United States Patent [19]

Sick

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[54] **ADJUSTABLE PAPER STACK GUIDE APPARATUS**

[75] Inventor: **Milton W. Sick,** Rochester, N.Y.

[73] Assignee: **Eastman Kodak Company,** Rochester, N.Y.

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[21] Appl. No.: **349,522**

Related U.S. Application Data

[63] Continuation of Ser. No. 203,959, Dec. 2, 1971, abandoned.

[52] **U.S. Cl.** **271/171**

[51] **Int. Cl.** **B65h 1/04**

[58] **Field of Search** 271/171, 170, 169, 145, 271/86, 144

[56] **References Cited**

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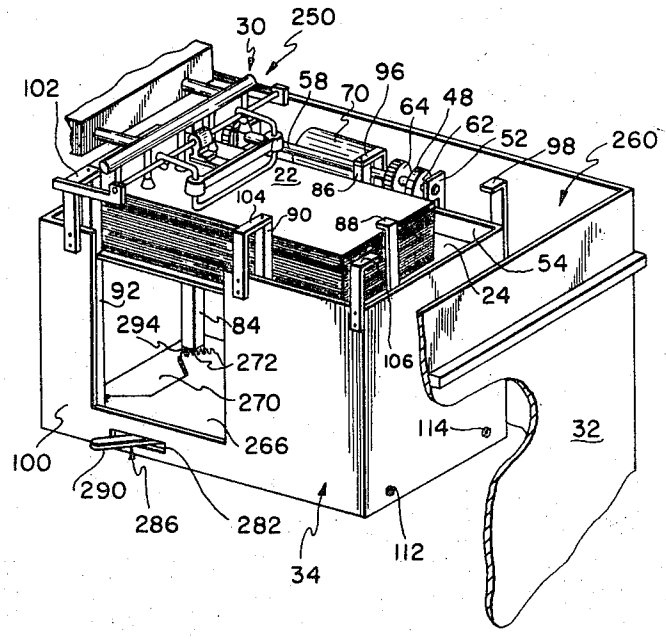
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Primary Examiner—Evon C. Blunk
Assistant Examiner—Bruce H. Stoner, Jr.
Attorney, Agent, or Firm—L. P. Kessler

[57] **ABSTRACT**

Adjustable paper stack guide apparatus having at least one set of square, rotatable guide members which are individually rotatable in 90° increments, each guide member in a set rotating in opposite directions. A large, rotatable drive plate having a plurality of gear segments thereon is positioned with the gear segments in meshing engagement with a like number of rotatably mounted gudgeon gears. Each guide member is fixedly mounted to one of the gudgeon gears, but positioned so that center of rotation of the gudgeon gears is off-axis with respect to the center of the guide members. Rotation of the drive plate will cause the guide members to rotate, thereby varying the distance between guide members in a particular set, allowing the apparatus to accommodate a range of different size paper.

7 Claims, 7 Drawing Figures



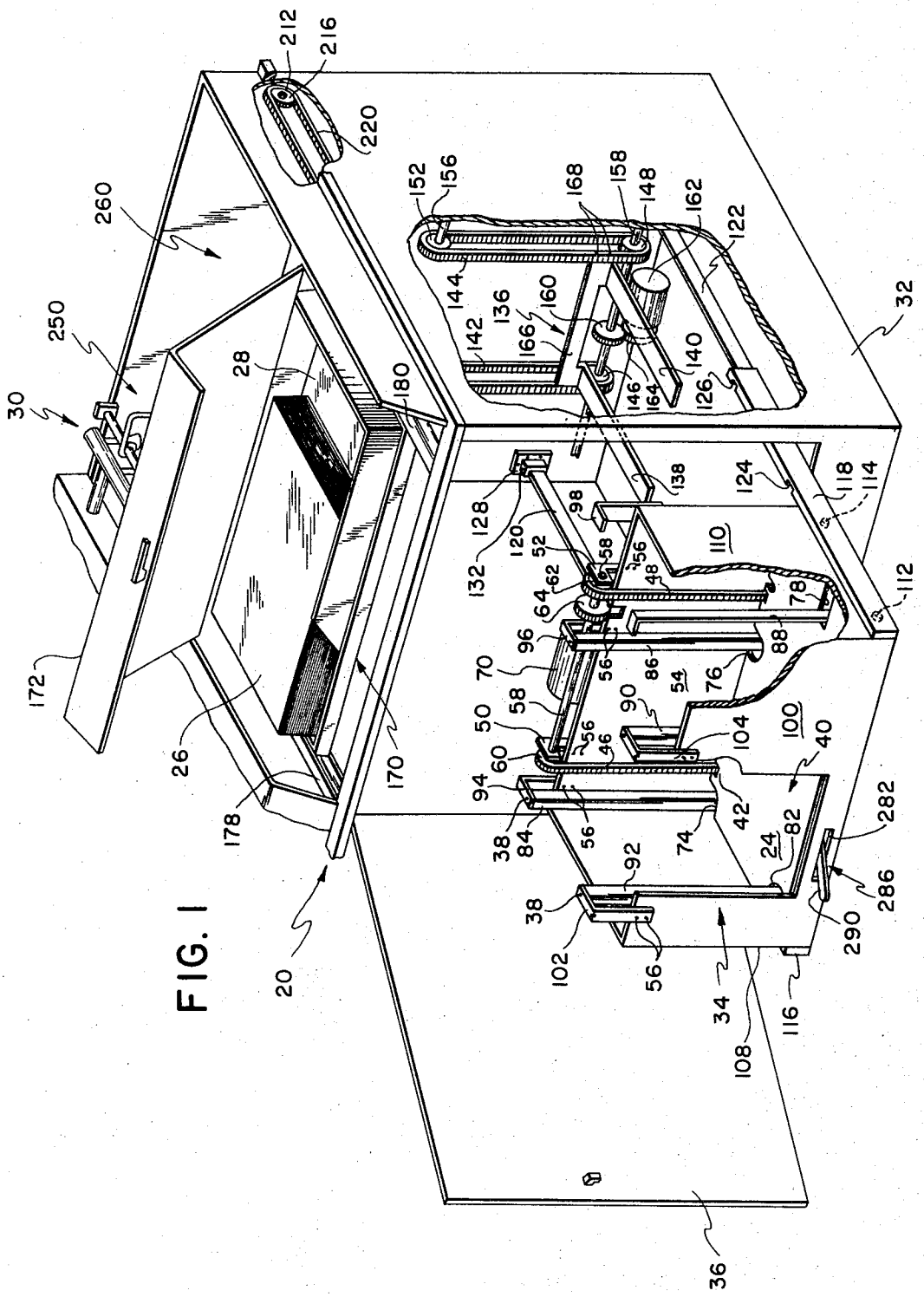
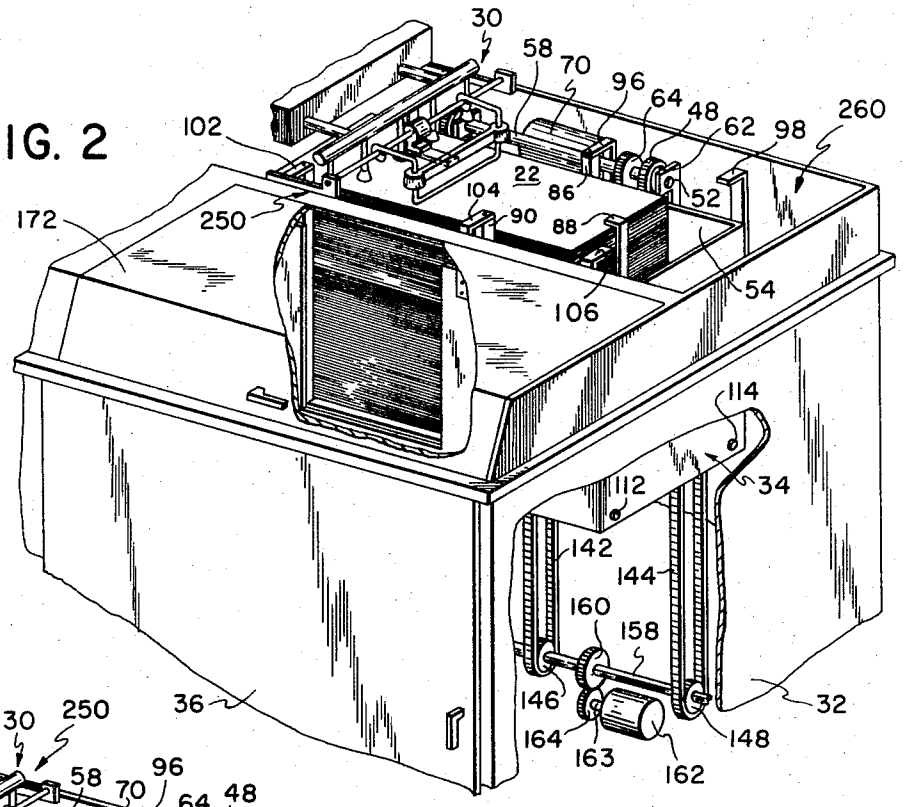

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FIG. 1

FIG. 2



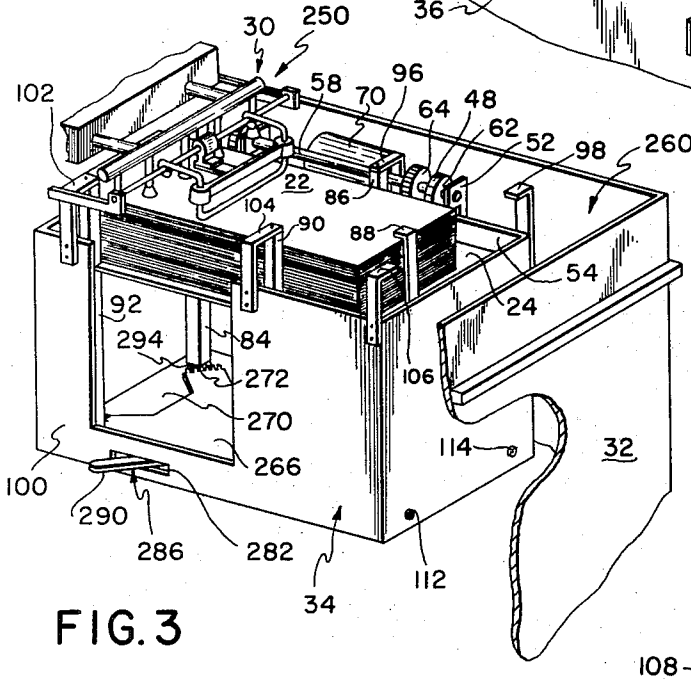


FIG. 3

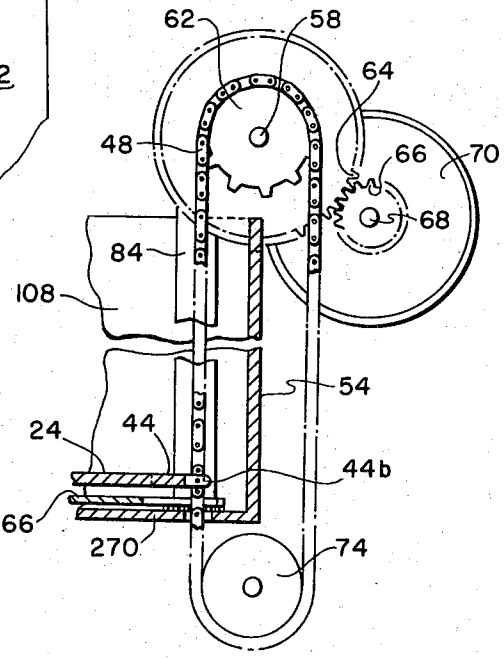


FIG. 4

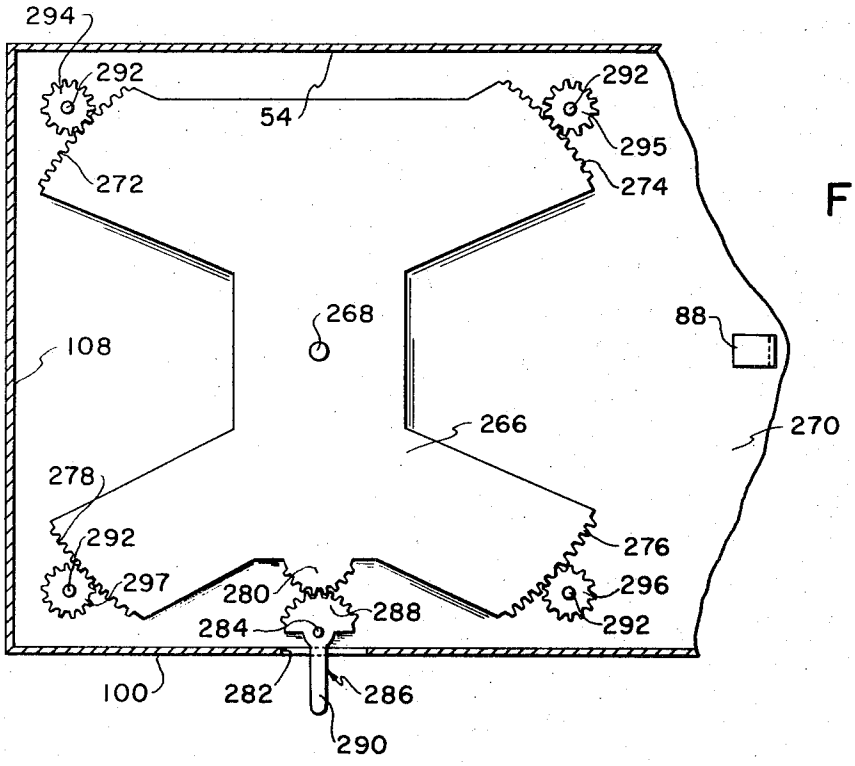


FIG. 5

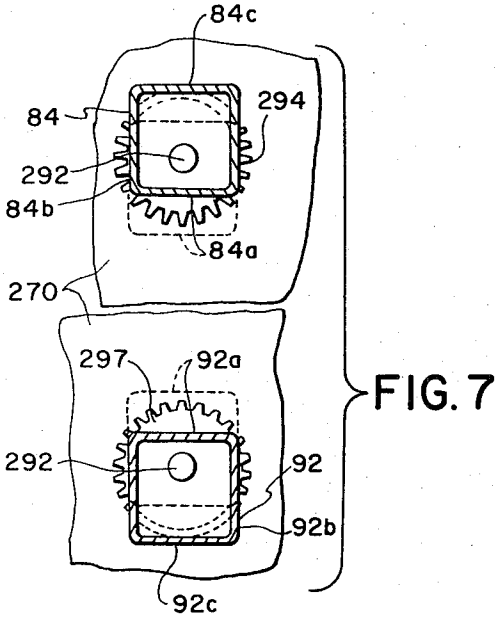
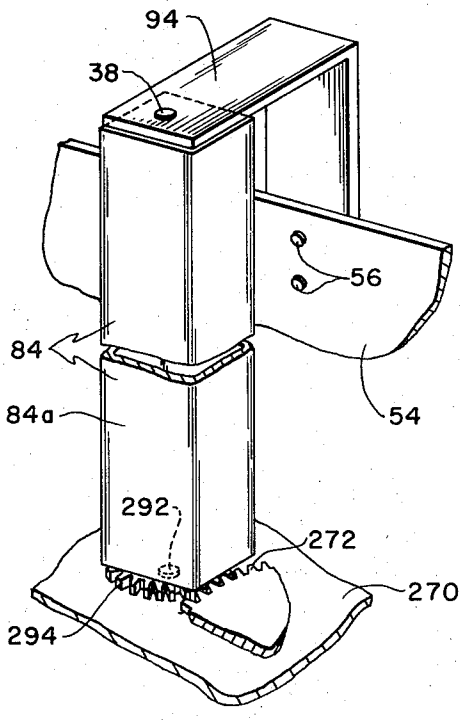


FIG. 7

FIG. 6



ADJUSTABLE PAPER STACK GUIDE APPARATUS

This application is a continuation of application Ser. No. 203,959, filed Dec. 2,1971 now abandoned.

CROSS-REFERENCES TO RELATED APPLICATIONS

Reference is hereby made to commonly assigned and copending U.S. Pat. application Ser. No. 204,131, entitled SHEET HANDLING APPARATUS and filed on DEC. 2, 1971, in the name of Donald J. Albert. Reference is also made to commonly assigned U.S. Pat. application Ser. No. 29,403, now U.S. Pat. No. 3,617,048 entitled VACUUM PAPER FEEDER, filed on Apr. 17, 1970, in the name of Donald J. Albert and commonly assigned U.S. Pat. application Ser. No. 40,028, now U.S. Pat. No. 3,627,308. entitled SHEET SEPARATOR, filed on May 25, 1970, in the name of Hans O. Stoever.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to paper stack guide apparatus and, more particularly, to adjustable paper stack apparatus capable of accommodating different sized paper.

2. Description of the Prior Art

Those familiar with the art know that the general approach to retaining or positioning a stack of sheet material, such as paper, is to provide adjustable side guides that are brought together by hand, screw feed, rack and pinion feed or like arrangement. All such sheet guide devices have drawbacks in that the guide members must be locked or, even if locked, fail to hold the paper stack in the proper position required for sheet feeding.

With the exception of special purpose copy paper, such as preprinted forms, the normally encountered and used copy paper widths throughout the world are 8, 8¼ or 8½ inches. Consequently, any paper stack guide apparatus must be adjustable to at least accommodate these sizes in order to gain universal acceptance. However, such apparatus should be free of the prior art defects.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide adjustable paper stack apparatus which need not be locked in place.

It is another object of the present invention to provide such apparatus which is relatively easy to adjust.

It is an additional object of the present invention to provide such apparatus wherein the spacing between the guides is automatically fixed, in the absence of a paper stack, to the correct distance.

Accordingly, there is provided for use in a copying machine or similar environment, adjustable paper stack guide apparatus for positioning and retaining a stack of sheet material such as copy paper. A drive gear is provided and rotatably mounted to the floor of a paper stack carrying carriage. The drive gear is mounted between a movable platform on which the paper stack is to be placed and the carriage floor. Also rotatably mounted to the carriage floor is a plurality of gudgeon gears, each of which meshingly engages and is driven by the drive gear. Mounted fixedly to the gudgeon gears, but off-axis with respect to the center of rotation of those gears, are square guide members which rise vertically in the carriage above the platform. The platform has a plurality of notches cut therein which provide clearance for the guide members, allowing the platform to be raised without interference between it or the guide members.

Other objects, advantages and uses of the present invention will become apparent from the detailed description of the preferred embodiment set forth in particular below.

BRIEF DESCRIPTION OF THE DRAWINGS

In the detailed description of the preferred embodiment of the present invention set forth below, reference is made to the accompanying drawings in which:

FIG. **1** is an isometric view of a cabinet, partially broken away for illustrative purposes, and having a main door and an auxiliary door both shown open, which cabinet houses the present invention, showing a first or main carriage, also partially broken away for illustrative purposes, a second or auxiliary carriage and a fork lift mechanism;

FIG. **2** is another isometric view of the FIG. **1** arrangement with both doors closed, the first carriage raised by the fork lift mechanism to its uppermost limit and the auxiliary door partially broken away with the second carriage omitted for clarity purposes;

FIG. **3** is yet another isometric view of the FIG. **1** arrangement broken away more fully to show the first carriage supported stack of sheets elevated to an operative position adjacent sheet feeding apparatus;

FIG. **4** is a side elevation, partly in section, of the first carriage platform drive arrangement;

FIG. **5** is a top plan view, partly in section, of the bottom of the first carriage showing the paper guide mechanism employed therein;

FIG. **6** is an isometric view of one of the paper guides illustrating its adaptation in the first carriage; and

FIG. **7** is a top plan view, partly in section and partly broken away, showing the cooperation between two facing paper guides.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein like reference numerals have been used in the several views for like elements, FIG. **1** illustrates sheet handling apparatus, generally indicated by reference numeral **20.** The sheet handling apparatus **20** is designed to deliver a first stack of sheets **22** (see FIG. **2**) supported on platform **24** or a second stack of sheets **26** supported on auxiliary tray **28** to sheet feeding apparatus **30.**

As will be become clearer from a reading of the detailed description below, the sheet handling apparatus **20** is capable of delivering almost any type of sheet to the sheet forwarding apparatus **30.** Consequently, while in the following description reference is made to the delivery of paper sheet stacks to the sheet feeding apparatus of a xerographic or copying machine, the present invention is not so limited, the xerographic use being exemplary only.

Cabinet **32** houses a main paper supply carriage **34** slidably mounted therein for movement from the rear of the cabinet **32** to the front thereof. A hinged door **36** provides access to carriage **34** for paper loading purposes through opening **40** in front wall **100** of the car-

riage housing **34.** The platform **24** is mounted within housing **34** and is formed with two yoke sections **42** and **44** in its rear edge. Fixedly pinned between the yoke arms of yoke **42,** as shown in FIGS. **1** and **4,** is a first endless vertical platform drive chain **46.** Fixedly pinned between the yoke arms of yoke **44** is a second vertical endless platform drive chain **48.** Two inverted L-shaped support brackets **50** and **52** are fixedly mounted to the rear wall **54** by means of rivets **56,** or any other known joining technique. A shaft **58** is journalled in brackets **50** and **52** for rotation in the leg portions thereof and extends therethrough as shown in FIG. **1.** Chain drive gears **60** and **62** are fixedly mounted on shaft **58** for rotation therewith. Also fixedly mounted to shaft **58** is driven gear **64** which, as shown in FIG. **4,** is mounted thereon in meshing engagement with respect to drive gear **66.** As is also shown in FIG. **4,** drive gear **66** is fixedly mounted to shaft **68** of the reversible platform drive motor **70.** Motor **70** is bolted to rear wall **54** by a bracket (not shown) at a proper height for engagement of gears **64** and **66.** The vertical platform drive chains **46** and **48** are drivingly looped about chain drive gears **60** and **62** respectively at their upper ends and about idler pulleys **72** and **74** respectively at their lower ends.

Platform **24** has a number of notches, **74, 76, 78, 80** and **82** respectively, cut therein. Extending through these openings are paper edge guides **84, 86, 88, 90** and **92,** respectively. The details of operation of the paper edge guides shall be hereinafter set forth. For purposes of the description to that point, it is sufficient to appreciate that the paper stack **22** to be supported on platform **24** is properly positioned or guided by the paper edge guides **84, 86, 88, 90** and **92.** Fixedly mounted to rear wall **54,** by rivets **56,** are three inverted L-shaped support brackets **94, 96** and **98.** Paper edge guides **84** and **86** are journeled respectively to the legs of brackets **94** and **96,** but do not move or rotate unless adjusted in a manner to be hereinafter explained. Fixedly mounted to front wall **100,** by rivets **56,** are three inverted L-shaped brackets **102, 104** and **106.** Paper edge guides **90** and **92** are journaled respectively to the legs of brackets **102** and **104** and, similarly to paper edge guides **84** and **86,** do not move or rotate unless adjusted. It should be noted that the top surfaces of brackets **94, 96, 98, 102, 104** and **106** all lie in the same horizontal plane.

Rotatably fastened to carriage side wall **110** is a set of rollers **112** and **114,** illustrated in FIGS. **1–3.** An identical set of rollers (not shown) is rotatably fastened to side wall **108.** The respective roller sets are fitted in races within outer slides **116** and **118** which are mounted at the respective bottoms of side walls **108** and **110.** Each of the outer slides **116** and **118** engages an inner slide, **120** and **122** respectively. The roller sets can ride for a portion of their travel between facing surfaces of the slidably mated inner and outer guides. Each of the outer guides **116** and **118** are formed with a pair of spaced openings in the top of the rear portion thereof. Outer guide **118,** for example, is formed with openings **124** and **126** therein. Furthermore, the distance between the centers of openings **124** and **126** is equal to the distance between the centers of rollers **112** and **114,** with each of the openings **124** and **126** being slightly larger than the diameter of rollers **112** and **114.** The identical arrangement for guide **116** is not shown, but is also provided. Inner guides **120** and **122** are mounted respectively in rear brackets **128** and **130,** each of which has a magnetic catch **132** and **134** mounted to the front portion thereof. Thus, when carriage **34** is slid to the rear of cabinet **32,** magnetic catches **132** and **134** secure the rearmost portions of outer guides **116** and **118** respectively. The slide mechanism utilized to move carriage **34** to and from its rear ready position and its forward loading position is known and requires no further detailed explanation. Not shown, for example, are the internal guide stops which limit the forward travel of carriage **34.**

With both the platform **24** and fork lift mechanism fully lowered, carriage **34** can be manually rolled to its front loading position. After a full stack **22** of copy paper has been loaded onto platform **24** and positioned thereon by the paper guides **84, 86, 88, 90** and **92,** the carriage **34** is returned to its rear ready position and the main door **36** closed. For purposes of this description, the rear ready position of first carriage **34** is reached when magnetic catches **132** and **134** secure the rearmost portions of outer guides **116** and **118** respectively, as described above. When this occurs, the carriage **34** is positioned over a powered fork lift mechanism **136,** having two tines **138** and **140,** which extend forward from the rear of cabinet **32.** The fork lift mechanism **136** comprises a pair of drive chains **142** and **144** which are drivingly looped about driven gears **146** and **148** at their respective lower ends and about idler gears **150** and **152** at their upper ends. Each of the idler gears **150** and **152** are rotatably mounted on shafts **154** and **156** respectively. Each of the driven gears **146** and **148** are fixedly mounted on shaft **158** which is journaled in the side walls of cabinet **32** by means of retaining brackets (not shown). Also mounted on shaft **158** for rotation therewith is driven gear **160** which meshingly engages drive gear **164** fixedly mounted to the shaft **163** of reversible motor **162.** Lastly, the vertical bar **166** joining tines **138** and **140** of the fork lift mechanism **136** is pinned at each end thereof to the drive chains **142** and **144** by fastening means **168.**

To deliver paper stack **22** to the sheet forwarding apparatus **30,** the details of which are set forth in the above-referenced U.S. Pat. application Ser. Nos. 29,403 and 40,028, now U.S. Pat. Nos. 3,617,048 and **3,627,308** respectively, carriage **34** is manually pushed to the rear of cabinet **32.** The subsequent operations for effecting delivery of paper stack **22** to the sheet forwarding apparatus are described in detail in commonly assinged and copending U.S. Pat. application Ser. No. 204,131, the details of which are not essential to the understanding of the present invention.

Referring now to FIGS. **5, 6** and **7,** there is shown a mechanism for locating or positioning the main paper stack **22** on platform **24.** As shown in FIG. **5,** a large segmented gear plate **266** is rotatably coupled by a pin **268** to the floor **270** of carriage **34.** Plate **266** is formed of five gear segments **272, 274, 276, 278** and **280** and is positioned with gear segment **280** facing and aligned with opening **282** in the front wall **100** of carriage **34.** Rotatably mounted by pin **284** just inside front wall **100** and aligned with opening **282** is a paper guide actuator **286** having a handle **290** which protrudes through opening **282** and a segmented gear section **288** which meshingly engages gear segment **280.** The resulting mechanical advantage of the mating of gear segments **280** and **286,** allows even the frailest operator to pivot han-

dle 290 to operate the paper locating or positioning mechanism.

Rotatably mounted to floor 270 by pins 292 are four gudgeon gears 294, 295, 296 and 297. Pins 292 are located so that each of the gudgeon gears 294-297 is drivingly engaged by or meshed respectively with gear segments 272, 274, 276 and 278. Fixedly mounted to each of gears 294–297 respectively for rotation therewith are the square paper guides 84, 86, 90 and 92. As shown in FIGS. 1 and 6, each of the paper guides 84, 86, 90 and 92 are rotatably mounted to brackets 94, 96, 104 and 102 by pins 38. As shown in FIGS. 6 and 7, the paper guides 84, 86, 90 and 92 are mounted off-axis with respect to pins 292. Consequently, when lever 290 is moved from its center position, the spacing or distance between facing sides of any two of the facing paper guides changes.

The versatility achieved thereby works in the following manner. Each of the paper guides 84, 86, 90 and 92 is mounted off-axis by a predetermined amount with respect to the center of pins 292. In order to accept the three most commonly used widths of copy paper (8, 8¼ and 8½ inches), the paper guides are choosen to be ¾ inch squares. As indicated in FIG. 7, with respect to paper guide 84 in particular, and the same being true for paper guides 86, 90 and 92, a first side 84*a* is spaced ¼ inch from a parallel centerline through pin 292, a second side 84*b* is spaced ⅜ inch from a parallel centerline through pin 292 and a third side 84*c* is spaced ½ inch from a parallel centerline through pin 292. With each of the facing paper guides, 84 and 92, and 86 and 90 positioned so that the center of rotation about pins 292 is fixed at 9 inches, it can be readily seen that: when sides 84*a* and 92*a* face each other, they are separated by 8½ inches; when sides 84*b* and 92*b* face each other, they are separated by 8¼ inches; and when sides 84*c* and 92*c* face each other, they will be 8 inches apart. Illustrated in solid lines, in section, in FIG. 7, are paper guides 84 and 92 rotated by moving lever 290 fully to the right so that sides 84*a* and 92*a* face each other. Full movement of lever 290 to the right from its center position causes paper guides to be rotated 90°. Shown in dotted lines in FIG. 7 is the position assumed by paper guides 84 and 92 when lever 290 is pushed fully to its left which brings sides 84*c* and 92*c* parallel to each other. The spacing between paper guides 84 and 86, as also between paper guides 90 and 92, is held at and remains at 7 ⅝ inches regardless of how the paper guides' surfaces are aligned. This feature is designed to prevent the smallest width of copy paper expected to be used, 8 inches, as well as the other widths of 8¼ and 8½ inches, from being incorrectly oriented on platform 24 which could cause jamming of the platform as it is raised or lowered or improper paper feeding.

It will be appreciated that by altering the dimensions and/or cross-sectional configuration of the paper stack guides and the placement of pins 292, or some combination of these, the above-described adjustable paper stack guide apparatus can be adapted to accommodate even greater or the same number of different width copy paper. Also of interest is the fact the present paper stack guide apparatus is positively adjustable to the correct spacing without need of first loading a paper stack therein. Furthermore, since the adjustment of this apparatus is positive, there is no need to provide a locking mechanism for the guide members since, once loaded, the copy paper stack prevents any movement thereof should there be any spurious movement of gear plate 266 of handle 290.

A label (not shown) is affixed to front wall 100 of carriage 34 beneath opening 282 and indicates the three different sized widths of copy paper acceptable on platform 24. By moving the lever 290 to the width of paper to be used, the paper guides are easily and quickly rotated into proper orientation to accept the selected copy paper stack. The copy paper stack 22 is then placed on platform 24 where it is restrained across its width by paper guides 84, 86, 90, and 92, at one end by side wall 108 and at the other end by paper guide 88. As the copy paper stack 22 is raised along with platform 24, in the manner previously described, notches 74, 76, 78, 80 and 82 provide clearance respectively for vertically fixed paper guides 84, 86, 88, 90 and 92. The properly located and restrained main paper stack 22 is then ultimately delivered to the sheet feeding apparatus 30, also as previously described.

It should or may be noted that paper guides have been omitted from the drawings with respect to the auxiliary tray 28. Since the positioning and retention of paper stack 26 is of as much concern as that of paper stack 22, it is appreciated that some arrangement of paper guides or locating projections or the like are needed. However, with respect to the auxiliary tray, any one of many known paper stack guide means, such as hand movable slides, screw-fed guides or rack and pinion operated guides, may be used.

The invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

I claim:

1. Apparatus for operatively positioning any of a plurality of different width stacks of sheet material on a supporting platform to enable the feeding of sheets therefrom, said apparatus comprising:

a. a first elongated guide member operatively associated with such supporting platform and being of uniform cross-section and mounted for rotation about an axis which is parallel to and displaced from the length centerline of said first guide member and which is perpendicular to such supporting platform,

said first guide member having a plurality of engaging means, at least two of which are at differing distances from said axis, (1) for engaging the lateral side of a stack, positioned on such platform, at more than one spaced line of contact to prevent rotation of the first guide member about its axis when one of the engaging means is in engagement with the lateral side of the stack, and (2) for guiding the sheets from such positioned stack during feeding;

b. a second elongated guide member operatively associated with such supporting platform and being similar to said first guide member and mounted for rotation about an axis which is parallel to and displaced from the length centerline of said second guide member and parallel to the length centerline of said first guide member,

said second guide member having a plurality of engaging means, at least two of which are at differing distances from said axis, (1) for engaging the

lateral side of a stack, positioned on such platform, at more than one spaced line of contact to prevent rotation of the second guide member about its axis when one of the engaging means is in engagement with the lateral side of the stack, and (2) for guiding the sheets from such positioned stack during feeding;

c. means operatively coupling said first and second guide members for synchronous rotational movement about the rotational axes thereof to change, by the same amount, the effective distance of the engaging means of said first and second guide members from an imaginary first plane,

said first plane being parallel to said axes and to the direction of such feeding of sheets, and equidistant from said axes,

said effective distance being the perpendicular distance between said first plane and imaginary planes lying tangent to the facing engaging means of said first and second guide members, and parallel to said first plane; and

d. means for rotating said first and second guide members to determine said effective distance in accordance with any such width.

2. The invention according to claim **1** wherein said axes of rotation are within the periphery of a cross-section of said first and second guide members.

3. The invention according to claim **1** wherein the cross-section of said first and second guide members is such that a line passing through the center thereof divides said cross-section into two congruent geometric figures.

4. The invention according to claim **1** wherein said elongated guide members are of multilateral cross-section.

5. The invention according to claim **1** wherein:

a. said first and second guide members are of multilateral cross-section;

b. said coupling means includes:

first and second gears fixedly mounted on said first and second guide members, respectively, so that the axes of rotation of said gears are coincident with the axes or rotation of said guide members, and

a plate rotatably mounted in operative relation to such supporting platform having a segmented gear portion in meshing engagement with said first and second gears whereby a rotation of said plate results in synchronous rotation of said guide members; and

c. said axes of rotation are within the periphery of a cross-section of said first and second guide members.

6. Apparatus for operatively positioning any of a plurality of different width stacks of sheet material on a supporting platform to enable the feeding of such sheet material therefrom, said apparatus comprising:

a. first, second, third and fourth elongated guide members operatively associated with such supporting platform and being of multilateral, uniform cross-section and mounted respectively for rotation about individual axes which are parallel to and displaced equal amounts from the length centerlines of said guide members and which are perpendicular to such supporting platform,

said guide members each having a plurality of engaging means, at least two of which are at differing distances from said axis of the respective guide member, (1) for engaging the lateral side of a stack, positioned on such platform, at more than one spaced line of contact to prevent rotation of the respective guide member about its axis when one of the engaging means is in engagement with the lateral side of the stack, and (2) for guiding the sheets from such positioned stack during feeding;

said first guide member having a first engaging means parallel to an imaginary bisecting plane which is parallel to the axes of rotation of said guide members and to the direction of such feeding of sheet material,

said second guide member having a second engaging means parallel to and facing said first engaging means, said first and second engaging means, and respective axes thereof, being equidistant from said bisecting plane,

said third guide member having a third engaging means parallel to and in the same plane as said first engaging means, the respective axes of said first and third guide members defining a plane parallel to said bisecting plane,

said fourth guide member having a fourth engaging means parallel to and in the same plane as said second engaging means, the respective axes of said second and fourth guide members defining a plane parallel to said bisecting plane;

b. means operatively coupling said first, second, third and fourth guide members for synchronous rotational movement about the rotational axes thereof to change by the same amount the perpendicular distance of said first, second, third and fourth engaging means from said bisecting plane; and

c. means for rotating said first, second, third, and fourth guide members to determine said perpendicular distance in accordance with any such width.

7. The invention according to claim **6** wherein said individual axes of rotation are within the periphery of a cross-section of said first, second, third and fourth guide members.

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