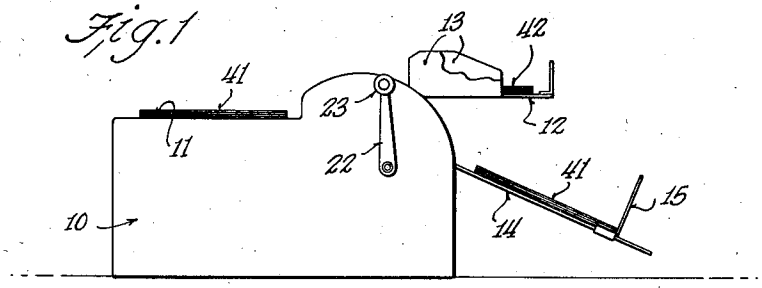
April 17, 1945. R. R. ROCKHILL 2,374,039

DUPLICATING MACHINE

Filed Dec. 23, 1940 2 Sheets-Sheet 1

Fig. 1



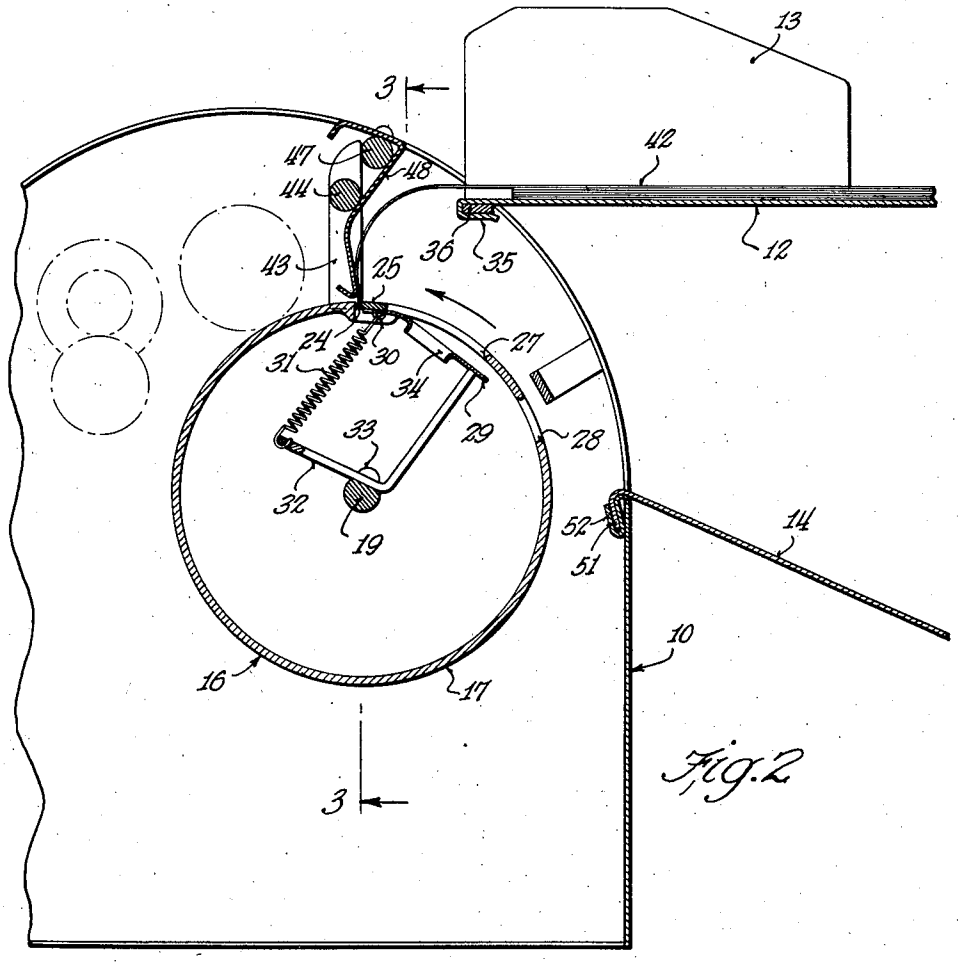




Fig. 2

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DUPLICATING MACHINE

Filed Dec. 23, 1940 2 Sheets-Sheet 2

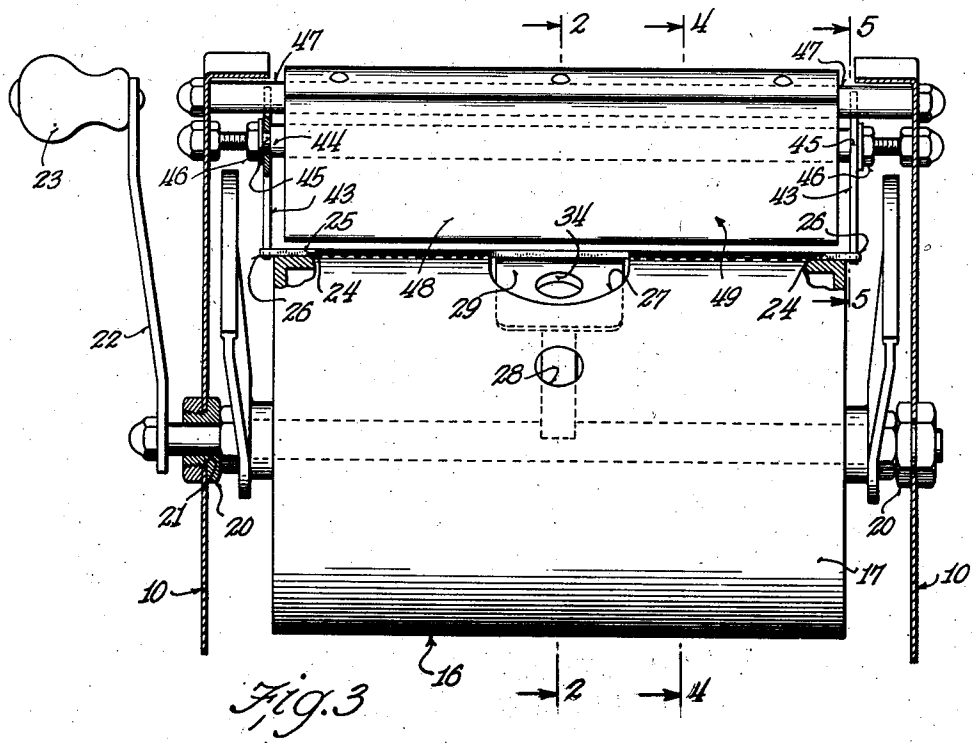



Fig. 3

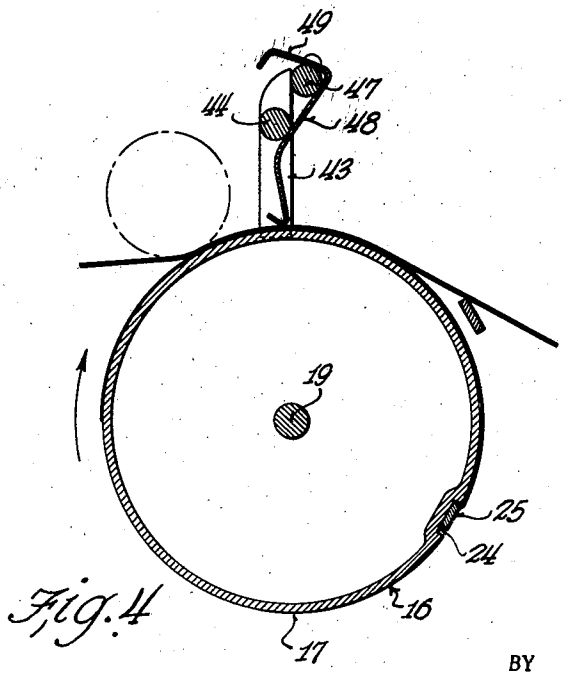



Fig. 4

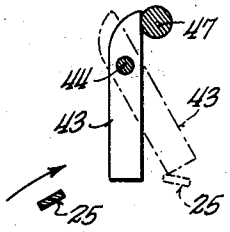



Fig. 5

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# UNITED STATES PATENT OFFICE

2,374,039

## DUPLICATING MACHINE

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Application December 23, 1940, Serial No. 371,224

8 Claims. (Cl. 101—132)

This invention relates to duplicating machines, and more particularly to new and improved means for introducing a master sheet into a clamping mechanism on a duplicating drum, releasably retaining a master sheet on the drum during work dispensing rotation thereof, and effecting release of the master sheet clamping means by reverse rotation of the duplicating drum.

The primary object of the present invention resides in the provision of new and improved means under the control of a single manually operable element, the operating crank of the machine, for effecting the opening of the clamping means to permit the application of a master sheet to the drum and for effecting the opening of the clamping means to permit the release of the master sheet after the desired number of copies have been made therefrom.

A further object resides in the provision of new and improved means for introducing a master sheet into a sheet receiving opening formed in the duplicating drum.

A further object resides in the provision of new and improved means for releasably retaining a master sheet in a sheet receiving opening formed in the duplicating rim.

A further object resides in the provision of new and improved means for releasing the master sheet clamping means to permit the discharge of a master sheet from the drum after the desired number of copies have been struck from it.

Another object resides in the provision of new and improved means disposed to contact the master sheet clamping means on each revolution of the drum, the means being operative to permit unimpeded rotation of the drum in work dispensing direction and also operative to engage the clamping bar at a predetermined position in the rotation of the drum in the reverse direction to arrest further movement of the bar and effect the release of the clamping action of the bar upon further movement of the drum in the last mentioned direction.

Another object resides in the new and improved arrangement of the clamping bar contacting means in such position that the arrested movement of the clamping bar results in the alignment of the sheet receiving opening in the drum with a master sheet guide plate disposed adjacent the duplicating drum, to facilitate the insertion of the master sheet into the sheet receiving opening formed by movement of the drum beyond the position in which movement of the clamping bar is arrested by contact between it and the clamping bar contacting means.

Another object resides in the provision of new and improved clamping bar contacting means adapted to be maintained in operative position at all times by the action of gravity.

Another object resides in the provision of new and improved clamping bar contacting and actuating means that are simple in form, automatic in operation, free from mechanical difficulties, inexpensive to produce and extremely efficient in operation.

Another object resides in the provision of new and improved spring urged means for normally maintaining the clamping bar in pressure contact with one side of a sheet receiving groove formed in a duplicating drum.

Another object resides in the improved arrangement of the master sheet guide plate, the master sheet receiving groove formed in the drum, the clamping bar, the clamping bar actuating means, and the operating crank of the duplicating machine whereby the position of the crank indicates definitely the position of the master sheet receiving groove and the direction of manipulation of the crank determines the function of the clamping bar contacting means, rotation in work dispensing direction results in unimpeded movement of the drum, while rotation in the reverse direction results in the automatic releasing action of the clamping bar at a predetermined point in the rotation of the drum to permit the release and discharge of the master sheet.

Other objects and advantages of the present invention will become manifest from the following description of an illustrative embodiment of the invention shown in the accompanying drawings.

In the drawings:

Figure 1 is an operator's side elevational view of a duplicating machine embodying the teachings of the present invention;

Fig. 2 is a fragmentary vertical longitudinal sectional view through the discharge end of the machine taken substantially on the line 2—2 of Fig. 3;

Fig. 3 is a vertical transverse sectional view taken on the line 3—3 of Fig. 2 and showing the associated relationship between the drum, clamping bar, master sheet guide plate and a clamping bar contacting element;

Fig. 4 is a vertical sectional view taken on the line 4—4 of Fig. 3 showing a master sheet clamped in work dispensing position on the drum

and a copy sheet in the process of being produced, and

Fig. 5 is a detail sectional view taken on the line 5—5 of Fig. 3 showing means operative to effect release of the gripping action of the clamping bar.

The duplicating machine shown in the accompanying drawings comprises a body portion 10 composed of the usual side and end walls and including a copy sheet feed surface 11, a master sheet feed tray 12 provided with adjustable master sheet guiding plates 13, and a copy receiving tray 14 provided with an adjustable stop plate 15.

A drum 16 including a cylindrical shell 17 and a pair of ends is secured to a shaft 19 that is journalled for rotation in bearing elements 20 that are fixed in aligned openings 21 formed in the side walls of the body portion 10. One extremity of the shaft 19 extends beyond the side wall of the machine a sufficient distance to provide suitable anchorage for a crank arm 22 on which an operating handle 23 is mounted. The drum 16 is provided with a smooth polished surface that is interrupted by a relatively shallow longitudinally disposed groove 24 adapted to receive a clamping bar 25. The clamping bar 25 has a thickness substantially equal to the depth of the groove 24 so as to conform with the cylindrical surface of the drum 16. The width of the bar 25 is slightly less than that of the groove 24 so as to permit lateral movement of the bar within the groove 24. The length of the bar 25 is such that end portions 26 thereof extend beyond the ends of the drum 16, for a purpose to be hereinafter more specifically described. An aperture 27 is formed in the cylindrical portion 17 of the drum 16 midway between the ends thereof and the same extends circumferentially from the right hand edge of the groove 24 (as shown in Fig. 2). A second aperture 28 is disposed a short distance circumferentially from the aperture 27. These holes 27 and 28 serve to receive the thumb and index finger respectively of the right hand of the operator so as to facilitate manual manipulation of the clamping bar 25 if such be desired. A plate 29 is secured to the clamping bar 25 in any appropriate manner at a point midway between the ends thereof so as to lie directly beneath the aperture 27 when the clamping bar is applied to the drum 16. An ear 30 preferably formed on the plate 29 serves to receive one end of a tension spring 31, the other end of which is secured adjacent one end of a rod 32 that extends radially from the shaft 19 and is secured thereto by means of a screw 33. The position of the spring 31 is such that the clamping bar 25 is normally retained in pressure contact with the bottom and one side of the groove 24. The other end of the rod 32 extends outwardly toward the inner wall of the shell 17 and terminates in a position such that it provides a stop to limit the inward movement of the free portion of the plate 29. A hole 34 formed in the plate 29 serves to receive the thumb of the operator so that the gripping bar 25 may be displaced manually from contact with the side of the groove 24. As the thumb is introduced through the aperture 27 into the hole 34, the index finger may be inserted into the aperture 28 to retain the drum 16 against rotary movement during the manual operation of unclamping the bar 25.

The master tray 12 is provided with downwardly and rearwardly extending clips 35 (one of which is shown) adapted to frictionally engage a bar 36 secured to the side walls of the body portion 10 to retain the master sheet receiving tray in proper position upon the machine. The master sheet receiving tray 12 is provided with adjustably mounted guide plates 13 that are adapted to be positioned in a manner to accurately align the master sheet with the copy sheets which may be fed either manually or automatically from the sheet feed surface 11 disposed adjacent the duplicating drum 16.

With a supply of blank copy sheets 41 positioned on the feed surface 11 and a supply of master sheets 42 positioned on the master tray 12 the machine is in readiness for operation. In order to introduce the first master sheet into the groove 24 formed in the drum 16, the operator may grip the handle 23 and turn the crank 22 in a counterclockwise direction to a position in which further movement is impeded by contact between the end portions 26 of the clamping bar 25 with the forward edges of the lower portions of arms 43 that are pivotally mounted on a rod 44 the ends of which are secured in the side walls of the body portion 10. The arms 43 are retained against lateral movement by being positioned between a shoulder 45 formed on the rod 44 and a washer and nut 46 which is threaded on the rod 44. The arms 43 extend upwardly from the rod 44 and are provided with surfaces that contact a second rod 47 having its ends anchored in the side walls of the body portion 10 in a manner similar to that of rod 44. The arms 43 are designed to hang freely in a perpendicular position by the action of gravity and their swinging movement in one direction is limited by their contact with the rod 47 (see Fig. 2). With the crank 22 swung to the position previously mentioned, the ends 26 of the bar 25 are in contact with the arms 43 which in turn are in contact with rod 47 in a manner to arrest further movement of the bar 25. With the bar 25 retained against further movement with the drum, continued rotation of the crank 22 results in movement of the drum 16 relative to the fixed position of the bar 25 and causes a sheet receiving opening to be formed between one side of the groove 24 and the adjacent side of the clamping bar 25.

With the clamping bar 25 retained in its unclamped position, the operator may advance the topmost master sheet 42 so that the leading edge thereof contacts the downwardly curved surface 48 of a guide plate 49 that is secured to the rods 44 and 47. Continued movement of the master sheet 42 toward the guide plate 49 results in directing the leading edge of the master sheet into the sheet receiving opening formed between the clamping bar 25 and the side wall of the groove 24. When the master sheet has been fed a sufficient distance to have the leading edge thereof in contact with the bottom of the groove 24, the master sheet is in proper position to be clamped.

The clamping action is effected automatically by means of the tension of the spring 31 which reestablishes pressure contact between the clamping bar 25 and the groove 24 when the operating handle 23 and crank arm 22 are moved in a clockwise direction. With the master sheet securely clamped on the drum 16 by action of the clamping bar 25, the copy sheets may be fed into the machine either manually or automatically to produce the desired number of copies of the material contained on the master sheet. When the

desired number of copies have been made, the master sheet may be removed by stopping the rotation of the operating handle in a position just beyond its uppermost position in a course of rotation.

The unclamping operation comprises the reversing of the direction of rotation of the operating handle to a point where the ends 26 of the clamping bar 25 again contact the lower portions of the arms 43 whereupon the tension of the spring is increased by moving the drum relative to the clamping bar 25 to relieve pressure contact between the bar 25 and the side wall of the groove 24. With the release of the clamping pressure between the bar 25 and the groove 24, the narrow marginal portion of the master copy will free itself from contact with the drum 16 and clamping bar 25 by reason of its inherent tendence to again assume its normal flat position. Rotation of the crank 22 in a clockwise direction will result in the discharging of the master sheet on top of the copy sheets 41 which have been directed onto the copy receiving tray 14 which is secured to the frame 10 by the insertion of a downwardly directed flange 51 formed on the forward edge thereof into a channel 52 formed on the upper edge of one end of the body portion 10. The remaining master sheets may be inserted individually in the manner previously described to permit the running off of any desired number of copies of each of the master copies at hand.

The position of the arms 43 is such that when the operating handle 23 is rotated in a clockwise direction to produce the desired copies, the ends 26 of the clamping bar 25 urge the arms 43 in a direction in which they are free to move and hence the cyclic contact between the ends of the clamping bar and the arms 43 (as indicated in Fig. 5) does not impede the normal operation of the machine. However, the operator is free at any time to discontinue the feed of the copy sheets and discharge the master then in use without as much as requiring a single extra turn of the operating handle 23. This feature adds greatly to the efficiency of the machine and results directly from the inclusion of the new and improved means for effecting movement of the clamping bar 25 within the groove 24.

From the foregoing description it will readily be understood that a simple and effective master sheet clamping means has been provided for releasably retaining a master sheet in position on the drum of a duplicating machine. It should also be noted that the operation of clamping and unclamping the master sheet requires only the manual operation of a single element, the operating crank of the machine. By reason of this condition the efficiency of the duplicating machine has been greatly increased as the time consumed in adjusting, clamping, unclamping and discharging the master sheet has been reduced to the operation of the single element which is normally used for running off the desired copies of the material contained on a master sheet.

While the invention has been described in considerable detail in the foregoing description it is understood that various changes may be made in its embodiment without departing from or sacrificing any of the advantages hereinafter claimed:

I claim:

1. In a duplicating machine the combination with a frame and a manually rotatable duplicating drum having a longitudinally disposed groove in the surface thereof, of a master sheet clamping means on said drum, said clamping means comprising a clamping bar receivable in said groove, said bar being laterally movable in said groove, means for normally retaining said bar in pressure contact with the bottom and one side of said groove, and pivotally mounted means disposed adjacent each end of said drum for engaging said bar upon rotation of said drum, means for limiting the movement of said pivotally mounted means in one direction, said pivotally mounted means being operative upon said bar upon rotation of said drum in one direction to engage said movement limiting means to arrest movement of said bar to effect the release of clamping pressure between said bar and groove to provide an opening adapted to receive a master sheet, said pivotally mounted means being operative upon rotation of said drum in the opposite direction to permit unimpeded movement of said clamping bar and drum without affecting the clamping contact between said clamping bar and said groove.

2. In a duplicating machine the combination with a frame and a manually rotatable duplicating drum having a longitudinally disposed groove in the surface thereof, of a master sheet clamping means on said drum, said clamping means comprising a clamping bar receivable in said groove, said bar being laterally movable in said groove, means for normally retaining said bar in pressure contact with the bottom and one side of said groove, and pivotally mounted means disposed adjacent each end of said drum for engaging said bar upon rotation of said drum, means for limiting the movement of said pivotally mounted means in one direction, said pivotally mounted means being operative upon said bar upon rotation of said drum in one direction to engage said movement limiting means to arrest movement of said bar while said drum is permitted continued movement sufficient to effect the release of clamping pressure between said bar and groove to provide an opening adapted to receive a master sheet, said pivotally mounted means being operative upon rotation of said drum in the opposite direction to permit unimpeded movement of said clamping bar and drum without effecting the clamping contact between said clamping bar and said groove.

3. A master sheet clamping mechanism for duplicating machines including a drum and a manually operable drum rotating crank, said clamping mechanism including a longitudinally disposed groove formed in the surface of said drum, a clamping bar receivable in said groove, said bar being longer and narrower than said groove, means for releasably retaining said bar in said groove, said retaining means operative to urge said bar into pressure contact with the bottom and one side of said groove, and pivotally mounted means disposed adjacent the ends of said drum for engaging the overhanging portions of said bar to arrest the movement of said bar upon rotation of said drum in one direction to effect the release of clamping pressure between said bar and one side of said groove, said pivotally mounted means being operative to permit unimpeded rotation of said drum and clamping bar in the opposite direction.

4. In a duplicating machine, the combination with a frame, a duplicating drum rotatably journalled in said frame, a duplicating drum rotatably journalled in said frame and having a longitudinally disposed groove formed therein, and a manually operable means for rotating said drum, of a master sheet clamping means on said

drum, said clamping means comprising a bar receivable in said groove, means for yieldably retaining said bar in pressure contact with the bottom and one side of said groove, said bar having end portions extending beyond said drum, means disposed adjacent each end of said drum adapted to contact the adjacent end portion of said bar on each revolution of said drum, said means being operative to arrest the movement of said bar and its pressure contact with said groove at a predetermined position of rotation of said drum in one direction and having no effect on said bar upon rotation of said drum in the reverse direction.

5. The combination in a duplicating machine of a rotatable duplicating drum and master sheet clamping means on said drum, said drum including a longitudinally disposed groove extending the length of said drum, a clamping bar receivable in said groove, said clamping bar having a thickness substantially equal to the depth of said groove, a width narrower than said groove, and a length greater than said groove, yieldable means for retaining said clamping bar in pressure contact with the bottom and one side of said groove, and means disposed adjacent each end of said drum adapted to contact the adjacent end portion of said bar on each revolution of said drum, said means being operative to arrest movement of said bar and release its pressure contact with said groove at a predetermined position of rotation of said drum in one direction and having no effect on said bar upon rotation of said drum in the reverse direction.

6. In a duplicating machine the combination with a frame and a manually rotatable duplicating drum having a longitudinally disposed groove in the surface thereof, of a master sheet clamping means on said drum, said clamping means comprising a clamping bar receivable in said groove, said bar being longer than said groove and being laterally movable in said groove, means for normally retaining said bar in pressure contact with the bottom and one side of said groove, with the ends thereof extending beyond the ends of said drum, rockably mounted arms adjacent the ends of said drum adapted to lie in the path of travel of said bar during the rotation of said drum, said arms being adapted to arrest the movement of said bar at a predetermined position in the rotation of said drum in one direction to effect the release of clamping pressure between said bar and said groove thereby forming a master sheet receiving opening and said arms being operative upon rotation of said drum in the reverse direction to permit the clamping bar to pass unimpeded with said clamping bar retained in master sheet clamping position.

7. In a duplicating machine the combination with a frame and a manually rotatable duplicating drum having a longitudinally disposed groove in the surface thereof, of a master sheet clamping means on said drum, said clamping means comprising a clamping bar receivable in said groove, said bar being longer than said groove and being laterally movable in said groove, means for normally retaining said bar in pressure contact with the bottom and one side of said groove, with the ends thereof extending beyond the ends of said drum, rockably mounted arms adjacent the ends of said drum adapted to lie in the path of travel of said bar during the rotation of said drum, said arms being free to swing in one direction, abutment means adapted to limit the movement of said arms in the reverse direction, said arms being adapted to arrest the movement of said bar at a predetermined position in the rotation of said drum in one direction wherein said arms are in contact with said abutment means to effect the release of clamping pressure between said bar and said groove thereby forming a master sheet receiving opening and said arms being operative upon rotation of said drum in the reverse direction to permit the clamping bar to pass unimpeded with said clamping bar retained in master sheet clamping position.

8. In a duplicating machine the combination with a frame, a copy sheet support, a master sheet support, a master sheet guide plate, a manually rotatable duplicating drum, and a work receiving tray, of master sheet clamping means on said drum, said clamping means comprising, a clamping bar, a longitudinally disposed groove in said drum adapted to receive said bar, yieldable means for retaining said bar in said groove, said clamping bar being narrower than said groove whereby lateral movement of said bar may be effected in said groove, said clamping bar being longer than said groove thereby providing end portions that extend beyond said drum, means disposed adjacent the ends of said drum adapted to contact the end portions of said clamping bar on each revolution of said drum, said means serving upon rotation of said drum in one direction to arrest the movement of said clamping bar at a predetermined position in the rotation of said drum wherein said groove and bar are in alignment with said master sheet guide plate, means operative upon further movement of said drum for effecting the release of clamping pressure between said groove and said bar to form a master sheet receiving opening therebetween, said opening being in alignment with said master sheet guide plate whereby master sheets fed against said plate will be directed into said opening, means for effecting the clamping of said master sheet between said bar and groove upon rotation of said drum in a reverse direction, said bar contacting means permitting uninterrupted rotation of said drum in said last named direction without rendering said clamping means ineffective.

ROSCOE R. ROCKHILL.