April 29, 1952 C. O. RUMPH 2,594,499

ROTARY INTERLEAVING APPARATUS

Filed Dec. 28, 1946 5 Sheets-Sheet 1

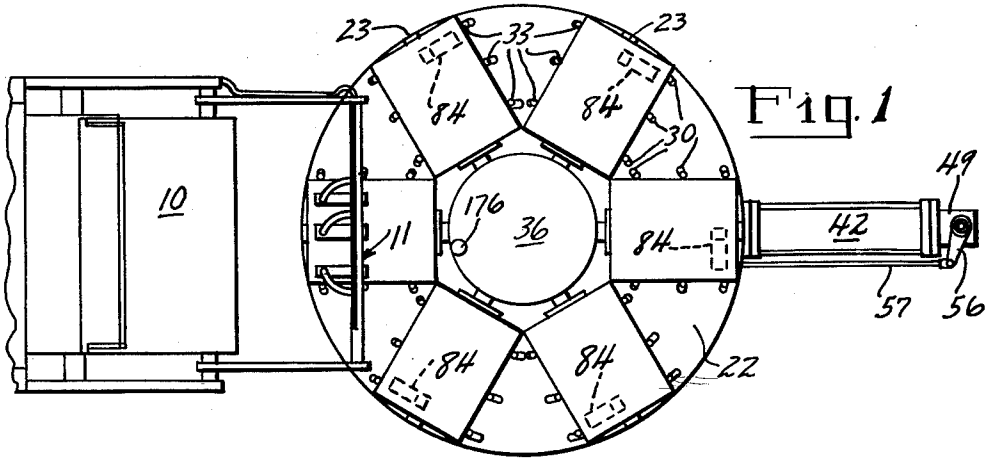


Fig. 1

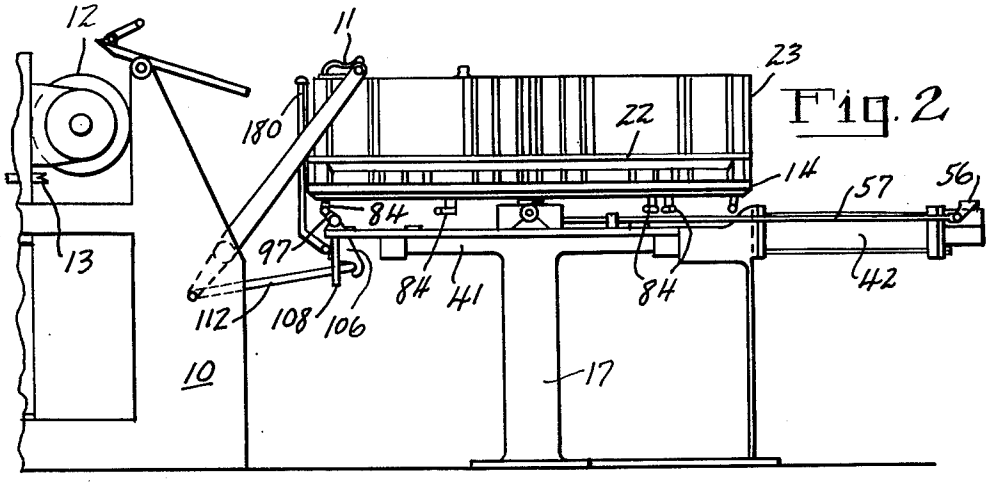


Fig. 2

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ROTARY INTERLEAVING APPARATUS

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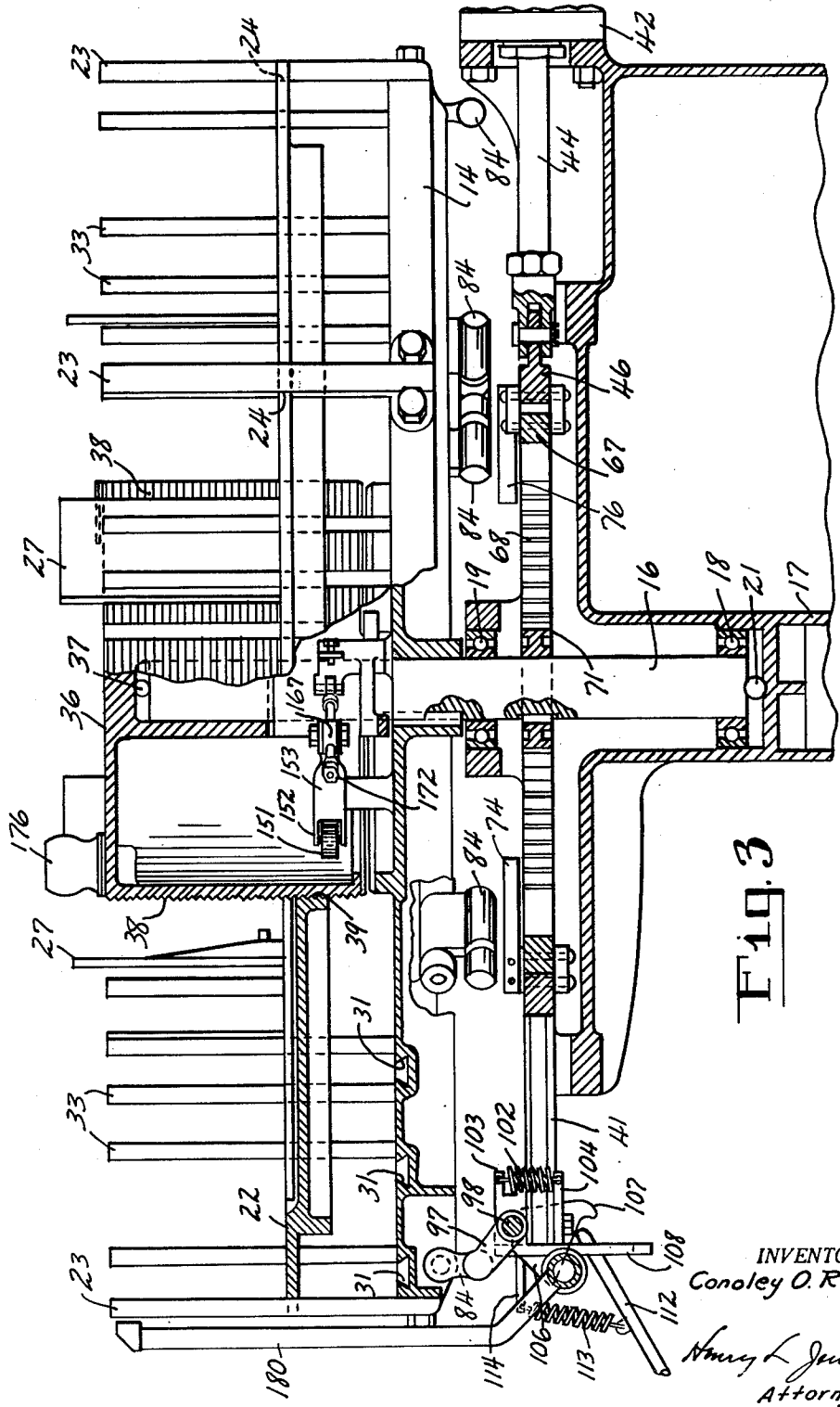


Fig. 3

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ROTARY INTERLEAVING APPARATUS

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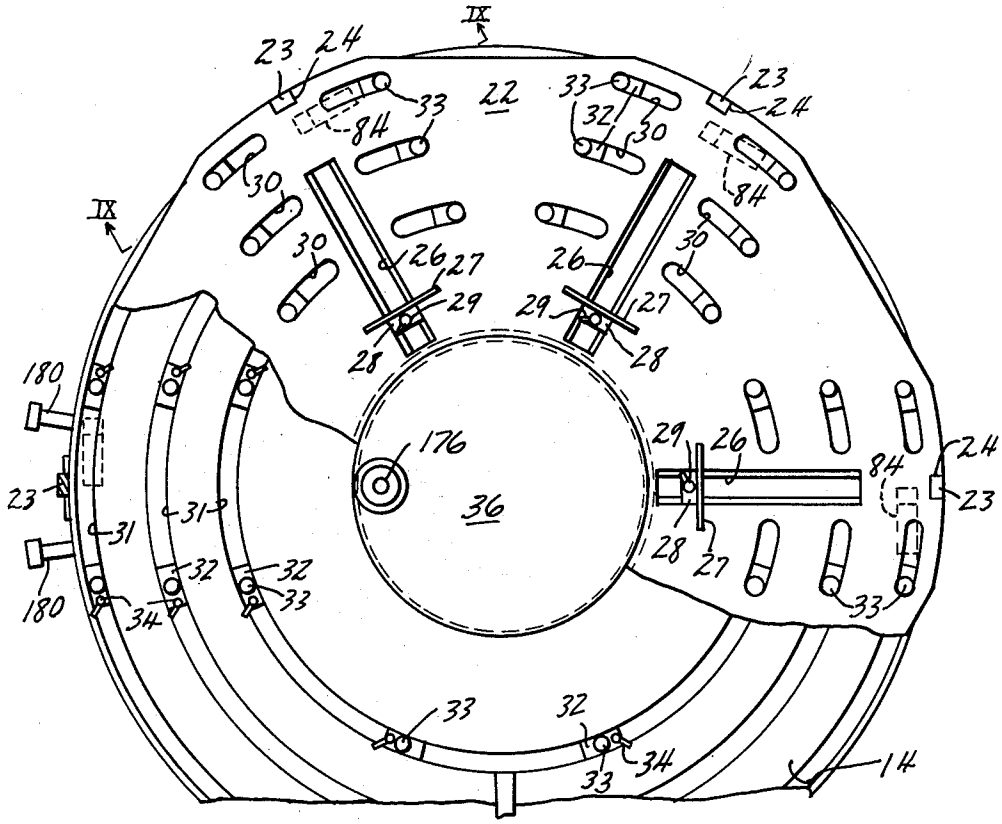


Fig. 4

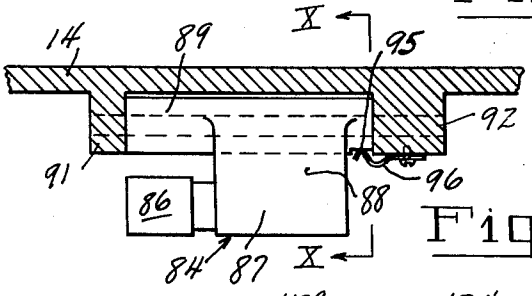


Fig. 9

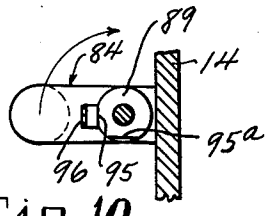


Fig. 10

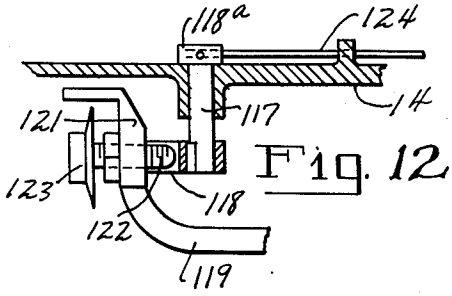


Fig. 12

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ROTARY INTERLEAVING APPARATUS

Filed Dec. 28, 1946 5 Sheets-Sheet 4

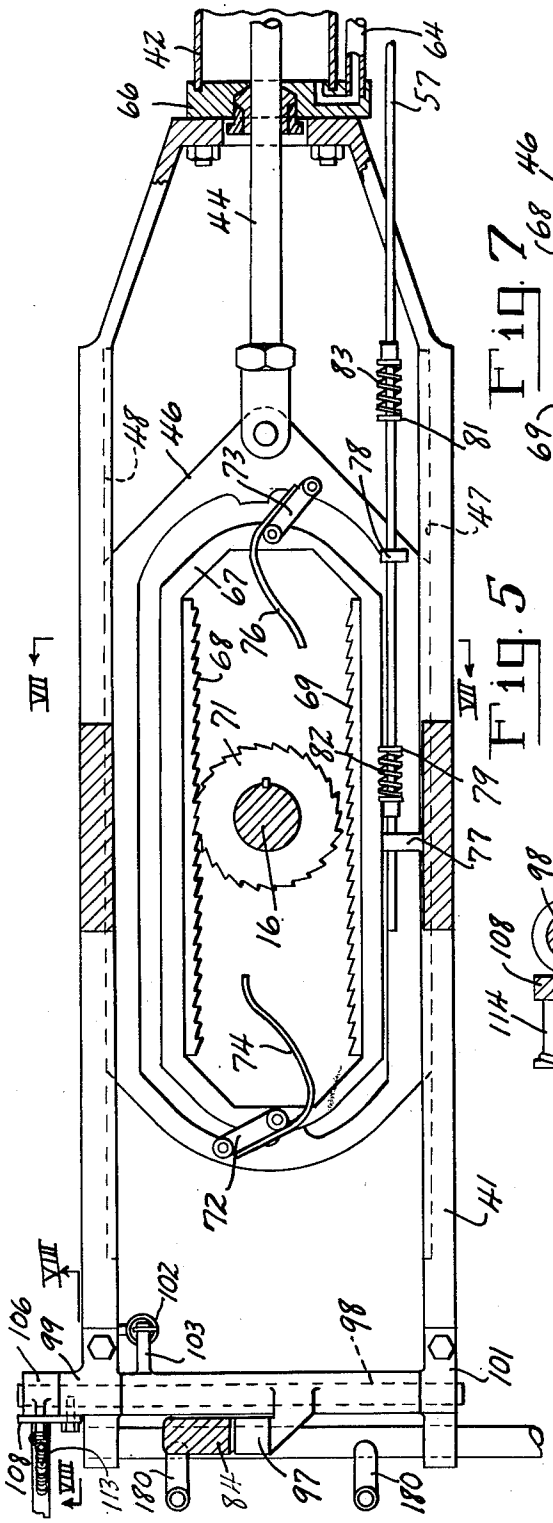


Fig. 5

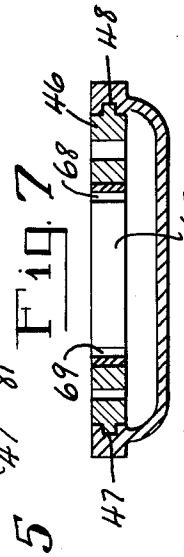


Fig. 7

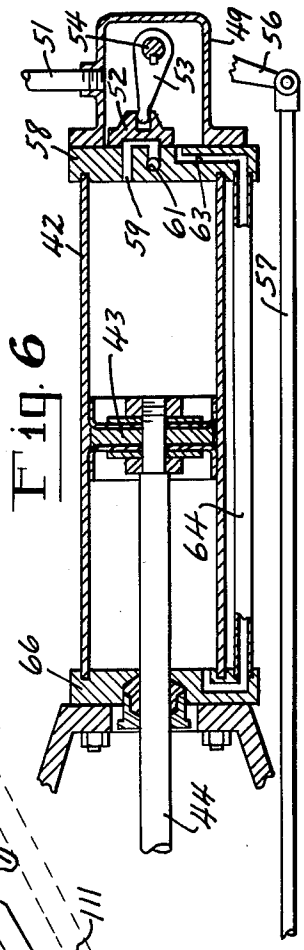


Fig. 6

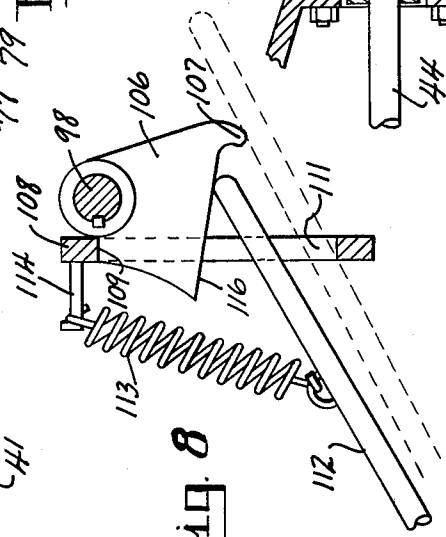


Fig. 8

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ROTARY INTERLEAVING APPARATUS

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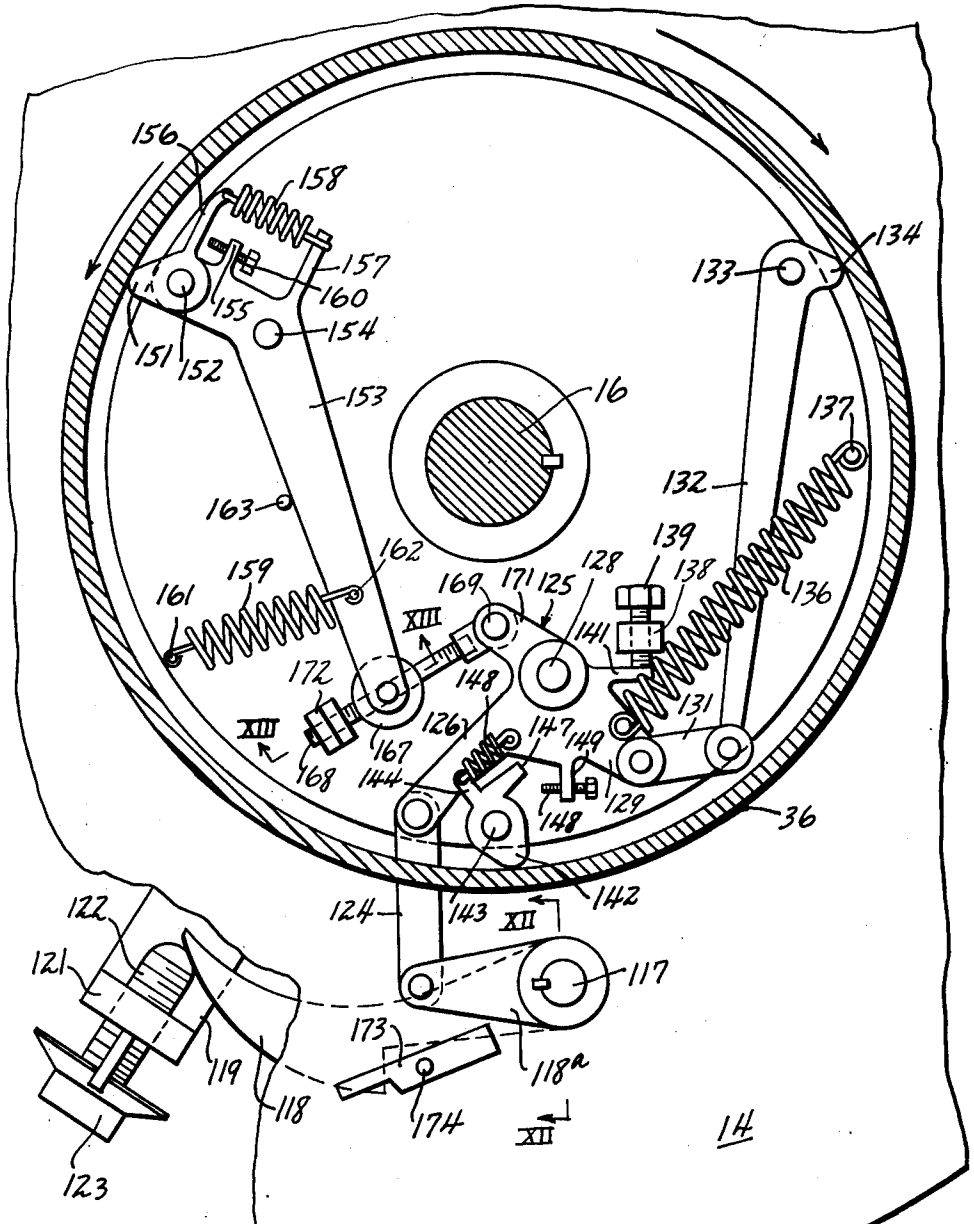


Fig. 11

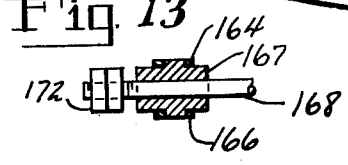


Fig. 13

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UNITED STATES PATENT OFFICE

2,594,499

ROTARY INTERLEAVING APPARATUS

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Application December 28, 1946, Serial No. 718,972

6 Claims. (Cl. 270—58)

1

This invention relates to interleaving apparatus, or apparatus for stacking sheets of paper in predetermined sequence, and has for an object the provision of apparatus of the character designated which shall be simple of design, economical of manufacture, and reliable of operation.

A further object of my invention is to provide interleaving apparatus which shall be particularly adapted for association with a printing press having automatic feed and sheet stacking means, and which shall include a rotary magazine having means thereon for mounting a plurality of stacks of sheets of paper, together with means for shifting the magazine to place the stacks in position to be accessible successively to the paper feed means.

A more specific object of my invention is the provision of interleaving apparatus for association with paper feed means, which shall include a rotary magazine with means thereon to mount a plurality of stacks of paper sheets and means to interrupt the rotation of the carriage to place the several stacks of sheets in position for access, successively by the paper feed means.

In my copending application, Serial No. 716,015, filed December 13, 1946, I have shown, described, and claimed, interleaving apparatus in association with a printing press having automatic paper feed and stacking means, which apparatus included a reciprocating carriage having means thereon for mounting a plurality of stacks of paper sheets and means to interrupt the movement of the carriage in one direction with the stacks successively positioned accessible to the paper feed means. It is the principal object of my present invention to simplify the apparatus therein disclosed and to that end I have devised a rotating magazine or carriage having means for mounting thereon a plurality of stacks of paper sheets, and have provided novel means for interrupting rotation of the magazine or carriage with the several stacks successively positioned in paper pick up position with respect to the paper feed means.

Apparatus embodying features of my invention is illustrated in the accompanying drawings forming a part of this application, in which:

Fig. 1 is a diagrammatic plan view showing my improved apparatus in association with a printing press;

Fig. 2 is a side elevation of Fig. 1;

Fig. 3 is vertical sectional view of the rotary carriage;

Fig. 4 is a partial plan view of the paper support with parts broken away;

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Fig. 5 is a sectional plan view showing the mechanism for rotating the carriage;

Fig. 6 is a sectional view of the pneumatic cylinder forming a part of the mechanism shown in Fig. 4;

Fig. 7 is a detail sectional view taken along the line VII—VII of Fig. 5;

Fig. 8 is a detail sectional view taken along the line VIII—VIII of Fig. 5 and drawn to a larger scale;

Fig. 9 is a detail sectional view showing the mounting of one of the stop members and taken generally along line IX—IX of Fig. 4;

Fig. 10 is a sectional view taken along the line X—X of Fig. 9;

Fig. 11 is a sectional plan view of the actuating mechanism for the paper take-up;

Fig. 12 is a detail sectional view taken along the line XII—XII of Fig. 11; and

Fig. 13 is a sectional view taken along the line XIII—XIII of Fig. 11.

Referring now to the drawings for a better understanding of my invention, I show at 10 a printing press of the well-known Meihle type having paper feed means including a paper pickup arm 11, which, as is well known, feeds the sheets to the platen 12 of the press where they are printed and then removed and stacked by a paper stacking arm 13. The details of construction and operation of this part of the apparatus are well known and form no part of my invention; consequently, a detailed description thereof will not be given. Associated with the printing press and its paper pickup and stacking means just mentioned, is my improved interleaving apparatus which will now be described.

At 14 I show a rotary, circular table which is fixedly mounted on a vertical shaft 16. The shaft 16 is mounted in a pedestal 17 and is freely rotatable therein in ball bearings 18 and 19 and a lower thrust bearing 21. Mounted to move vertically above the table 14 is a paper support 22 which is held in fixed angular relation with respect to the table by means of vertical guides or splines 23, a plurality of which are secured at their lower ends to the table 14, as shown in Fig. 3 of the drawing, and which fit in notches 24 in the paper support. The paper support is provided, opposite each of the vertical guides 23, with radial, dovetailed grooves 26 in each of which is adjustably mounted a vertically extending plate 27 for holding in place a stack of paper sheets. The plate 27 is provided at its base with a lug 28 through which a set screw 29 extends for adjustably positioning the plate. Un-

derneath and alongside each of the radial grooves 26 in the table 14 are a plurality of dovetailed arcuate grooves 31, and in the paper support are corresponding arcuate slots 30. Lugs 32 fit into the arcuate grooves 31 and each has mounted thereon a vertically extending rod 33 which extends upwardly through the corresponding arcuate slot 30 and is adapted to bear against the side of a stack of paper sheets extending to the top thereof. The lugs 32 are adjustably positioned in the grooves 31 by means of set screws 34 and serve to hold the stacks of paper sheets against lateral displacement.

The paper supporting plate 22 is in turn supported from a central drum 36 mounted on the upper end of the shaft 16 and freely rotatable with respect thereto, a ball bearing 37 being interposed between the upper end of the shaft and the drum. The drum is exteriorly threaded as shown at 38 and the paper support 22 is provided with a threaded opening 39 in engagement with the threads 38 on the drum. It will be seen that upon rotation of the drum 36 with respect to the paper support 22, the latter will be raised or lowered, depending upon the direction of rotation. This maintains the stacks of paper sheets at the proper level for access by the paper pickup arm 11 in a manner to be described later.

Mounted on the pedestal 17, beneath the rotary table 14, is an elongated frame 41. At the outer end of the frame is a pneumatic cylinder 42, in which is mounted a double acting piston 43. A piston rod 44 extends out through one end of the cylinder and is connected to a yoke 46 slidably mounted in guides 47 and 48, forming a part of the elongated frame 41. At the outer end of the cylinder 42 is a valve chamber 49 to which air under pressure is admitted through a pipe 51. Mounted in the valve chamber 49 is a valve 52 which may be of the D slide type and which is actuated by an oscillating arm 53 secured to a shaft 54 extending through the valve chamber and which is connected at its outer end to an arm 56, in turn connected to a valve rod 57. The adjacent head 58 of the cylinder 42 is provided with an air admission port 59 and an exhaust port 61. It is also provided with a port 63 leading out through the head 58 to a pipe 64 connected through the opposite head 66 of the cylinder to the opposite end thereof. It will be seen that as the valve 52 is oscillated on its seat, air under pressure will be admitted to, and exhausted from opposite ends of the cylinder 42 and cause the piston 43 to reciprocate.

Mounted within the yoke 46 is a second yoke 67 having rack teeth 68 and 69 along the inner sides thereof which are adapted to engage selectively with a pinion 71 mounted on the shaft 16. The yoke 67 is connected at its ends to the yoke 46 for lateral shifting by means of links 72 and 73, the said links being connected respectively on opposite sides of a center line passing longitudinally through the yoke 46 and inclined to said center line. Connected to the link 72 is a leaf spring 74 which is curved, as shown, so as to strike the shaft 16 when the yoke is moved to the right, thereby causing the yoke 67 to swing and disengage the rack 68 from the pinion 71 and engage the rack 69. The link 73 has mounted thereon a leaf spring 76 which is curved to engage the shaft 16 when the yoke 46 is moved to the left, as viewed in Fig. 5. This causes the yoke 67 to be swung downward, as viewed in Fig. 5, to disengage the rack 69 and reengage the rack 68. By means shown it will be seen

that the shaft 16 is caused to rotate clockwise, as viewed in Fig. 5, by the racks 68 and 69 in whichever direction they are caused to move by the piston 43. The valve rod 57 extends alongside the yoke 46 and has its outer end mounted in a stationary guide bracket 77. Mounted on the yoke 46 is a bracket 78 through which the valve rod 57 passes and which strikes, alternately at the opposite ends of its travel, against collars 79 and 81, mounted on the valve rod, and which are cushioned, respectively, by springs 82 and 83. By this means, the valve 52 is shifted on its seat to bring about reciprocation of the yoke 46.

Mounted on the underside of the rotary table 14 are a plurality of stop members 84, each of which is associated with one of the places provided on the paper support 22 for a stack of paper sheets. As shown in Fig. 9, each of the stop members 84 is comprised of a cushioned head 86 such as is disclosed in my hereinbefore mentioned copending application. The cushioned head 86 is mounted on a body 87 connected by a web member 88 to a bearing portion 89 pivotally mounted between flanges 91 and 92 on the underside of the table 14. A spring detent 96 bears against a flat portion 95 on the bearing portion 89 whereby the stop member may be held in its lowered position. As shown in Fig. 9, a second flat portion 95^a, disposed at 90 degrees to the portion 95, is adapted to be engaged by the spring when the stop is rotated to raised position, thereby to hold the stop up for a reason to be later explained.

At the end of the frame 41 opposite the piston 42 is mounted a stop arm 97 on a shaft 98 which is mounted in bearings 99 and 101. The stop arm 97 is biased toward a position to engage the stops 84 on the underside of the table 14 by a spring 102 connected to an arm 103 on the side of the shaft opposite the stop arm 97. The lower end of the spring 102 is connected to a lug 104 on the frame 41. See Fig. 3. On the outer end of the shaft 98 is mounted a triangular shaped arm 106 having a finger 107 at the lower corner thereof. Mounted alongside the arm 106, on the frame 41, is a bracket 108 having a slot 111 therein in which the arm 106 swings. A shoulder 109 on the arm 106 is disposed to engage the upper end member of the slot and limit the swing of the stop arm 97 by reason of the spring 102. A trip rod 112 extends through the slot 111 to engage the finger 107 on the arm 106. A spring 113 is connected at its lower end to the trip rod 112 and at its upper end to an arm 114 secured to the bracket 108. It will be understood that the trip rod 112 is reciprocating from the press 10 in timed relation with the movements of the paper pickup arm 11. As it moves to the right, as viewed in Fig. 8, its outer end engages the finger 107 and causes the shaft to rotate counterclockwise, as viewed in Figs. 3 and 8, to rotate the stop arm 97 out of the way of a stop 84. As the rod 112 moves farther to the right, as viewed in Fig. 8, it is engaged by the lower side 116 of the crank arm 106 to disengage it from the finger 107. When this occurs, the stop arm 97 is immediately pulled back to stop engaging position by means of the spring 102. By the means shown, it will be seen that each time a sheet of paper is picked off the stack on the carriage, the stop arm 97 is disengaged from the stop 84 momentarily and the carriage is allowed then to continue in its rotation. As the trip rod 112 is disengaged from the crank arm 106, the stop arm is pulled back into stop engaging position to

interrupt the rotation of the carriage at the next stack of paper sheets, and so on. In event fewer than the total number of places for mounting stacks of sheets are utilized, the corresponding stops 84 are turned up out of the way of the stop arm 97, whereupon the magazine carriage will be rotated until the first lowered stop 84 is engaged.

As sheets of paper are removed from the several stacks it is necessary for the paper support 22 to be raised to bring the upper level of the stacks of sheets in position to be engaged by the paper pickup arm 11. This is brought about by the means for effecting relative rotation of the drum 36 with respect to the paper support 22, which will now be described.

Journaled in the rotary table 14 is a short vertical shaft 117 on which is mounted a curved striking arm 118 on the lower end thereof, beneath the table 14. On the upper end of the shaft 117, above the table 14, is secured an actuating arm 118a. Mounted on the frame 41 underneath the table 14 is a bracket 119 having an upstanding portion 121 through which a screw 122 extends, the end of which lies in the path of the striking arm 118. It will be seen that as the table 14 rotates, carrying the striking arm 118 past the screw 122, the outer end of the striking arm will be pushed inward, as viewed in Fig. 11. The screw 122 may be manually adjusted to vary the movement of the striking arm 118 by means of a knob 123. Connected to the actuating arm 118a is a link 124 which is connected to one arm 126 of a spider 125 which is mounted to oscillate about a pin 128 mounted on the table 14. A second arm 129 of the spider is connected by means of a link 131 to an arm 132, pivoted at 133 on the table 14, and having on its outer end a friction pawl 134 adapted to engage the inner surface of the drum 36 and hold it against counterclockwise rotation. The arm 129 is biased in a direction to hold the pawl 134 in engagement with the drum by means of a spring 136 secured at one end to the arm 129, and at the opposite end to a pin 137 carried by the table 14. At 138 I show a lug mounted on the table 14 through which an adjustable stop screw 139 is threaded, which screw bears against a lug 141 on the spider to limit its counterclockwise rotation.

The drum 36 is normally held against clockwise rotation by means of a friction holding pawl 142, pivotally mounted at 143 to the table 14, adjacent the arm 126 of the spider. The pawl 142 has an arm 144 extending beyond its pivot point which is connected to the arm 126 of the spider by means of a spring 146. This holds the pawl in engagement with the drum 36. The pawl 142 is also provided with a shoulder 147 which extends inwardly of the drum at an angle of approximately 90° to the pawl and which is disposed to be engaged by a screw 148 carried by a lug 149 on the arm 129 of the spider 125, to disengage the pawl from the drum when the spider 125 is rotated clockwise as hereinafter explained.

Rotational movement of the drum 36 with respect to the table 14 is imparted by means of an actuating friction pawl 151, pivotally mounted at 152 on the short arm of a lever 153, which is pivotally mounted at 154 on the table 14. The pawl 151 is provided with an arm 156 and the lever 153 is provided with an arm 157 extending outwardly adjacent its pivot point which arms are connected by a spring 158 to hold the pawl 151 in engagement with the inner surface of the drum. A spring 159 anchored to the table 14 at

161 is connected to the long arm of the lever 153 at 162 to bias the lever against a stop pin 163. The outer end of the lever 153 is divided, as shown in Fig. 13 to provide arms 164 and 166 between which is journaled a cylindrical member 167. The cylindrical member 167 has an opening therethrough in which is slidably mounted a rod 168 which is pivotally connected at 169 to an arm 171 of the spider 125. The outer end of the rod 168 is threaded and is provided with adjusting nuts 172 to limit the movement of the rod through the member 167.

Adjacent the pawl 151 is a lug 155 on the lever 153 through which a screw 160 passes to limit the clockwise movement of the pawl 151, as viewed in Fig. 11 of the drawing.

It will be seen that when the striking member 118 is moved in a clockwise direction by engagement with the adjustable abutment 122, the actuating arm 118a is moved inwardly, rotating the spider 125 in a clockwise direction. As the spider is rotated, the lever 132 is moved about its pivot point 133 to release the pawl 134. The drum 36 is now free to rotate in a counterclockwise direction. When the spider 125 has rotated in a clockwise direction sufficiently for the nuts 172 to engage the cylindrical member 167, further movement rotates the lever 153 about its pivot 154, causing the friction pawl 151 to rotate the drum in a counterclockwise direction. Accordingly at each revolution of the table 14, the drum 36 is rotated a slight distance with respect thereto in a counterclockwise direction. This raises the paper support 22 sufficiently to maintain the upper surfaces of the stacks of paper sheets at the proper height for access by the paper pickup arm.

At 173 I show a manually operable detent which is pivotally mounted at 174 to the table 14, adjacent the actuating arm 118a. Whenever it becomes necessary to re-set the position of the paper support 22, as when mounting fresh stacks of paper sheets thereon, the actuating arm 118a is manually pushed inwardly of the drum and the detent 173 is turned to hold the arm 118a in its inward position. The inward movement of the arm 118a is sufficient for the screw 148 to engage the shoulder 147 on the holding pawl 142 to disengage the holding pawl from the inner surface of the drum. At the same time, the holding pawl 134 has been disengaged therefrom by the clockwise movement of the spider 125, as already described. Also as the lever 153 is rotated about its pivot in a counterclockwise direction by its connection with the arm 171 of the spider, the screw 160 engages the arm 156 of the pawl 151 to hold it out of engagement with the inner surface of the drum 36. The drum being thus fully released may now be rotated manually by means of a handle 176, shown in Fig. 3.

From the foregoing description, the operation of my improved apparatus will be readily understood. Stacks of paper sheets are mounted on the paper support 22 and are held in position by the backing up plate 27 and by the guide members 33 at the sides. The drum 36 is rotated manually, in a manner hereinbefore described, to adjust the stacks of paper sheets to the proper height for access by the paper pick-up arm 11. The detent 173 is then released and the apparatus is placed in operation. The reciprocation of the piston 43 in the cylinder 42 effects rotation of the table 14 with its paper stacks. As the paper pickup arm 11 starts its movement toward the stacks of paper sheets, the trip arm 112 engages

with the finger 107 on the arm 106 and swings the stop member 97 downward to disengage it from its associated stop member 84, whereupon the table 14 is released momentarily until the trip arm 112 passes the finger 107, whereupon the spring 102 swings the stop arm 97 upwardly to engage the next stop 84. This places a stack in position for the upper sheet to be picked up by the paper pickup arm 11. In order to assist in this operation, I may provide pipes 180 for air under pressure directed toward the upper sheets of the stacks to loosen them in a manner well understood. At each revolution of the table 14 the rotation is interrupted at each stack of paper sheets while the top sheet is being removed by the paper pickup arm 11. The trip arm 112 operating in timed relation with the paper pickup arm releases the table 14 as the paper pickup arm moves away from each stack. Also, at each revolution of the table 14, the striking arm 118 strikes the adjustable abutment 122 to effect rotation of the drum 36 with respect to the table 14, and raise the stacks of sheets as hereinbefore described. The extent of this movement can be varied by the adjustment of the position of the screw 122. During the periods of time when the table is at rest, the pneumatic cylinder remains connected to the source of air, and upon release of the stop member 97, the piston rod continues its movement to the end of the stroke.

While I have shown my improved apparatus in association with a printing press it will be obvious that it is adapted for association with other kinds of duplicating apparatus having automatic feed means, such as a multigraph press, a lithograph press, or other duplicating apparatus. It will also be obvious that my improved interleaving apparatus may be used without a printing press or duplicating apparatus, but with a paper pickup and stacking means.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but that it is susceptible of various changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In interleaving apparatus, a table mounted to rotate in a horizontal plane, a paper support mounted on the table to move vertically but held against rotation with respect to the table, a central rotatable exteriorly threaded drum supporting the paper support there being a threaded opening at the center of the paper support engaging said threaded drum, means to mount a plurality of stacks of paper sheets in spaced relation about the periphery of the paper support, means to remove sheets successively one at a time from the tops of the several stacks, a pawl pivotally mounted on the table in position to impart rotary motion to the central threaded drum, a striking member pivotally mounted on the table and operatively connected to the pawl to actuate it, and an adjustable stationary abutment in the path of the striking member to impart motion thereto at each rotation of the table.

2. In interleaving apparatus, a table mounted to rotate in a horizontal plane, a paper support mounted on the table to move vertically but held against rotation with respect to the table, a central rotatable exteriorly threaded drum supporting the paper support there being a threaded opening at the center of the paper support engaging said threaded drum, means to mount a plurality of stacks of paper sheets in spaced relation about the periphery of the paper support, means to remove sheets successively one at a time from the tops of the several stacks, an actuating pawl mounted on the table in position to impart rotary motion to the central threaded drum, a holding pawl interconnected with the actuating pawl, a striking member pivotally mounted on the table and operatively connected to the pawls to release first the holding pawl and then remove the actuating pawl, and an adjustable stationary abutment in the path of the striking member to impart motion thereto at each rotation of the table.

3. In interleaving apparatus, in combination with a paper pickup arm, a rotary table, a vertical shaft about which the table rotates in a horizontal plane, an exteriorly threaded drum mounted free to rotate on the upper end of the shaft, a paper support splined to the table and in threaded engagement with the drum, means to mount a plurality of stacks of paper sheets on the paper support to lie thereon in the same plane, stop means for interrupting the rotation of the table in position for the pickup arm to remove sheets of paper successively from the tops of the stacks, mechanism for actuating the stops and pickup arm in timed relation whereby the arm picks up sheets from the stacks while the carriage is at rest, and means to impart relative rotary movement to the drum to raise the paper support.

4. The combination with a rotary table, and means to mount a plurality of stacks of paper sheets in uniform spaced relation about the periphery of the table, of a vertical shaft upon which the table is mounted, a pinion on the shaft, rack members on opposite sides of the shaft for engaging the pinion, a reciprocable yoke in which the rack members are mounted for lateral shifting, means carried by the rack members for engagement with the shaft to shift them, a pneumatic cylinder having a reciprocating piston therein connected to the yoke, valve means for admitting pressure alternately to opposite ends of the cylinder, a valve rod for actuating the valve means, means on the yoke for engaging the valve rod to operate it, paper feed means, means to interrupt the rotation of the table at each stack of paper sheets for the feed means to remove a sheet from the top thereof, and means to actuate the paper feed means while the rotation of the table is interrupted.

5. The combination with a rotary table, and means to mount a plurality of stacks of paper sheets in uniform spaced relation about the periphery of the table, of a vertical shaft upon which the table is mounted, a pinion on the shaft, rack members on opposite sides of the shaft for engaging the pinion, a reciprocable yoke in which the rack members are mounted for lateral shifting, means carried by the rack members for engagement with the shaft to shift them, a pneumatic cylinder having a reciprocating piston therein connected to the yoke, valve means for admitting pressure alternately to opposite ends of the cylinders, a valve rod for actuating the valve means, and means on the yoke for engaging the valve rod to operate it, paper feed means, a stationary frame having guide means therein for the yoke, a stop arm pivotally mounted on the frame, stop members mounted on the table at each stack of paper sheets for engagement by the stop arm, means biasing the stop arm into

position to engage the stop members, and trip means operable in timed relation with the paper feed means for swinging the stop arm out of the path of the stop members.

6. In interleaving apparatus, a table mounted to rotate in a horizontal plane, a paper support mounted on the table to move vertically but held against rotation with respect to the table, a central rotatable threaded drum supporting the paper support, means to mount a plurality of stacks of paper sheets in spaced relation about the periphery of the paper support, means to remove sheets successively one at a time from the tops of the several stacks, a pawl pivotally mounted on the table in position to impart rotary motion to the central threaded drum, a striking member pivotally mounted on the table and operatively connected to the pawl to actuate it, an adjustable stationary abutment in the path of the striking member to impart motion thereto at each rotation of the table, two holding pawls interconnected with the first mentioned pawl, and a lost motion connection between the holding pawls and the first mentioned pawl, in

which motion from the striking member is first transmitted to one of the holding pawls to release it before moving the first mentioned pawl.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
367,281	Estlow	July 26, 1887
466,719	Bredenberg	Jan. 5, 1892
565,146	Smyth	Aug. 4, 1896
921,983	Hanson	May 18, 1909
1,757,553	Tauschek	May 6, 1930
1,845,907	Cook et al.	Feb. 16, 1932
2,172,519	Reeder	Sept. 12, 1939
2,174,569	Dinzl	Oct. 3, 1939
2,334,684	Zappia	Nov. 16, 1943

FOREIGN PATENTS

Number	Country	Date
15,209	Great Britain	July 13, 1908