

Sept. 17, 1940.

M. HARDING ET AL

2,214,960

DUPLICATING MACHINE

Filed Aug. 18, 1937

3 Sheets-Sheet 2

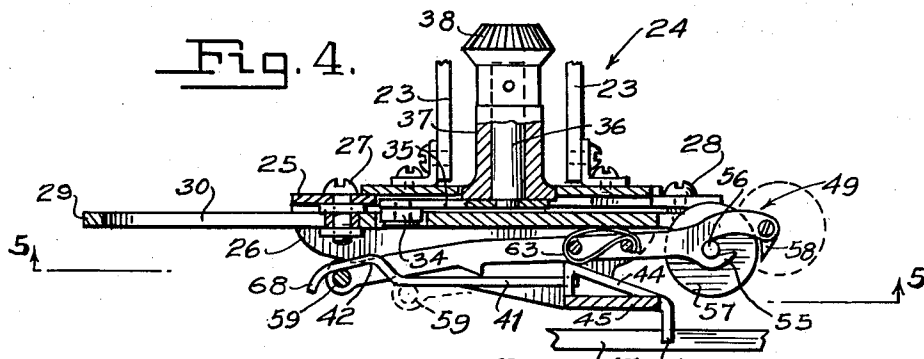
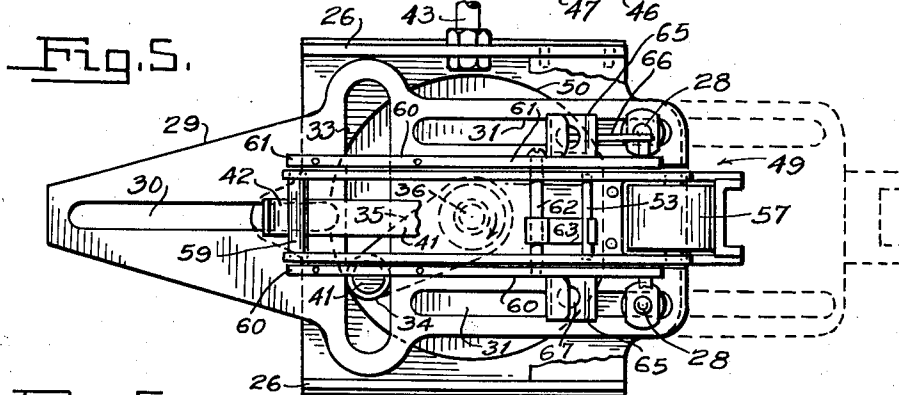
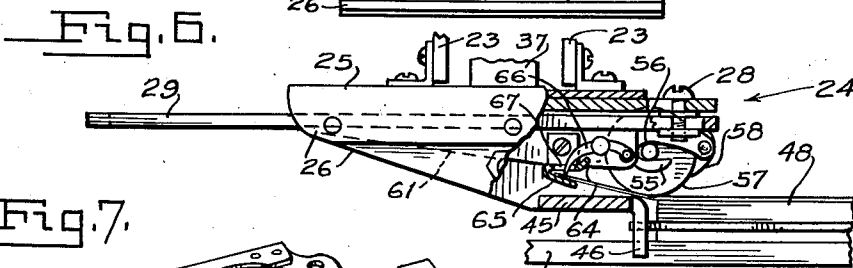


Fig. 7.

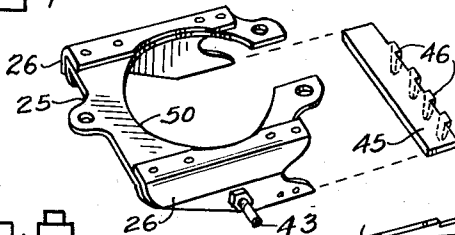


Fig. 8.

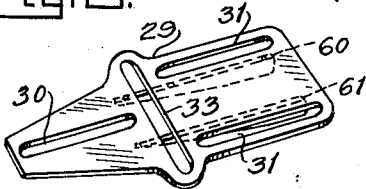
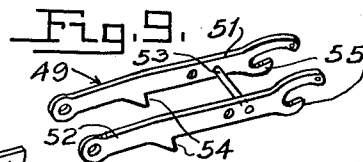


Fig. 10.
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3 Sheets-Sheet 3

Fig. 11.

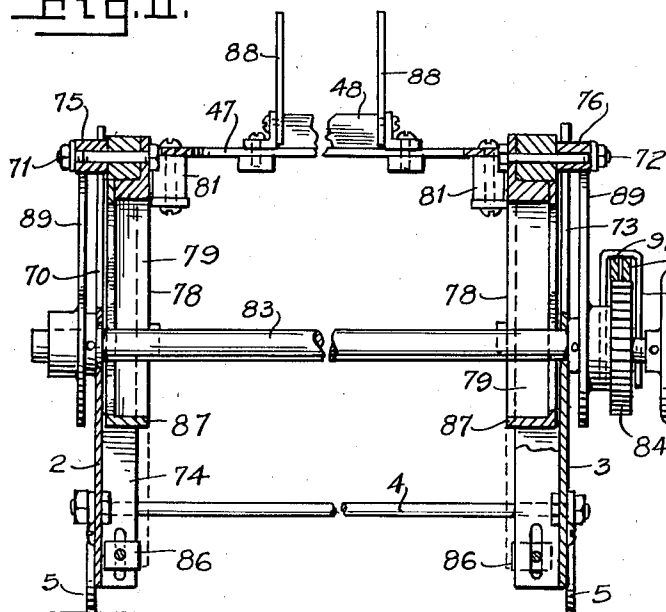


Fig. 12.

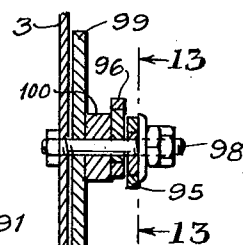


Fig. 13.

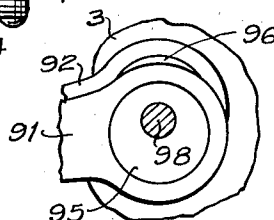
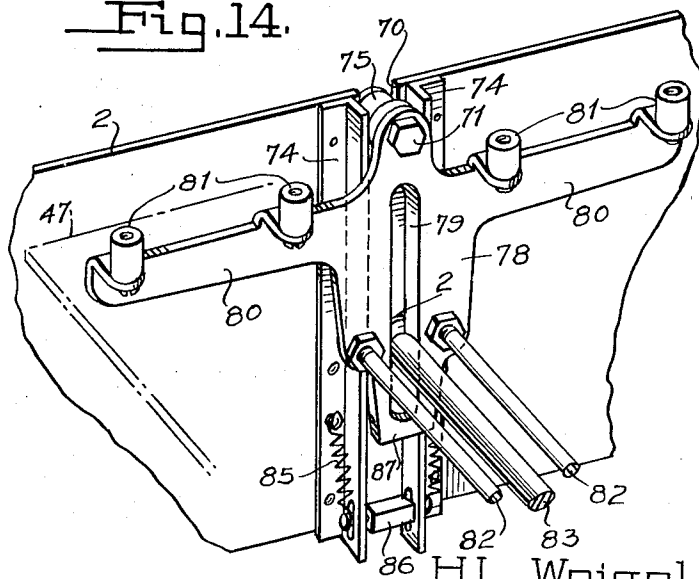


Fig. 14.



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2,214,960

DUPLICATING MACHINE

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9 Claims. (Cl. 271—43)

Our invention relates to duplicating machines. An important object of the invention is to provide automatic feeding means that will accurately feed sheets of paper to a rotating drum, whereby the printing on the sheets will register, the printing on one with the printing on the other, irrespective of the age of, or wear upon, the machine.

Another object is to void contact of the feeding means with the surface to be printed, whereby to avoid stirring up fibers from the paper, which interfere with neat printing.

Still another object is to provide means for lifting up successive sheets of paper from a stack, and, by engagement with the edges thereof, move the sheets successively toward the printing drum.

A further object is to provide means for progressively raising the stack as the sheets are taken therefrom.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description.

In the drawings, like reference characters designate similar parts in the several views.

Figure 1 is a plan view, partly in section, of an embodiment of the invention.

Figure 2 is a side elevation, partly broken away, and looking in the direction of the arrow A of Figure 1.

Figure 3 is a perspective view of the portion broken away in Figure 2.

Figure 4 is an enlarged section taken on the line 4—4 of Figure 1, showing a feeding mechanism.

Figure 5 is an underneath sectional view, taken on the line 5—5 of Figure 4, looking in the direction of the arrows.

Figure 6 is a view showing certain parts of the feeding mechanism, but in different operative positions.

Figures 7 to 10, inclusive, are disassembled views of parts of the feeding mechanism.

Figure 11 is a section taken on the line 11—11 of Figure 1, illustrating parts of a mechanism for raising a platform that is arranged to support a stack of paper.

Figure 12 is an enlarged section taken on the line 12—12 of Figure 2.

Figure 13 is still further enlarged section taken on the line 13—13 of Figure 12.

Figure 14 is a perspective view of a part of the platform supporting mechanism.

Referring more in detail to the drawings, the

reference numerals 2 and 3 designate side plates of the present duplicating machine. Suitable tie rods, as suggested at 4, are employed to hold the side plates in proper relative positions. Feet 5 are arranged at the bottom of the machine.

A rotary drum 6 is mounted on a shaft 7 that rotates in bearings 8 and 9 on the side plates 2 and 3 respectively. The side plate 3 has an up-standing end 10 that substantially conforms with the contour of the drum, as suggested in Figure 2. The end 10 has a slot 12 for receiving the shaft 7.

A crank 13 is connected to rotate the drum, which in normal operation is rotated in a counter-clockwise direction, as shown in Figure 2. Of course it is to be understood that the drum 6 may be driven by any suitable means, instead of manually.

Fastened on the shaft 7 is a bevel gear 14, which meshes with a bevel gear 15 on a square shaft 16. A bevel gear 17 has a square central opening that slidably fits on the square shaft, whereby the gear 17 is made to rotate with the shaft, but may be moved longitudinally of the shaft 16.

A bevel gear 18 engages the gear 17 and is in turn mounted on the shaft 19 hereinafter described.

The gear 17 and shaft 16 are enclosed in a housing 20, the shaft 16 being journaled in the ends of the housing. The housing has an opening 21 in its inward facing side, whereby the shaft 19 and its gear 18 may be slid lengthwise of the housing.

Freely mounted on the housing 20 is a carriage 22 that has two arms 23 which support a feeding mechanism generally designated 24. The feeding mechanism includes a frame 25 having downwardly bent flanges 26. Bolts 27 and 28 slidably support a plate or Scotch yoke 29 on the underside of the frame 25.

The plate, yoke or cross-head 29 has a longitudinal slot 30 whereby the plate slides on the bolt 27 and has longitudinal slots 31 for sliding the plate on the bolts 28. Nuts (not numbered) are fastened on the lower ends of the bolts for maintaining the plate in sliding position. The plate 29 also has a transverse slot 33 in which a flat roller 34 reciprocates.

A rotary arm 35 is supported on the under side of the frame 25, on the lower end of a stub shaft 36, which is journaled in a bushing 37 mounted upright on the frame 25. The upper end of the shaft 36 carries a bevel gear 38, which meshes with a bevel gear 39 on the end of the shaft 19.

The arm 35 rotates in a cut-out portion 50 of the frame 25.

A finger 43, on one of the flanges 26 engages a bracket 40 on the side 3 of the machine, as shown in Figure 3. This means supports the feeding mechanism in an operative position so that it may be lifted upward when inserting a fresh stack of paper in the machine.

Fixed between the flanges is a track 41 having a raised portion 42, provided with a downwardly inclined tip 68. Forward of the track is an incline 44, disposed on a cross bar 45 that has depending fingers 46. These fingers depend in a slot in a vertically movable platform 47 between the sides 2, 3 of the machine. A stack of paper 48 is indicated ahead of the fingers 46.

Movably supported on the track 41 and on the cam 44 is a carriage 49 comprising parallel bars 51 and 52 fastened together by a tie rod 53. The bars 51, 52 have shoulders 54 that engage the rear edge of the stack of paper in one cycle of operation, to straighten the stack prior to the removal of the next top sheet, in the next cycle of operation.

Loosely supported in claws 55 at the forward ends of the bars 51, 52 is a spindle 56 carrying a friction roller 57, e. g., of sponge rubber. A brake shoe 58 at the tips of the bars 51, 52 frictionally resists turning of the roller when the latter is in engagement with the brake.

The bars are also tied together by a cross rod 59. The carriage 49 is pivotally supported on ribs 60 and 61 by means of a pin 62. The ribs in turn are fastened to the underside of the cross-head 29 to reciprocate therewith. A flat spring 63 tends to move the front end of the carriage 49 down, whereby the roller 57 contacts the top sheet of paper 64 on the stack 48, when the cross rod 59 rests in the raised portion 42 of the track 41.

The ribs 60 and 61, on their outer faces, carry feeding fingers 65. Small pivoted weights 66 are inserted through openings 67 in the top of the fingers 65. These weights provide slight pressure upon an edge of a sheet of paper within the fingers 65, to maintain the paper in proper position.

The operation of this feeding mechanism is as follows: The shaft 36 is driven by rotation of the drum 6, through the intermediary of the gear train described. Rotation of the shaft 36 causes reciprocation of the cross-head plate or Scotch yoke 29 by means of the rotary arm 35 and the roller 34.

At the beginning of the forward movement of the cross-head 29, the cross rod 59 is being depressed by the downwardly inclined tip 68 of the track 41. As the cross-head travels forward, toward the drum 6, the carriage 49 moves forward therewith. During such movement, the cross rod 59 rides upward into the raised portion 42 of the track, which lowers the roller 57 into contact with the paper.

The distance between the notches on the claws 55 and the brake shoe 58 is sufficient to allow play of the spindle 56 and the roller 57 between said notches and the brake shoe. Thus while the roller 57 is in contact with the paper and rolling toward the drum 6, the roller is moved away from the brake shoe, allowing the roller to turn idly. After the cross rod 59 rides downward on the track, as indicated in broken lines in Figure 4, the roller is lifted from the paper.

Throughout the forward movement of the carriage, the edge of the paper is seated in the feed-

ing fingers 65, which feed the sheet of paper to the printing drum 6.

At the end of the forward stroke, the feeding fingers and the carriage move rearward from the sheet of paper just fed. The roller remains in the raised position until the cross rod 59 has traveled down the horizontal portion of the track 41. By the time the cross rod has entered the raised portion 42 of the cam, the roller 57 is to the rear of the sheet just fed and descends, contacting with the next top sheet. Since the roller then moves into contact with the brake shoe and is prevented from turning, the friction of the roller with the engaged sheet causes the sheet to follow the rearward movement of the roller, thus drawing the sheet up the incline 44 and into the feeding fingers 65. At this point the roller is raised from the paper by the downwardly inclined tip 68 of the track 41. The mechanism is now ready to feed forward the sheet within the feeding fingers, in the manner hereinbefore described.

With a relatively fixed frame 25, it is apparent that the stack of paper 48 should be progressively raised to compensate for sheets that are removed. To accomplish this, the platform 47 is vertically movable. The side plates 2, 3 are slotted, as shown at 70, 73, for stub shafts 71, 72, respectively. Spaced angle irons 74 on the side 2 provide a track for a roller 75 on the stub shaft 71. A roller 76 on the stub shaft 72 rides on angle irons 77 on the side 3.

Heads 78, slotted at 79, have arms 80 which support the platform on blocks 81. Tie rods 82 fasten the heads 78 together. Journaled in the sides 2, 3 and disposed in the slots 79 is a shaft 83 that carries a ratchet 84 at one end. The heads 78 move vertically relative to the shaft 83.

Shock absorbing means for the platform comprises springs 85 which resiliently support a rubber cushion 86. The lower end 87 of the head 78 strikes the cushion 86 in the downward movement of the head. Adjustable, side paper guides are shown on the platform 47 at 88.

Mounted on ends of the shaft 83 projecting beyond the sides 2, 3 are snail cams 89, which engage the rollers 75, 76, so as the shaft 83 rotates in the direction of the arrow on the cam 89 of Figure 2, the platform 47 is raised. The abrupt descent 90 on the snail cams allows the platform to drop to its lowest position, being dampened in its drop by the shock absorber hereinbefore mentioned.

This drop is effected when the supply of paper has been exhausted and is a signal to the operator to place a fresh supply on the platform. If the machine is driven by power means, the descent on the cams will avoid injury to the machine when the paper stack 48 has been exhausted.

The means for rotating the snail cams progressively, but gradually, as the paper stack is used up, includes twin pawls 91, 92 that alternately rotate the ratchet 84 on the snail cam shaft 83. A yoke 93 maintains the pawls in engagement with the ratchet 84. A knob 94 is provided on the pawl 91.

Eccentrics 95, 96 respectively drive the pawls 91, 92, which alternately rotate the ratchet 84. A hand wheel 97 is mounted on the outermost end of the shaft 83. A bolt 98 on the side 3 supports the eccentrics and friction wheel 99. The bolt 98 is mounted to rotate on the side 3, while the eccentrics and friction wheel are keyed on the

bolt. A spacer 100 is arranged between the wheel 99 and the nearest eccentric 96.

A flat spring 101 prevents movement of the wheel 99 unless positively turned. Means to rotate the friction wheel 99 includes a reciprocating bar 102 that engages the circumference of the friction wheel 99 and is slidably supported on a pin 103. A coiled spring 104 tends to draw the bar 102 from the wheel 99.

One end of a lever 105, which lever is fulcrumed at 106, engages a stop 107 on the bar 102. The opposite end of the lever is arranged to be moved by a nose 108 on the handle 13 of the drum.

A roller 114 is arranged under the drum 6, to impress paper against the drum, to print on the paper. A pin 115 and concentric spring 116 for resiliently maintaining the roller in printing position are of conventional construction, so detailed showing and description are deemed unnecessary for one skilled in the art.

In the operation of raising the platform 47, once each rotation of the drum 6, the nose 108 of its handle trips the lever 105, advancing the wheel 99 through the intermediary of the bar 102. Rotation of the wheel 99 in turn rotates the eccentrics, which alternately advance the ratchet 84 and hence rotate the snail cams 89, thus progressively raising the platform 47.

To compensate for paper of different thickness (which of course would require different speeds of raising the platform), an adjustable strip 109 having a flange 110 is provided. Loosening a screw 112, which holds the strip 109 on the end 10, permits the adjustment. Graduations 113 on the end 10 indicate the amount of adjustment.

For thinner paper, the strip 109 is adjusted to the right in Figure 2. Thus the nose 108 will move the lever 105 less which in turn will rotate the wheel 99 less, which will rotate the snail cams less, through the media described. Adjustment of the strip 109 to the left in Figure 2 allows the nose 108 to move a greater distance, thus increasing the amount of movement of the snail cams for each revolution of the drum.

While we have illustrated and described what we now regard as the preferred embodiment of our invention, the construction is, of course, subject to modifications without departing from the spirit of our invention. We, therefore, do not wish to restrict ourselves to the particular form of construction illustrated and described, but desire to avail ourselves of all modifications which may fall within the scope of the appended claims.

For instance, other driving means may be employed than that shown and described herein, and friction means other than the roller 57 may be used. Furthermore, changes in details of construction will occur to those skilled in the art.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. In a duplicating machine, a rotary printing drum, means to support a stack of sheets of paper to be fed to the drum, a friction roller, journal means loosely supporting the roller, a brake shoe arranged to frictionally engage the roller when the latter is moved into contact therewith, a pivoted, reciprocating carriage for the journal means, a cam arranged to tip the carriage at a predetermined point, and driving mechanism to reciprocate the carriage, the roller being arranged to engage the brake shoe when the roller engages the paper during movement of the carriage away from the drum and being arranged

to move away from the brake shoe during movement of the carriage toward the drum, and the cam tipping the carriage and lifting the roller from the paper during a portion of the movement of the roller away from the drum, to permit the removal of the top sheet.

2. In a duplicating machine, a rotary printing drum, means to support a stack of sheets of paper to be fed to the drum, means to separate successive top sheets from the stack, mechanism apart from said separating means to push the successive top sheets respectively to the drum, said mechanism including a grooved member in which edges of the sheets are seated, the grooved member being arranged to engage the rear edge of a sheet and push same toward the drum, and means to maintain the respective sheets in position in the grooved member during the pushing movement of the sheet toward the drum.

3. In a duplicating machine, a rotary printing drum, means to support a stack of sheets of paper to be fed to the drum, means to separate successive top sheets from the stack, mechanism apart from said separating means to move the successive top sheets respectively to the drum, said mechanism including a grooved member in which edges of the sheets are seated, and a loosely mounted weight arranged to maintain the respective sheets in position in the grooved member during movement of the sheet toward the drum.

4. In a duplicating machine, a rotary printing drum, means to support a stack of sheets of paper to be fed to the drum, mechanism to move successive top sheets relative to the stack in a direction other than toward the drum, means apart from said mechanism to move the successively moved top sheets to the drum, and an element connected to be actuated by the last-mentioned means to straighten the remaining sheets of the stack.

5. In a duplicating machine having a printing element and having means to support a stack of sheets to be fed to the printing element, frictional means, mechanism to move the frictional means along a sheet in the stack in a direction away from the printing element, to move the engaged sheet relative to the stack and away from the printing element, mechanism to engage the moved sheet and to feed same to the printing element, and means movable toward the printing element and engaging the stack in its said movement to straighten disarrangement of the stack caused by the movement of the frictional means thereon.

6. In a duplicating machine having a printing element and having means to support a stack of sheets to be fed to the printing element, a friction roller, a brake for the roller, mechanism to move the roller in one direction with the brake applied, to move a sheet frictionally relative to the stack, and means to engage the moved sheet and to feed same to the printing element, the mechanism causing the brake and roller to be separated during the step of feeding the sheet to the printing element.

7. In a duplicating machine having a printing element and having means to support a stack of sheets to be fed to the printing element, frictional means, mechanism to drag the frictional means along a sheet in the stack, to move the engaged sheet relative to the stack, mechanism to engage the moved sheet and to feed same to the printing element, spring means tending to urge the frictional means into contact with the engaged sheet

to aid in said movement of said sheet, and mechanism to move the frictional means from the engaged sheet, against the action of the spring, during the feeding step.

- 5 8. In a duplicating machine, a rotary printing drum, means to support a stack of sheets of paper to be fed to the drum, means to separate successive top sheets from the stack, mechanism
10 apart from said separating means to move the successive top sheets respectively to the drum, said mechanism including angularly arranged, fixed members providing a grooved element in which edges of the sheets are seated, and pivoted means movable in the angle of the fixed members
15 to maintain the respective sheets in position in the grooved element during movement of the sheet toward the drum.

9. In a duplicating machine having a printing element and having means to supply a stack of sheets to be fed to the printing element, frictional means, mechanism to move the frictional means along and in the plane of the top sheet 5 in the stack in a direction away from the printing element to move the engaged sheet relative to the stack and away from the printing element, means to engage the moved sheet and to feed same toward the printing element, and mechanism 10 to move the frictional means from the stack after the moved sheet has been engaged, for the feeding step.

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