June 5, 1934.

J. K. DUNCAN ET AL

1,961,285

ROTARY DUPLICATOR

Filed Dec. 24, 1931

5 Sheets-Sheet 1

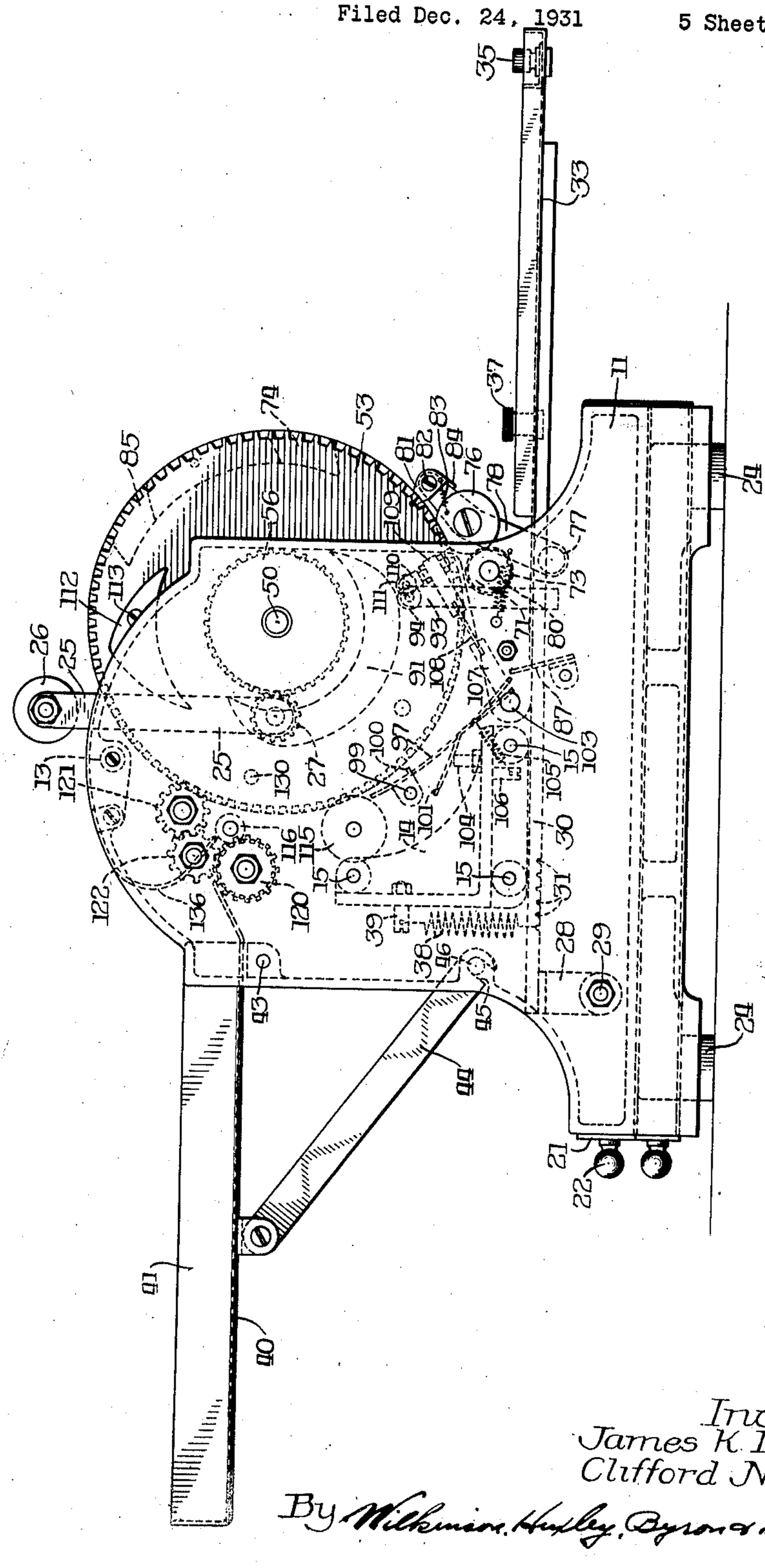

Fig. 1.

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5 Sheets-Sheet 2

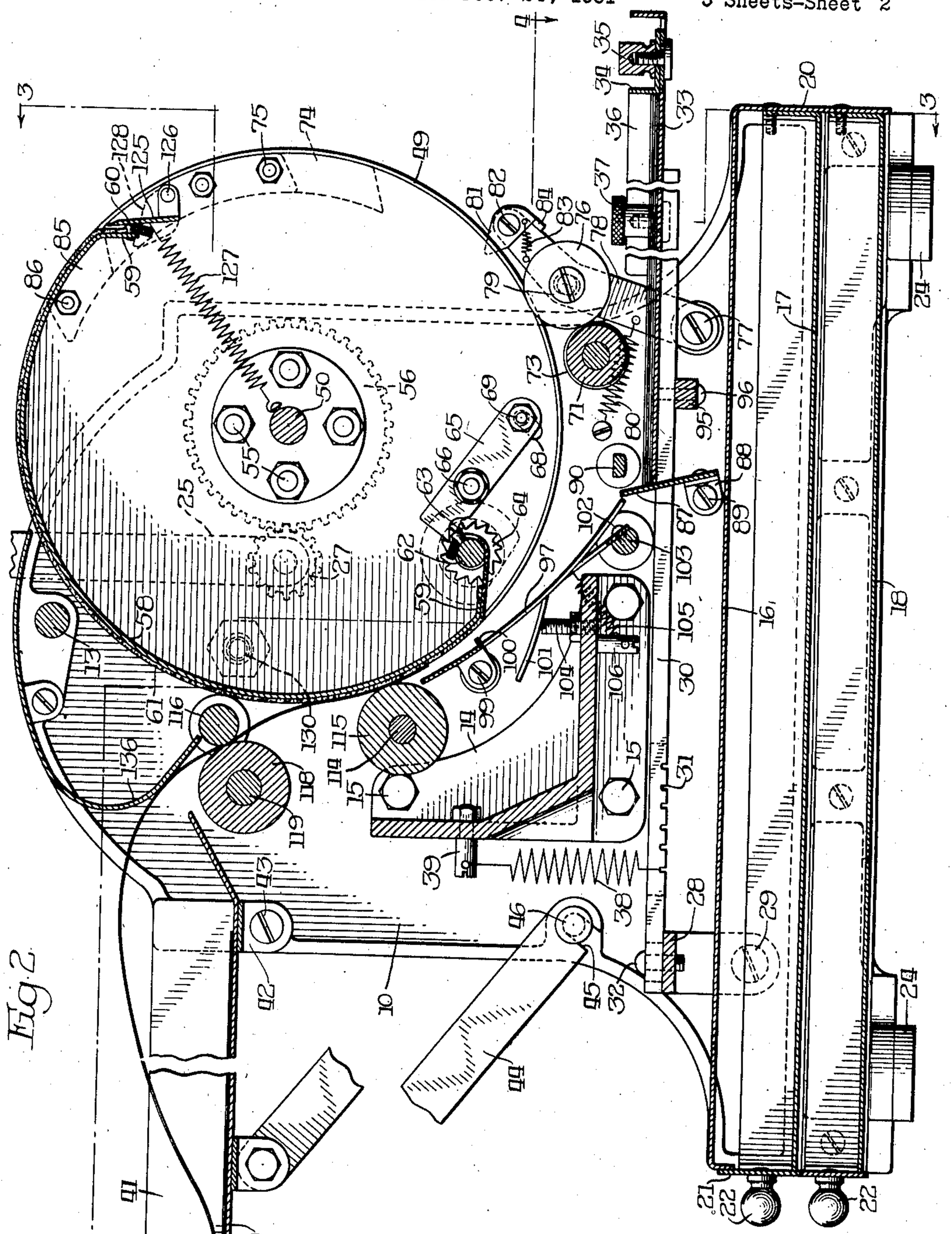

Fig 2

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5 Sheets-Sheet 3

Fig 7

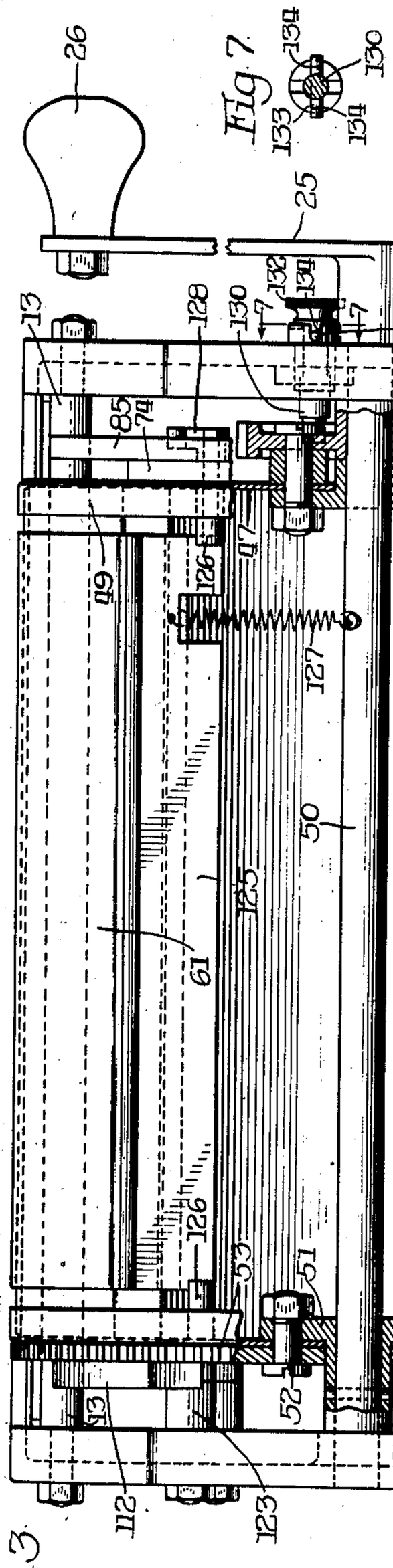
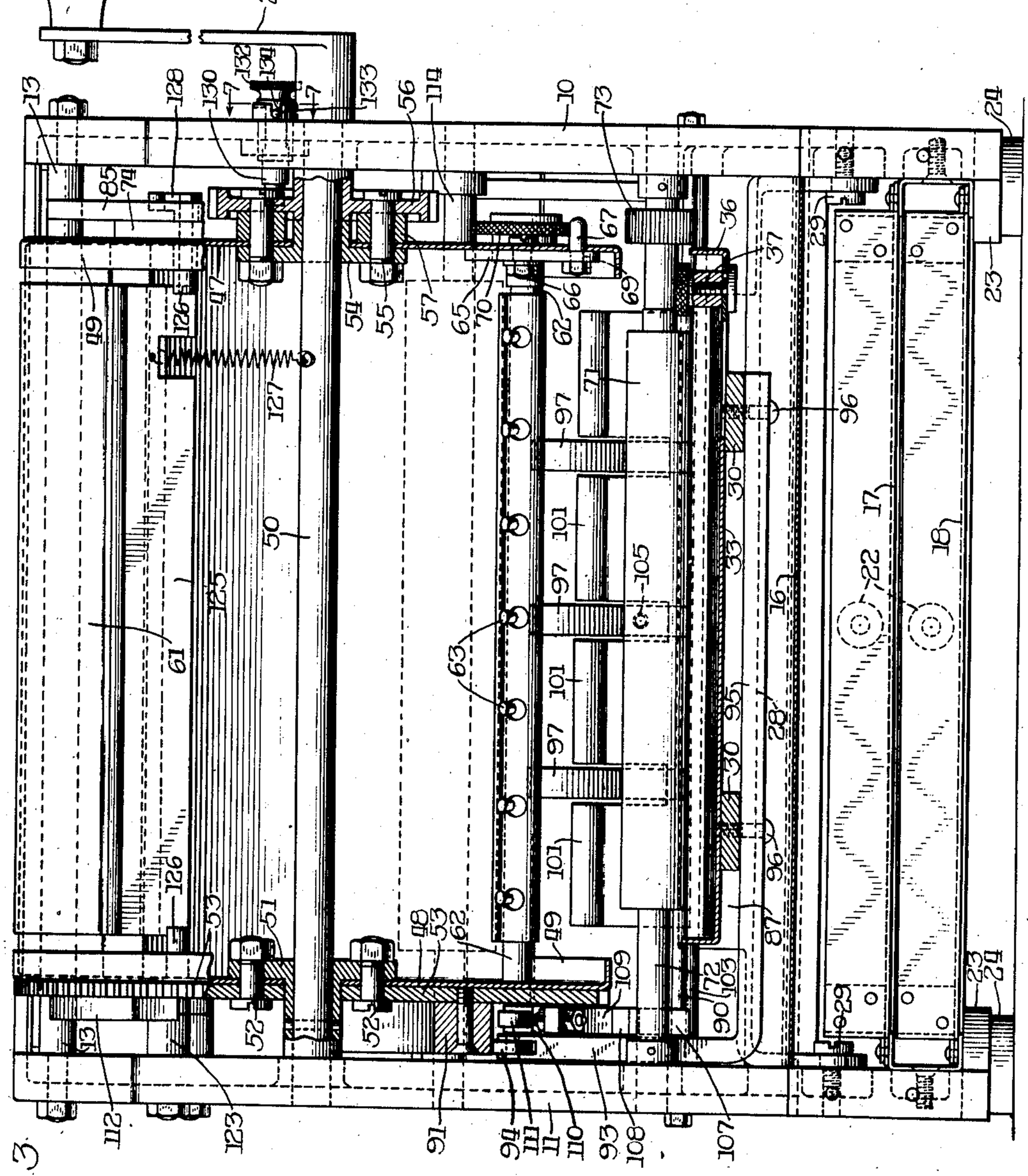


Fig 3



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ROTARY DUPLICATOR

Filed Dec. 24, 1931 5 Sheets-Sheet 4

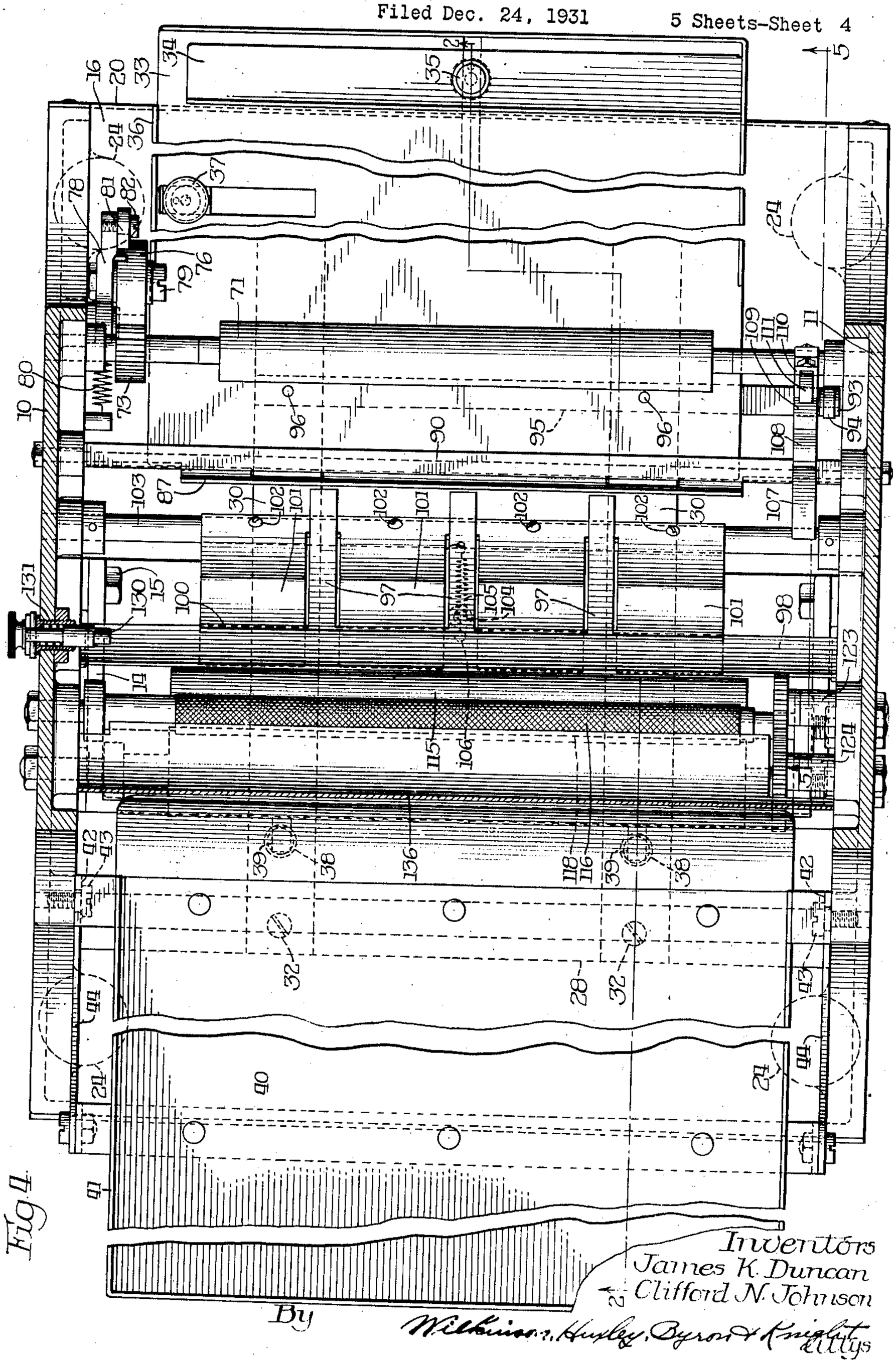

Fig 4.

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June 5, 1934. J. K. DUNCAN ET AL 1,961,285

ROTARY DUPLICATOR

Filed Dec. 24, 1931 5 Sheets-Sheet 5

Fig 6

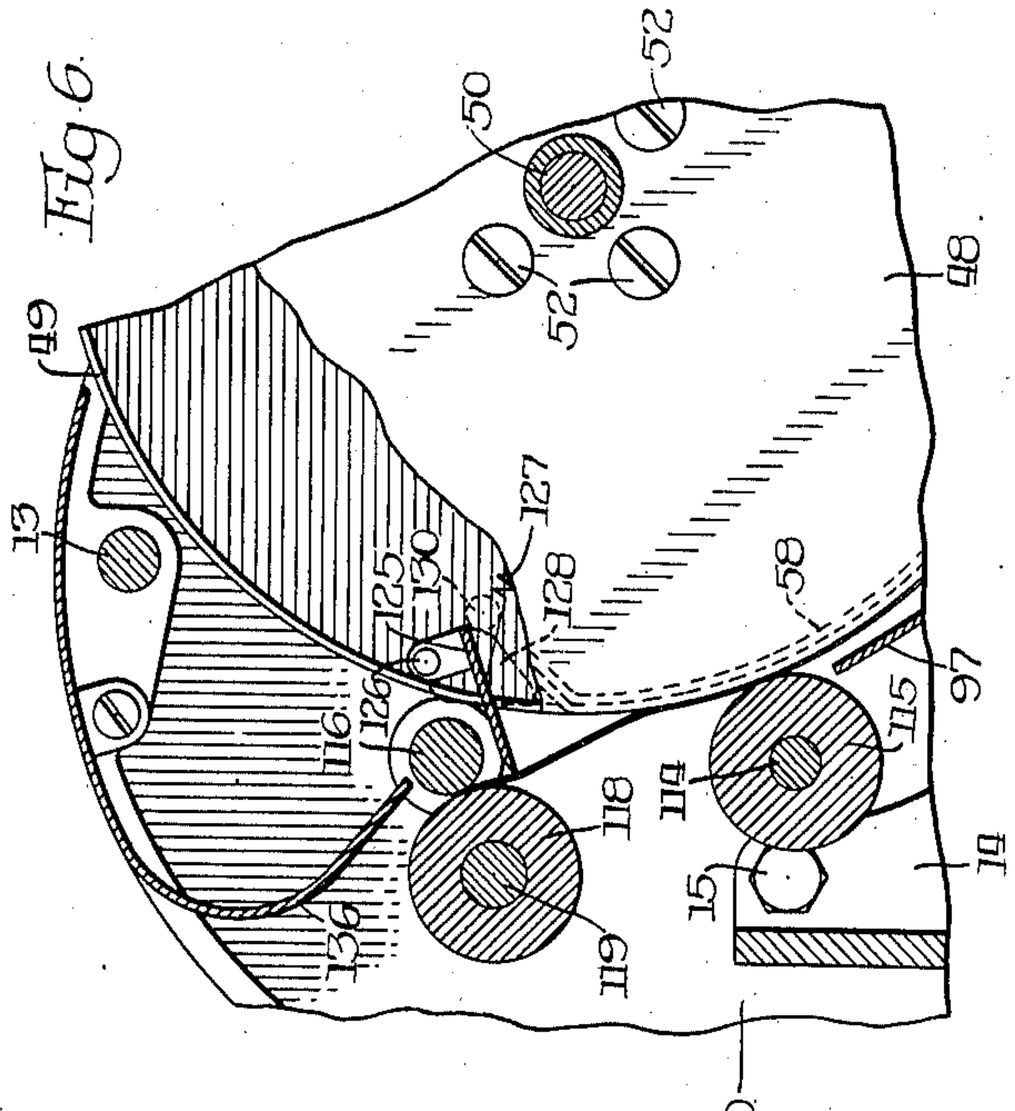
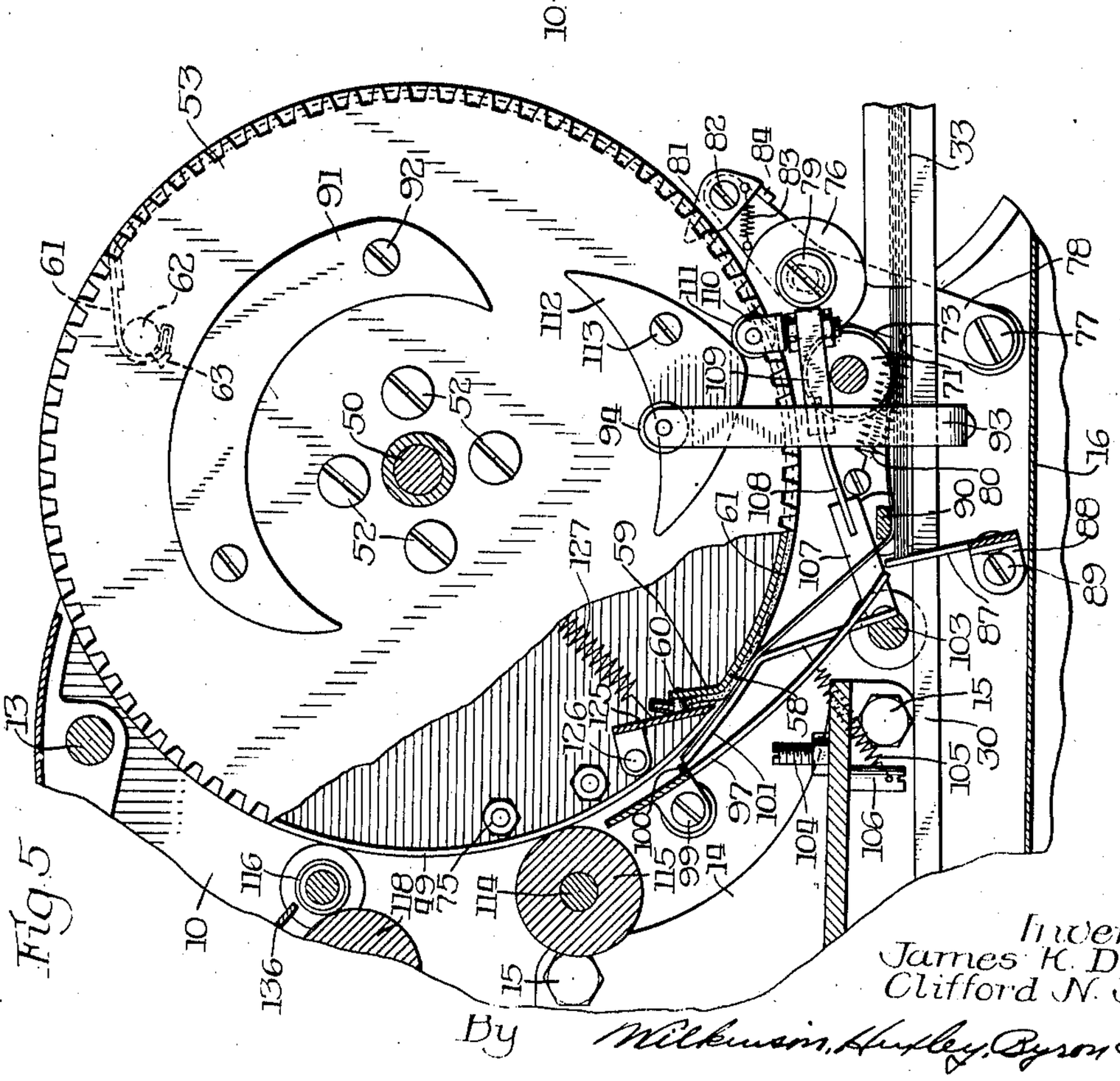


Fig 5



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Patented June 5, 1934 1,961,285

UNITED STATES PATENT OFFICE

1,961,285

ROTARY DUPLICATOR

James K. Duncan and Clifford N. Johnson, Chicago, Ill., assignors to Ditto, Incorporated, Chicago, Ill., a corporation of West Virginia

Application December 24, 1931, Serial No. 582,901

20 Claims. (Cl. 101—132)

The invention relates to rotary duplicators and particularly to a rotary duplicator employing a gelatin band or matrix for receiving an impression from a master sheet and for imparting the same to blank sheets subsequently impressed on the matrix.

One of the objects of the invention is to provide a rotary type of duplicator with feeding mechanism characterized by a movable paper tray which functions to contact a top sheet of the paper stock supported thereon with a rotating feed roller, the roller serving to separate the top sheet from the remaining sheets and to present the same for further operations.

A further object is to provide feeding mechanism embodying a novel friction drive wherein the feeding roller is rotated from the cylinder through an intermediate friction wheel and which can be thrown out of engagement with the cylinder when the latter is rotated in the reverse direction.

Another object is the provision of a paper stop for association with the paper tray in such a manner as to facilitate the separation by the feeding roller of the top sheet from the stock supported on the tray.

Another object of the invention is to provide a rotary type duplicator with instrumentalities located between the feeding and impression rollers and actuated in timed relation to the feeding roller and rotary cylinder to adhere to the gelatin surface provided on the cylinder, the marginal edge of the fed sheet.

The operative means for accomplishing this embodies registering fingers which form a stop for the fed sheet and which correctly positions the leading marginal edge of the sheet before those feeding devices are actuated to present the sheet to the printing surface of the cylinder. This operation positively insures correct margin at all times and proper aligning of the sheet with respect to the gelatin.

A further object is to provide stripping devices for stripping the work sheets from the printing surface which will insure positive removal of the duplicated sheet from the gelatin band and depositing of the same in a receptacle provided for the purpose.

A feature of the invention in connection with the stripping means is the provision of a cam actuated plate or strip carried by the cylinder and having association with the gelatin band and duplicated sheet, such that upon actuation of the same, the leading marginal edge of the sheet will be projected between rotating stripping rollers.

A further object of the invention is to provide a rotary duplicator which will be simple in construction, embodying an organization of devices for causing positive feeding of the sheets and removal of the duplicated sheets, and wherein the structural arrangement and positioning of the operative parts will result in discharging the duplicated sheets with their printed matter visible to the operator.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings which illustrate an embodiment of the device and wherein like reference characters are used to designate like parts—

Figure 1 is a side elevational view of a rotary duplicator embodying the features of the present invention;

Figure 2 is a longitudinal vertical sectional view taken substantially through the center of a machine constructed according to the present invention and showing a duplicated sheet in the process of being stripped from the printing surface of the rotary cylinder;

Figure 3 is a transverse vertical sectional view through one end of the duplicator, being taken substantially on the plane indicated by line 3—3 of Figure 2;

Figure 4 is a sectional plan view of the duplicator taken on the plane indicated by line 4—4 of Figure 2;

Figure 5 is an operational view taken on the plane indicated by line 5—5 of Figure 4 and showing the feeding and associated mechanism in the process of delivering a work sheet to the gelatin surface of the cylinder; and

Figure 6 is an operational view showing in detail the stripping devices and the manner of projecting the leading edge of the duplicated sheet in the path of the stripping rollers.

Figure 7 is a section taken on line 7—7 of Fig. 3.

The machine is mounted within spaced frame members 10 and 11, Figures 2 and 3, held in spaced relation by means of an upper tie rod 13, a supporting member 14 extending from frame to frame at substantially their central portions and being secured thereto by fastening screws 15 and by means of a plurality of receptacles carried by the frames at their lower portions and formed of a top plate 16, a dividing plate 17 and a base

plate 18. End closure members 20 and 21, the latter being provided with knobs 22, complete the receptacles which contain a supply of gelatin bands, one, the used bands, and the other, the fresh bands, which form the duplicating surface on the rotary cylinder. The frames are also provided with inwardly extending portions 23 for receiving rubber feet 24 by means of which the machine is yieldingly supported on any suitable base. The frame member 10 journals a crank 25 provided with handle 26 and the pinion 27, Figure 2, the pinion being adapted to mesh with means to be subsequently described, for the purpose of imparting rotary movement to the cylinder.

If it is desired to substitute for the manual operation of the cylinder electric operation, as by an electric motor, it will readily be seen that the handle can be dispensed with or may preferably incorporate a clutch drive which will render the handle inoperative when the pinion 27 is being driven by the electric motor.

The frame forms a support for a plurality of paper trays which according to the present invention are located at different elevations with respect to each other. The tray for receiving the work sheets is pivotally supported from the frames 10 and 11 by means of a yoke member 28 having its arms pivotally secured to the frames by pivot pins 29. Longitudinal members 30, provided with notches 31, are rigidly secured at one end by screws 32 to the yoke member 28 and support at their other ends the work sheet receiving tray 33 having an adjustable rear flange 34 adjustably positioned through actuation of the set screw 35 and a right hand flange 36 positioned by means of the set screw 37. The arrangement of the pivoted supporting yoke pivotally mounts the tray 33 within the side frames and in order to maintain the tray in correct vertical relation with the feeding devices a coil spring 38 is provided, secured at one end to stud 39 projecting from the support 14 and having its other end located in one of the notches 31. To vary the tension exerted by the spring in order to care for paper stock of varying weight a plurality of notches are formed in the members 30, the adjustment being accomplished by locating the spring in the notch desired.

Also supported from the spaced frames 10 and 11 is a receiving tray 40 having marginal flanges 41, being pivotally secured to the frame at its inner end by means of a supporting yoke 42 and securing members 43. This pivotal construction permits the tray to be dropped so as to assume an inoperative position, the arms 44 pivotally secured to the tray at an intermediate point serving to releasably maintain the tray in elevated or operative position. For the purposes the arms are provided at their lower ends with a notch 45 adapted to engage with the set screws 46 located in the respective frame members.

Referring more particularly to Figures 2 and 3, the duplicating cylinder is shown as comprising spaced end members 47 and 48, provided with inwardly directed peripheral flanges 49 and being mounted in spaced relation adjacent the respective frame members 10 and 11 on a transverse operating shaft 50 journalled at its ends in the members. A left hand hub 51 is non-rotatably secured to shaft 50 and provides securing bolts 52 by means of which the end member 48 and the gear 53 is secured to the hub and thus to the shaft. A somewhat similar construction, including a hub member 54 providing securing bolts 55, serves to non-rotatably secure to shaft 50 the end frame 47 and also the gear 56 which is spaced outwardly from the end member by washers 57 so as to have meshing engagement with pinion 27 forming part of the manual operating means.

By the above structure it will be clearly seen that the cylinder which carries the duplicating surface to be presently described is mounted for rotation within the frame members, the rotation being imparted manually by rotating pinion 27 through actuation of the crank handle 25, 26.

The cylinder is provided with a printing surface including an arcuate platen member 58 suitably secured at its ends to the marginal flanges 49 and extending for substantially half the circumference of the cylinder. The platen 58 is formed with inwardly bent terminal portions 59, one of which has secured thereto a plurality of spaced pins 60, the pins serving to detachably secure to the portion 59 one end of a gelatin band 61, which is stretched over and supported on the surface of platen 58 to form a duplicating surface, the other end being detachably secured to shaft 62 provided with the projecting pins 63 and being journalled in the respective end members 47 and 48. In order to hold the gelatin band in stretched position on the platen the shaft 62 has mounted thereon a ratchet wheel 64 located adjacent the end member 47 and adapted to be engaged by the locking pawl 65 pivoted to the member at 66 and having outwardly projecting stud 67 secured at its lower end and extending through the arcuate slot 68. The stud 67 allows the operator to rock the locking pawl to release its engagement with ratchet wheel 64, the pawl being held in operative position by means of the locking nut 69. The right hand end of shaft 62 receives a knurled operating wheel 70 to provide accessible means for the operator so that the shaft 62 can be rotated for releasing the gelatin band from the shaft or for stretching the band over its supporting surface, in which case the shaft is held in position by the locking pawl 65.

A feature of the invention is the provision of feeding means which will function to efficiently and positively separate the top sheet from the paper stock supported on tray 33 and feed the same until its leading edge contacts with registering stops, insuring correct positioning of the leading edge of the sheet prior to the presenting of the sheet to the duplicating surface on the cylinder. For performing the above operations a feeding roller 71, of any suitable composition, is mounted on shaft 72, journalled in the frame members 10 and 11, and having mounted on its right hand end the knurled roller 73. The roller 71 is rotated from the cylinder by means of the engagement between the arcuate cam 74, secured to end member 47, by securing screws 75, and the friction roller 76. The friction roller in operative position has contact with cam 74 and the knurled roller 73, thus causing rotation of the feeding roller 71 intermittently in timed relation to the rotary movement of the cylinder, which has clockwise rotation, and accordingly, it will be seen that the arcuate cam 74 is located in advance of the duplicating surface of the cylinder so as to initiate a feeding operation prior to the time the duplicating surface is in position for receiving a sheet. The friction drive provided for the feeding roller can be thrown out of operation should the cylinder be inadvertently rotated in a reverse direction.

Pivotally secured at 77 to frame member 10 is

a supporting arm 78 providing the supporting stud 79 on which the friction roller 76 is journaled. The coil spring 80, secured at one end to the frame and at its other end to the arm 78, yieldingly maintains the arm in upright position and thus the friction roller 76 in engagement with the knurled roller and cam. In the event that the cylinder is rotated in a counter-clockwise direction, which would otherwise cause a feeding of a sheet toward the right from tray 33, Figure 2, a pawl 81 is pivoted at 82 to the upper end of arm 78 and is held in upright position by the coil spring 83, which maintains the stop 84 in contact with the arm. Secured to end member 47, adjacent arcuate cam 74 and in staggered relation therewith, is a second cam 85 of similar contour, held in position by securing screws 86 for the purpose of engaging the pawl 81 which, when the cylinder is rotated in a reverse direction, since cam 85 leads cam 74, will cause arm 78 to be depressed in advance of the positioning of the feeding cam 74 for engagement with the driving roller 76. It will be clear that with the cylinder rotating in a reverse direction, cam 85 will engage pawl 81 since the parts are in alignment to perform the above disengagement of the friction drive but when the cylinder rotates in its proper direction then pawl 81, although engaging cam 85 as before, will in this instance be rocked on its pivot, allowing the arm to remain upright and the friction drive in engagement.

Positioned to the left hand end of the paper tray 33 is a paper stop 87 adjustably mounted within the frames 10 and 11 by the yoke 88 and securing screws 89. The stop has an angular relation with respect to the paper tray and terminates at a point above the tray substantially in alignment with the transverse bar 90. The angular relation of the stop with respect to the tray is determined so that the stop may form an abutment for the paper stock against which the work sheets may engage when deposited on the tray and may also facilitate in the separation of the top sheet for feeding purposes. Movement of the top sheet in a direction toward the stop is caused by engagement of the same with the rotating feeding roller, which, due to the friction between the top and adjacent sheets, tends to cause movement of the adjacent sheet. Sufficient resistance to this movement of the adjacent sheet is provided by the stop so as to overcome the friction between them and as the top sheet is positively fed it rides over the stop to be deposited on the paper guides and against the registering means to be described.

Actuation of the paper tray 33 in order to initiate a feeding operation is caused by engagement of cam 91, secured by screws 92 to end member 48 of the cylinder with the upstanding arm 93 provided at its upper end with roller 94 adapted to directly engage the cam and thus reduce the friction between the parts, and being secured to the paper tray through securement of its base portion 95 with the longitudinal members 30. As shown in Figure 3, the screws 96 secure the paper tray to the longitudinal members and the latter to the base portion 95. As previously described, the paper tray is pivotally supported within the frame members and resiliently held in elevated position by the coil spring 38. In this position of the paper tray, Figure 5, it will be seen that the top sheet of paper has contacting engagement with the rotating feed roller 71.

In order to terminate a feeding operation it is therefore only necessary to lower the tray against the tension of spring 38 which is caused by the engagement of cam 91 with roller 94 journalled in the upstanding arm 93. By the above construction engagement between the feeding roller and the paper stock is yieldingly maintained through the tension of spring 38 and the tray is positively lowered through cam structure in order to separate the paper stock from contact with the roller. The fed sheet of paper from the tray 33 is deposited on paper guides 97 located at intervals substantially centrally of the paper stop 87 and terminating at the lower end adjacent the stop. The paper guides are integral with a supporting portion pivotally supported within the frames by securing screws 99 and thus permit vertical adjustment of the guides to properly locate their lower ends with respect to the paper stock. The members 97, in addition to providing paper guides, present a plurality of stops 100 which function as registering means for registering the leading edge of the fed sheet. Associated with the guides and operating in a manner to present the registered marginal edge of the sheet to the duplicating surface are a plurality of paper engaging fingers 101 and alternating with respect to the guides and being secured at 102 to an operating shaft 103, rotatably mounted in the frame members of the machine. The support 14 locates an adjustable rest 104 in the path of the upper arcuate portions of the fingers, which are held in engagement with the stop in position below the paper guides by the coil spring 105 secured at one end to the fingers and at its other end to the depending stud 106.

For actuating the paper engaging fingers in timed relation to the rotations of the cylinder the shaft 103 has suitably secured thereto a member 107 from which extends a flexible strip 108 having secured to its end a second member 109. The stud 110, suitably secured to member 109, presents a roller 111 in alignment with and adapted to engage the cam 112, secured by screws 113 to the end member 48. The cam is provided with a cusp of determined contour so that its engagement with roller 111, although of short duration, is such that the roller is depressed a considerable extent. By means of the flexible strip 108 the rocking of shaft 103, although positive, is sufficiently yielding to prevent any damage being done to the duplicating surface. The quick rotary movement imparted to shaft 103 causes the paper engaging fingers 101 to travel upwardly, the fingers passing beyond the paper guides and engaging the marginal edge of the sheet and presenting the same to the leading surface of the duplicating band 61, as shown in Figure 5. The actuation of roller 103 to perform the above operation is of course timed by means of proper positioning of the cam 112 on the cylinder and is such that the leading marginal edge of the fed sheet is presented and caused to adhere to the gelatin surface, with the leading portion of the sheet overlying the securing portions of the gelatin bands, which portions, as described, engage the pins 60, provided on the inwardly directed ends 59 of the platen. From the above it will be clear that the paper engaging fingers operate to contact the leading marginal portion of the sheet with the surface of the gelatin, which on account of the adherent nature of the gelatin band, adheres the contacted portion thereto, with the leading edge of the sheet, however, being located in advance of the duplicating surface and overlying a stripping member to be presently described. Rotatably mounted within the frames

10 and 11 of the machine is a shaft 114 from which is mounted an impression roller 115, the roller being positioned with respect to the rotating cylinder so as to have engagement with the duplicating surface thereon for impressing the sheets upon the surface.

Also rotatably mounted in the frame members of the machine is a roller 116 adapted to engage with a second roller 118 mounted on shaft 119 rotatably supported in the frame members and having mounted at its left hand end a pinion 120, Figure 1. The rollers comprise stripping means for stripping the duplicated copy from the surface of the gelatin band 61 and for feeding the same outwardly onto the receiving tray 40. The gear 53, previously described as secured to end member 48, serves as the driving means for the rollers, the same being driven through intermediate pinions 121 and 122 mounted for rotation from the frame member 11 by means of the inwardly projecting studs 123 and 124, respectively, Figure 4. Pinion 121 meshes directly with gear 53 and with pinion 122 which meshes with pinion 120 to drive the roller 118. In order to locate the leading edge of the duplicated sheet so that the same is engaged by the stripping rollers, the printing cylinder has pivotally mounted therein a stripping plate 125 pivoted to the end frames by securing studs 126 and held in retracted position by the coil spring 127, secured at one end to the stripping plate, and at its other end to shaft 50, Figures 3 and 6. The stripping plate is located immediately in advance of the duplicating surface provided on the cylinder and in operative position is held by the spring in a position overlying the secured end of the gelatin band 61. In this position it will be seen that the stripping plate is out of contact with the feeding roller and also the impression roller and is so positioned with respect to the gelatin surface in the cylinder as to be located under the leading edge of the duplicated sheet. The stripping plate is cam actuated and for the purpose the cam 128 is operatively associated therewith and positioned outwardly of the end frame 47 and in alignment with the inwardly projecting pin 130 supported in the frame member 10. The location of the pin determines the point in the rotations of the cylinder at which the cam is actuated to rock the stripping plate in a clockwise direction and as the leading marginal edge of the sheet on the duplicating surface has overlapping relation with the plate the same is caused to be projected outwardly away from the periphery of the cylinder and between the path of the stripping rollers 116 and 118. Upon continued rotation of the cylinder the cam 128 passes beyond pin 130 whereupon the tension of the coil spring 127 again locates the stripping plate in its retracted inoperative position.

It is sometimes desirable, especially when a master sheet has been impressed on the surface of the gelatin, to permit the same to remain for a greater length than is necessary in the case of the duplicated sheets and for the purpose the pin 130 is resiliently mounted in the member 131 threaded in the frame 10. The pin resiliently urged inwardly into the path of cam 128 is provided with knob 132 so that the pin can be withdrawn and by means of the diametrically extending studs 133 formed on the shaft of the pin the same can be held in retracted position, the construction locating the pin for operation when the studs are located in slot 134. By the formation of cam 128 it will be seen that rotations can be imparted to the cylinder in either direction.

In the operation of the duplicator above described, paper stock of the desired size is deposited on the tray 33, the leading marginal edges of the sheets being aligned by engagement with the paper stop 87. By rotation of the crank handle 25, 26 the operator can impart the necessary rotary movement to the printing cylinder, which functions in the first instance to cause cam 74 to engage the friction roller 76, rotating the roller and, through contact of the same with the knurled wheel 73, the feeding roller 71. Practically simultaneous with the above operation the cam 91 rotates out of engagement with roller 94 carried by the upstanding arm 93 to permit the paper tray 33 to travel upwardly, the movement being caused by spring 38, whereupon the rotating feeding roller contacts the top sheet of the paper stock on the tray. The top sheet is separated from the stock and is fed over the stop 80 to be deposited on the paper guides 97 with the leading edge engaging the registering stops 100.

The feeding roller continues its rotation until the paper has been fed into engagement with the registering stops, whereupon the cam 74 rotates out of contact with the friction roller 76. Continued rotation of the cylinder locates the cam 112 in position to contact a roller 111 carried by the flexible arm rigidly secured to shaft 103. The actuation thus imparted to the flexible arm gives a quick rocking movement to the shaft supporting the paper engaging fingers 101, causing an upward movement of the same beyond the plane of the paper guides to present to and cause contacting engagement between the leading marginal portion of the sheet and the leading surface of the gelatin band. It will be understood, however, that in advance of this operation the fed sheet has been positioned against the registering stops to accurately align the leading edge of the sheet with respect to the gelatin band.

The cam 91 has by this time rotated sufficiently to again engage roller 94 on the upright 93 to depress the paper tray, freeing the top sheet from engagement with the roller 71. The fed sheet with its marginal edge in adhesion with the leading portion of the duplicating band is thus removed from the paper tray through the rotary motion of the cylinder and as the duplicating surface engages the impression roller 115 the sheet is entirely impressed upon the surface for receiving an impression therefrom as is well understood in the duplicating art.

Before the entire sheet is impressed on the gelatin surface it is necessary to initiate the stripping operation which functions to strip the sheet therefrom. In the present construction this is accomplished by the stripping plate 125 actuated by engagement of cam 128 with the pin 130 to project the leading edge of the sheet into the path of the stripping rollers. The rollers are continuously rotated, being driven from the rotating cylinder, and complete the stripping operation by feeding the duplicated sheet outwardly against the deflecting flange 136 and locating the same in the receptacle 40 provided for receiving it.

It is to be understood that we do not wish to be limited by the exact embodiment of the device shown, which is merely by way of illustration and not limitation, as various and other forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

We claim:

1. A rotary duplicator, in combination, a rotating duplicating cylinder, a paper tray for supporting work sheets to be duplicated, a feeding roller, means movably supporting the tray with respect to the feeding roller, registering stops against which a fed sheet is adapted to engage, and paper engaging fingers actuated in timed relation to the rotary cylinder for presenting the registered edge of the sheet to the cylinder.

2. A rotary duplicator, in combination, a rotating duplicating cylinder, a duplicating surface provided thereon, a paper tray for supporting work sheets, means for feeding said sheets, registering stops for receiving a fed sheet and positioning the leading edge, and fingers actuated from the rotating cylinder for presenting the registered edge to the duplicating surface.

3. A rotary duplicator, in combination, a rotary cylinder, a duplicating surface provided thereon, a paper tray for supporting work sheets, a plurality of paper guides providing registering stops, feeding means for separating the top sheet from the stock on the tray and positioning the leading edge of the same against the stops, and pivoted paper engaging fingers associated with the guides and operative for presenting the registered edge to the duplicating surface of the cylinder.

4. A rotary duplicator, in combination, a rotary cylinder, a duplicating surface provided thereon, a paper tray for supporting work sheets, a plurality of paper guides providing registering stops, feeding means for separating the top sheet from the stock on the tray and positioning the leading edge of the same against the stops, and paper engaging fingers associated with the guides and operative to present the registered edge to the duplicating surface, the fingers when inoperative being positioned below the guides.

5. A rotary duplicator having a duplicating surface, a paper tray for supporting work sheets, a feeding roller, registering stops for positioning the leading edge of the fed sheet, an impression roller, and means positioned between the rollers and operating to adhere to the duplicating surface the leading portion of the registered sheet.

6. In a duplicator, a rotating cylinder journaled in frame members, a duplicating surface provided thereon, feeding devices supported in the frame members and operating to feed work sheets to the cylinder and to impress the leading portion of the same on the duplicating surface, an impression roller, stripping means for the impressed sheet including a plate pivotally mounted on the cylinder and underlying the leading marginal edge of the impressed sheet, and retractible means on the frame members for causing actuation of the plate.

7. In a duplicator, a rotating cylinder journaled in frame members, a duplicating surface provided thereon, feeding devices supported in the frame members and operating to feed work sheets to the cylinder and to impress the leading portion of the same on the duplicating surface, an impression roller, stripping means for the impressed sheet including a plate pivotally mounted on the cylinder and underlying the leading marginal edge of the impressed sheet, and retractible means on a frame member for causing actuation of the plate, whereby the marginal edge is projected outwardly to facilitate stripping of the sheet.

8. In a duplicator, a rotating cylinder journaled in frame members, a duplicating surface thereon, an impression roller, a feeding roller for feeding work sheets to the cylinder, a knurled wheel on the feed roller shaft, a friction wheel contacting therewith and journaled in means pivoted to one frame, a cam secured to the periphery of the cylinder for contacting the friction wheel and rotating same as the cylinder rotates, a second cam on the cylinder, a dog pivoted to the pivoted means and positioned in the path of the second cam, said dog when engaged by said cam during reverse rotation of the cylinder being operative to break contact between the friction wheel and the knurled wheel to render the friction drive inoperative.

9. A rotary duplicator having a duplicating surface, a paper tray for supporting work sheets, a feeding roller, registering stops for positioning the leading edge of the fed sheets, and paper engaging fingers pivotally mounted adjacent the registering stops, said fingers being operated by the cylinder to engage the leading marginal edge of the sheet and present same to the duplicating surface.

10. A rotary duplicator having a duplicating surface, a paper tray for supporting work sheets, a feeding roller, registering stops for positioning the leading edge of the fed sheet, and paper engaging fingers pivotally mounted adjacent the registering stops, means for actuating the fingers including a cam on the cylinder, and a flexible strip position for engagement by the cam and having connection to the fingers, whereby the fingers are operated in timed relation from the cylinder to engage the registered edge of the sheet and yieldingly present the same to the duplicating surface.

11. A rotary duplicator having a duplicating surface, a paper tray for supporting work sheets, a feeding roller, registering stops for positioning the leading edge of the fed sheet, and paper engaging fingers pivotally mounted adjacent the registering stops, and means yieldingly actuating the fingers to cause the same to intercept the plane of the registering stops and engage the registered edge of the fed sheet.

12. In a rotary duplicator, a rotatable duplicating cylinder, a paper tray for supporting work sheets to be duplicated, a feeding roller for advancing the sheets solely by frictional engagement therewith while it is being rotated, means actuated by said cylinder for rotating said feeding roller intermittently, a support mounting the tray for vertical movement, resilient means maintaining the support and tray in elevated position, and cam means for causing a lowering of the tray, whereby the work sheets engage the roller when the tray is elevated for performing a feeding operation.

13. A rotary duplicator comprising a duplicating cylinder provided with an adhesive duplicating surface, a paper tray for supporting work sheets, a feeding roller, registering stops for positioning the leading edge of the fed sheet, and oscillating paper engaging fingers for pressing the leading margin of the sheet to the duplicating surface so that it adheres thereto.

14. Sheet feeding apparatus comprising a tray for holding a plurality of sheets of paper, a paper stop located at the forward end of said tray to hold the forward ends of said sheets in alinement, said paper stop serving to separate said sheets when they are advanced, sheet feeding means frictionally engageable with the uppermost of said sheets to advance it over said

paper stop, said sheet feeding means operating solely on one side of said paper stop and solely by frictional engagement with the paper, and resilient means for displacing the tray to bring the paper into frictional engagement with the sheet feeding means.

15. Sheet feeding apparatus comprising a tray for holding a plurality of sheets of paper, a combined paper stop and sheet separator located at the forward end of said tray, a roller engageable with the uppermost of said sheets, means for rotating said roller to cause it to advance said uppermost sheet past said paper stop and sheet separator solely by frictional engagement with the paper, and resilient means for displacing the tray to bring the paper into frictional engagement with said roller.

16. Sheet feeding apparatus comprising a tray for holding a plurality of sheets of paper, a combined paper stop and sheet separator located at the forward end of said tray, a registering paper stop, and means for frictionally engaging said paper and advancing it past said combined paper stop and sheet separator to said registering stop, said advancing means operating solely by frictional engagement with said paper.

17. A duplicator comprising a rotatable duplicating drum having a duplicating surface, a tray for holding a plurality of sheets of paper, a combined paper stop and sheet separator located at the forward end of said tray, a second paper stop for registering the forward ends of said sheets with said duplicating surface, and sheet feeding means frictionally engageable with the uppermost of said sheets to advance it over said combined paper stop and sheet separator to said second stop, said sheet feeding means operating solely by frictional engagement with the paper.

18. A duplicator comprising a rotatable duplicating cylinder provided with a duplicating surface, a tray mounted for vertical movement and adapted to hold a plurality of sheets of paper, a driven feed roller engageable with the uppermost of said sheets, resilient means for raising said tray, a combined paper stop and sheet separator located at the forward end of said tray, said combined paper stop and sheet separator co-operating with said feed roller to separate said uppermost sheet from the remaining sheets, and a registering stop for registering the forward edge of said uppermost sheet when it is advanced by said feed roller.

19. Sheet feeding apparatus comprising a tray for holding a plurality of sheets of paper, a combined paper stop and sheet separator located at the forward end of said tray, means for securing a combined paper stop and sheet separator in a plurality of adjusted positions with respect to said tray, a second paper stop, sheet feeding means frictionally engageable with the uppermost of said sheets to advance it in one continuous, direct movement over said combined paper stop and sheet separator to said second paper stop, and resilient means for displacing said tray to bring the uppermost sheet of paper thereon into contact with said sheet feeding means.

20. In a rotary duplicator, a rotating duplicating cylinder, a paper tray for supporting work sheets to be duplicated, means for feeding said work sheets, a support pivotally mounting said tray for movement with respect to said feeding means, a cam on the cylinder, a bar fixed to said tray, a roller journaled in said bar and engaging said cam whereby said cam actuates said tray, and a second cam on the cylinder for actuating said feeding means.

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