May 20, 1924. 1,494,581

A. BREUER ET AL

DUPLICATING APPARATUS

Filed July 10, 1920 3 Sheets-Sheet 1

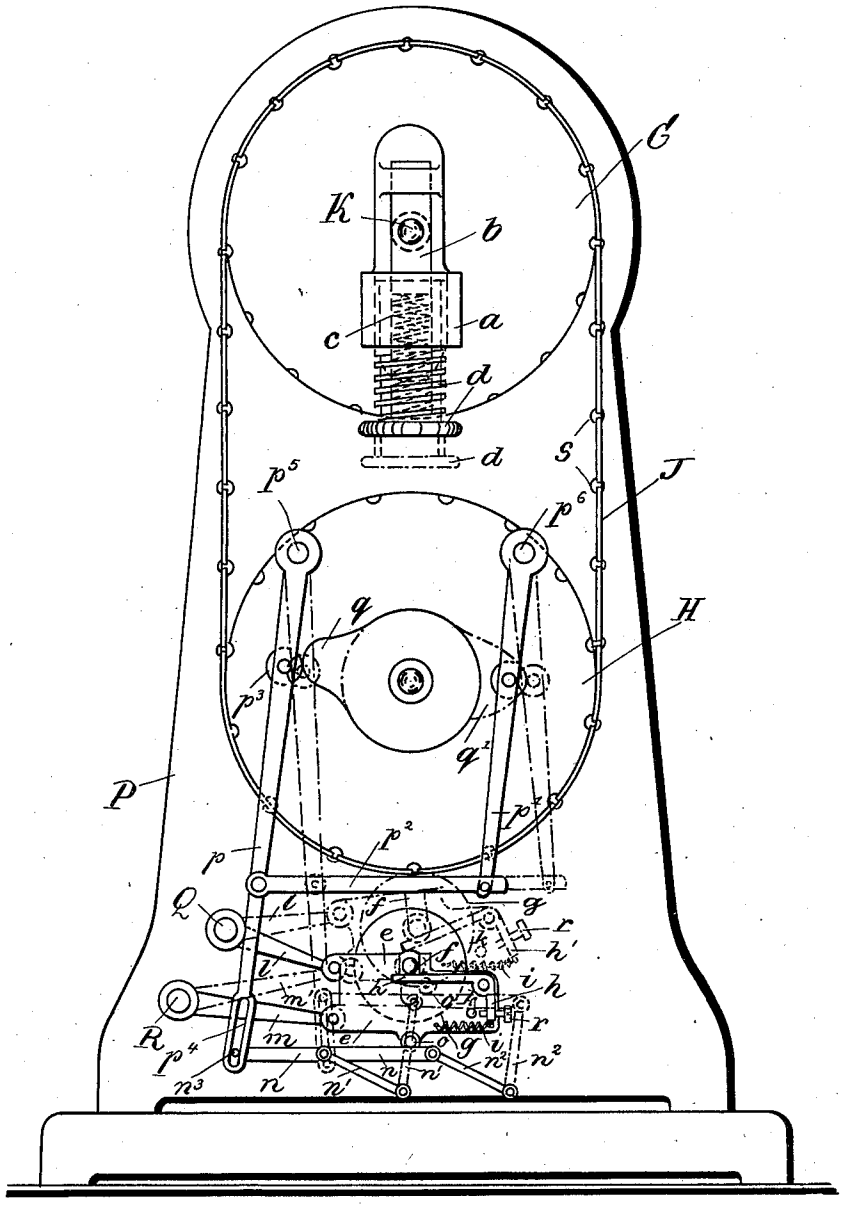


FIG.1.

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Filed July 10, 1920 3 Sheets-Sheet 2

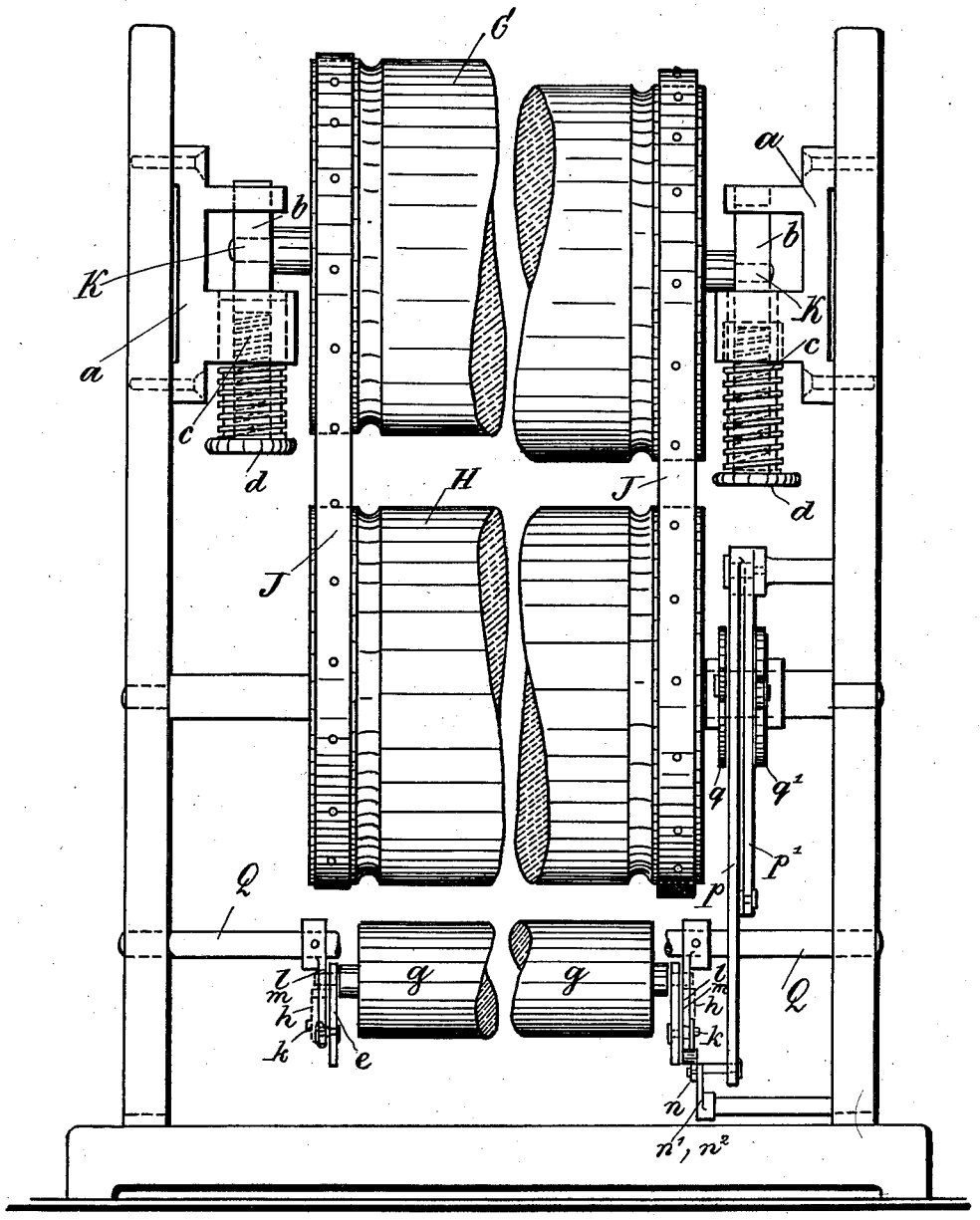


FIG. 2.

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DUPLICATING APPARATUS

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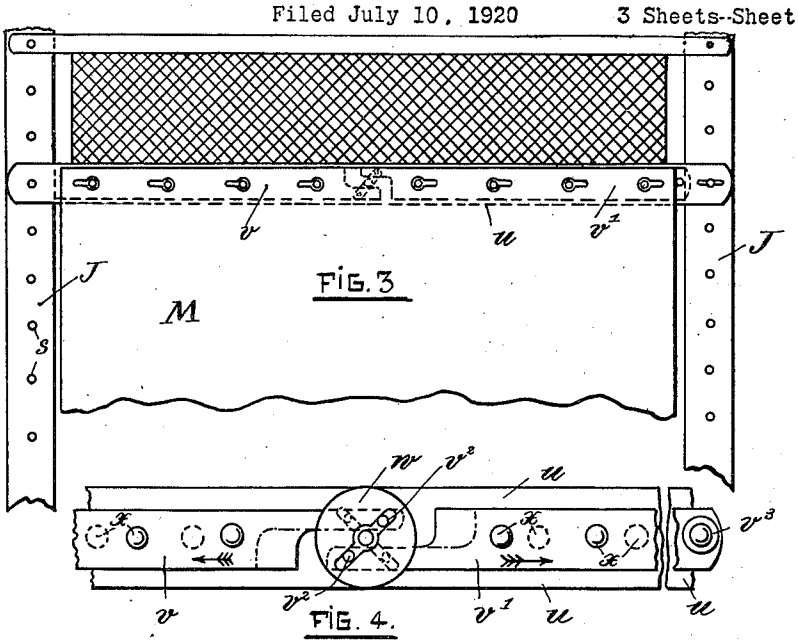


FIG. 3.

FIG. 4.

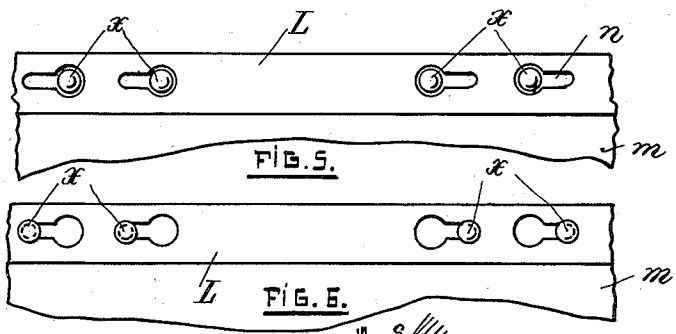


FIG. 5.

FIG. 6.

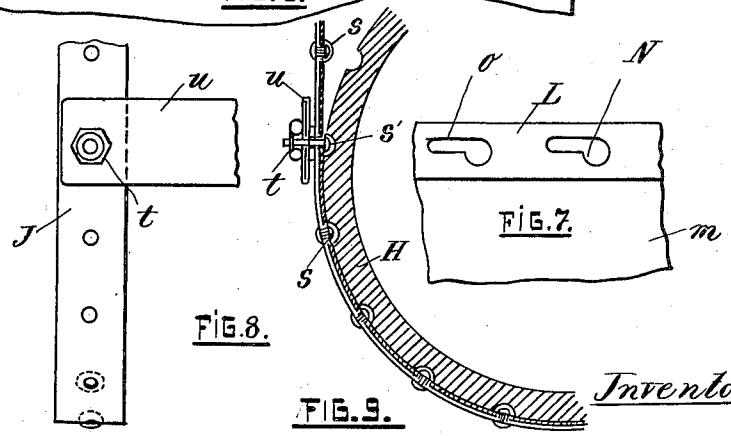


FIG. 8.

FIG. 7.

FIG. 9.

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Patented May 20, 1924. 1,494,581

UNITED STATES PATENT OFFICE.

ARMIN BREUER AND ARNO HEYN, OF BERLIN, GERMANY.

DUPLICATING APPARATUS.

Application filed July 10, 1920. Serial No. 395,416.

(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313.)

To all whom it may concern:

Be it known that we, ARMIN BREUER and ARNO HEYN, citizens of the State of Germany, residing at Berlin, Motzstr. 79, Germany, have invented certain new and useful Improvements in or relating to Duplicating Apparatus (for which I have filed application in Germany, March 14, 1919, page No. 331,697), of which the following is a specification.

This invention relates to a duplicating apparatus of the two cylinder type, in which the printing is effected by the aid of a stencil fixed to two feed bands.

The devices of this kind hitherto known possess the drawback that the stencil will frequently run out of alignment and that in consequence fractures, creases, and the like, are caused to arise which in a very short time render the stencil useless. The reason for this fact may be sought in the unequal spring action exerted by the springs supporting the upper cylinder, since these wear unevenly as a result of the constant strain to which they are subjected, thus giving rise to the formation of differences in tension on the part of the feed bands serving to connect the two cylinders. Moreover, the operation of assembling and adjusting the upper cylinder, as also the replacing and exchanging of the feed bands, (all which is frequently required to be done) can only be carried out by means of a very powerful and excessive compression of the springs, so that these as a result become overstrained. Hence, as already stated, the tensions of the feed bands gradually become unequal, so that in the first instance strong springs must be used in order to effectively permit a loss of tension.

A further disadvantage resides in the fact that in machines heretofore known, the device, which serves to press the paper sheet to be duplicated (the work-sheet) against the printing cylinder, is apt to strike heavily against the stencil fixed intermediate the pressure roller and the cylinder, when the latter and the pressure device are brought into cooperation during the operation of the duplicator which causes the stencil to become so damaged as to be useless after a certain number of copies have been made. And likewise the known means for attaching the stencil to the feed bands, as also the manner in which the said feed bands are usually caused to enter into engagement with the printing cylinder clearly produce obvious defects. The cross bar supporting or carrying the stencil has heretofore been provided with stationary buttons or pins into which the stencil is loosely locked, an arrangement which generally causes the formation of longitudinal folds or creases in the stencil and therewith its fracture. The said cross bar is fixed to the feed bands by means of rivets or screws, the heads of which slightly project and thus prevent the feed bands from lying uniformly level on the edges of the cylinders, a fact which has again caused differences of pressure to arise, while the bands are seriously weakened and in consequence are apt to be easily broken.

The present invention is intended to successfully obviate all these drawbacks and disadvantages. To obviate the first of the above mentioned difficulties, the springs which serve to draw the cylinders apart are adjustably arranged, a supporting surface being provided which will permit of an easy removal or of an entire release of parts, during the exchanging or replacing of the feed bands or of the upper cylinder.

To obviate the second named difficulty the roller for pressing the work-sheet against the stencil is gently raised, without the aid of a spring, to the level of the cylinder and it is only after the pressure roller has engaged with the cylinder, that the former is pressed or forced against the latter by aid of a light spring which gradually enters into action. By this arrangement any possibility of the stencil being injured, even while the apparatus is being run at a high rate of speed, will be avoided. Further, this arrangement permits the resetting of the pressure roller in addition to permitting the pressure to be suitably regulated and adjusted. Any want of uniformity in said pressure, apt to arise owing to a conical formation of the pressure roller or of the cylinder is effectively counterbalanced.

To overcome the third difficulty the stencil is fixed or attached to the feed bands by means of a carrier or holder comprising two parts adapted to be moved apart in a lateral direction. By these means the stencil may be placed under tension in a lat-

eral direction, and the formation of folds or creases be prevented. Any possibility of the feed bands breaking is obviated by their being provided with buttons, semi-circular in shape, adapted to engage with corresponding depressions formed in the cylinder and which at the same time serve as a means of attaching the cross bar or bridge-member so that no projecting rivet heads will any longer be required. This improved arrangement furthermore enables the machine to operate without noise.

An embodiment of the invention is shown by way of example in the accompanying drawings in which:

Figure 1 is a cross section of the apparatus,

Fig. 2 a front view of the same,

Fig. 3 illustrates the method of attaching the stencil,

Figs. 4–7 show various positions of the bridge member, serving to attach the stencil, and

Figs. 8 and 9 show in a front view and section respectively the manner of effecting the engagement of the feed bands with the cylinders.

The reference letters G and H denote the two rollers or cylinders which are constructed in the customary form and which are connected to each other by the feed bands J. In accordance with this invention the spindle K of the upper cylinder is journaled at each side in a slide or block *b* adapted to slide perpendicularly within a bearing *a* secured to the framework P.

Each of the blocks *b* is forced upwardly by a spring *c*, fitted in a sleeve *d*, screwed into the bearing *a*. By screwing the sleeve *d* either up or down, the spring *c* may be placed under more or less tension, so that any relaxing of the spring tension, which would be liable to cause the stencil to run out of alignment may be readily counterbalanced by adjustment. When the sleeves *d* are entirely withdrawn from the bearings *a* the cylinder G will be entirely released and may then be readily exchanged along with the feed bands J. This is due to the fact that the blocks *b* in which the ends of the cylinder spindle K are journaled are supported directly by the springs, instead of being engaged by the screws; and since the springs themselves are seated in and carried by the hollow screws, the latter and the springs may be removed together, whereupon the blocks *b* can be withdrawn from the bearings *a*, thus permitting the direct removal of the cylinder from the framework P.

A special advantage of this arrangement resides in the fact that the springs selected need not be any stronger than is absolutely necessary to effect the drawing or pressing apart of the two cylinders since, owing to the possibility of resetting the springs, whenever required, the liability of the tension relaxing at any time need no longer be taken into consideration. Hence, the feed bands J will neither be overstrained, nor break readily.

At each side, the pressure roller *g* is mounted in a supporting plate *e*, which plates in their inoperative positions assume the position shown in full lines in Figs. 1 and 2. The roller *g* is disposed with each end of its shaft located in a slot *f* in supporting plate *e* and supported on one arm of a bell crank lever *h* pivoted to the supporting plate and moved by a spring *i* secured to the other arm *h'* of the bell-crank lever *h* and to the supporting plate *e*. The bell-crank lever *h* is limited in its movement under the influence of the spring *i* by means of a stop *k* fixed to the plate *e* and a coacting adjustable stop in the form of a screw *r* extending through the arm *h'*. Each of the supporting plates *e* is provided with two arms *l* and *m* which are secured to the rods R and Q, respectively, which are mounted in the framework P; the arms being pivotally secured to the plates *e*. These guide arms have their axis of rotation so arranged with relation to the plates *e* that the plates move in parallel planes and are maintained in horizontal position when being shifted from the full line to the dot and dash line positions as shown in Fig. 1. In dot and dash line or raised position the pressure roller *g* engages with the lower cylinder H. The supporting plates *e* are thus raised by means of a bar *n*, on which one of the plates *e* is adapted to rest and engage by means of a roller *o*. The bar *n* is guided in a vertical direction along a parallel plane by means of two guide arms n^1, n^2 the ends of which are pivoted to the bar *n* and the frame P of the apparatus. The guide arms n^1, n^2 being shifted from the position shown in full lines (Fig. 1) into that shown in dash and dot lines, will simultaneously raise the bar *n* into the position indicated in dash and dot lines and with it the plates *e* and the roller *g*. The movement of the bar *n* and of the guide arms n^1, n^2 is effected by means of a lever *p* having a roller p^3 engaging with a cam disc *q* and being provided with a slot p^4 at one end engaging with a pin or roller n^3 on the bar *n*. The other end of the lever *p* is pivoted to the frame P at p^5. The cam disc *q* serves to move the lever *p* into the inoperative position shown in full lines. For the purpose of shifting said lever into the working position, shown in dash and dot lines it is connected with a lever p^1 pivoted at p^6 to the frame P by means of a link p^2 pivotally connected to said levers *p* and p^1, said lever p^1 being operated by a cam disc q^1. It should be understood that the cam disc q^1

will not assume the position shown in Fig. 1 at the same time when the cam disc q happens to be in engagement with the lever p. Therefore, the two discs q and q^1 in reality assume quite a different position relatively to each other from the one shown in the drawing. For this reason the cam disc q^1 is represented in dash and dot lines.

By virtue of the aforesaid arrangement the pressure roller is raised gradually by the lever p^1. At the instant this roller comes to bear against the stencil stretched over the cylinder H no tension exists between these two members. The roller will consequently and in true correspondence with the shape of the cam q place itself gently against the stencil; and as the movement of the lever p^1 continues the spring i will be gradually placed under tension. The reason for this is that as the plate e continues to rise, the pressure roller g engaging with the stencil will rotate the lever h counter to the action of the spring i. Hence, the operation of pressing the roller g against the stencil is carried out under spring action, but, however, in such a manner that as the power of the spring is gradually increased, the corresponding part of the stencil is prevented from being damaged. Another advantage of this arrangement of the levers is that the spring i may be placed under tension without requiring any particular expenditure of force on the part of the person working or attending to the apparatus, because at the time when said operation has to be effected the guide arms n^1, n^2, will be disposed almost perpendicularly. The operation of forcing these members into their final positions thus requires the exertion of but an extraordinarily small amount of force, so that even a great spring pressure can be overcome with comparative ease. Hence the machine may be operated with a slight expenditure of energy.

As shown in Fig. 2 a plate e and a device for raising and lowering same are arranged at each end of the roller g, although only one bar n and one mechanism for operating the same are provided. But this one bar n is sufficient since the levers l and m on both sides are fixed to a common axle Q and R respectively, one of which is only represented in Fig. 2.

As the two levers h may be reset separately by their setting screws r it is possible to adjust the position of the pressure roller and thereby compensate for any lack of uniformity in the pressure exerted at either side owing to possible conicity of said roller. In addition and in view of the fact that two separate cam discs q and q^1 respectively are employed for the purpose of raising and lowering the plates e it is possible to raise and lower the plates at any time whatsoever by a suitable adjustment of said cam discs and the raising and lowering operations may be separately controlled as desired. It follows that the position of the heading or free space on the upper end of the sheet to be printed or duplicated, as also the length of space required for the text or body of the letter or the like, may be varied at will by the mere adjustment of these cam discs.

The feed bands J employed to establish the connection between the cylinders G and H and for other purposes, in order to avoid their durability and strength being impaired by the formation of holes therein, are provided with semicircular heads or buttons (Fig. 1 and Fig. 2) which may consist of rivets s suitably fixed in the said bands J at regular intervals therealong. It is obvious that these heads or buttons may also be formed by stamping or by a similar operation and that their shape need not be absolutely semi-circular. These semi-circular heads or buttons coact with depressions or grooves s^2 arranged at equal distances apart in the edges of the cylinders G and H into which they are adapted to engage, so that in addition to reinforcing the feed bands, they render the machine silent in operation.

In this form of construction, the cross bar or bridge member for holding the stencil may be simply attached to the feed bands J by connecting the bar u, which acts as a base plate for the stencil holder, to two oppositely disposed bolts s^1 arranged on the feed bands, said bolts being in that case not shaped to constitute rivets but rather, as screws having semi-circular heads to enable the bar u to be more easily removed and by fixing the bar u by means of a nut t to said screw bolts.

For the purpose of attaching the stencil proper there are arranged to move laterally on the transverse bar u two slide bars v and v^1 operated by a slotted disc w pivoted to bar u. Within a slot formed in the disc w are slidingly mounted two pins v^2 one of which is fixed to each of the slide bars v, and v^1. When the disc w is rotated by hand or by drawing out the head v^3 fixed to the slide bar v^1 in the direction indicated by the arrow in Fig. 4, the slide bars v and v^1 are moved out of the position shown in full lines in Fig. 4 into the position marked by dash and dot lines. The slide bars v, v^1 are provided with headed pins or buttons x on which the key-hole slots N in the upper edge L of the stencil M are placed. Fig. 5 shows the position assumed by the stencil after it has been placed on the pins x. After this has been done, the bars v, v^1 are moved apart by the rotation of disc w, the pins x being thus shifted into the position indicated in Fig. 6 and may therefore in turn stretch the stencil, so that this latter will, in all circumstances, be found to lie perfectly taut and flat, even when the perforations or

slots in the edge L of the stencil happen to be uneven. In any case, however, the forming of creases will be rendered impossible. The slots N in the stencil will preferably be shaped in the manner shown in Fig. 7, with their stem portions or bores so arranged that the line O along which the pins x will slide is a rectilinear one. By these means, any possibility of the stencil being shifted out of alignment when the pins move laterally is successfully avoided.

It will be obvious that the described apparatus may be modified in various manners without departing from the spirit of the invention.

We claim:

1. In a duplicating machine, the combination of a cylinder; a frame wherein the cylinder is arranged having bearings at opposite ends of the cylinder; a screw threaded into each bearing; and a spring carried by each screw and itself supporting the adjacent end of the cylinder; said screws being adjustable independently of each other in said bearings to vary the tension of the springs, and being completely removable, together with the springs, from the bearings to enable the direct removal of the cylinder from the frame.

2. In a duplicating machine, the combination of a cylinder; a frame wherein the cylinder is arranged having bearings at opposite ends of the cylinder; a hollow screw threaded into each bearing; and a spring fitting in each screw and projecting above the same to support the adjacent end of the cylinder; said screws being adjustable independently of each other in said bearings to vary the tension of the springs, and being completely removable, together with the springs, from the bearings to enable the direct removal of the cylinder from the frame.

3. In a duplicating machine, the combination of a printing cylinder; a pressure roller for coaction therewith; and operating mechanism for said roller acting automatically to lift it directly upward into engagement with the cylinder, said mechanism including means for forcing the roller yieldingly against said cylinder after such engagement has been effected.

4. In a duplicating machine, the combination of a printing cylinder; a pressure roller for coaction therewith; and operating mechanism for said roller acting automatically to lift it directly upward into engagement with the cylinder, said mechanism including springs which are put under tension after such engagement has been effected, thereby to yieldingly force the roller against said cylinder.

5. In a duplicating machine, the combination of a printing cylinder; a pressure roller for coaction therewith; supporting bearings for the ends of said roller; means connected to lift said bearings and therewith said roller directly upward into engagement with the cylinder; springs for pressing said roller against the cylinder; and means for tensioning said springs to effect said pressing action, said tensioning means being brought into operation only after such engagement has commenced.

6. In a duplicating apparatus, the combination of a printing cylinder; a pressure roller; supporting bearings wherein the ends of the roller are mounted; a parallel-motion device connected with said bearings to lift the same and therewith said roller directly upward into engagement with the cylinder; and springs associated with the roller to press it yieldingly against said cylinder, but placed under tension to effect said pressing operation only after such engagement has commenced.

7. In a duplicating apparatus in combination a printing cylinder, a pressure roller; lateral end plate bearings; slots formed in said bearings in which said pressure roller is mounted; means for yieldingly supporting said roller within said slots; a parallel guide for said bearings; and means for raising and lowering said bearings.

8. In a duplicating apparatus in combination a printing cylinder; a pressure roller; lateral end plate bearings; slots formed in said bearings in which said pressure roller is mounted; spring actuated levers pivotally connected with said bearings and yieldingly supporting said roller within said slots; a parallel guide for said bearings; and means for raising and lowering said bearings.

9. In a duplicating apparatus in combination a printing cylinder; a pressure roller; lateral end plate bearings; slots formed in said bearings in which said pressure roller is mounted; spring actuated levers pivotally connected with said bearings and yieldingly supporting said roller within said slots; a stop arranged on each of the bearings; a stop on each lever engaging said first mentioned stop for limiting its movement; a parallel guide for said bearings; and means for raising and lowering said bearings.

10. In a duplicating apparatus in combination a printing cylinder; a pressure roller; lateral end plate bearings; slots formed in said bearings in which said pressure roller is mounted; spring actuated levers pivotally connected with said bearings and supporting said roller within said slots; a stop arranged on each of the bearings; a stop on each lever; springs adapted to bring said stops into engagement with each other; a parallel guide for said bearings; and means for raising and lowering said bearings.

11. In a duplicating apparatus in combination a printing cylinder; a pressure

roller; lateral end plate bearings; slots formed in said bearings in which said pressure roller is mounted; spring actuated levers pivotally connected with said bearings and yieldingly supporting said roller within said slots; a stop arranged on each of the bearings; an adjustable stop on each lever; springs adapted to bring said stops into engagement with each other; a parallel guide for said bearings; and means for raising and lowering said bearings.

12. In a duplicating apparatus of the type described in combination a printing cylinder; a pressure roller; a cam device for bringing said cylinder and roller into engagement; and a separate cam device for moving said cylinder and roller out of engagement with each other.

13. In a duplicating apparatus of the type described in combination a frame; a printing cylinder rotatably mounted on said frame; a pressure roller; and two separate cam devices to carry out the operations of raising and lowering the said roller into and out of engagement with said cylinder respectively.

14. In a duplicating apparatus of the type described in combination two cylinders; feed bands connecting the same; a stencil support; projections arranged at regular distances from each other on the said bands; and grooves arranged on the cylinders corresponding to said projections, one of the projections of each band being adapted to serve as a means of attachment for said stencil support.

15. In a duplicating apparatus of the type described in combination two cylinders; feed bands connecting the same; and a stencil support arranged on said feed bands comprising bars for receiving a stencil, said bars being adapted to be shifted endwise relative to each other in opposite directions to stretch the stencil laterally.

16. In a duplicating apparatus of the type described in combination two cylinders; feed bands connecting the same; and a stencil support arranged on said feed bands comprising bars provided with heads for receiving a stencil, said bars and heads being adapted to be shifted endwise relatively to each other in opposite directions to stretch the stencil laterally.

17. In a duplicating apparatus of the type described in combination two cylinders; feed bands connecting the same; a stencil support arranged on said feed bands; a stencil supported by said stencil support and having key-hole slots; and heads on said stencil support engaging with said slots, the latter being disposed along a straight line at the upper surface of the stencil.

18. In a duplicating apparatus of the type described in combination two cylinders; feed bands connecting the same; a stencil support arranged on said feed bands; a stencil supported by said stencil support and having key-hole slots; and heads on said stencil support engaging with said slots, the latter having their bores so arranged that the heads slide along a rectilinear line.

In testimony whereof we have affixed our signatures in presence of two witnesses.

ARMIN BREUER.
ARNO HEYN.

Witnesses:
LUPOR OYER,
KAPPE GEECH.