Feb. 27, 1934. F. F. FECHER 1,949,154

DUPLICATOR

Filed Sept. 2, 1932 3 Sheets-Sheet 1

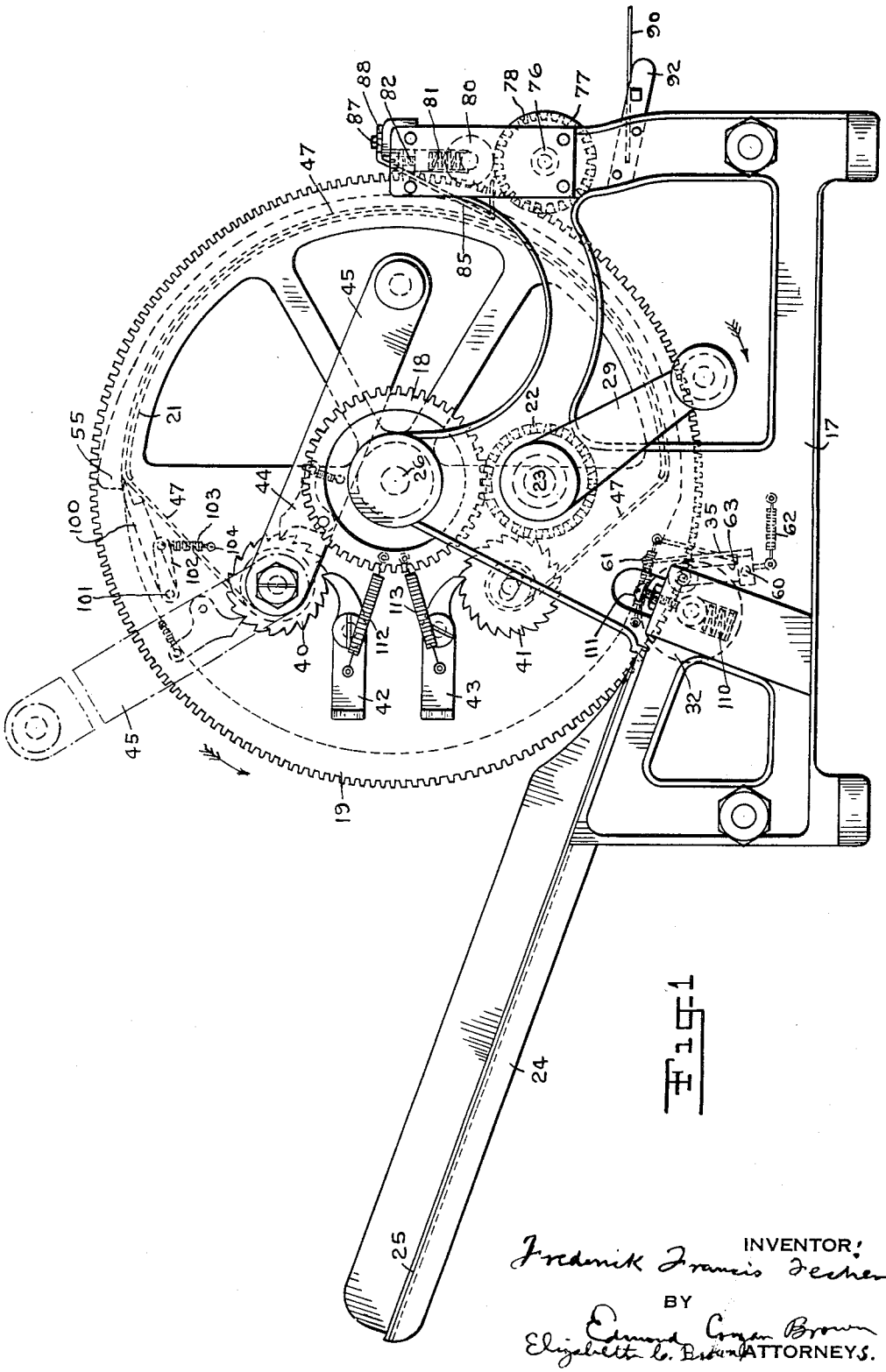


Fig. 1.

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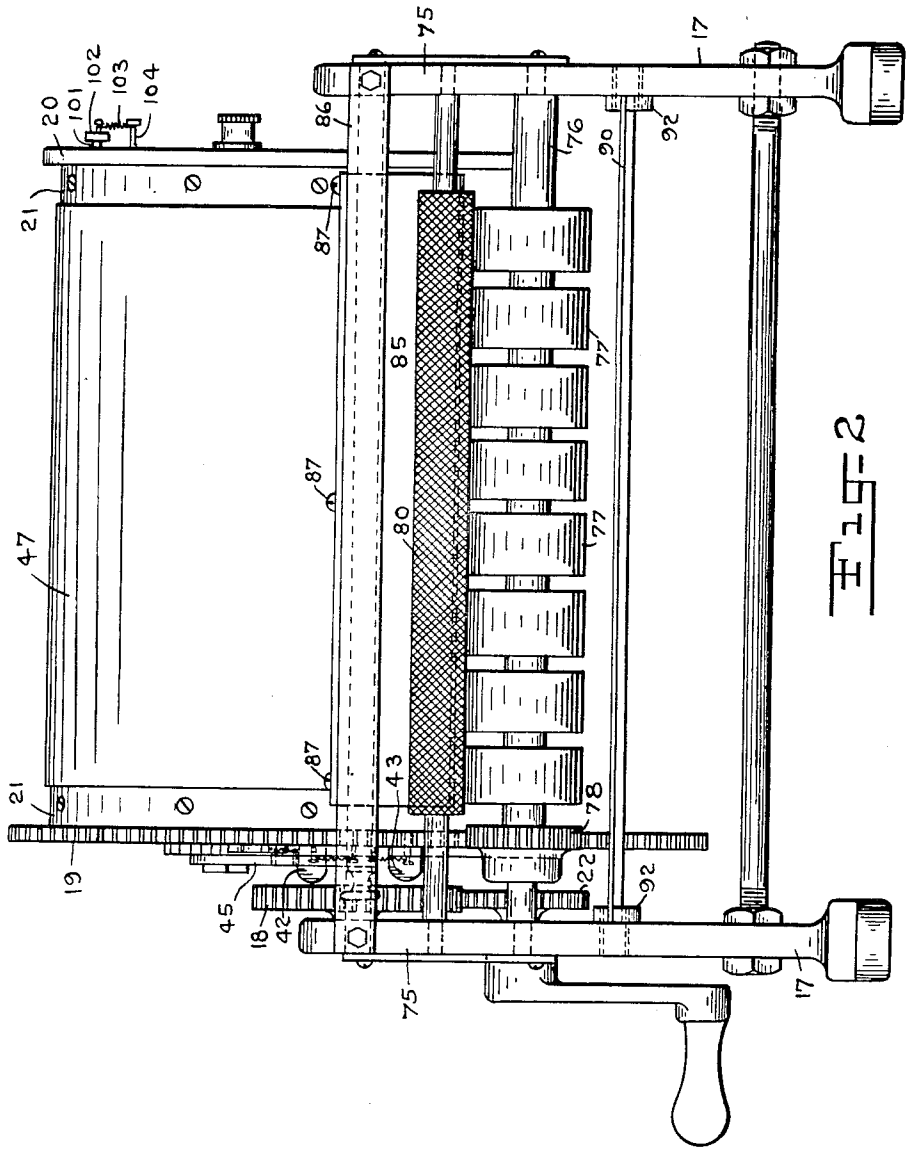


FIG-2

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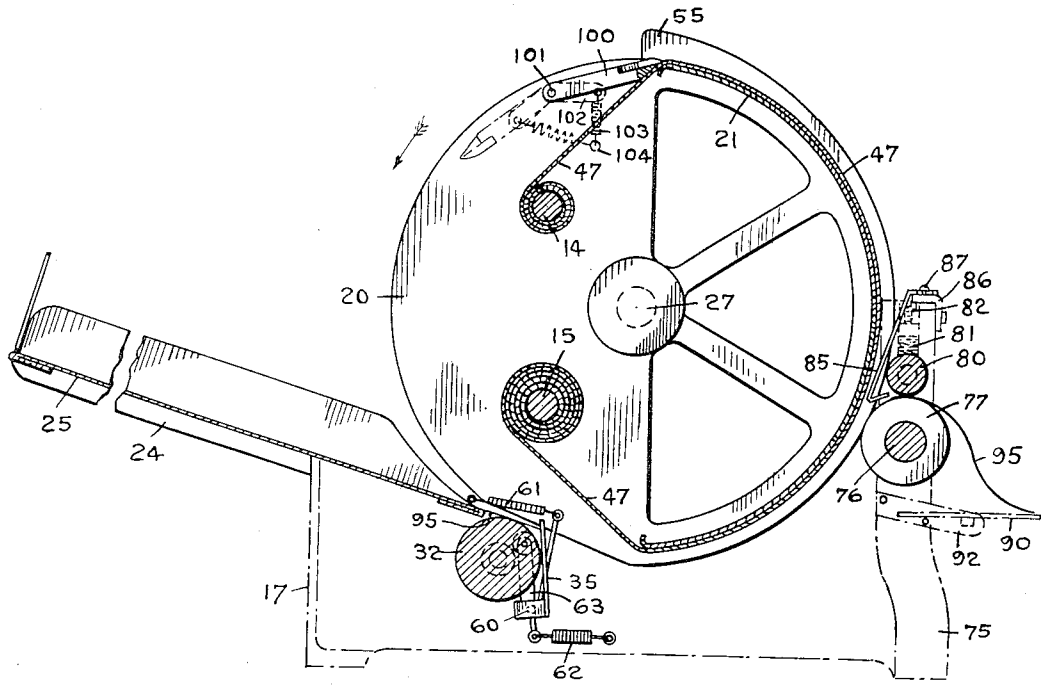


Fig 3

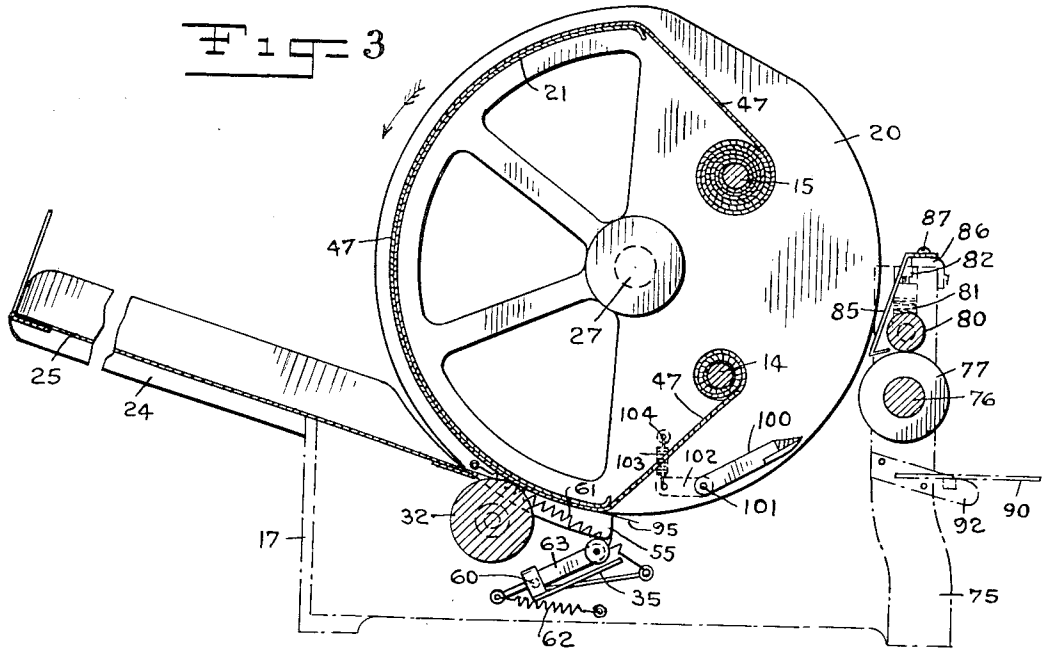


Fig 4

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UNITED STATES PATENT OFFICE

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DUPLICATOR

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Application September 2, 1932. Serial No. 631,477

4 Claims. (Cl. 101—132)

The invention relates to duplicators of that form in which a negative or reversed impression of matter to be copied is impressed upon an adhesive duplicating surface and positive impressions taken therefrom by bringing sheets of paper or the like in contact therewith, and particularly relates to that form of duplicator in which the adhesive duplicating surface is mounted upon a rotating member adjacent which the paper passes and from which positive impressions are placed upon the paper. The invention also particularly relates to winding mechanism by which the position of such an adhesive duplicating surface may be changed relatively to its supporting bed, whether such bed be a part of a rotating member or otherwise.

One of the principal objects of the invention is to provide simple, efficient and economical means whereby the rapid handling of sheets of paper and the feeding of the same to the adhesive duplicating surface and stripping the same therefrom and delivering the same out of the machine, are facilitated. Another object of the invention is to provide simple, convenient, easily operated and compact means whereby the position of the adhesive duplicating surface in the machine may be changed when desired, in order to utilize different portions of the same from time to time, and such change of position prevented when not so desired. Further objects and advantages of the invention will be in part set forth in the following specification, and in part will be obvious therefrom without being specifically pointed out, the same being realized and attained by means of the instrumentalities and structural characteristics and relative arrangements and combinations which will be hereinafter more fully described or which will be pointed out in the claims hereof.

With the above and other objects of the invention in view, the invention consists in the novel construction, arrangement and combination of various devices, elements and parts, as set forth in the claims hereof, one embodiment of the same being illustrated in the accompanying drawings and described in this specification.

In the accompanying drawings,

Fig. 1 is a side elevation of a duplicator constructed according to my invention;

Fig. 2 is a rear view of the same, some of the parts at the front of the machine being omitted, however, for the sake of greater clearness;

Fig. 3 is a sectional view, on a somewhat reduced scale; and

Fig. 4 is a similar view but showing the parts in a different position.

In carrying my invention into effect in the embodiment thereof which has been selected for illustration in the accompanying drawings and for description in this specification, and referring first more particularly to Figs. 1 and 2, it will be seen that there is provided a main frame structure, which may be of any form suitable for the purpose, such as may comprise side frame members 17 suitably secured together so as to make a frame of sufficiently rigid construction, which frame structure supports various moving and other parts of the machine.

Supported by the side frame members 17 is the main rotating member which principally performs the actual duplicating work. By reference to the drawings it will be seen that this main rotating member comprises the gear-wheel 19 (see Figs. 1 and 2) and a plain wheel or disk 20 of approximately the same size (see Figs. 2, 3 and 4), and that located between these two wheels for about one-half of their circumference (see particularly Figs. 3 and 4) is a piece of sheet metal 21, bent into a semi-cylindrical form and secured to the wheels 19 and 20.

This main rotating member bears the adhesive duplicating surface of the machine, which is designated 47 and which may be applied to and assembled with the said main rotating member in any manner suitable for the purpose, and as shown in the drawings the same consists of a sheet or roll of substantial length, the ends of which are secured to spindles 14 and 15, (see particularly Figs. 3 and 4) upon and from which the adhesive duplicating surface may be wound and upon one or both of which the portions of the said duplicating surface not in use may be stored. These spindles 14 and 15 may be journaled between the wheels 19 and 20 in any suitable manner, and the devices by which, in the embodiment of the invention herein shown and described, the spindles may be rotated when desired and such rotation prevented when not desired, are best shown in Fig. 1, and will be hereinafter more fully described.

The wheels 19 and 20 are journaled in the side frame members 17 of the machine in any suitable manner, as by means of short shafts upon which the said wheels are fast and which extend outwardly from the same respectively and are journaled in the members 17. These shafts are shown in dotted line in Figs. 1, 3 and 4, and are designated 26 and 27 respectively, but do not appear in Fig. 2, being hidden or obscured by other parts of the machine.

The shaft 26, upon which the gear-wheel 19 is fast, also has fast thereon a smaller gear-wheel 18 (see Figs. 1 and 2), which gears with a still smaller wheel 22, which is fast upon a shaft 23 extending through the side frame 17. This shaft appears in dotted line in Fig. 1, but is not seen in Fig. 2, being hidden by the shaft 76. This shaft 23 constitutes the main drive of the machine, and has upon its outer end the handle or crank 29 by means of which the machine is operated.

Extending forwardly and upwardly from the side frame members 17, are extensions 24 (see Figs. 1, 3 and 4), which uphold an inclined shelf or table 25 adapted to support paper to be fed into the machine. The paper is fed by the operator, one sheet at a time, down this inclined shelf 25, until its lower end extends over the roller 32 and comes to rest against the stop 35, both of which will be hereinafter more fully referred to. (See Fig. 3, where a sheet of paper is shown in this position and designated 95.)

It will be seen that the stop 35 extends across the machine not far beyond the foot of the inclined shelf 25 and that therefore the paper will be automatically brought into correct position to be acted on by the machine, even though no great care or skill be exercised by the operator, as the incline of the shelf 25 will cause the paper to slide down by gravity against the stop 35 and come to rest with its leading edge in a straight position transversely of the machine.

The paper then remains at rest in this position, with its end over the roller 32, until the rotating member has turned far enough to bring the forward edge of the adhesive duplicating surface 47 over the same, when the paper will be caused to adhere to the duplicating surface by the pressure of the roller 32 against the same, and will be carried around by the said duplicating surface until it reaches the stripping mechanism hereinafter to be described, the stop 35 being removed from its path by means now about to be described.

The stop 35 extends across the machine from side to side for about the same distance as the width of the adhesive duplicating surface 47, and is pivotally mounted at 60 in each of the side frame members 17. The stop is provided with springs 61 and 62 which tend to hold the same normally in the position shown in Fig. 3, and is also provided with an arm 63 at the left hand end thereof, adapted to be engaged at certain times by the wheel 20, as about to be described.

The periphery of the wheel 20 is not a regular circle, of the same radius throughout, but, as best shown in Figs. 3 and 4, and as also seen by the dotted line in Fig. 1, the same is of an irregular contour and thereby is adapted to serve as a cam for the operation of the stop 35, approximately one-half of the wheel being of a larger radius than the other half. As the advancing end 55 of the larger portion of the wheel descends (the same being slightly in advance of the leading edge of the adhesive duplicating surface), the same will strike the arm 63 and move the same toward the rear of the machine (see Fig. 4), thereby depressing the stop 35 out of the path of the paper 95 and into the position shown in said figure. Immediately thereafter, the leading edge of the operative portion of the adhesive duplicating surface 47 comes into contact with the part of the paper lying over the roller 32 and carries the same onward, the roller 32 continuing to bear against the main rotating member and thereby insure good contact of all following portions of the paper with the adhesive duplicating surface.

This roller 32 is journaled at its ends in the frame of the machine, and as shown in Fig. 1 is provided with springs 110 and screws 111, by means of which the upward pressure of the roller is maintained and may be adjusted as desired from time to time, as will be well understood.

The stop 35 remains in the depressed or inoperative position shown in Fig. 4 until the rotation of the main rotating drum brings the latter again into approximately the position shown in Fig. 3, whereupon the arm 63 will be released and the stop will rise into the position shown in said figure.

The stripping and discharging mechanism will now be described. It will be seen that the side frames 17 are provided with upwardly extending portions 75, and that in the same is suitably journaled a shaft 76, which bears a series of rollers 77, which may be of rubber or any other suitable material, and also a gear-wheel 78, which is fast thereon and which engages with the gear-wheel 19 and is driven thereby. Above the rollers 77 is journaled a roller 80, which may be of knurled metal or any other suitable construction, and which is journaled in slots or sockets in the upper part of the members 75, in a manner which will be entirely clear from the drawings, its pressure upon the rollers 77 being adjustable as may be desired from time to time, by means of the springs 81 and screws 82, in a manner which will be clear from the drawings.

Supported between the extensions 75 is a guiding member 85, best shown in Figs. 1, 3 and 4, and which consists of a suitably shaped strip of material, comprising a backwardly and upwardly extending portion at its lower edge, adapted to direct the leading edge of a sheet of paper toward and between the rollers 77 and 80.

This member 85 is supported by the crossbar 86 (see particularly Fig. 2), and may if desired be slightly adjustable toward or away from the main rotating member, being secured to the bar 86 by means of screws 87 which pass through slots 88 (see Fig. 1) in the member 85 and thereby permit said adjustment from time to time, in order to adapt the machine for more efficient operation upon paper of various degrees of thickness and stiffness, as may be desired.

A receiving table or shelf 90 is provided at the back of the machine (the rearward part of the same being broken away in Figs. 1, 3 and 4 in order to save space). This shelf may if desired be pivotally mounted in the members 92, as shown in the drawings, so that the same may be tilted out of the way when the machine is not in use, or for packing and shipping the same.

Extending across between the two ends of the main rotating member of the machine, is a flat member 100 (best shown in Figs. 3 and 4, although the same also appears in dotted line in Fig. 1), which serves, when in the position relative to the adhesive duplicating surface shown in Fig. 1 and in the full lines in Fig. 3, to direct an edge the pin 101 by which the right-hand end of same may pass between the rollers 77 and 80, in a manner which will be hereinafter more fully referred to. This member 100 is pivotally mounted in the end wheels of the main rotating member, the pin 101 by which the right-hand end of same is mounted extending through the gear-wheel 19 and bearing on its outer end a short arm 102, the free end of which is provided with a spring 103, the lower end of which is secured at 104 to

the wheel 19, and it will be seen that in whichever of the two positions of the member 100 shown in the drawings the same may be placed, the spring 103 and arm 102 will hold the same against change, until the same is manually adjusted into the other of said positions.

The free edge of the lifing member 100 normally rests, as best shown in the full lines in Fig. 3, upon the adhesive duplicating surface. The positions in which the paper is pressed against the adhesive duplicating surface as above referred to, is such that the front edge of the paper extends slightly in advance of the leading edge of the operative portion of the adhesive duplicating surface (as shown in Fig. 4, where, however, the member 100 is in its alternative position hereinafter to be more fully referred to), and the said edge of the paper therefore lies below the edge of the member 100, by which it is held slightly outward away from the adhesive duplicating surface. The following portion of the paper remains in undisturbed contact with the adhesive duplicating surface, however, until the parts come into such position that the advancing edge of the paper, being so held out by the member 100, passes under the guide 85 and is by the latter directed between the rollers 77 and 80. These rollers 77 and 80 then engage the paper between them and draw same away from the adhesive duplicating surface 47, and as the parts continue their rotation the entire sheet of paper is stripped from the adhesive duplicating surface, carried through between the rollers 77 and 80, and delivered upon the table 90, as shown in Fig. 3 (which figure illustrates one sheet being delivered from the machine and the following sheet lying upon the inclined table 25 and against the stop 35, ready to be carried around by the next revolution of the main rotating drum).

At certain times it may not be desired to strip the paper from the adhesive duplicating surface at once, but to allow the same to remain thereon for a longer time than above referred to, as for instance when the master-sheet upon which is the matter to be copied is placed upon the duplicating surface, in order to make the reversed impression thereon from which copies are then taken. This may be accomplished by turning the member 100 into the position shown in the full lines in Fig. 4 and in dotted line in Fig. 3, in which position it will then be held by the spring 103. It will be seen that in such case the leading edge of the paper will not be held away from the adhesive duplicating surface 47, but will be pressed closely against it by the roller 32 and will be allowed to remain adhering thereto, and will therefore not pass under the guide 85 and out of the machine, but on the contrary will clear the guide and pass on up and around with the adhesive duplicating surface 47. The master-sheet may thus be left in contact with the adhesive duplicating surface during as many full revolutions of the drum as may be desired, after which it is removed therefrom by hand and the member 100 restored to the position shown in the full lines in Fig. 3, whereupon other sheets may be fed into the machine and removed therefrom in the manner first above described.

The manner in which the adhesive duplicating surface is mounted upon the main rotating member of the machine in this embodiment of my invention, and the means for adjustably locating the same in any desired position, will be best seen from Fig. 1. As there shown, the adhesive duplicating surface 47 consists of a sheet or roll of substantial length, the ends of which are respectively secured to the spindles 14 and 15, which are journaled between the wheels 19 and 20 in any suitable manner. The right-hand end of the spindle 14 is operatively connected with the ratchet 40, on the outside of the wheel 19, and the right-hand end of the spindle 15 is operatively connected with the ratchet 41. The said ratchets are adapted to engage with pawls 42 and 43 respectively, which are normally held in such engagement by springs 112 and 113 respectively.

Pivotally mounted adjacent the central portion of the ratchet 40 is the winding-handle or lever 45 (see Figs. 1 and 2) by which the spindle 14 may be rotated and the adhesive duplicating surface moved with relation to the semi-cylindrical member 21 upon which the operative portion of the same is supported. This handle 45 bears a pawl 44 which moves freely over the said ratchet 40 when the handle is pushed toward the rear of the machine (that is to say, toward the right in Fig. 1), but which engages with the ratchet 40 and rotates the latter when the handle 45 is drawn by the operator toward the front of the machine. It will be seen that in order to shift the duplicating surface from one position to another with reference to the member 21, that is to say, to unwind a fresh portion thereof from the spindle 15 and at the same time to wind up the used portion upon the spindle 14, the pawl 43 is disengaged from the ratchet 41, whereupon the spindle 15 may rotate freely and the spindle 14 may be rotated by the handle 45 and pawl 44, as above referred to, the said handle moving backward and forward and upon each forward movement winding up a portion of the duplicating surface upon the spindle 14. When the duplicating surface has been shifted into approximately the desired position and it becomes necessary to tighten the same smoothly over the surface of the member 21, the pawl 43 is permitted to re-engage with the ratchet 41, thus preventing further unwinding of the duplicating surface from the spindle 15. The handle 45 is then again moved backward and drawn forward, thus rotating the ratchet 41 as far as the looseness of the adhesive duplicating surface over the member 21 will permit and thereby taking up such slack as may remain in the said duplicating surface and winding the same up upon the spindle 14, which is prevented from rotating in the unwinding direction by the action of the pawl 42. The duplicating surface may thus be easily and conveniently located in any position with reference to the member 21, and when the entire length of the adhesive duplicating surface has been used and it is desired to reverse the same as is usual in such cases, the spindles 14 and 15 may be removed from the machine, turned end for end, and each inserted in the position formerly occupied by the other, and the operation continued as before. This construction is provided for the sake of simplicity and compactness, but it will be understood that a handle similar to the handle 45 may be provided also for the ratchet 41 if desired.

It will be understood that the particular means by which the spindles are journaled or mounted in the end wheels of the main rotating member, and are operatively connected to the ratchets 40 and 41 respectively, form no part of the present invention and may be of any construction suitable for the purpose.

After the adhesive duplicating surface has been shifted into the desired position and secured smoothly therein, the handle 45 may be again

moved back and allowed to remain in the position shown in full lines in Fig. 2, in which position it is out of the way of other parts of the machine and of the operator, and will be held in place, even during the rotation of the main drum, by the engagement of the pawl 44 with the ratchet 40, which latter, in the position of the parts shown in full lines in Fig. 1, is unable to rotate.

The operation of this embodiment of my invention is as follows: The first step in the production of the result aimed at is to impress upon the adhesive duplicating surface 47 a reversed impression of the material which is to be reproduced upon the copies, this impression being derived from an original or "master-sheet" upon which the material to be duplicated has been written, printed or otherwise impressed in suitable duplicating ink. This master copy is laid face upwards upon the table 25 and fed down until the edge passes over the roller 32 and rests against the stop 35.

The machine is then adjusted by turning the member 100 into the position shown in Fig. 4, and the main rotating member is then operated by means of the handle 29 and gearwheels 22 and 18, the handle 29 being moved in a clockwise direction so as to rotate the main semi-cylindrical member in a counterclockwise direction.

As the said semi-cylindrical member rotates, the cam portion 55 of the end wheel 20 descends and strikes against the arm 63, depressing the stop 35 out of the path of the paper, and almost at the same moment the forward edge of the operative portion of the adhesive duplicating surface will be brought over the portion of the paper which is lying upon the roller 32. The adjustment of the roller 32 in the machine is such that when this takes place the paper will be pressed between the roller and the adhesive duplicating surface, and the paper is therefore immediately caused to adhere to the said duplicating surface and is at once carried on and around by the latter as it continues its rotation, the roller 32 continuing to press all parts of the paper smoothly against the duplicating surface as the parts rotate.

In the ordinary operation of the machine, the edge of the paper would pass under the guide 85 and between the rollers 77 and 80, but when the member 100 is turned into the position here referred to, the edge of the paper is permitted to cling closely to the adhesive duplicating surface and will therefore clear and pass by the guide 85, and the result is that the master-sheet is retained in close contact with the adhesive duplicating surface for several revolutions, many or few as desired, in order that there may be a sufficiently complete absorption of the ink from the master-sheet into the adhesive duplicating surface. When the master-sheet has remained upon the adhesive duplicating surface for what the operator considers a sufficient length of time, it may be stripped therefrom, by hand, the member 100 again turned into the position shown in the full lines in Fig. 3 and the dotted lines in Fig. 1, and the machine will then be ready for the production of copies.

In order to obtain copies from the matter which has been impressed upon the adhesive duplicating surface, one sheet of paper at a time is fed down over the inclined table 25 and allowed to come to rest against the stop 35, which automatically locates the same in correct position to be taken up and carried through the machine.

As the semi-cylindrical member rotates, the cam-portion 55 of the wheel 20 depresses the stop 35 and the adhesive duplicating surface immediately thereafter takes up the sheet of paper lying over the roller 32 and carries the same onward, in the same manner as above referred to with regard to the master-sheet, but as the member 100 has now been adjusted into its stripping position as shown in Fig. 3, so that its edge lies upon the adhesive duplicating surface 47, it will be seen that the leading edge of the paper, which extends beyond the adhesive duplicating surface, is thereby given a slight outward curve, and, as the same is carried around to the rear of the machine, it passes under the guide 85 and between the same and the rollers 77, and as the rotation continues the paper is gripped between the rollers 77 and 80 and by them stripped from the adhesive duplicating surface and delivered, in a flat condition and face up, upon the receiving shelf 90 (see Fig. 3).

In the meantime another sheet of paper has been fed downward against the stop 35, as also shown in Fig. 3, and is ready to be carried around when released thereby and then stripped from the adhesive duplicating surface, so that the operation above described is successively repeated as many times as may be desired.

The operation of the devices used in changing the position of the adhesive duplicating surface upon the member 21 has already been fully referred to when describing the construction of the same, and although the same form an important part of the present invention, it is thought that the operation thereof will be entirely clear from what has been above said and that it is not necessary to recapitulate the same further.

I have found in the practical use of machines constructed according to my invention, that the same can be used at a rapid speed and will produce efficiently, in a shorter time and with a greater degree of convenience than has heretofore been practicable with devices of this type, the maximum number of copies of matter desired to be reproduced. Not only is it possible to obtain quickly and easily the maximum number of copies which it is possible to take from a single impression upon the adhesive duplicating surface, but the change of position of the adhesive duplicating surface when desired and thereby the obtaining of reproductions from a number of different impressions upon the adhesive duplicating surface, with the minimum expenditure of time and effort, is greatly facilitated by the use of my invention. It will be seen that the action of the various parts of the machine in making reproduction is entirely automatic so long as the operation of the machine is continued by means of the operating handle, with the exception of feeding successive sheets of paper down the shelf 25 toward the stop 35, and even this operation is partially automatic, owing to the incline of the shelf 25. It will also be seen that the sheets of paper are both fed to and delivered from the machine face upward, and also that the said copies are delivered in flat form, ready for immediate use without further attention in straightening the same out.

Other advantages of the invention will be obvious from what has been above said with regard to its construction and operation.

I do not limit myself to the particular details of construction set forth in the foregoing specification and illustrated in the accompanying drawings, as the same refer to and set forth only

one embodiment of the invention, and it is obvious that the same may be modified, within the scope of the appended claims, without departing from the spirit and scope of the invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

1. In a duplicator, the combination with a stationary frame and a rotary frame adapted to support a duplicating surface; of means adapted to remove paper from said duplicating surface, said means comprising a pair of rollers between which the paper may pass, a member pivotally mounted in said rotary frame and adapted when in one position to hold an edge of a sheet of paper away from said duplicating surface and thereby direct the same toward said rollers when the rotation of said rotary frame brings said edge into proximity to said rollers, and when in another position to allow a sheet of paper to be placed and to remain in close contact with said duplicating surface, and means adapted to hold said member in either operative or inoperative position as may be desired.

2. In a duplicator, the combination with a stationary frame and a rotary frame adapted to support a duplicating surface; of means adapted to remove paper from said duplicating surface, said means comprising a pair of rollers between which the paper may pass, a member pivotally mounted in said rotary frame and adapted when in one position to lie with its free edge upon said duplicating surface and thereby hold an edge of a sheet of paper away from said duplicating surface and direct said edge toward said rollers when the rotation of said rotary frame brings said edge into proximity to said rollers, and when in another position to lie with its free edge turned away from the adjacent portion of said duplicating surface and thereby to allow a sheet of paper to be placed and remain in close contact with said duplicating surface, and means adapted to hold said member in either operative or inoperative position as may be desired.

3. In a duplicator, the combination with a stationary frame and a rotary frame adapted to support a duplicating surface; of means adapted to remove paper from said duplicating surface, said means comprising a pair of rollers between which the paper may pass, a member pivotally mounted in said rotary frame and adapted when in one position to hold an edge of a sheet of paper away from said duplicating surface and thereby direct the same toward said rollers when the rotation of said rotary frame brings said edge into proximity to said rollers, and when in another position to allow a sheet of paper to be placed and to remain in close contact with said duplicating surface, and resilient means adapted to hold said member in either operative or inoperative position as may be desired.

4. An apparatus such as is set forth in claim 1, characterized by the fact that the same is provided with a guide mounted in said stationary frame and adapted to direct paper towards said rollers, said guide being so mounted as to be adjustable toward and away from said rotary frame.

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