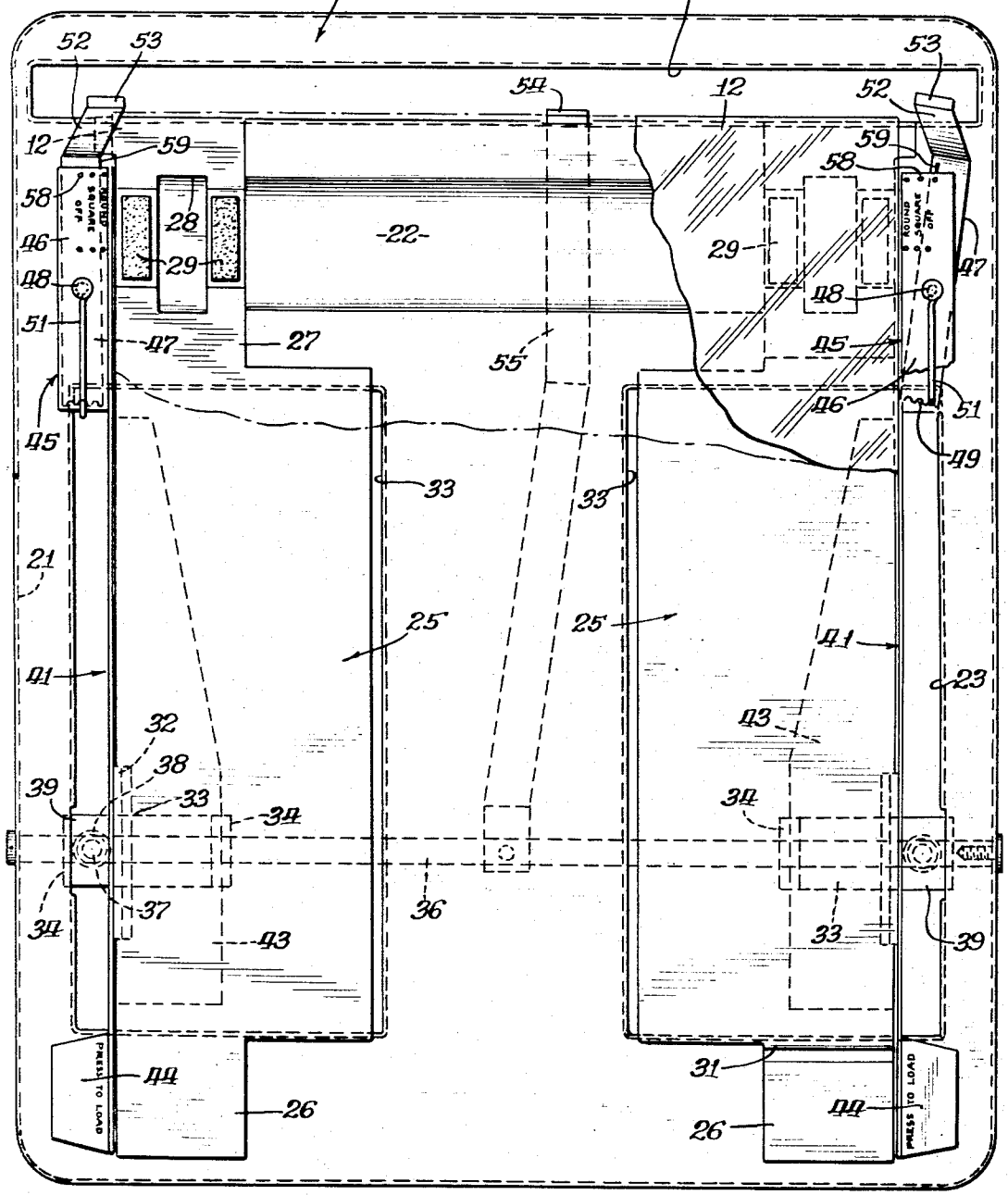
Dec. 24, 1968 E. M. SPRINGER 3,417,988

SHEET GUIDING MECHANISM

Filed March 13, 1967 2 Sheets-Sheet 1

Fig. 1.



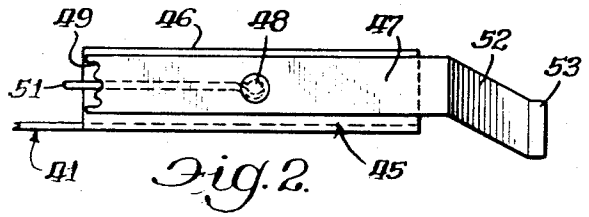


Fig. 2.

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SHEET GUIDING MECHANISM

Filed March 13, 1967 2 Sheets-Sheet 2

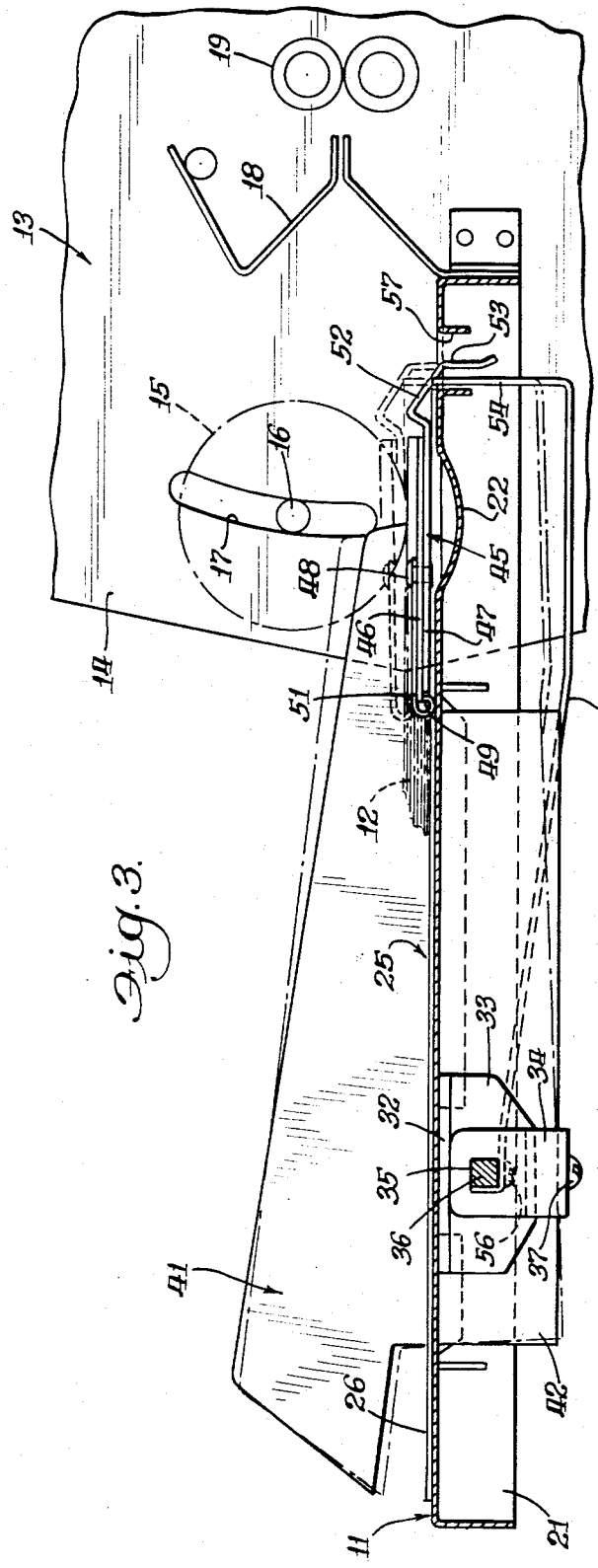


Fig. 3.

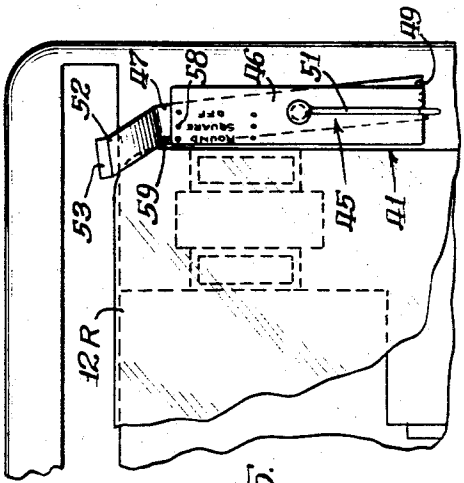


Fig. 5.

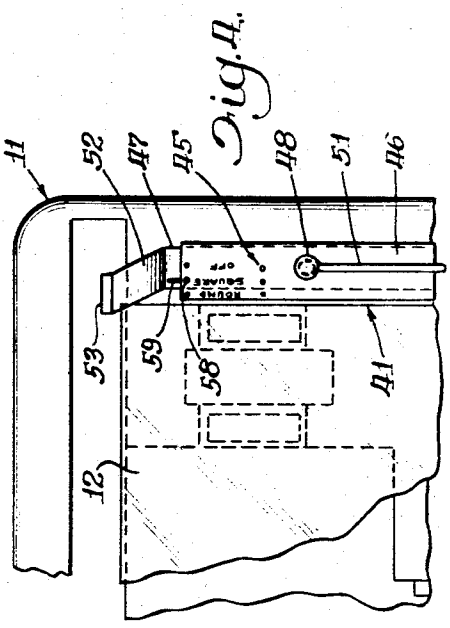


Fig. 4.

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SHEET GUIDING MECHANISM

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10 Claims. (Cl. 271—19)

ABSTRACT OF THE DISCLOSURE

Fingers for engaging the forward corners of the uppermost sheet in a stack to facilitate separation only of the top sheet for feeding from the stack which are selectively adjustable to vary the effective area of the sheet engaged thereby and may be moved to an inoperative position.

Background of the invention

Field of the invention.—This invention relates in general to sheet guiding mechanism for use with means for feeding the uppermost sheets forwardly individually from a stack of sheets of paper, or the like.

Description of the prior art.—Sheet guiding and feeding mechanisms of similar construction are disclosed in my copending applications for U.S. Letters Patent Ser. No. 516, 489, filed Dec. 27, 1965, issued Oct. 24, 1967 as 3,348,838 and Ser. No. 533,209, filed May 26, 1966, issued Apr. 4, 1968 as No. 3,378,252 which include 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 which are vertically movable and provided at their forward ends with a sheet corner engaging and restraining lip. These lips are adapted to rest upon the forward corners of the uppermost sheet in stack to temporarily restrain the same when that sheet is moved forwardly by the sheet advancing means, which causes buckling of the leading portion of the uppermost sheet and the resulting release of that sheet only from the lips for advancement and individual separation from the stack. Application Ser. No. 516,489 also includes means for varying the downward pressure exerted by the sheet corner engaging lips to facilitate feeding of sheets of different flexibility or resiliency, but this is not entirely satisfactory for feeding heavy and relatively inflexible sheets, such as cover stock or post cards, and sheets having rounded, rather than square, corners.

Summary of the invention

A principal object of this invention is to assure single sheet feeding only at all times by enabling the operator to selectively very the effective sheet engaging area of such sheet corner engaging and restraining or separator means to suit the individual characteristics of the sheets being fed, and also to facilitate use of the same sheet guiding means during hand-feeding operations.

This object is attained by providing such sheet corner engaging and restraining means which are selectively adjustably mounted for movement between inoperative and a plurality of operative positions to vary the restraining effect thereof from zero or non-engagement to substantially the same effective sheet engaging area for sheets having differently shaped corners, such as square or rounded. More specifically, such sheet corner engaging and restraining means preferably comprises sheet separator finger means mounted on a vertical pivot on each side rail for selective lateral movement of the sheet engaging portion thereof to such different positions, together with latching means for each finger means for retaining the same in any selected position.

Thus, an important object of the invention to facilitate the handling of hard-to-feed sheets is realized, since both side rails, which comprise the sheet guiding means, may be used for guidingly engaging the edges of the sheets in stack, while only one of the sheet corner engaging or separator means is disposed in an operative position and the other is rendered inoperative, thereby requiring bending or buckling of only one corner portion of the sheet being fed to effect the desired separation of that sheet from the stack.

A further object of the invention likewise is attained which is to facilitate use of the stack edge engaging side rails as sheet guiding means during hand-feeding operations.

Another object is to prevent any possibility of lower sheets in a stack from jamming under either of the side rails and this is accomplished by providing each side rail with a depending portion for substantially its entire length which extends through an aperture in the feed table of about the same length and wide enough to accommodate the desired maximum lateral adjustment of the side rail, and a horizontal slide which overlies the major portion of such aperture, when the side rail is in its outermost position, and engages the depending portion of the side rail and presents a solid base for a stack of sheets, the two horizontal slides being vertically offset to permit movement of the side rails inwardly into closely adjacent relationship for cooperation with both lateral edges of a stack of narrow sheets.

A further object of the invention is to facilitate placement of a stack of sheets on a feed table having such guiding mechanism, which object is attained by providing a horizontal shaft journaled for rotation on the table with a main portion of non-circular cross-section for cooperation with the horizontal slides and slidably engaging the side rails to pivotally support the latter intermediate their ends, and manually depressible means formed integrally with each side rail adjacent its rear end for imparting pivotal movement to both side rails to raise the sheet restraining means at their forward ends.

In the drawings:

FIGURE 1 is a top plan view of a sheet guiding mechanism embodying the features of this invention showing portions of a stack of sheets in full lines and broken lines, respectively, mounted thereon, with the two side rails disposed slightly inwardly from their outermost positions, and with the sheet restraining finger at the left side illustrated in an intermediate position engaging and the forward corner of a stack of sheets having square corners and the finger at the right side shown in an outer inoperative position;

FIG. 2 is a detail bottom plan view of one of the sheet restraining finger means;

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 and sheet restraining fingers in their lowermost position in full lines and in an upper position in engagement with a stack of sheets in broken lines;

FIG. 4 is a detail top plan view of one of the sheet restraining fingers disposed in an intermediate adjusted position for engaging the forward corner of a stack of sheets having square corners; and

FIG. 5 is a view similar to FIG. 4 showing the sheet restraining finger moved to an inner position for engaging the corner portion of a stack of sheets having rounded corners.

Description of the preferred embodiment

Referring more particularly to the drawings, means are provided for supporting a stack of sheets in the form of

a feed table indicated generally by reference numeral **11**, a portion of a stack of sheets having square corners being shown at **12** in FIGS. 1 and 4 and in broken lines in FIG. 3, and a portion of the stack of sheets having rounded corners being shown at **12R** in FIG. 5. As illustrated in FIG. 3, the sheet supporting means **11** may be part of a duplicator or folding machine, designated generally by reference numeral **13**, which 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 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 feeding 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 elongated punched out apertures **23** which, as best seen in FIG. 1, are disposed rearwardly of the trough **22** and extend laterally from near the respective sides of the table well inwardly toward its center.

Horizontal slide means are mounted on the table **11** for selectively adjustable lateral movements thereon in the form of a pair of slides **25** each of which, when in an outer position as in FIG. 1, substantially covers one of the apertures **23**. Each of these slides **25** is formed with a tail piece **26** extending rearwardly almost to the sheet receiving end of the table **11** and a forward extension **27** which overlies and extends beyond the feed roller receiving trough **22** and is provided with a centrally disposed aperture **28** through which the associated feed roller **15** may extend. At either side of the aperture **28**, each forward extension **27** may be provided on its upper surface with a roughened portion **29** which may be in the form of an added piece of material suitably adhered thereto for insuring frictional contact between the feed table and the lowermost sheet in stack. As best seen in FIG. 3, the entire portion of the left slide **25** lies in the same plane and rests directly upon the upper surface of the feed table **11**. However, in order to accommodate the inwardmost lateral adjustment of the two slides **25** while assuring substantial coverage thereby of the respective apertures **28**, it is necessary that one of the slides overlap the other when they are brought into their innermost positions. To this end, the main portion of the right slide **25** is vertically offset upwardly from its tail piece **26** and forward extension **27**, as shown at **31** in FIG. 1, for a distance only slightly in excess of the thickness of the slides. Thus, when the two slides **25** are moved inwardly to their innermost positions, that portion of the right slide between its tail piece **26** and forward extension **27** will overlie the main portion of the left slide.

Each of the slides **25** is provided near its rear end, but forwardly of the tail piece **26**, with a depending vertical flange **32** (FIGS. 1 and 3) to the inner surface of which is secured, as by welding or the like, the outer vertical leg of an inverted U-shaped spacer bracket **33**. The inner vertical leg of each bracket **33** is frictionally engaged by the inner leg of the inverted U-shaped sliding guide member **34**. Both legs of each of the guide members **34** are provided with suitable non-circular apertures **35** (FIG. 3) slidably receiving a similarly shaped, non-circular cross sectional portion of a horizontal shaft **36** extending transversely below the feed table **11** and rotatably supported in any suitable manner at its ends in the depending side flanges **21** of the table. Secured to each guide member **34** and extending upwardly through a tapped aperture adjacent the outer end thereof is a stud bolt **37** which extends a short distance upwardly into the lower end of a suitable coil spring **38** shown in broken lines in FIG. 1. The upper end of each of these springs similarly engages a depending stud formed on a friction shoe or plate **39** which is urged upwardly into engagement with the lower surface of the non-circular portion of the shaft **36** by its associated spring **38**.

A vertically disposed and longitudinally extending side rail, indicated generally by reference numeral **41**, is operatively associated with each of the horizontal slides **25** and includes a depending portion **42** for the major portion of its length which is only slightly shorter than the associated aperture **23** in the table **11** and extends therethrough immediately adjacent the outer edge of the associated slide **25**. Each of these depending portions **42** is provided with a non-circular aperture similar to the apertures **35** in the sliding guide members **34** for slidingly engaging the non-circular portion of the horizontal shaft **36**. As best seen in FIG. 1, the friction plate **39** slidably engages the inner surface of the outer leg of the associated sliding guide member **34** and the outer surface of the depending portion **42** of the associated side rail **41**. The lower ends of the depending portions **42** terminate in inwardly extending horizontal flanges **43** (FIG. 1) which are secured, as by welding or the like, to the transverse portion of the associated guide member **34**. It will thus be seen that the guide member **34** and spacer bracket **33** secure the associated horizontal slide **25** to its vertical side rail **41** for selective lateral adjustment as a unit relative to the feed table **11** and the other side rail and its associated horizontal slide means **25**, with the friction shoe **39** and its coil spring **38** comprising means for frictionally constraining the associated horizontal slide and side rail means jointly against lateral movement to retain the same in selected adjusted positions. At the same time, by virtue of being journaled in the depending side flanges **21** of the table **11**, the shaft **36** pivotally supports the side rail means **41** intermediate the ends thereof for conjoint vertical movements relative to the horizontal slide means **25** and the feed table **11**. To facilitates effecting such pivotal movements of the side rails **41**, each of them is provided with an outwardly extending horizontal flange **44** at its rear end (FIG. 1).

Sheet corner engaging and restraining means, indicated generally by reference numeral **45**, are provided at the forward ends of the side rails **41** for movement vertically therewith and laterally therewith and relative thereto. In the embodiment of the invention herein illustrated, each side rail **41** is provided at its forward end with an outwardly extending horizontal flange **46**. The shank or main body portion of a finger **47** lies below each of the horizontal flanges **46** and is pivotally secured thereby to means of a rivet, or the like, **48**. The tail or rear end of each finger **47** terminates adjacent the rear end of its associated flange **46** and is serrated, as best seen in FIG. 2, to pro-

vide three vertically extending notches **49** in its end surface. The vertically coiled rear end of a spring latch **51** is selectively engageable with one of these notches **49** and also engages in a suitable notch in the rear end of the flange **46** to prevent its lateral displacement relative to the latter. The forward end of the spring **51** is anchored by the rivet **48**. With this arrangement, pivotal movement of the finger **47** may be effected selectively relative to the supporting flange **46** to one of three positions, an intermediate position shown in FIGS. 2 and 4 and at the left side of FIG. 1 in which the center notch **49** is engaged by the spring latch **51**, an "inner" position as shown in FIG. 5 in which the spring **51** engages the innermost notch **49**, and an "outer" or inoperative position shown at the right side in FIG. 1 in which the spring **51** engages the outermost notch **49**. Movement of a finger **47** between these three positions may be effected by lateral finger pressure against the forward end of the finger to overcome the latching effect of the spring and cam the rear end thereof upwardly relative to the flange **46** by means of the side surfaces of the notches **49**. It will be appreciated, of course, that any other suitable means may be employed for latching each finger **47** in any one of its selectively adjustable positions.

The purpose of so adjustably mounting each finger **47** is to selectively vary the restraining effect of the finger against forward movement of the uppermost sheet in a stack during a sheet feeding operation. To this end, also, the forward end of each of the fingers **47** extends upwardly from the main body thereof adjacent the front end of the flange **46**, continues forwardly in an inwardly angularly offset portion **52**, and terminates in a downwardly extending front flange **53**. This front flange **53** of each finger **47** will constitute a stack engaging member for limiting forward movement of stacked sheets when the finger is in an operative position, as shown in FIGS. 4 and 5, and the offset portion **52** of the finger is so disposed as to overlie and rest upon the adjacent front cover portion of the uppermost sheet in the stack. On the other hand, when the forward end of a finger **47** is moved outwardly to the position illustrated at the right side in FIG. 1, it is rendered inoperative, the offset portion **52** and the front flange **53** thereof then being disposed outwardly of the vertical sheet guiding plane defined by the associated side rail **41**.

Means are provided for limiting forward movement of a stack of sheets adjacent the center of the table **11** which, in the embodiment herein illustrated, comprises a vertical finger **54** formed at the forward end of an elongated member **55** that is secured, as by means of a screw **56**, at its rear end to the transverse shaft **36** (FIG. 3). When the side rails **41** are in their lowermost position, as shown in full lines in FIG. 3, the upper end of this center finger **54** extends upwardly through a laterally extending slot **57** in the table **11** to a point slightly below the sheet supporting surfaces of the table. As the forward ends of the side rails **41** are swung upwardly, the finger **54** is correspondingly moved therewith to constitute a center stop means for limiting forward movement of a stack of sheets on the table. The slot **57** also accommodates the front flanges **53** on the fingers **47** when the side rails **41** move downwardly.

Index means may be provided to facilitate the selective adjustment of the fingers **47** which, in the embodiment herein illustrated, includes three dots **58** inscribed upon the upper surface adjacent the forward end of each horizontal flange **46** for visual cooperation with an index line **59** inscribed in the rear surface of the vertically extending portion of the finger, and the words "round," "square," and "off" inscribed upon the upper surface of the flange **46** respectfully adjacent the inner, center, and outer dots **58**. Thus, as shown at the left side in FIG. 1 and in FIG. 4, when the index **59** is aligned with the center "square" dot **58**, the offset portion **52** of that finger **47** is adapted to engage a predetermined area of a properly positioned sheet **12** having square corners at its forward end. Likewise, when the index **59** is positioned in alignment with the inner "round" dot **58** as seen in FIG. 5, the offset portion **52** will engage a predetermined area of a properly positioned sheet **12R** having round corners at its forward end. In the main, the several parts are so dimensioned that substantially the same area of a square-cornered sheet is engaged when the finger **47** is in its intermediate position of FIG. 4 as is engaged thereby of a sheet having rounded corners when the finger is in its innermost position as illustrated in FIG. 5. Thus, substantially the same restraining effect will be had with respect to sheets having differently shaped corners so as to insure accurate feeding operations under all circumstances. It will be appreciated that, if for any reason it is desired to place a greater restraining effect upon square-cornered sheets than is obtained with the finger disposed in its intermediate position of FIG. 4, such may be accomplished by selectively moving the finger to its innermost "round" position so as to engage a much larger area of the corner portion of the square-cornered sheet. It also will be appreciated that there are times when the weight or stiffness of the sheets being fed is such that it will be desirable to engage only one of the two forward corners in order to assure proper operation. This may readily be accomplished merely by movement of one of the fingers **47** to its outermost "off" or inoperative position as shown at the right side in FIG. 1. And if it is desired to hand-feed sheets, the side rails **41** may be employed for their guiding function with both of the fingers **47** moved to such an inoperative position.

What is claimed is:

1. Sheet guiding mechanism, comprising means for supporting a stack of sheets for the purpose of having the uppermost sheets fed forwardly individually therefrom, longitudinally extending side rail means laterally adjustably mounted for edge-engagement with said stack, and sheet restraining means comprising finger means for engagement with the forward portion of the uppermost sheet in said stack selectively adjustably mounted for movement relative to said side rail means between inoperative and a plurality of operative positions to vary the restraining effect thereof against forward movement of the uppermost said sheet.

2. Sheet guiding mechanism according to claim **1**, wherein said side rail means comprises two vertical side rails selectively laterally adjustable relative to each other, and said finger means comprises a finger adjustably mounted on each said rail.

3. Sheet guiding mechanism according to claim **2**, wherein said sheet supporting means includes a horizontal table having an aperture associated with each said side rail extending front-to-rear for a major portion of the length of the latter, each said side rail having a depending portion only slightly shorter than the length of the associated said aperture and extending therethrough, said apertures being wide enough to accommodate lateral adjustments of said side rails, and a horizontal slide operatively associated with each said side rail to substantically cover the associated said aperture when the side rail is in an outermost position to receive said stack and insure against jamming of any sheets therein under said side rails, one of said horizontal slides being vertically offset relative to the other to facilitate inward adjustment of said side rails to within a distance from each other of substantially the width of a said slide.

4. In sheet guiding mechanism according to claim **1**, latching means for retaining said finger means in any selected said position.

5. In sheet guiding mechanism according to claim **2**, vertical pivot means for mounting each said finger on its associated said side rail for lateral movement of the sheet-engaging portion thereof between an outermost inoperative position and a plurality of inner operative positions.

6. In sheet guiding mechanism according to claim 5, latching means for retaining each said finger in any selected said position.

7. Sheet guiding mechanism according to claim 2, wherein said sheet supporting means includes a horizontal table, horizontally disposed pivot means mounted on said table or pivotally and laterally slidably mounting said side rails, and a flange on each side rail manually depressible to raise said fingers to facilitate placement of a stack of sheets thereunder on said table.

8. In sheet guiding mechanism according to claim 1, horizontal slide means operatively associated with said side rail means for receiving a stack of sheets and laterally adjustably movable with said side rail means, and means for frictionally constraining said horizontal slide means and said side rail means jointly against lateral movement to retain the same in selected adjusted positions.

9. In sheet guiding mechanism according to claim 8, a horizontal shaft journaled for rotation on said stack supporting means and having a main portion of non-circular cross-section for slidably engaging said side rail means to pivotally support the latter intermediate the ends thereof.

10. In sheet guiding mechanism according to claim 9, manually depressible means formed integrally with said side rail means for imparting pivotal movement to the latter to raise said sheet restraining means.

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U.S. Cl. X.R.

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