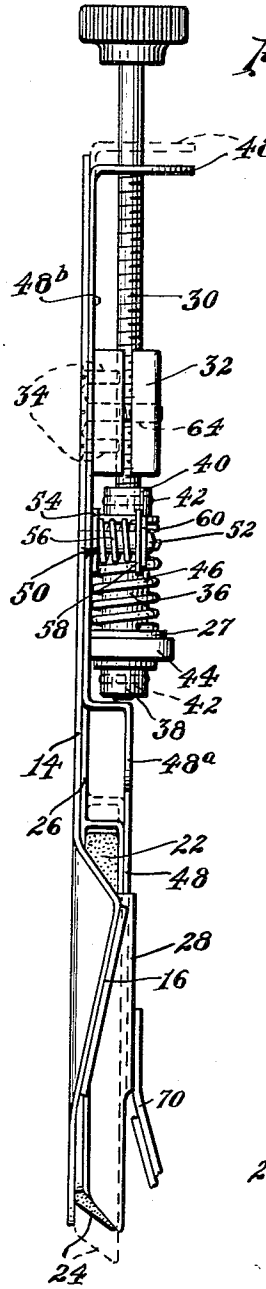


Fig. 8.

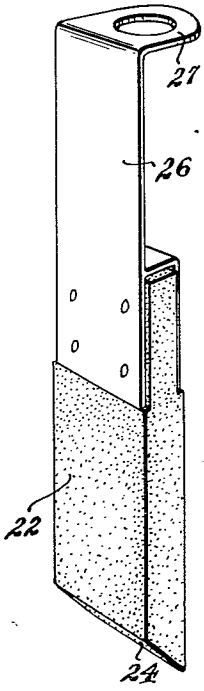
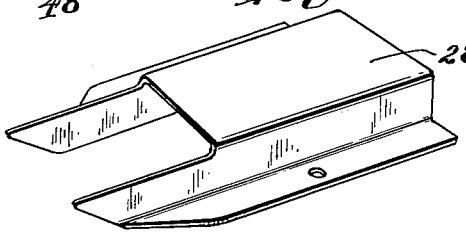


Fig. 9.



INVENTOR.
William M. Anderson
BY his Atty.,
John A. McKenna

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SHEET FEEDING APPARATUS

Wilbur M. Anderson, Arcadia, Calif., assignor to The Elliott Addressing Machine Company, Cambridge, Mass., a corporation of Massachusetts

Application March 20, 1952, Serial No. 277,657

5 Claims. (Cl. 271—41)

This invention relates to improvements in sheet feeding apparatus and more particularly to apparatus for advancing sheets in succession from the bottom of a supply stack of the sheets. The invention provides an improved sheet feeding apparatus which is more sensitively effective for advancing single thin sheets of paper, and the like, as compared with prior comparable sheet feeding mechanisms, and which is readily adjustable for handling sheets of different thicknesses, with means for quickly retracting the feed control means without disturbing any particular precise setting of the control, as when it may become necessary or desirable to release a sheet or sheets which may have caused a jamming of sheets at the feed region of any particular machine, such as an addressing machine, for example.

Various mechanisms have been available heretofore for feeding or advancing single sheets from the bottom of a stack of sheets. Such mechanisms have been employed in various arts, and are widely used in the printing art, such as in addressing machines, and the like, where sheets or sheet elements advance in succession into printing relation to printing devices, such as stencils, which also may advance in succession to the printing position.

The prior sheet feeding mechanisms have been effective for feeding relatively thick sheet elements, such as envelopes and post cards, and have been acceptably effective for feeding relatively thin paper sheets made of the better grades of paper. However, the prior sheet feeding mechanism and devices have been discouragingly ineffective and inefficient when called upon to feed extremely thin sheets of paper and sheets made of the poorer grades of paper. This inability of the prior sheet feeding devices to effectively handle extremely thin sheets and low grade paper sheets has been particularly troublesome to manufacturers of addressing machines in that these sheets tend to cling together and the prior feeding devices frequently advance more than one sheet at a time from the supply stack. The problem has been aggravated by the need for stopping the machines at not infrequent intervals so that the feed control means might be withdrawn to clear the feed regions of jammed sheets, after which the feed control means has had to be carefully re-set in sheet feeding position. Customarily the feed control means is adjustable and retractible by means of a screw and, heretofore, considerable time has been consumed, while a machine has been idle, to manually retract the feed control means and to restore it and properly re-set it by manual rotation of the adjusting screw.

It is among the objects of my present invention to provide a sheet feeding apparatus capable of feeding or advancing sheets and sheet elements, including extremely thin sheets and sheets of poorer grades of paper, one at a time in succession to a predetermined location at or from which the successive sheets may be brought into printing engagement with stencils, or comparable printing devices, with considerably greater assurance that only single sheets, or sheet elements, will be advanced,

as compared with prior sheet feeding mechanisms. According to the invention, a flexible finger, of rubber or the like, coacts with a rotating drum to effect the advance of only single sheets, or sheet elements, from the bottom of a supply stack, the flexible finger being combined with a backing plate and being manually adjustable relative to the backing plate toward and from the rotating drum, and the backing plate being adjustable, relative to the flexible finger, toward and from the rotating drum, thereby to condition the flexible finger in its adjusted positions for advancing only one sheet, or sheet element, at a time regardless of the grade or the thinness of the paper, the backing plate adjustments having the effect of increasing and decreasing the effective flexibility of the finger at its region of engagement with the sheets, or sheet elements, which are being advanced.

Another object of my invention is to provide a sheet feeding apparatus wherein a flexible finger coacts with a rotating drum to advance sheets, or sheet elements, from the bottom of a supply stack, one at a time in succession to a predetermined location, and wherein the flexible finger is mounted in an adjustable carrier by means of which the end portion of the finger may be adjusted toward and from the rotating drum, and wherein a backing plate for the flexible finger is separately adjustable along the finger to vary the effective flexibility of the work-engaging end portion of the finger to suit the character of any particular sheets, or sheet elements, which at any time are being advanced in succession from the stack.

Yet another object of my invention is to provide a sheet feeding apparatus having a flexible finger of rubber, or the like, coacting with a rotating drum, or roll, to advance sheets, or sheet elements, one at a time in succession from the bottom of a supply stack to a predetermined location, the flexible finger being mounted for manual adjustment whereby its end may be set to provide varying pressure on a sheet, or sheet element, projected between it and the rotating drum, or roll, and there being means for quick bodily retraction of the flexible finger without disturbing a said precise setting of the finger which, when released following a said retraction, returns to the same precise set relation to the drum, or roll, which it had prior to a said retraction.

It is, moreover, my purpose and object generally to improve sheet feeding structures and more especially such structures wherein a flexible finger coacts with a rotating drum, or roll, in effecting the feed of sheets and wherein the flexible finger, heretofore, has not been selectively conditionable to change its effective flexibility, nor bodily retractible without upsetting its precise operative sheet feeding relationship to the coacting drum, or roll.

In the accompanying drawings:

Fig. 1 is a medial vertical cross-sectional view of sheet feeding mechanism embodying features of my invention in coacting relation to a sheet feeding drum of an addressing machine, or the like;

Fig. 2 is a top plan view of a portion of the sheet feeding drum of Fig. 1;

Fig. 3 is a face view of the apparatus of Fig. 1 apart from the sheet feeding drum, with the hinged portions of the apparatus swung generally into a common plane from their relative positions of Fig. 1;

Fig. 4 is a cross-sectional view on line 4—4 of Fig. 3;

Fig. 5 is a view looking at the opposite face of a portion of the upper plate member as shown in Fig. 3;

Fig. 6 is a face view of the upper portion of the apparatus of Fig. 3, on a larger scale, and with portions broken away, the control finger, its carrier and the retracting lever being shown by full lines in their retracted positions and by dotted lines in their normal positions;

Fig. 7 is an edge elevation of the apparatus of Fig. 6, looking at the edge which is to the left in Fig. 6;

Fig. 8 is a perspective view of the rubber finger and its carrier member; and

Fig. 9 is a perspective view of the nose piece in which the rubber finger of Fig. 8 is guided.

Referring to the drawings, the invention is illustrated in Fig. 1 as it may be embodied in an addressing machine of the general variety disclosed in Patent No. 2,152,179, dated March 28, 1939, which is owned by the assignee of my present invention. In the said patent, sheet feeding means, including a rotating drum 10, advances sheets, or sheet elements, from the bottom of a supply stack, and delivers them in succession into printing coaction with printing devices, such as stencils, which are not herein shown but which advance in succession to a printing position at which each sheet, or sheet element, may have an address, or other information, printed thereon from one of the printing devices.

The lower portion of a supply stack of sheets is indicated at 12 in Fig. 1, the sheets being supported by any conventional means (not shown) with the sheets of the stack inclined downwardly toward the drum 10 so that the leading edge portion of the lowermost sheet rests on the drum which may be of a type well known in the addressing machine art. As best seen in Fig. 2, the drum 10 has an annular raised portion 10*a* of considerable width centrally between its opposite side edges, flanked on each side by the annular portions 10*b* of smaller diameter. Each portion 10*b* has a conventional serrated strip 10*c* of rubber, or the like, secured thereon and extending around only a predetermined fractional part of the total periphery of the drum 10. During each rotation of the drum, the serrated strips 10*c* engage the lowermost sheet in the stack 12 and, in conjunction with means adjacent to the drum surface, advance the sheets in succession from the bottom of stack 12.

My present invention is concerned primarily with improvements in means mounted adjacent to the drum 10 for coacting with the drum in effecting the feed or advance of sheets. A plate 14 is rigidly secured at a fixed location relative to the rotating drum 10, it being shown, in Fig. 1, inclined somewhat from verticality toward the supply stack 12 of sheets in position to serve as a wall or abutment against which the forward edges of the inclined stacked sheets engage. As herein shown, opposite marginal portions of plate 14, toward the lower end of the plate, are depressed out of the plane of the plate to provide the angularly disposed feet 16, for engaging and being secured to any suitable fixed vertical supports 18 (Fig. 1). Each foot 16 has two holes 20 therein for reception of screws by which the plate 14 may be rigidly secured to supports 18.

Adjustably mounted on plate 14 is a generally rectangular block 22 of resilient material, preferably rubber, one end of which is bevelled, as at 24, and the other end portion of which is secured to a carrier member 26 which is longitudinally movable on plate 14 to set the bevelled end of rubber block 22 toward and from the drum 10. The rubber block 22 constitutes a resilient finger for coaction with drum 10 in passing only single sheets from stack 12, and the block or finger is slidably retained on plate 14 by the nose piece 28 which, with plate 14, defines a rectangular passage within which block or finger 22 is guided in its movements toward and from the drum.

The upper end of carrier member 26 has an out-turned ear 27 thereon, and the lower end portion of an adjusting screw 30 is connected to ear 27 and is threadedly engaged in a nut 32 which is fixedly secured to plate 14 by the two screws 34. By removing the screws 34, the adjusting screw 30, nut 32, carrier 26 and block or finger 22 may be removed as a unit from plate 14.

An important feature of the invention resides in the provision of a resiliently yieldable connection between the carrier ear 27 and the lower end portion of the adjusting screw 30 whereby the carrier member 26 and the carried rubber finger 22 may be quickly retracted from drum 10 without disturbing the adjustment of screw 30, so that when the carrier and finger are retracted and subsequently released, the finger automatically returns to its previous position and setting relative to drum 10.

As best seen in Fig. 1, and in the larger scale showing of Fig. 6, the lower end portion of adjusting screw 30 has a sleeve 36 thereon fixed against longitudinal movement relative to the screw by the flanged collars 38, 40 which may be pinned to screw 30 as shown at 42. Carrier ear 27 has an opening therethrough and engages loosely around sleeve 36. One end of a retracting lever 44 has an opening therethrough and is engaged loosely around sleeve 36 between the ear 27 and the lower pinned collar 38. A spring 46 is coiled around sleeve 36 and is under compression between carrier ear 27 and the flange of the upper pinned collar 40. The looseness of the engagement of lever 44 around sleeve 36 is such that the lever may be manually actuated from its normal horizontal position, shown dotted in Fig. 6, to the full line position of lever 44 in Fig. 6, thereby to force carrier ear 27 upward along sleeve 36, with further compression of spring 46, and with substantial retraction of carrier 26 and the carried rubber finger 22. When lever 44 is released, spring 46 restores the lever to its dotted position of Fig. 6, and restores the bevelled end of rubber finger 22 to its previous position, indicated by dotted lines in Fig. 6. Hence, after finger 22 has been properly and precisely adjusted relative to drum 10, any jamming of sheets at the feed region may be quickly remedied by retracting the finger 22, and the finger returns to its precise predetermined relation to the drum when retracting lever 44 is released. Heretofore, retraction of a feed control finger, or comparable means, has involved a manual unscrewing of the adjusting screw, followed by careful manual restoration of the feed control means to a proper operative relation to the feed drum by means of the adjusting screw.

Another important feature of the invention resides in means for changing the effective flexibility of the rubber finger 22 in any position to which it may have been adjusted by means of the adjusting screw 30. A backing plate or blade 48 is slidably retained and guided within the nose piece 28 and directly engages rubber finger 22 substantially throughout the width of the finger at that side thereof which faces in the general direction of advance of sheets from stack 12. As best seen in Figs. 1 and 6, backing plate or blade 48 is adjustable along finger 22, toward and from drum 10, to reduce or increase the flexibility of the inner end portion of the finger. In other words, the location of the lower edge of backing blade 48 determines the amount that finger 22 can flex in the direction of feed in response to rotation of drum 10. Hence, in addition to permissible manual adjustments of finger 22 toward and from drum 10, the sensitivity of finger 22 in any set position may be considerably varied by adjusting blade 48 relative to the finger.

Although blade 48 may be adjusted by any suitable means, I have found it convenient to utilize a resilient friction clamp, indicated generally at 50, which maintains the blade, by friction, in any position of adjustment but which permits manual shifting of the blade between different positions. As herein represented, the blade 48 extends upward out of nose piece 28 and laterally at 48*a* to one edge margin of plate 14, and inward and upward along and in contact with the margin of plate 14, as at 48*b*. The upper end portion 48*b* preferably has an outturned finger piece 48*c* thereon to facilitate manual movements of the backing blade 48.

Friction clamp 50 engages the portion 48*b*, which is slotted at 48*d* for coaction with the clamp. The clamp consists of a pin or post 52 rigid on plate 14 and projecting forward through slot 48*d* and through washer 54, coil spring 56, and washer 58, with a lock-washer 60

engaged in groove 62 in the outer end portion of the post 52, maintaining spring 56 under compression between the two washers 54, 58. The clamp creates friction between portion 48*b* and plate 14 sufficient to maintain the backing blade 48 against unintentional movements on plate 14, and the blade remains stationary when finger 22 is being manually adjusted by screw 30 and also when it is retracted by actuation of retracting lever 44.

Preferably, the nut 32 in which adjusting screw 30 engages will be a split nut as best seen in Figs. 4 and 7, with a screw 64 for drawing the split portions of the nut into clamping relation to adjusting screw 30 when it may be desired to lock the adjusting screw with finger 22 in any particular adjusted position.

Fig. 1 shows conventional mechanism beyond control finger 22, including pressure roller 66 hinged at 68 to a plate part 70 on the nose piece 28, the roller 66 being constantly pressed toward the central raised portion 10*a* of drum 10 by springs 72, as is well known in the addressing machine art, and the pressure plate member 74 extending forward from a pivot 76 on the hinged frame 78 which supports roller 66.

It will be apparent from the foregoing description, in connection with the drawings, that my improved sheet feeding apparatus provides greater sensitivity in the control of the feed of sheets and sheet elements, as compared with sheet feeding mechanisms heretofore available, whereby extremely thin sheets, and sheets of poorer grade paper stock, may be effectively and efficiently advanced, one at a time, from the bottom of a supply stack, as well as thicker sheets and sheet elements. While the lower end of fixed plate 14 is set relatively close to the drum 10, it does not necessarily prevent the passage of more than a single sheet. The single sheet feed is effected as a result of pressure of the resilient finger 22 and this pressure is variable by adjusting the end of the finger toward and from the drum, but the pressure which is effective during the sheet feeding process also is variable by adjustment of blade 48 relative to the finger in any set position of the finger, and it is an important feature and advantage of the invention that the finger 22, when once properly set, automatically compensates for considerable variations in thicknesses of sheets and sheet elements. For example, a single proper setting of finger 22 and blade 48 will effectively handle postcards, No. 10 envelopes, and other mailing pieces of comparable thickness, without need for adjustment of the finger or blade. This is important as compared with the prior comparable feed devices which have required adjustment for each appreciable change of thickness of the sheets, or sheet elements. Considerable difficulty is encountered to get average machine operators to acquire the technique of making proper adjustments. The invention substantially reduces the number of adjustments required for handling a full range of thicknesses of sheets, or sheet elements, which any particular machine may be called upon to handle.

Also, my improved sheet feeding apparatus makes it feasible to quickly retract the feed control finger 22 whenever it may be necessary or desirable to clear a jammed condition at the feed region, and the control finger, when released, goes back automatically to its previous position, avoiding the need for subsequent adjustments of the finger 22 or the backing blade 48.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty exist in the invention disclosed.

I claim as my invention:

1. In a sheet feeding apparatus having a rotating drum, the combination therewith of a generally rectangular feed-control member having an edge portion of resiliently flexible material, said member being thrust edgewise into engagement with the periphery of the drum sufficiently to cause appreciable flexing of said edge portion in the direction of sheet travel whereby a sheet element advancing between said member and the drum is required to further flex said edge portion of said member away from the drum with the flexed edge portion resiliently engaging and wiping the advancing sheet element, plate means associated with said feed-control member and having an inner edge about which the said flexing of said edge portion of said member occurs, manual means for adjusting said plate means relative to said member thereby to move said edge of the plate means relative to said member in directions generally toward and from said drum, a said movement of said edge of the plate means toward the drum having the effect of reducing the degree of flexure of said edge portion of said member and increasing the relative stiffness of said flexed edge portion of said member.

2. In a sheet feeding apparatus having a rotating drum, the combination therewith of a generally rectangular feed-control member having an edge portion of resiliently flexible material, said member being thrust edgewise into engagement with the periphery of the drum sufficiently to cause appreciable flexing of said edge portion in the direction of sheet travel whereby a sheet element advancing between said member and the drum is required to further flex said edge portion of said member away from the drum with the flexed edge portion resiliently engaging and wiping the advancing sheet element, means supporting said feed-control member for bodily movements thereof generally toward and from said drum, said supporting means including a resilient element constantly biasing said member in general direction toward said drum, manually operable means for effecting gradual bodily movements of said member in general directions toward and from said drum whereby said edge portion of said member may be adjusted into a predetermined flexed relation to said drum, and an actuating lever for effecting rapid bodily retraction of said member in opposition to the bias of said resilient element and independently of said manually operable means, the latter said element restoring said edge portion of said member to its previous flexed relation to the drum when said lever is released.

3. In a sheet feeding apparatus having a rotating drum, the combination therewith of a generally rectangular feed-control member having an edge portion of resiliently flexible material, said member being thrust edgewise into engagement with the periphery of the drum sufficiently to cause appreciable flexing of said edge portion in the direction of sheet travel whereby a sheet element advancing between said member and the drum is required to further flex said edge portion of said member away from the drum with the flexed edge portion resiliently engaging and wiping the advancing sheet element, means supporting said feed-control member for bodily movements thereof generally toward and from said drum, said supporting means including a spring constantly biasing said member in general direction toward said drum, plate means associated with said feed-control member and having an inner edge about which the said flexing of said edge portion of said member occurs, manually operable means for effecting gradual bodily movements of said member in general directions toward and from said drum, whereby said edge portion of said member may be adjusted into flexed engagement with said drum with a predetermined degree of flexure thereof about said edge of said plate means, said plate means being movable independently of said member to adjust its said edge along said member to increase and decrease the relative stiffness of said flexed edge portion of said member following a said adjustment of its degree of flexure by said manually operable means, and a clamp for securing said plate means with its said edge in a selected position of adjustment along said member.

4. In a sheet feeding apparatus having a rotating drum,

the combination therewith of a generally rectangular feed-control member having a bevelled edge portion of resiliently flexible material with the bevelled surface facing in the direction from which a sheet element advances toward said member, said member being thrust edgewise into engagement with the periphery of the drum sufficiently to appreciably flex said edge portion of said member in the direction of sheet travel and to bring a substantial portion of said bevelled surface of said flexed edge portion of said member into approximately flatwise engagement with the periphery of the drum, whereby a sheet element advancing between said member and drum is required to further flex said edge portion of said member away from the drum with the flexed edge portion resiliently engaging and wiping the advancing sheet element, means supporting said feed-control member for bodily movements thereof generally toward and from said drum, said supporting means including a resilient element constantly biasing said member in general direction toward said drum, manually operable means for effecting gradual bodily movements of said member in general directions toward and from said drum whereby said edge portion of said member may be adjusted into a predetermined flexed relation to said drum, and an actuating lever for effecting rapid bodily retraction of said member in opposition to the bias of said resilient element and independently of said manually operable means, the latter said element restoring said edge portion of said member to its previous flexed relation to the drum when said lever is released.

5. In a sheet feeding apparatus having a rotating drum, the combination therewith of a generally rectangular feed-control member having an edge portion of resiliently flexible material, said member being thrust edgewise into engagement with the periphery of the drum sufficiently to cause appreciable flexing of said edge portion in the direction of sheet travel whereby a sheet element advancing between said member and the drum is required to further flex said edge portion of said member away from the drum with the flexed edge portion resiliently engaging and wiping the advancing sheet element, a sheet metal guide for said feed-control member having a relatively fixed position relative to said drum, said member being bodily movable in said guide in general directions toward and from said drum, manually operable means for gradual adjustment of said member in said guide and including a compression spring constantly biasing said member toward the drum, an actuating lever for rapid bodily retraction of said member in its said guide in opposition to the bias of said spring, said spring acting to restore said member to its original position when said lever is released, a plate arranged on that side of said member which faces in the direction of sheet feed, said plate having an inner edge about which said flexed edge portion of said member is flexed, means supporting said plate for sliding movements thereof generally toward and from said drum whereby said edge of the plate may be adjusted along said member to reduce the degree of flexure of said flexed end portion of said member and to increase the relative stiffness of said flexed end portion of said member, and means for securing said plate with its edge in any selected position of adjustment along said member.

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