

June 20, 1961

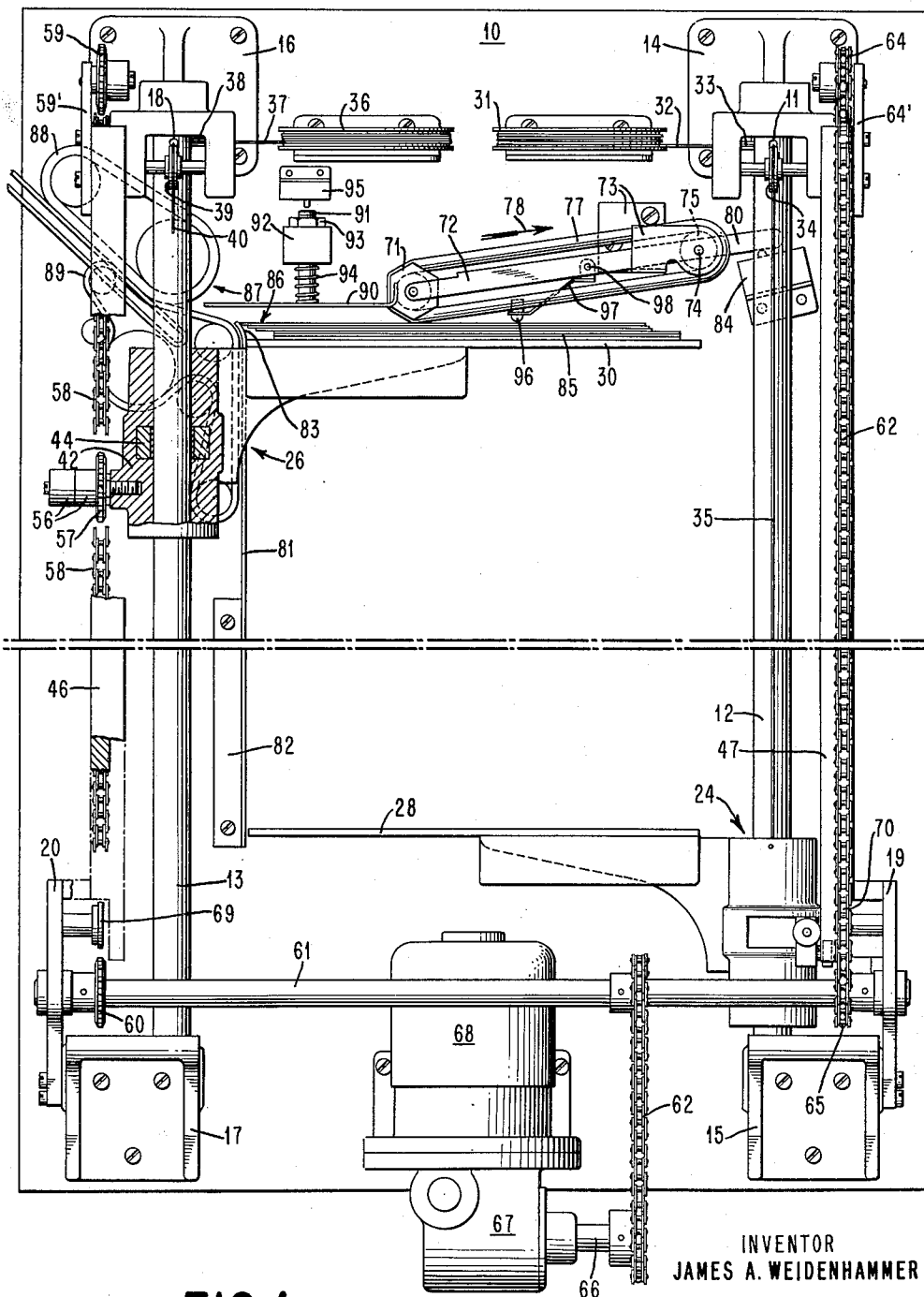
J. A. WEIDENHAMMER

2,989,307

SHEET FEEDING APPARATUS

Filed Nov. 12, 1958

3 Sheets-Sheet 1



June 20, 1961

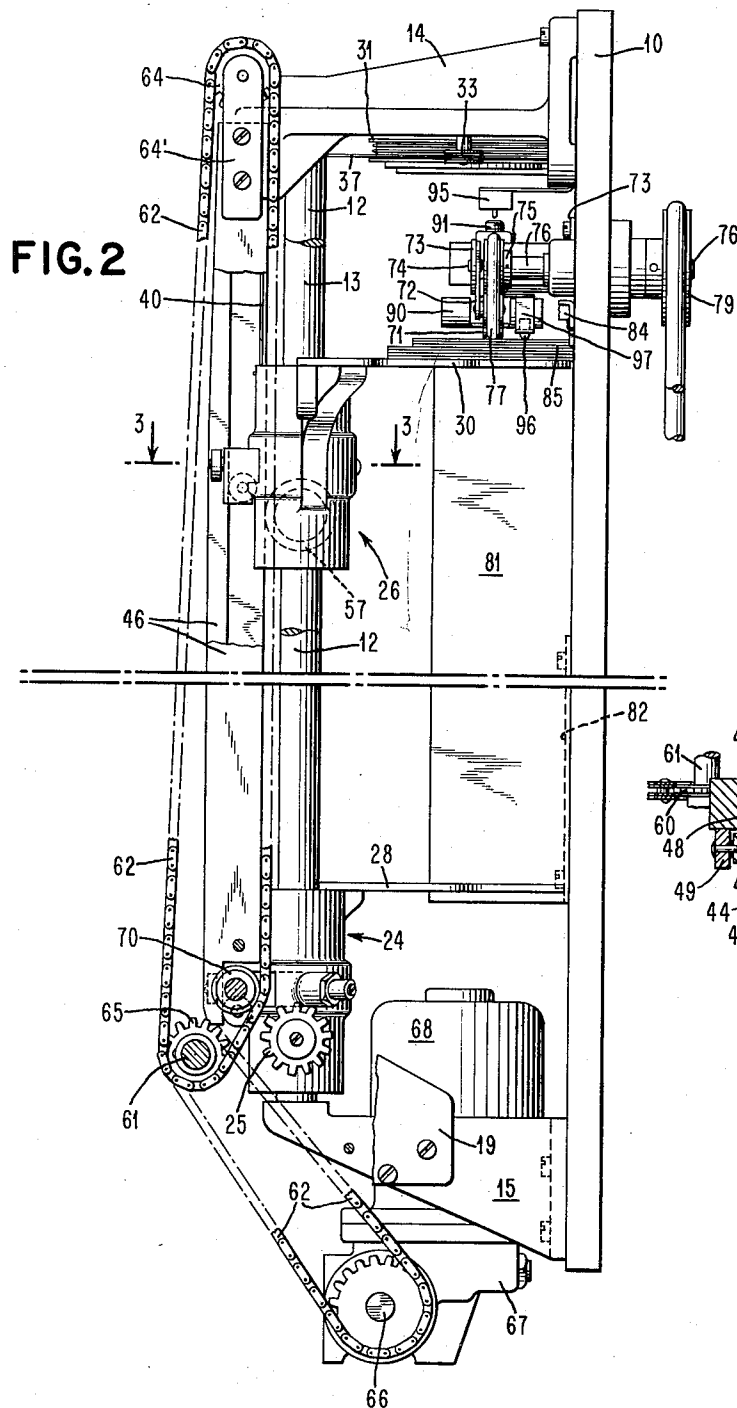
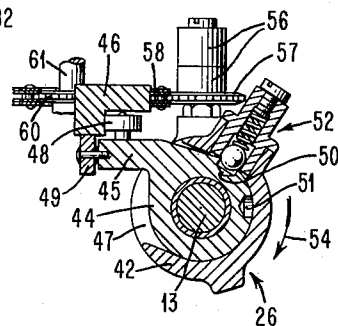
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3 Sheets-Sheet 3

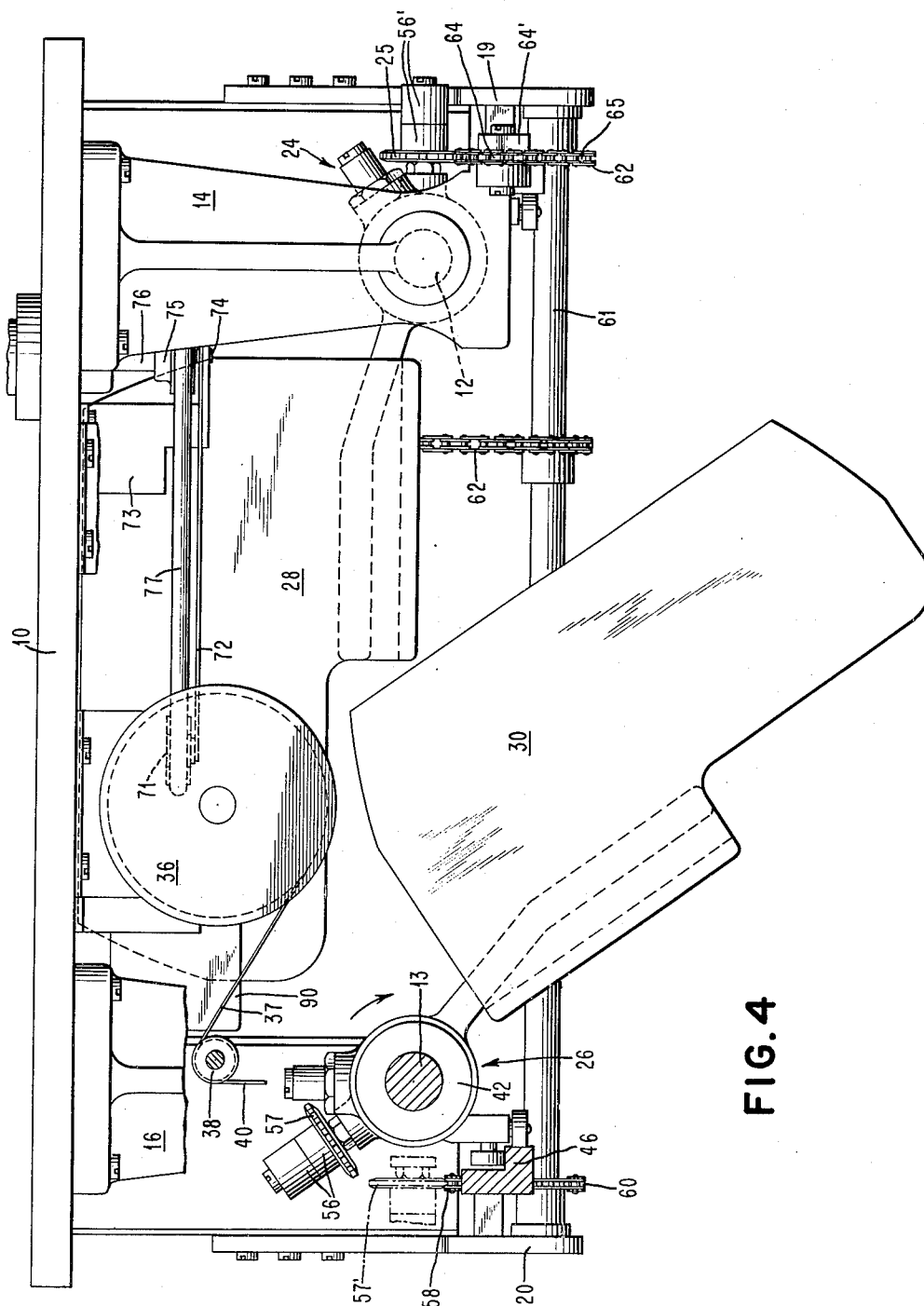


FIG. 4

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2,989,307

SHEET FEEDING APPARATUS

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7 Claims. (Cl. 271-62)

This invention relates to sheet feeding apparatus and more particularly to apparatus for feeding a succession of random sized sheets such as bank checks from a stack thereof. The feeding apparatus is adapted to deliver sheets to sheet separating apparatus of, for example, the type disclosed in the co-pending patent application of R. J. Furr and E. M. Valehrach, Serial No. 777,058, filed November 28, 1958.

It is the primary object of the invention to provide apparatus for feeding sheets successively from a stack thereof and more particularly for continuously feeding sheets from the top of a stack while providing for the addition of successive stacks of sheets to the bottom of the stack. This arrangement provides the highly desirable feature of feeding from the top of a stack, thus the feeding is not influenced by the weight of the stack, and at the same time, the arrangement provides for uninterrupted feeding during those time periods when additional sheets are being added to the stack.

It is a further object of the invention to provide sheet feeding apparatus adapted to handle sheets of various sizes, i.e., various lengths, widths, and thicknesses, and sheets formed of various paper stocks having various thickness, hardness and surface finish, such as encountered in the feeding of a stack of random bank checks which may be printed on papers ranging from punch card paper to light weight printing stock.

It is a further object of the invention to provide apparatus for feeding sheets which will feed sheets even though they may be creased or wrinkled.

An additional object of the invention is the provision of apparatus having maximum ease of operation including ease of loading and positioning sheets therein, visibility of all of the sheets and operative elements of the apparatus, and facility of loading, positioning and aligning of sheets in the apparatus.

It is a further object of the invention to provide sheet feeding apparatus which will, by its arrangement, provide for the accomplishment of various manipulative operations, such as loading, etc., by an operator at elevations and locations conveniently accessible to the operator.

The foregoing and other objects of the invention relating particularly to the construction and operation thereof will become evident from the following description when read in conjunction with the accompanying drawings in which:

FIGURE 1 is a front elevation partly in section of apparatus embodying the invention;

FIGURE 2 is a partially cut away side view showing the right hand side of the apparatus shown in FIGURE 1;

FIGURE 3 is a horizontal section taken on the trace 3-3 in FIGURE 2;

And, FIGURE 4 is a partially cut away top view of the apparatus with some parts displaced from the positions shown in FIGURES 1 and 2.

The apparatus is mounted on a vertical base plate 10 and includes a pair of vertically extending columns 12 and 13 positioned in spaced relation from the plate 10 by means of brackets 14 and 15 supporting the upper and lower ends, respectively of the column 12 and brackets 16 and 17 supporting the upper and lower ends, respectively, of the column 13.

A support assembly indicated generally at 24 in FIG-

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URE 1, is vertically slidable and horizontally rotatable on the column 12. A similar support assembly indicated generally at 26 in FIGURE 1, is vertically slidable and horizontally rotatable on the column 13. The support assembly 24 mounts a platform 28 shown in FIGURE 1 as extending across the space between the columns 12 and 13. The support assembly 26 mounts a platform 30 shown in FIGURE 1 as extending across the space between the column 13 and the column 12.

Counter weight means is provided for the support assemblies and their associated plates. The counter weight means for the support assembly 24 is in the form of a clock spring arrangement 31 in FIGURE 1. This clock spring may be of the type, for example, employed to return a typewriter carriage or may be in the form of the well-known Negator constant tension spring motor.

A cable 32 extending from the clock spring 31 passes around a pulley 33 affixed to the bracket 14, through a bore 11 in the upper end of the column 12 and around a pulley 34 mounted at the upper end of the column 12. The cable passing over the pulley 34 extends downwardly as indicated at 35 and is affixed to the support bracket 24.

A similar clock spring 36 is affixed to the base plate 10 and has its cable 37 passing around a pulley 38 affixed to the bracket 16, through a bore 18 in the upper end of the column 13, over a pulley 39 mounted at the upper end of the column 13 and downwardly as indicated at 40. The lower end of the cable 40 is shown as cut away. It will be evident, however, that it is attached to the support assembly 26 in the same manner as that in which the cable 35 is attached to the support assembly 24. Thus, the two springs provide individual counter balance for the two support assemblies and their associated platforms.

The support brackets 24 and 26 are right and left hand parts, respectively, of similar construction. Bracket 26 is shown in vertical section in FIGURE 1 and in horizontal section in FIGURE 3. Each support bracket includes an outer member 42 and an inner member 44. The outer member 42 is rotatable on the inner member 44.

Adjacent to the column 13 is a vertically extending angle member 46 having its upper and lower ends supported by the brackets 16 and 17, respectively. Similarly, an angle member 47 is positioned adjacent to the post 12 and has its upper and lower ends supported by brackets 14 and 15, respectively.

As is best shown in FIGURE 3, each inner member 44 includes an outwardly extending arm 45 which passes through a slot 47 in the wall of its outer member 42. A roller 48 is mounted on the arm 45 and is adapted to roll on an inner surface of its associated angle member 46, in FIGURE 3. A similar roller 49 is mounted on the arm 45 and is adapted to roll on an outer surface of its angle member 46, in FIGURE 3. Thus, each inner member 44 is permitted to slide vertically on its associated column and is restrained against rotation thereon by engagement of the rollers supported thereby with its associated vertically extending angle member.

Each inner member 44 is formed with a pair of sockets shown at 50 and 51 in FIGURE 3. Each outer member 42 is provided with means for mounting a spring loaded ball as is indicated generally at 52 in FIGURE 3, the ball being positioned to enter the socket 50 when the parts are in position as shown in FIGURE 3. The outer member is, however, rotatable on the inner member in the direction indicated by the arrow 54 in FIGURE 3 and upon such rotation the ball will move out of the socket 50 and drop into the socket 51. Thus, the ball and socket arrangement provides indexing for two rotational positions of the outer member 42 on the inner member

44. In FIGURE 4, the platform 30 is shown rotated forwardly or outwardly and when the platform is in this position, its associated ball is in socket 51 whereas when either platform is in the position of the platform 28 as shown in FIGURE 4, its associated ball is in socket 50.

A one-way clutch assembly 56 of conventional construction is mounted on the outer member 42 as shown in FIGURE 3 and mounts a sprocket 57 which is rotatable in one direction and not rotatable in the opposite direction. A similar clutch 56' operating in a reverse direction mounts a sprocket 25 on the support bracket 24. The clutch and sprocket 57 are so positioned that the sprocket 57 engages a chain 58 which is positioned between the sprocket and the angle member 46 when its associated platform is in the position of the platform 28 shown in FIGURE 4, and in the position of the platform 30 in FIGURES 1 and 2. The angle member 46 serves to prevent lateral displacement of the chain and disengagement of the sprocket therefrom.

It will be evident that when the outer member 42 is rotated in the direction of the arrow 54 shown in FIGURE 3, the sprocket 57 will move away from the chain 58. This position is shown in FIGURE 4 where the sprocket 57 is disengaged from the chain 58 and the platform 30 is in a forward position. The engaged position of the sprocket 57 is shown in construction lines at 57'.

The clutch 56 acts to permit the support bracket 26 to be raised in overrunning relation with the chain 58 while causing the support bracket to be raised when the chain is raised.

The chain 58 is an endless chain passing over an upper sprocket 59 supported by a plate 59' affixed to the bracket 16 and passing over a lower sprocket 60 mounted on a shaft 61 mounted for rotation in plates 19 and 20 supported by the brackets 15 and 17, respectively. A similar chain 62 is associated with the vertical angle member 47 and the sprocket 25 mounted on the support assembly 24. The chain 62 passes over an upper sprocket 64 supported by a plate 64' affixed to the bracket 14 and passes over a lower sprocket 65 mounted on the shaft 61. The chains 58 and 62 pass over idler sprockets 69 and 70 respectively mounted on plates 20 and 19 respectively.

The shaft 61 is driven by means of a chain 62 running over a sprocket thereon and the chain is in turn driven by a sprocket on a shaft 66 extending from a speed reducer 67 which is driven by a motor 68.

From the foregoing, it will be evident that either or both of the two support assemblies and their respective platforms can be carried upwardly by their associated chains when their platforms are rotated to an inward position, i.e., a position adjacent to the plate 10 such as that occupied by the plate 28 in FIGURE 4. On the other hand, when either of the platforms is rotated outwardly to the position of the plate 30 shown in FIGURE 4, its sprocket is disengaged from its driving chain and the support assembly and platform may be lowered.

In the lowermost platform position, i.e., that of platform 28 shown in FIGURES 1 and 2, the sprocket carried by the support assembly, sprocket 25 for support assembly 24, is disengaged from its associated drive chain. Thus, a platform not in use may be positioned at rest at the lowermost end of its support column.

When it is desired to bring a platform into operation, the platform may be manually raised on the column until its sprocket wheel engages its associated chain and even then the platform may be raised upwardly manually to any desired height with the sprocket in engagement with the chain and with sprocket wheel mounting clutch providing its overrunning function. When, however, the platform is no longer being raised manually, the platform and its support assembly will be supported by the chain and will be carried upwardly whenever the chain is driven by the motor 68. Means will be hereinafter described for limiting the upward travel of the platforms 28 and 30.

A hexagonal grooved pulley 71 is positioned above the

platforms 28 and 30 and is rotatably mounted on the left end of an arm 72 as viewed in FIGURE 1. The arm 72 is pivoted at 74 adjacent to its opposite end on a bracket 73 mounted on the plate 10 and extending under the arm 72 to limit downward pivoted rotation of the arm 72. A grooved pulley 75 is mounted on one end of a shaft 76 extending through and rotatably mounted in the plate 10 and has its axis of rotation extending through the pivot 74. A belt 77 extends around pulleys 71 and 75 and is driven in the direction of the arrow 78 by suitable conventional drive means driving a pulley 79 affixed to the other end of the shaft 76. The belt 77 is preferably made of rubber or other flexible high friction material which will be effective to advance sheets from a stack positioned therebelow.

The right hand end 80 of the arm 72, as viewed in FIGURE 1, extends beyond the pivot 74 and is positioned to engage a switch 84 when the hexagonal pulley 71 and the left hand end of the arm 72 are raised above a predetermined level. The switch 84 is supported from the plate 10.

A vertically extending plate 81, positioned perpendicular to the plate 10, is formed with a flange 82 affixed to the plate 10. The plate 81 is positioned adjacent to the left hand end portions of the platforms 28 and 30 as viewed in FIGURE 1 and is formed with its upper edge 83 curved to the left as viewed in FIGURE 1.

In operation of the apparatus, a stack of sheets to be fed may be positioned on either of the platforms and raised upwardly until the uppermost sheet of the stack is either in engagement with the belt on the pulley 71 or in engagement with the underside of the other platform. If the uppermost sheet is in engagement with the underside of the other platform, the other platform may be swung outwardly, i.e., to the position of platform 30 shown in FIGURE 4, and lowered downwardly to the at rest position, i.e., the position of the platform 28 shown in FIGURE 1. If the said other platform was carrying a stack of sheets, the sheets may be held in position against the plate 10 by the operator as the platform is swung outwardly whereupon the stack of sheets that was on the upper platform will drop downwardly slightly and fall upon the stack of sheets on the lower platform which, as has been described, have been previously raised upwardly to a position with the uppermost sheet on the stack on the lower platform in engagement with the underside of the upper platform.

A stack of sheets carried by either of the platforms may be manually pressed backwardly into engagement with the back plate 10 and should be positioned so as to be adjacent to, but not necessarily in contact with, the guide plate 81. Such a stack of sheets is indicated at 85 on the platform 30 in FIGURES 1 and 2.

As previously described, a platform carrying a stack of sheets may be lifted by an operator in overrunning relation with its drive chain. As the platform is lifted the uppermost sheet of the stack will eventually engage the belt on the hexagonal pulley 71 raising the pulley, pivoting the arm 72 in a clockwise direction, and closing the switch 84.

The switch 84 is connected in a conventional manner, not shown in the drawings, so as to provide starting control for the motor 68. When the switch 84 is actuated by contact with the end 80 of the arm 72, further operation of the motor 68 is arrested. On the other hand, when the uppermost sheet of the stack 85 has not raised the pulley 71, sufficiently to cause actuation of the switch 84, the motor 68 will be operating and raising either of the platforms in engagement with its associated driving chain. Thus, with the parts arranged as shown in FIGURES 1 and 2, if the switch is not closed by the arm 80, the motor 68 will be running, raising the platform 30 until the uppermost sheet thereon has raised the hexagonal pulley 71 sufficiently to cause closure of the switch 84 whereupon further operation of the motor 68 is ar-

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rested. It will be evident that this arrangement serves to provide for the maintenance of a substantially constant level of the uppermost sheet of the stack 85.

In normal operation of the apparatus, the shaft 76 is driven and the belt 77, in engagement with the uppermost sheet of the stack, is serving to urge the uppermost sheet of the stack to the left as viewed in FIGURE 1. As will be evident from FIGURE 1, the hexagonal pulley 71 serves to deform the belt 77 as the belt passes around the pulley and thus during document feeding the pulley 71 tends to bounce and jostle the checks thus facilitating separation of adjacent sheets and reduces the tendency of adjacent sheets to stick together and to be fed at one time. Thus, the sheets will be displaced in a shingled relation as indicated generally at 86 in FIGURE 1 and the uppermost sheet will ultimately be driven into sheet separating and feed means indicated generally at 87.

The sheet separation and feed means includes an upper belt 88 driven in the direction to carry sheets away from the stack 85 and a lower belt 89 moving relatively slowly in the opposite direction serving to prevent advancement of more than one sheet at a time. This apparatus has been disclosed in the co-pending application noted above and need not be described in detail herein.

It will be evident from the drawings that the upper end 83 of the guide plate 81 serves to prevent advancement of more than a relatively few sheets from the top of the stack 85. There is also provided a horizontal plate 90 which is supported above the stack of sheets 85 by means of a post 91 extending upwardly therefrom and passing through a block 92 affixed to the base plate 10. The upper end of the post 91 is threaded and is provided with a nut 93 which normally rests upon the block 92 limiting downward motion of the post 91 and the plate 90. A spring 94 is positioned between the plate 90 and the block 92 serving to insure positioning of the plate 90 in its lowermost position as shown in the drawing.

A switch 95 is mounted by means of a suitable bracket from the base plate 10 and positioned with its actuating member located above the upper end of the post 91. The position of the switch 95 is such that in the event that a stack of checks is raised upwardly by an operator to a height above the normal operating position the switch 95 will be actuated. Actuation of the switch 95 serves to control conventional motor reversing means, not shown in the drawings, serving to reverse the motor 68 thus lowering the platform which had been raised above a normal operating position. When the platform is lowered sufficiently that switch 95 becomes deactuated operation of the motor is again controlled by the switch 84.

The plate 90 also serves as a guide preventing the leading edge of the uppermost sheet from turning upwardly and failing to enter between the belts 88 and 89 of the check separating and carry off apparatus.

From the foregoing, it will be evident that the apparatus described provides for the feeding of sheets from a stack thereof and for feeding of the sheets from the top of the stack. Thus, the height of the stack and the condition and sizes of the sheets in the stack have substantially no effect upon each individual sheet as it is fed. At the same time, the apparatus provides for batch loading of the feed mechanism without interruption of operation of the mechanism, i.e., a stack of checks can be placed upon the platform 28 as shown in FIGURE 1 and the platform raised until the uppermost check of the stack is in engagement with the underside of the platform 30, as shown in FIGURE 1, whereupon the platform 30 can be rotated toward the operator permitting the sheets carried thereby to drop for the thickness of the platform 30 and come to rest upon the top of the stack carried by the platform 28 whereupon operation of the apparatus will continue uninterruptedly and the platform 30 may then

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be lowered to an at rest position and a subsequent stack of sheets positioned thereon.

A small weight 96 is mounted on an arm 97 pivotally connected at 98 to the arm 72. The weight is positioned to engage the rear edge of the top sheet of a stack, i.e., the edge adjacent to the plate 10. The weight provides a small drag at the rearward sides and ends of the sheets as they are fed tending to counteract any tendency for the rear ends of the sheets to move outwardly away from the base plate 10 as they are fed toward the separating and feeding apparatus indicated at 87. This tendency becomes particularly apparent as the last few sheets are fed from a platform.

As previously noted, the embodiment of the invention disclosed herein is contemplated for use in feeding bank checks of random sizes and paper stacks. It will be evident, however, that the apparatus may be employed for feeding other documents and for feeding sheets which may be either flat or folded. It will also be evident that various modifications may be made to structural elements employed in the disclosed embodiment of the invention without departing from the scope of the invention as set forth in the following claims.

What is claimed is:

1. Sheet feeding apparatus comprising means for selectively positioning two stacks of sheets one above the other, and means for advancing sheets from the top of the uppermost stack supported by said positioning means, said positioning means including a pair of support means and a pair of platforms for supporting sheets, each of said platforms being slidably and pivotally affixed to a respective one of said support means, said platforms thereby being alternatively movable to a position one above the other, while affixed to said support means, means for selectively elevating said platforms, and means responsive to the level of the top of a stack of sheets supported by the uppermost of said platforms for controlling said elevating means to maintain the top of the stack at a substantially constant level as sheets are advanced therefrom.

2. Sheet feeding apparatus comprising means for selectively positioning two stacks of sheets one above the other, and means for advancing sheets from the top of the uppermost stack supported by said positioning means, said positioning means including a pair of support means and a pair of platforms for supporting sheets, each of said platforms being slidably and pivotally affixed to a respective one of said support means, said platforms thereby being alternatively movable to a position one above the other while affixed to said support means, means for selectively elevating said platforms, and means responsive to the level of the top of a stack of sheets supported by the uppermost of said platforms for controlling said elevating means to raise the stack when the top of the stack is below a predetermined level and to lower the stack when the top of the stack is above a predetermined level.

3. Sheet feeding apparatus comprising means for selectively positioning two stacks of sheets one above the other, and means for advancing sheets from the top of the uppermost stack supported by said positioning means, said positioning means including a pair of columnar supports and a pair of platforms for supporting sheets, each of said platforms being slidably and pivotally affixed to a respective one of said supports, said platforms thereby being vertically and horizontally movable for alternative positioning one above the other, while affixed to said supports, means for selectively elevating said platforms, and means responsive to the level of the top of a stack of sheets supported by the uppermost of said platforms for controlling said elevating means to maintain the top of the stack at a substantially constant level as sheets are advanced therefrom.

4. Sheet feeding apparatus comprising means for selectively positioning two stacks of sheets one above the other, and means for advancing sheets from the top of the uppermost stack supported by said positioning means, said positioning means including a pair of columnar sup-

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ports and a pair of platforms for supporting sheets, each of said platforms being slidably and pivotally affixed to a respective one of said supports, said platforms thereby being manually movable for selective lowering of each of said platforms from a position above the other platform to a position below the other platform, while affixed to said supports, means for selectively elevating said platforms, and means responsive to the level of the top of a stack of sheets supported by the uppermost of said platforms for controlling said elevating means to maintain the top of the stack at a substantially constant level as sheets are advanced therefrom.

5. Sheet feeding apparatus comprising means for selectively positioning two stacks of sheets one above the other, and means for advancing sheets from the top of the uppermost stack supported by said positioning means, said positioning means including a pair of mounting means and a pair of platforms for supporting sheets, each of said platforms being slidably and pivotally affixed to a respective one of said mounting means, power means for selectively elevating said platform mounting means, said mounting means providing for selective manual raising of each of said platforms in overrunning relation with said power elevating means and said mounting means providing for selective manual lowering of each of said platforms from a position above the other platform to a position below the other platform, while affixed to said mounting means, and means responsive to the level of the top of a stack of sheets supported by the uppermost of said platforms for controlling said elevating means to maintain the top of the stack at a substantially constant level as sheets are advanced therefrom.

6. Sheet feeding apparatus comprising means for selectively positioning two stacks of sheets one above the other, and means for advancing sheets from the top of the uppermost stack supported by said positioning means, said positioning means including a pair of platforms for receiving stacks of sheets, a pair of support means, means affixing each of said platforms to a respective one of said support

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means, each said platform being vertically and horizontally movable with respect to its associated support means, whereby said platforms may be alternatively positioned one above the other, means for selectively elevating said platforms, and means responsive to the level of the top of a stack of sheets supported by the uppermost of said platforms for controlling said elevating means to maintain the top of the stack at a substantially constant level as sheets are advanced therefrom.

7. Sheet feeding apparatus comprising means for selectively positioning two stacks of sheets one above the other, and means for advancing sheets from the top of the uppermost stack supported by said positioning means, said positioning means including a pair of platforms for receiving stacks of sheets, a pair of support means, means affixing each of said platforms to a respective one of said support means, each said platform being vertically and horizontally movable with respect to its associated support means, whereby said platforms may be alternatively positioned one above the other, while affixed to said support means, power means for selectively elevating said platforms, means providing for selective manual raising of said platforms in overrunning relation with said power elevating means and means responsive to the level of the top of a stack of sheets supported by the uppermost of said platforms for controlling said power elevating means to maintain the top of the stack at a substantially constant level as sheets are advanced therefrom.

References Cited in the file of this patent

UNITED STATES PATENTS

1,277,139	Schroeder et al.	Aug. 27, 1918
1,287,202	Bowes	Dec. 10, 1918
2,185,947	Neer	Jan. 2, 1940
2,589,428	Pearce	Mar. 18, 1952
2,701,136	Schmidt et al.	Feb. 1, 1955

FOREIGN PATENTS

21,465	Great Britain	Sept. 30, 1912
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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,989,307

June 20, 1961

James A. Weidenhammer

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 8, line 4, after "other," insert -- while affixed to said support means, --.

Signed and sealed this 21st day of November 1961.

(SEAL)

Attest:

ERNEST W. SWIDER

Attesting Officer

DAVID L. LADD

Commissioner of Patents

USCOMM-DC