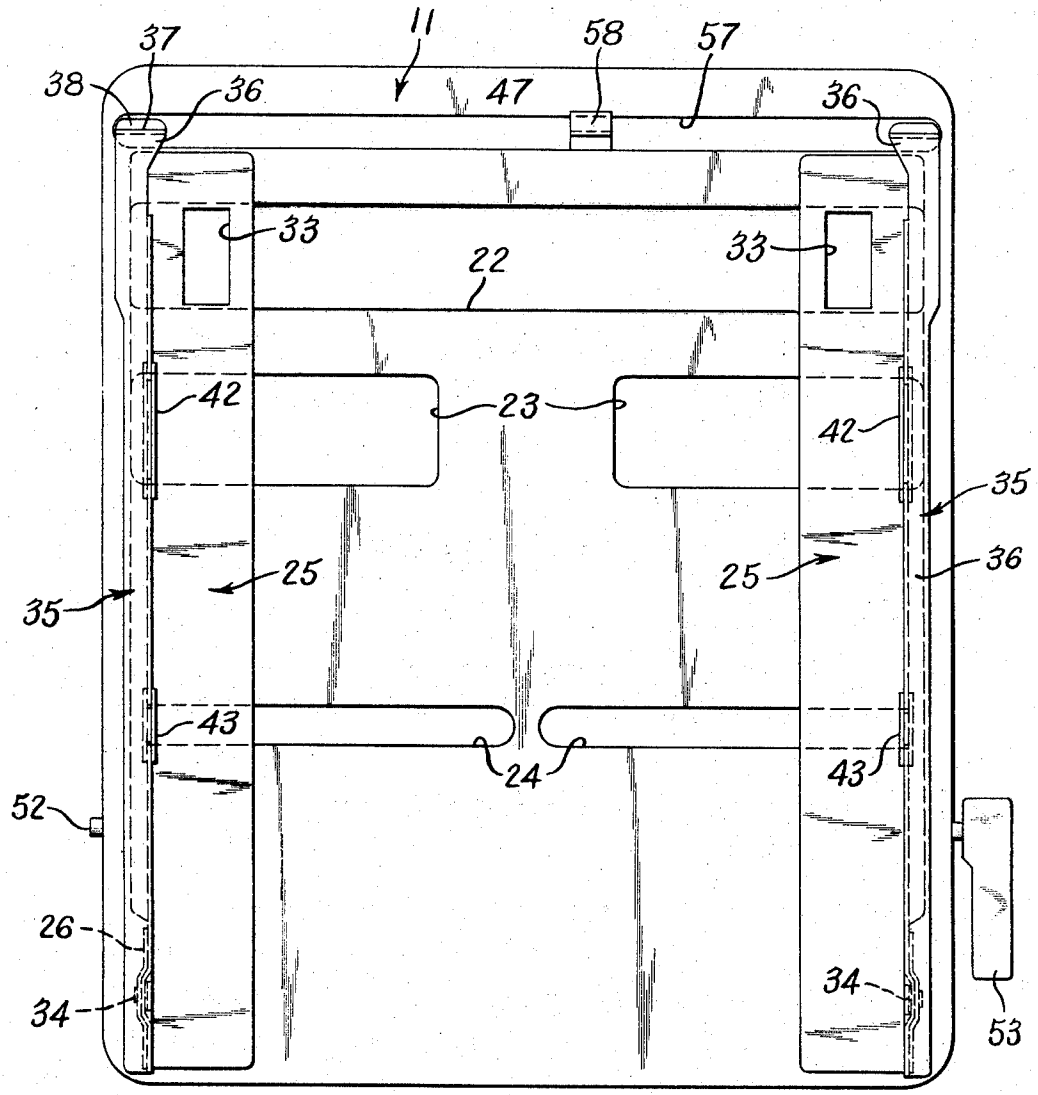
April 16, 1968 E. M. SPRINGER 3,378,252

SHEET GUIDING AND RESTRAINING MECHANISM

Filed May 26, 1966 3 Sheets-Sheet 1

Fig. 1.



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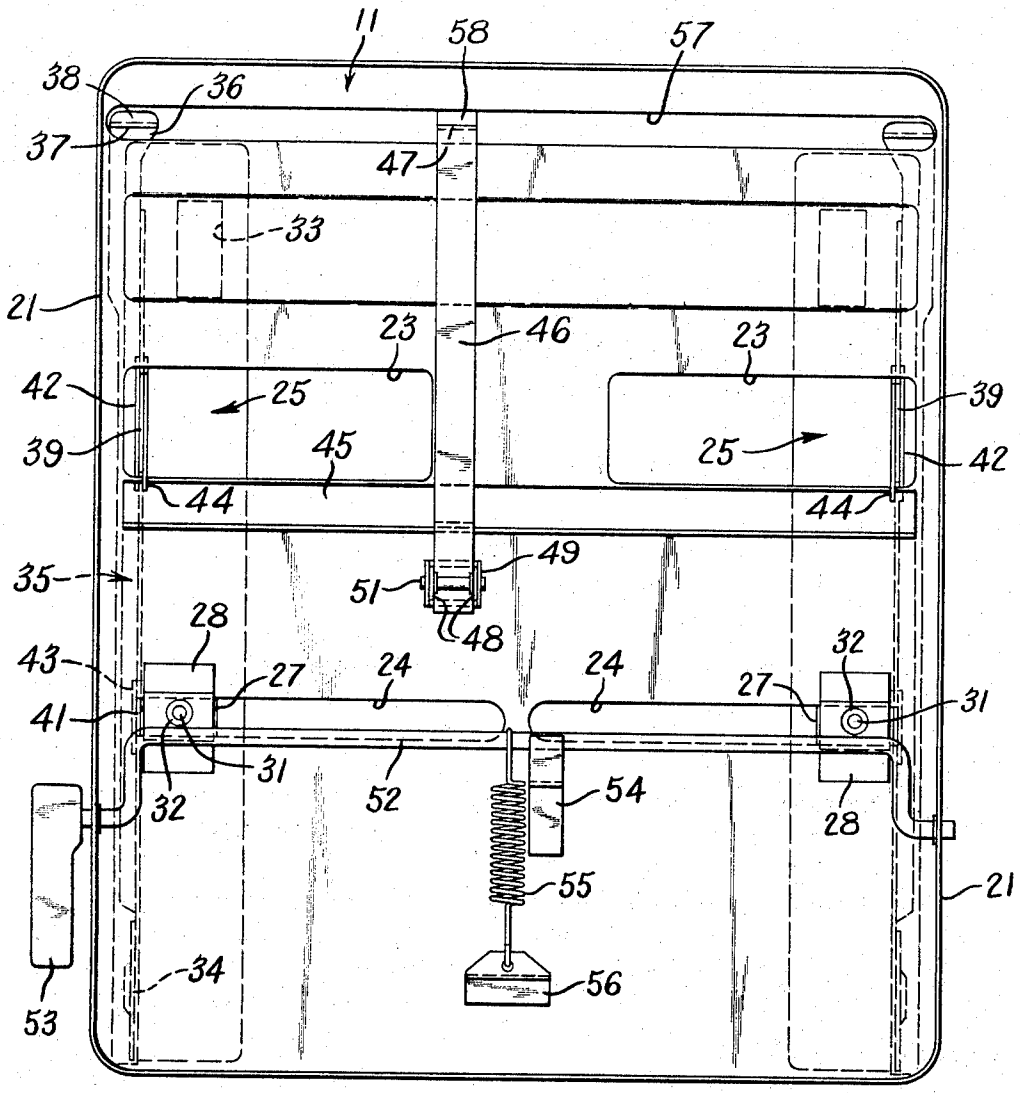
BY Horton, Davis, Brewer & Brugman
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Fig. 2.



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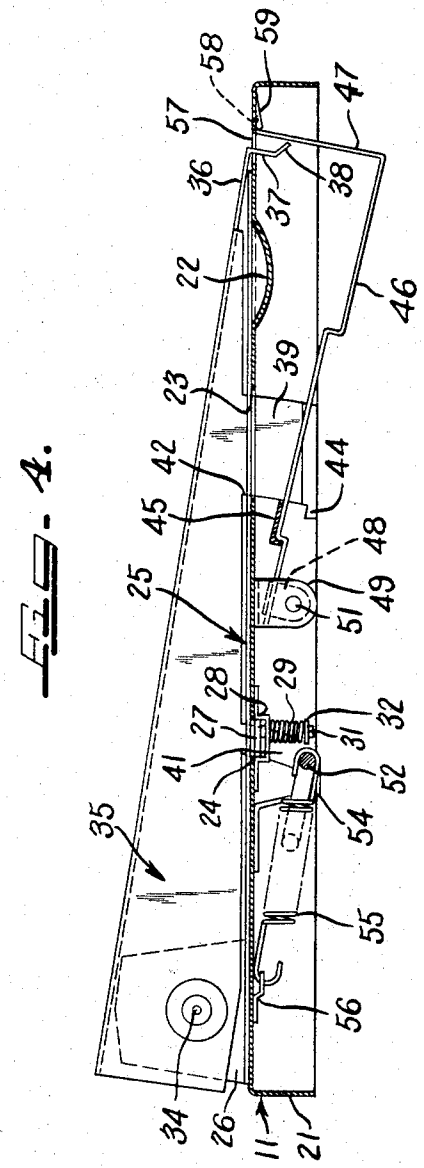


Fig. 4.

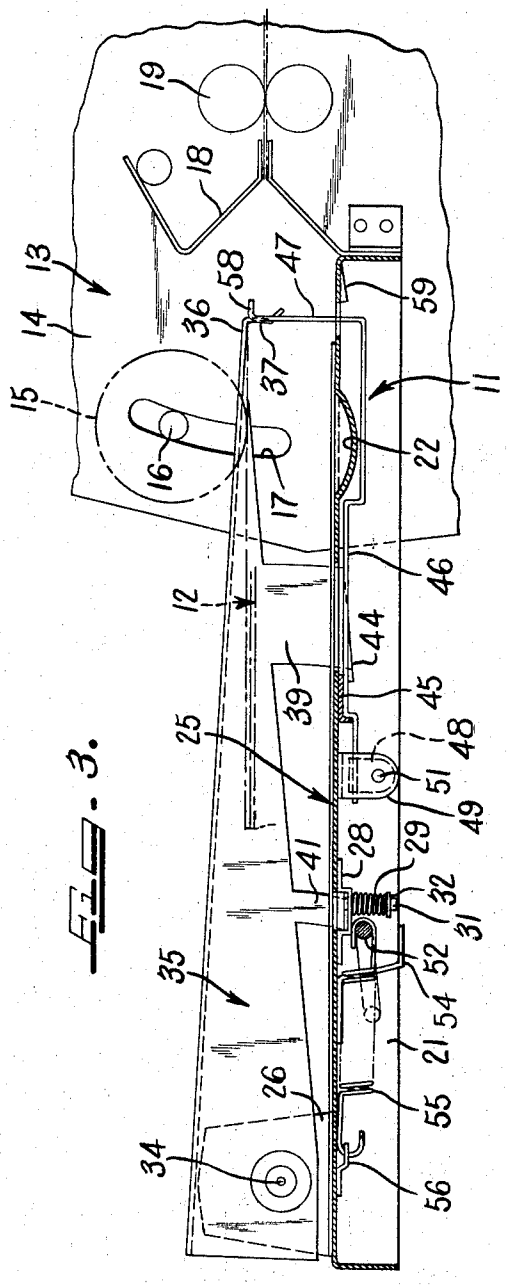


Fig. 3.

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3,378,252

SHEET GUIDING AND RESTRAINING MECHANISM

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Filed May 26, 1966, Ser. No. 553,209
10 Claims. (Cl. 271—61)

This invention relates in general to means for feeding sheets of paper, or the like, one at a time from the top of a stack of such sheets to apparatus for printing on, folding, or otherwise working therewith, and more particularly to improved guiding and restraining mechanism for facilitating such single sheet feed operations.

Similar mechanism is disclosed in my copending application Ser. No. 516,489, filed Dec. 27, 1965, issued Oct. 24, 1967 as U.S. Letters Patent No. 3,348,838, which includes a feed table for receiving and supporting a stack of sheets, feed rollers or sheet advancing means adapted to rest upon the uppermost sheet in stack and urge it forwardly, and a pair of side rails independently laterally adjustable to guidingly engage the edges of the sheets in stack, with each side rail being pivotally supported at its rear end by the table and provided at its forward end with a sheet corner engaging and restraining lip and, intermediate its ends, with a depending portion extending downwardly through a laterally extending aperture in the table. This prior mechanism also includes center abutment or stop means for the inner or forward end of the stack, and means interconnecting the same with the two side rails to compel simultaneous vertical movements thereof.

Consequently, with sheets of a length extending rearwardly from the center stop means and sheet restraining lips to some point substantially rearward of the depending portions of the side rails and slightly forward of the pivot point of the latter, lateral shifting of the rear end portions of some of the sheets in stack may result in the same sliding under the lower edge of a side rail to prevent its proper sheet releasing operation. This is particularly true and objectionable if it is desired to use only one of the two side rails.

A principal object of this invention, therefore, is to improve the operation of such sheet guiding and restraining mechanism by reducing to a minimum the likelihood of sheets in stack sliding under a side rail and jamming or preventing downward movement of the side rails and their sheet restraining lips.

This is accomplished by providing a pair of side rails, each of which is pivoted at the rear to a vertical flange or ear upstanding from a horizontal slide mounted for lateral movement on the feed table, with each side rail being provided with two depending portions spaced form each other and forwardly of its pivot and passing through suitable laterally extending slots in the feed table and cooperating with the horizontal slide to guide and restrain the sheets in a stack against outward lateral movement into a jamming position under the lower edge of the side rail.

Also with the prior structure, if only one of the side rails is slid into engagement with a side of a stack of sheets, the likelihood of such sheet jamming is increased tremendously and the free weight of the other side rail is transmitted as a bending or twisting moment to the stack engaging rail when the latter is released and its downward movement is terminated by the sheet restraining lip on its forward end engaging the top of the stack, which will materially impair the single sheet releasing function of the lip.

Consequently, another important object of this invention is to enable selective use of either one or the other of the two side rails alone without affecting its normal single sheet releasing function. This object is attained by mounting the two side rails for movements completely

independent of each other and providing means for raising the center abutment or stop means with and in response to lifting of either of the side rails.

A further important object of the invention is the provision of a manually operable control member adapted to raise both side rails simultaneously and means for releasably latching the same in their uppermost position which may be rendered ineffective merely by exerting a slight downward pressure on the forward end of either one of the side rails.

As indicated, one object of the invention is to so arrange the several parts of such improved sheet guiding and restraining mechanism that the side rails may selectively be raised independently or simultaneously, while assuring that in either instance the center stop means is correspondingly raised. This is accomplished by the rearwardly disposed pair of depending portions of the side rails resting upon and cooperating with manually operable means for raising the side rails simultaneously, and the forwardly disposed pair of depending portions of the side rails extending under a transverse bar which is attached to the center stop or abutment means.

Another object of the invention is to eliminate the necessity of using the center abutment or stop means during sheet feeding when the vertical height of the stack of sheets is less than the length of the depending vertical portion of the sheet corner engaging means, and still be able to employ it for stack positioning during placement of a stack on the table. This is accomplished by providing means for lifting the center abutment means in response to upward movements of a side rail, with a lost-motion arrangement interposed to render the same ineffective until after the depending vertical portion of the sheet corner engaging means of the side rail has been moved vertically from lowermost position for a distance substantially equal to its length.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, when taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

In the drawings:

FIGURE 1 is a top plan view of a sheet guiding and restraining mechanism embodying the features of this invention;

FIG. 2 is a bottom plan view of the mechanism of FIG. 1;

FIG. 3 is a vertical sectional view taken longitudinally through the mechanism of FIG. 1, showing a portion of a machine with which the same may be associated and illustrating the side rails latched in uppermost position;

FIG. 4 is a longitudinal vertical section similar to FIG. 3, showing the side rail and center abutment means in lowermost positions.

Referring more particularly to the drawings, reference numeral 11 indicates in general a table for a sheet feeding mechanism embodying the features of this invention which is adapted to support a stack of sheets, shown in part in broken lines at 12 in FIG. 3, on a machine, such as a duplicator or folding machine, a portion of which is illustrated in FIG. 3 and designated generally by reference numeral 13. The machine 13 includes side flanges 14 and sheet advancing means which are illustrated herein in the form of rollers 15 mounted on a shaft 16 extending transversely of the table 11 and through slots 17 in the side flanges 14. Since the specific means for mounting and rotating the feed rollers 15 is not part of the instant invention, reference may be had to my prior U.S. Letters Patent No. 2,975,707, issued Mar. 21, 1961, for the details of suitable such sheet advancing means, it being understood that the rollers 15 and their shaft 16 are mounted for up-and-down movements, as between the

upper position of FIG. 3 wherein the rollers 15 rest upon the uppermost sheet in the stack 12, and a lowermost position, subsequently to be referred to, into which they fall by gravity upon the removal of the last sheet in the stack. As is customary with such sheet feed mechanism, deflectors 18 are provided for guiding each sheet, as it is advanced from the stack by the rollers 15, into proper alignment and engagement with machine rollers 19. It will be appreciated that the sheet guiding and restraining mechanism of the present invention hereinafter to be described may be employed with any suitable form of sheet advancing means other than the illustrated rollers 15.

The table 11 preferably is formed of a unitary metal stamping provided with depending side flanges 21 and a laterally extending, feed roller receiving, trough 22 into which the rollers 15 will fall by gravity upon removal of the last sheet from the stack 12. It will be understood that the feed rollers 15 are mounted on their shaft 16 for selective lateral adjustment to accommodate the sheets of different widths and, as best seen in FIG. 1, this transverse trough 22 will accommodate the feed rollers in any of their selectively adjusted lateral positions. As is understood in the art, the purpose of the final downward movement of the feed rollers 15 by gravity into the trough 22 is to effect automatic stopping of the machine when the latter is motor driven. The table 11 also is provided with a pair of laterally extending apertures 23 disposed rearwardly of the trough 22 and a second pair of laterally extending apertures 24 spaced rearwardly therefrom, both for purposes which will be readily apparent hereinafter.

Mounted on the table 11 for selectively adjustable lateral movements thereon are a pair of horizontally disposed and longitudinally extending slides 25, each of which is provided with an upstanding ear or vertical flange 26 at its outer or rear end, which is the left end as seen in FIGS. 3 and 4. To the lower surface of each of these slides 25 is secured in any suitable manner a guide portion 27 (FIG. 4) which is slidably disposed in the associated laterally extending rear aperture 24. This guide portion 27 of each slide also extends downwardly into the centrally depressed portion of a slide bracket 28, the upper or terminal portions of which slidably engage the undersurface of the table 11. Each of these brackets 28 is maintained in frictional engagement with the table 11 by means of a coil spring 29 mounted on a stud 31 which is secured at its upper end to the associated slide 25 and its guide portion 27, extends through a suitable aperture in the central portion of the bracket 28, and is provided at its lower end with suitable spring retaining means 32 between which and the bracket 28 the coil spring 29 is disposed. With this arrangement, the slide members 25 are retained frictionally in any selected adjusted position on the upper surface of the table 11 and are maintained parallel to each other by virtue of the sliding engagement of the guide portion 27 in the associated slot 24 (FIG. 2). Each of these slide members 25 is provided adjacent its forward end with an aperture 33 (FIG. 1) for receiving one of the rollers 15 when the same is aligned laterally therewith and the last sheet in a stack is removed, as previously explained.

Pivotally mounted in any suitable manner at 34 on each of the upstanding ears 26 is the rear portion of a vertically disposed and longitudinally extending side rail indicated generally by reference numeral 35. Each side rail 35 terminates at its forward end (FIGS. 1 and 4) in an integral sheet corner engaging lip comprising an angularly inwardly extending portion of a horizontal flange 36 terminating in a substantially vertical depending portion 37, the lower end 38 of which may be forwardly and downwardly inclined. If desired, the horizontal flange 36 may be extended rearwardly for the full length of the side rail 35 for strengthening purposes. This sheet corner engaging lip 37, 38 is adapted to overlie and engage with the associated forward corner of the uppermost sheet in the stack of sheets 12 when the associated side rail 35 is in contact with the adjacent side edges of the sheets in the stack. The depending portions 37 comprise corner abutment stop means for limiting and restraining forward movement of the upper sheets in the stack in well known manner.

Each of the side rails 35 also is provided with integral depending front and rear portions 39 and 41 (FIG. 4) aligned, respectively, with the laterally extending apertures 23 and 24 and preferably extending, respectively, through front and rear guide slots 42 and 43 (FIG. 1) in the associated horizontal slide 25.

As best seen in FIGS. 2–4, each of the front depending portions 39 of the side rails 35 is provided with a rearwardly extending finger 44 which underlies the forward edge of a transversely disposed bar 45. This bar 45 is secured in any suitable manner intermediate its ends to a longitudinally extending member 46 which terminates at its forward end in an upstanding portion 47 comprising center abutment stop means disposed, when in active position as in FIG. 3, with its rear face substantially in the same transversely extending plane defined by the rear surfaces of the substantially vertical portions 37 of the sheet corner engaging lips.

The rear end of he longitudinally extending member 46 is provided with downwardly extending ears 48 disposed between the legs of a U-shaped bracket 49. This bracket 49 is welded or otherwise secured to the underside of table 11 and supports a transversely extending shaft 51 on which the ears 48 are pivotally mounted.

The lower ends of the rearwardly depending portions 41 of the side rails 35 (FIGS. 2–4) overlie and are engageable by the main portion of a crank shaft 52 extending transversely across the machine. The offset ends of the crank shaft 52 are pivotally mounted in suitable apertures in the side flanges 21 of the table 11. The right-hand end of this crank shaft 52 extends outwardly beyond the associated flange 21 and is provided with a suitable manually operable lever or finger 53. Intermediate the ends of the chank shaft 52 is mounted a depending bracket 54 secured in any suitable manner at its upper end to the table 11 and extending at its lower end below the shaft 52 to limit downward movement thereof. Adjacent this bracket 54, the forward end of a coil spring 55 is hooked over the central portion of the crank shaft 52, and the rear end of this spring is anchored by an apertured bracket 56 which is secured in any suitable manner to the table 11.

To accommodate the depending portions 37, 38 of the forward ends of the side rails 35 and the upstanding forward end 47 of the member 46, the table 11 is provided with a transversely extending slot 57. Since the center stop or abutment means 47 is not required during sheet feeding operations after the stack 12 has been reduced in height to a vertical thickness which is less than the length of the depending corner abutment or stop means 37, the front depending portions 39 of the side rails 35 are made long enough to space the rearwardly extending fingers 44 a distance below the transverse bar 45, when the members 35 and 45, 46 are in their lowermost positions of FIG. 4, which is proportional to the effective length of the corner abutment means 37. To avoid any distortion or bending of the horizontal flange portions 36 of the sheet corner engaging lips of the side rails 35 due to contact with the table 11 when dropping into their lowermost position, the bracket 54 may be provided, as previously described, to limit downward movement of crank shaft 52 and the rear depending portions 41 of the side rails.

Downward movement of the center stop or abutment means 47 is limited by a forwardly extending flange 58 formed at the upper end thereof contacting the upper surface of the table 11. The latter is formed with a depression 59 (FIGS. 3 and 4) of sufficient depth to receive the flange 58 to avoid any part of the center stop means 47 extending above the table 11 when in its lowermost inoperative position of FIG. 4 so as not to interfere with feeding movement of sheets thereover.

When loading a stack of sheets on the table 11 for the purpose of effecting feeding of single sheets therefrom, the operator normally will push the slides 25 and their associated side rails 35 laterally to their outermost positions of FIGS. 1 and 2. Such outward sliding of these members is restrainingly permitted by the spring-urged slides 28 frictionally engaging the under surface of the table 11, is guided by the depending portions 27 of the slides 25 sliding in the apertures or slots 24, and is limited by engagement of the rear depending portions 41 of the side rails 35 and the outer ends of the associated slots 24. Depression of the finger piece 53 will raise both of the side rails 35 and the center stop 47 from their lowermost positions of FIG. 4 to their uppermost positions shown in FIG. 3. It will be appreciated from a comparison of the disclosures in these two figures that such lifting of the side rails and center stop is accompanied by movement of the axis of the coil spring 55 to a position above the centers of the offset ends of the crank shaft 52, so that the spring 55 will resiliently and releasably retain the parts so moved in their uppermost positions of FIG. 3.

It also will be appreciated that this latching means for so maintaining the side rails 35 and center stop 47 in raised position may be released merely by exerting a slight downward pressure on the forward end of either one of the raised side rails 35. This will carry the longitudinal axis of the coil spring 55 to a point below the center lines of the offset end portions of the crank shaft 52, and the spring 55 and gravity thereafter will urge the side rails 35 downwardly toward their lowermost position of FIG. 4.

Before so releasing the raised side rails 35 and center stop means 47, the operator will place the stack of sheets 12 on the table 11 with the forward edges of the sheets in contact with the center stop 47 and the lowermost sheet resting upon one or both of the horizontal slides 25, the latter being adjusted inwardly, if necessary, to so receive the stack and to engage one or both of the side rails 35 with the associated lateral edges of the sheets in stack. Now upon release of the spring-urged latching means described, downward movement of the forward end of either or both of the side rails 35 will be limited by engagement of the associated flange 36 with a corner of the uppermost sheet in stack. Subsequent operation of the sheet feeding means, such as the rollers 15 which have been laterally adjusted into alignment with their associated apertures 33 in the slides 25, will cause a temporary buckling of the uppermost sheet due to the restraint against forward movement imposed upon one or both of its front corners by the associated corner engaging lip 36, 37. If the center stop 47 is still being retained in an upper active relationship with the corner engaging lips, such as that shown in FIG. 3, this buckling of the uppermost sheet will clear its forward edge over the center abutment means 47 and the subsequent release of the sheet from the corner engaging means will permit same to be fed forward singly in well known manner.

The primary function of the center stop or abutment means 47 is to facilitate proper placement of a stack of sheets on the table 11 for engagement by the corner lips 36, 37. With this mechanism, the center stop 47 is not required during sheet feeding operations whenever the stack of sheets is no higher than the length of the substantially vertical portions 37 of the sheet corner engaging means. It is for this reason that the forward depending portions 39 of the side rails 35 are made long enough, as best seen in FIG. 4, to dispose the rearward extensions 44 in spaced relationship to the transverse bar 45 when the parts are in their lowermost positions. This comprises a lifting means for the center stop 47 which includes a lost-motion arrangement for not raising that center abutment means 47 until after the forward ends of the side rails 35 have been moved vertically from their lowermost position a distance substantially equal to the length of the vertical portion 37 of the sheet corner engaging means. Conversely, as the sheets uppermost on the stack 12 are fed therefrom to result in automatic lowering of the side rails 35, or the one thereof resting on the stack if only one side rail is being employed, the flange 58 on the upper end of the stop 47 finally engages in the depression 59, as shown in FIG. 4. During the feeding of the remaining sheets from the stack, the center abutment means 47 remains inoperative, maintenance of the forward edges of the sheets in stack in proper position being effected solely by the depending portions 37 of the sheet corner engaging means.

From the above, it will be appreciated that the initial positioning of one or both of the horizontal slides 25 under the stack of sheets 12, or the placement of the latter thereon, and engagement of the associated side rail or rails 35 with the lateral edges of the sheets in the stack will effectively prevent or reduce to a minimum the likelihood of any of the sheets in the stack sliding under the lower edge of a side rail and jamming or preventing downward movement of the side rails and their sheet restraining lips. This result is assured, despite varying lengths of sheets, because of the spacing of the depending portions 39 and 41 and the positioning thereof with respect to the pivot point 34, and the resulting cooperation between these depending portions 39 and 41 and the horizontal slide 25 extending under the stack. While the depending portions 39 and 41 are shown herein as extending through slots 42, 43 in the horizontal slide 25, it will be understood that the latter may be so shaped as to eliminate the necessity of such slots as long as it cooperates properly with the associated side rail 35.

It also will be noted that either of the side rails 35 may be used without the other, and that in any such case, lifting of a side rail will raise the center abutment means 47 in the previously described time-lag relationship to assure proper placement of the stack of sheets on the feed table. And lifting of one side rail 35 independently of the other will completely avoid any possibility of the second one imposing any bending or twisting forces on the first. At the same time, the mechanism of the preferred embodiment herein illustrated permits of simultaneous lifting of both side rails 35 merely by depressing the lever 53, and the readily releasable means for latching the side rails in uppermost position frees both hands of the operator for stack placement purposes.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. Sheet guiding and restraining mechanism for use with feed means for imparting forward movement to the uppermost sheet in a stack of sheets, comprising a table for supporting a stack of sheets, a horizontally disposed slide supported by and mounted on said table for lateral movement relative thereto and having a vertical flange upstanding therefrom, a side rail pivoted at the rear to said upstanding flange for vertical movement and having sheet corner engaging means at its forward end and depending portions spaced from each other and from its rear pivot for cooperation with said slide to guide and restrain the sheets against lateral movement into a jamming position under the lower edge of said side rail.

2. In sheet guiding and restraining mechanism according to claim 1, vertically movable center abutment means extendable upwardly from said table for cooperation with the forward end of the stack of sheets, and lifting means interposed between a forward said depending portion and said center abutment means for raising the latter in response to upward movements of said side rail.

3. Sheet guiding and restraining mechanism according

to claim 2, wherein said sheet corner engaging means has a substantially vertical portion, and said lifting means includes a lost-motion arrangement for raising said center abutment means only after the forward end of said side rail has been moved vertically from its lowermost position a distance substantially equal to the length of said vertical portion of said sheet corner engaging means.

4. In sheet guiding and restraining mechanism according to claim 2, manually operable means for cooperation with a rearward said depending portion to move said side rail upward.

5. In sheet guiding and restraining mechanism according to claim 4, means for releasably latching said manually operable means to maintain said side rail in its uppermost position, said latching means being rendered inoperative by a slight downward pressure exerted on the forward end of said side rail.

6. Sheet guiding and restraining mechanism according to claim 1, comprising a second said horizontally disposed slide supported by and mounted on said table for lateral movement relative thereto and to the first said slide, and a second said side rail pivoted at the rear to said second slide for vertical movement relative thereto and independently of any vertical movements of the first said side rail.

7. In sheet guiding and restraining mechanism according to claim 6, vertically movable center abutment means extendable upwardly from said table for cooperation with the forward end of the stack of sheets, and means for raising said center abutment means in response to upward movements of either of said side rails.

8. In sheet guiding and restraining mechanism according to claim 7, manually operable means for moving said side rails upwardly simultaneously.

9. In sheet guiding and restraining mechanism according to claim 8, means for latching said manually operable means to maintain said side rails in their uppermost position.

10. In sheet guiding and restraining mechanism according to claim 6, manually operable means for raising said side rails simultaneously, and means for latching said manually operable means to retain said side rails in their uppermost position.

References Cited

UNITED STATES PATENTS

3,239,212	8/1966	Springer	271—61
3,348,838	10/1967	Springer	271—24

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