Oct. 11, 1966 R. H. FROHOCK 3,277,808

APPARATUS FOR PRODUCING OFFSET PRINTING PLATES

Filed Jan. 24, 1964 3 Sheets-Sheet 1

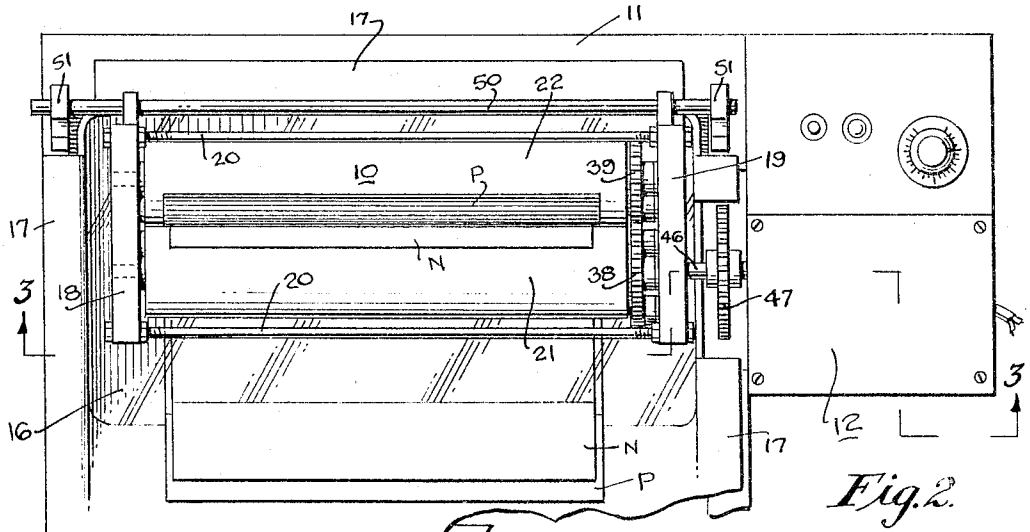
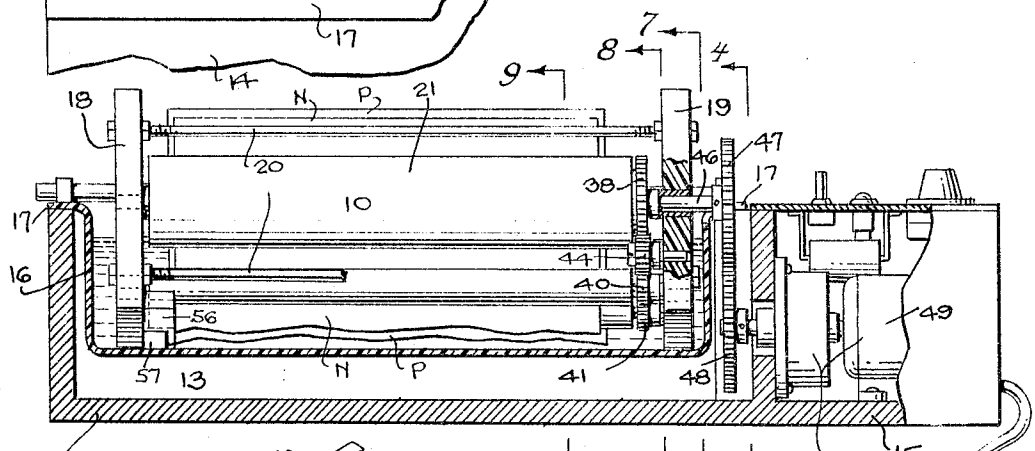


Fig. 2.



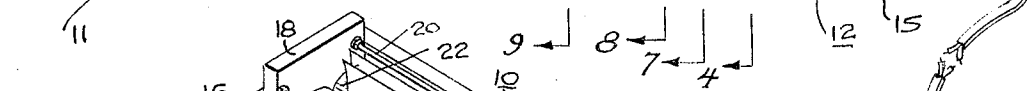


Fig. 3.

Fig. 1.

INVENTOR.
RICHARD H. FROHOCK
BY L. Earl Adelson
ATTORNEY.

Oct. 11, 1966 R. H. FROHOCK 3,277,808

APPARATUS FOR PRODUCING OFFSET PRINTING PLATES

Filed Jan. 24, 1964 3 Sheets-Sheet 2

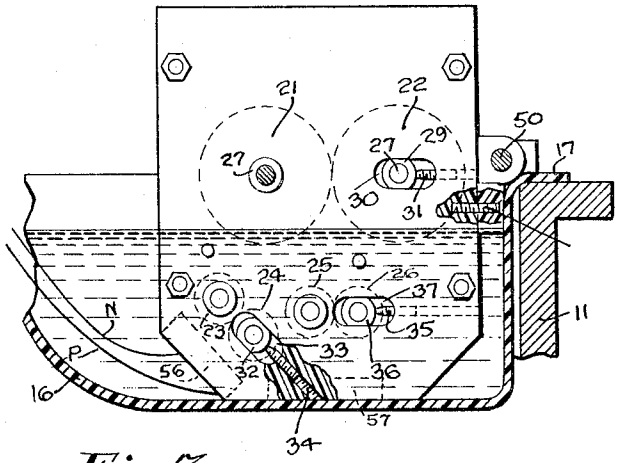
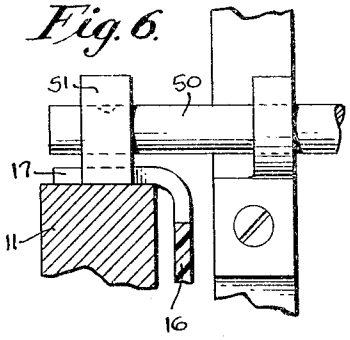


Fig. 7.

Fig. 6.



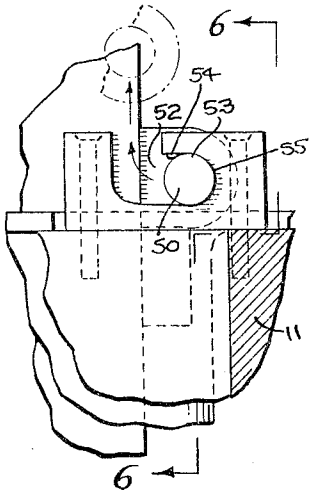


Fig. 5.

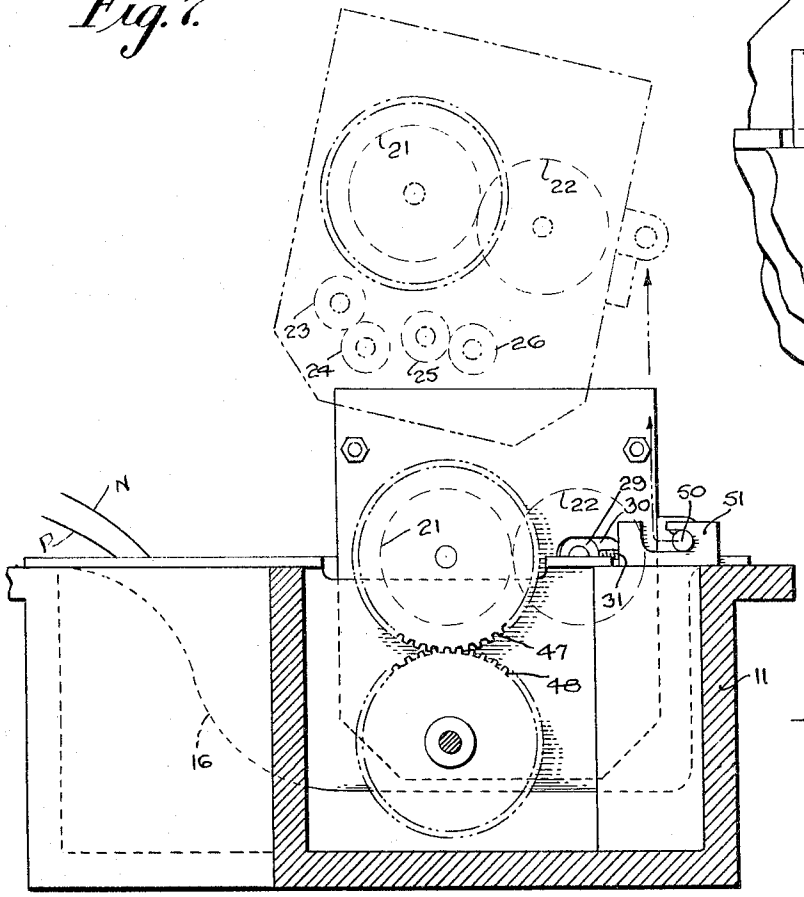


Fig. 4.

INVENTOR.
RICHARD H. FROHOCK
BY Leon Edelman
ATTORNEY

Oct. 11, 1966 R. H. FROHOCK 3,277,808

APPARATUS FOR PRODUCING OFFSET PRINTING PLATES

Filed Jan. 24, 1964 3 Sheets-Sheet 3

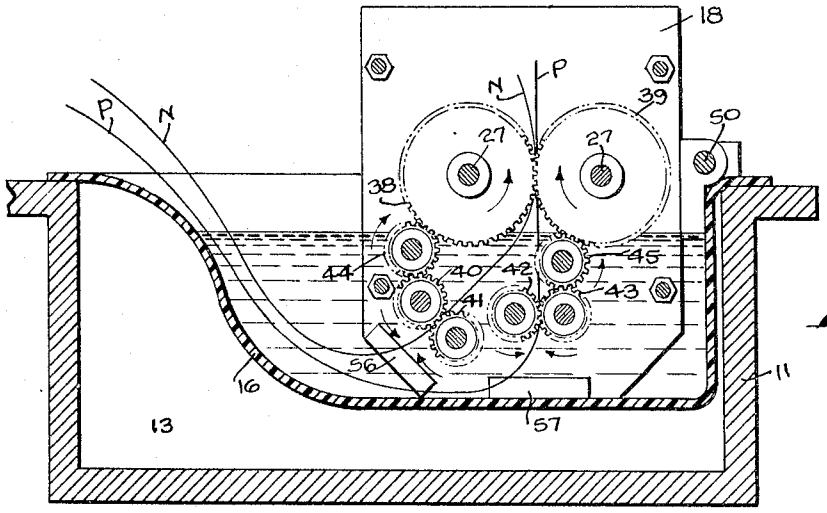


Fig. 8.

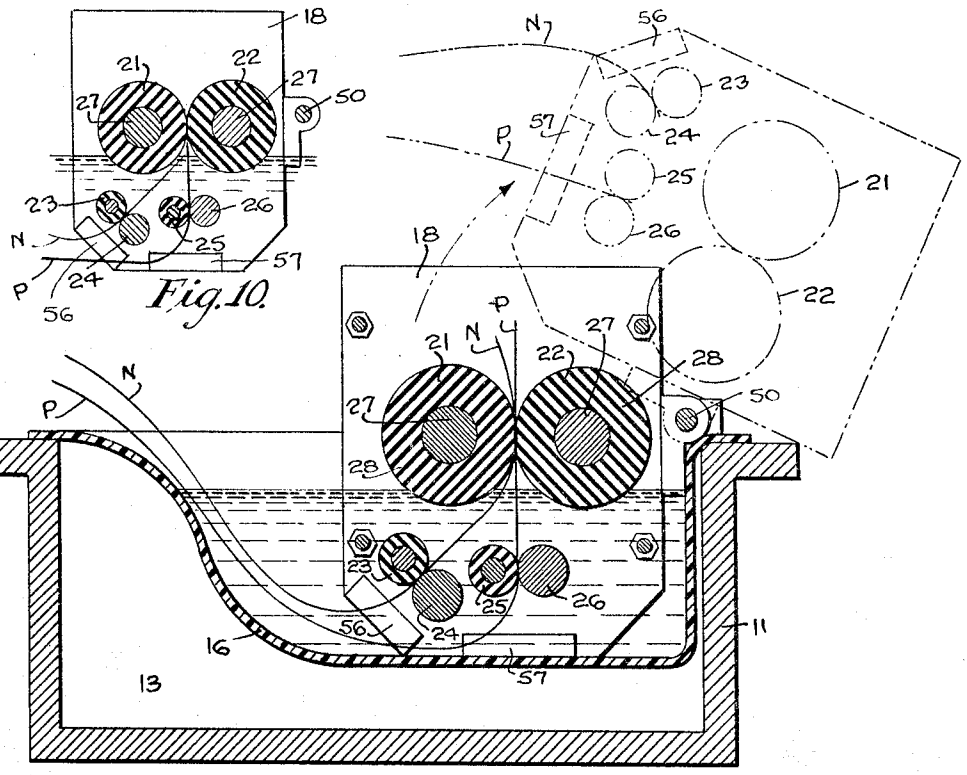


Fig. 9.

INVENTOR.
RICHARD H. FROHOCK
BY
ATTORNEY.

United States Patent Office

3,277,808

Patented Oct. 11, 1966

3,277,808

APPARATUS FOR PRODUCING OFFSET PRINTING PLATES

Richard H. Frohock, Williamstown, N.J., assignor to Bernard R. Cahan, trustee, Elkins Park, Pa.

Filed Jan. 24, 1964, Ser. No. 339,934

15 Claims. (Cl. 95—89)

This invention relates generally to apparatus for producing offset printing plates. More particularly, the invention relates to apparatus for producing positive offset printing plates from a copy negative and for insuring proper alignment and margin spacing between the copy negative and the offset printing plate, so that uniform margins and copy orientation may be produced on successively made printing plates.

One method of making offset printing plates employs photocopying commonly carried out by wet process contact printing apparatus used in most business offices for photocopying letters, invoices and other business papers. The contact photocopying apparatus generally includes a light source for exposing a sheet of sensitized negative paper with the copy material imprinted upon the paper which it is desired to reproduce, the exposure being made either by transmission through the material to be copied or by the reflex method. After the negative has been exposed, it is separated from the copy material and placed in flat surface contact with the sheet of positive transfer paper. The positive and negative paper are then inserted into a pair of parallel adjacent slots in the apparatus, passing downward into a developer liquid bath and into a pair of counter-rotating squeegee rollers which intimately press the wetted positive and negative sheets together and pass them out of the apparatus. The adhered positive and negative sheets are then separated and a positive print of the copy material previously exposed onto the negative paper is obtained on the positive paper.

Offset printing plates may be made in exactly the manner previously set forth, the only difference being that the positive print paper usually used to provide the finished print is replaced by a flexible metal offset printing plate which is commonly made of thin aluminum sheet. The offset printing plate must, of course, have the copy placed upon it in a precise orientation relative to the edges of the plate, and with prescribed top and side margins or the printed copies produced therefrom will be unacceptable. Unfortunately, the office types of contact photocopying machine provide no means of indexing the negatives to the offset plate prior to the transfer step which will insure the proper positioning of the negative relative to the plate, the proper positioning being a matter of estimation by the person operating the machine which essentially resolves itself to guess work. As a result of this deficiency in the photocopying apparatus, it frequently occurs that quite a few printing plates are ruined before obtaining an acceptable plate. This situation is aggravated by the fact that the results of the negative to plate misalignment during the producion of the first plate cannot be compensated for by making a second plate from the same negative because a given negative can usually be used only once, and new negatives must be made to produce successive printing plates.

The apparatus according to the present invention employs a novelly arranged swingable system of rollers for providing a fixed offset between the leading edges of the negative and printing plate so that the top marginal spacing may be precisely controlled. The roller system includes means for adjusting the pressure between the various rollers so that a uniform pressure may be obtained along the length of the rollers. The improved apparatus according to the invention essentially includes a swingably mounted roller assembly in which all of the operative

parts are fixedly indexed to one another and which is designed to be operatively mounted upon any suitable support having a developing bath well or tank into which the roller system may be swung and then motor driven for travel of the negative and printing plate conjointly through the developing solution, with the apparatus so designed and operative as to permit in insertion of both the negative and the printing plate into the roller system from the front side thereof.

Accordingly, it is a primary object of this invention to provide a novel apparatus for transferring the latent image on an exposed negative to an offset printing plate so that the image will be transferred to the plate with a known desired orientation and top and side margins.

Another object of this invention is to provide a novel apparatus for transferring a latent negative image to an offset printing plate which provides a desired side margin width by means of an edge guide which positions side edges of the negative and of the printing plate.

Still another object of this invention is to provide a novel apparatus for transferring the latent image on a negative to a printing plate which includes means for offsetting the top edges of the negative and the printing plate by a prescribed amount to thereby repeatedly obtain a desired top margin width.

Yet another object of this invention is to provide a novel apparatus of the aforedescribed type which is of mechanically simple and reliable construction, which may be relatively easily disassembled for cleaning, and which performs its desired function by indexing the negative and printing plate into a system of particularly related intercoupled motor driven rollers, which latter carry the negative and plate through a developing bath, thereafter pressing them firmly together and ejecting the adhered negative and plate from the apparatus.

A further object of this invention is to provide a novel apparatus as aforesaid wherein all of the operating parts which determine and control the relative positions of the copy negative and offset plate as they are moved through the apparatus are fixedly indexed to one another in a unitary structure to thereby properly index the copy negative and offset plate to one another.

Another important object of this invention is to provide a novel swingable arrangement of the roller system as an assembly relatively to the tank which contains the developing solution and into which the roller system may be swung after the leading edges of the negative and the printing plate have been initially inserted into the roller system and therein held in proper registry for subsequent travel through the developing bath.

Still another object of the invention is to provide an apparatus for producing offset printing plates wherein the roller system is so swingably mounted relatively to the developing solution tank as to enable the roller system to be swung into a position well above the tank to facilitate insertion of the negative and printing plate into the roller in proper registration one with the other and at the same time insure attainment of the desired lead of the metal printing plate relatively to the paper negative during passage of the paper and plate through the developing bath.

Still further, it is among the objects of the present invention to provide a roller assembly which is readily and conveniently swingable into and out of operative position relatively to the developing bath and which facilitates to maximum degree insertion of the paper negative and the metal printing plate into the roller system, while the same is swung free of the developing bath and is not in operative engagement with the driving mechanism for the roller system, thereby precluding all possibility of the rollers grabbing either the paper negative or the printing

plate to cause either or both to travel through the roller system out of proper registration one with the other.

Yet another and important object of the invention is to provide a swingable roller system which allows initial insertion of the leading edges of the paper negative and metal printing plate into the roller system while it is swung upwardly into its inoperative position and then, when the system is swung downwardly into the developing bath and is motor driven, employs to advantage the inherent relative stiffness of the printing plate to guide the paper negative in proper relation to the plate through those rollers of the system which operate to press the negative and plate together as they emerge from the developing bath.

Still other objects and advantages of the present invention will be apparent hereinafter, it being understood that the present invention resides in the combination, construction, location or relative arrangement of parts, all as more fully described in the following specification, as shown in the accompanying drawings and as finally pointed out and defined in the appended claims.

In the accompanying drawings which are illustrative of a preferred construction of the apparatus embodying the principles of the present invention:

FIGURE 1 is a perspective view of the apparatus in its assembled form showing the roller system thereof in its operative position relative to the developing bath;

FIGURE 2 is a plan view of the apparatus shown in FIGURE 1;

FIGURE 3 is a vertical sectional view of the apparatus as taken along the line **3—3** of FIGURE 2;

FIGURE 4 is a transverse vertical sectional view as taken along the line **4—4** of FIGURE 3 and showing in phantom the roller assembly of the apparatus removed from its supporting table;

FIGURE 5 is an enlarged detail view, partly in section showing the hinged connection between the roller assembly and the table support therefor;

FIGURE 6 is a sectional view taken along the line **6—6** of FIGURE 5;

FIGURE 7 is a somewhat enlarged transverse sectional view as taken along the line **7—7** of FIGURE 3;

FIGURE 8 is an enlarged transverse sectional view taken along the line **8—8** of FIGURE 3;

FIGURE 9 is a correspondingly enlarged sectional view taken along the line **9—9** of FIGURE 3; and

FIGURE 10 is a fragmentary sectional view of the roller assembly showing the same operatively positioned relatively to the developing solution and showing also the relationship between the paper negative and the printing plate as the same are initially fed into the roller system during the process of transferring the copy material on the negative to the printing plate.

Referring now more particularly to the drawings, it will be observed that the apparatus of the present invention essentially includes a roller assembly generally designated by the reference numeral **10** which is adapted to be swingably mounted upon a suitable support therefor designated generally by the reference numeral **11**, which support includes a gear motor unit **12** adapted for operative engagement with the roller assembly to drive the same when it is in its lowered operative position.

The support **11** may be of any desired form and construction as provided with a recess **13** into which the roller assembly may be lowered for feeding of the paper negative and metal printing plate therethrough during operation of the apparatus. The size and shape of the recess **13** is not critical, it being only required that it be of sufficient depth, width and length to accommodate a solution receiving tray containing therein sufficient quantity of the developing solution into which the roller system may be submerged when it is swung downwardly into its operative position. Preferably, the table support **11** is provided with a frontally extending platform **14** disposed in coplanar relation with the top edges of the front, rear and side walls of the table support which define the recess **12**. In addition, the table support is provided at one end thereof with an extension **15** for supporting thereon the gear motor unit **12** for driving the roller assembly, which motor unit so mounted upon its support may be completely enclosed by suitable side, end and top wall panels as shown in FIGURES 1 to 3. Fitted in the recess **13** of the table support is a removable tray **16** formed of any suitable material, which tray is provided with a perimetrally extending top flange **17** which rests upon the top edges of the table recess and so removably suspends the tray in the table support. The tray itself is dimensioned to receive the roller assembly when the latter is swung downwardly into its operative position and is of such depth that it properly supports the roller assembly in position with the lower portion thereof submerged in the developing bath contained in the tray.

The roller assembly **10** includes a pair of spaced apart end bearing blocks **18** and **19** which are secured together in spaced parallel relation by a plurality of longitudinally extending stay rods **20**. Revolubly supported between the bearing blocks **18** and **19** are three sets of paired rollers, one set comprising a pair of main press rollers **21–22**, a second set comprising a pair of guide and feed rollers **23–24** for the paper negative N and a third set comprising a pair of guide and feed rollers **25–26** for the metal printing plate P.

The main press rollers **21** and **22** each consist of a central shaft **27** about which is fitted a cylindrical resilient cover **28**, preferably formed of rubber or like material, it being noted that these main press rollers **21–22** are disposed with their axes in parallel relation and in a plane which is substantially horizontal when the roller assembly is in its operative position as shown in FIGURE 9.

Preferably, the roller **23** of the pair which serves as the paper guide rolls and the rolls **25** of the pair which serves as the printing plate guide rolls are each provided with a metal shaft fitted with a cylindrical resilient cover of rubber or the like. Thus, each set of the paired rollers provides a resilient bight therebetween for firmly and positively engaging the two sheets of materials as the same are fed through the apparatus for processing. It will be noted that the paired guide rollers **23–24** for the paper negative N are spaced below the main press roller **27** with their parallel axes so disposed in a plane inclined with respect to the plane of the axes of the main press rollers as to present the bight of said rollers **23–24** in forwardly offset relation to the bight of the main press rollers **21–22**. The printing plate rollers **25–26** are also spaced below the main press rollers but in such position that the bight between the said rollers **25–26** is coplanar with the bight of the main press rollers. Thus, the relative arrangement of the several sets of paired rollers is such that when the roller assembly is in its operative position as shown in FIGURE 9, the two sets of guide rollers are completely submerged in the solution with the rollers **23–24** operating to feed the paper negative along an inclined plane which intersects the plane of travel of the printing plate P upwardly from its guide rollers **25–26** into the bight of the main press rollers **21–22**. This relationship between the several sets of rollers and the relative orientation of their bights remains fixed regardless of the position which may be assumed by the roller assembly as a unit, that is, when the roller assembly is swung downwardly into its operative position as shown in FIGURE 9 or when it is swung into its inoperative position as shown in phantom in FIGURE 9 or when it is completely removed from its support as shown in phantom in FIGURE 4

In order to provide for proper and adequate exertion of pressure between the rolls of each paired set, means are provided in the end bearing blocks **18** and **19** for adjusting the axis of one roller of each pair relatively 5° the axis of the other roller. Such adjusting means are most clearly shown in the bearing block **19** illustrated in FIGURE 7, it being understood of course that similar adjusting means are provided in the opposed bearing block

18. It will be noted that the opposite ends of each of the roller shafts are respectively journalled in the bearing blocks 18 and 19 and that the opposite ends of the shaft 27 of the main press roller 22 are each fitted with a bearing sleeve 29 (see FIGURE 7) which is non-rotatably but slidably accommodated within an elongated slot 30 formed in the bearing block 19. Threaded into a side edge of the bearing block 19 for engagement with the bearing sleeve 29 is an adjusting screw 31, it being apparent that as said screw is axially adjusted toward or away from its associated bearing sleeve 29 the roller 22 is caused to bear with more or less pressure against its companion roller 21 which is revoluble about the relatively fixed axis. Since the opposite bearing block 18 is similarly provided with a pressure adjusting screw bearing against the shafted end of the roller 22 journalled in said block 18, upon adjustment the two screws 31 the main press rollers may be adjusted to and maintained in exact parallel relationship with requisite pressure exerted by these rollers one against the other.

Similar adjusting means are provided in the end bearing blocks 18 and 19 for adjusting and maintaining proper positional and pressure relationship between the guide rollers 23–24 for the paper negative and between the guide rollers 25–26 for the printing plate. Thus, as most clearly appears in FIGURE 7, the opposite ends of the roller 24 are each fitted with a bearing sleeve 32 which is non-rotatably but slidably accommodated in an inclined slot 33 formed in the main bearing block, which bearing sleeve 32 is in each instance adapted for positional adjustment within its accommodating slot by means of an axially adjustable screw 34 threaded into the bottom edge of the bearing block with its axis disposed in the inclined plane of the guide rolls 23–24.

Similarly, the guide roll 26 is adjustable relatively to its fixed axis companion roller 25 by means of an axially adjustable screw 35 bearing against a bearing sleeve 36 which is fitted on the end of the shaft 26 and is in turn non-rotatably but slidably accommodated in an elongated slot 37. It will be noted that the axially adjustable screws for each set of the paired rollers are shiftable in a plane which is common to the axes of rotation of each pair of the rollers.

The roller assembly as a unit also includes at one end thereof a pair of gears 38 and 39, which gears are respectively keyed to corresponding ends of the main roller shafts 27—27 and are meshed with one another to provide for counter-rotation of the main press rollers in the direction of the arrows shown in FIGURE 8. Corresponding shafted ends of the guide rolls 23–24 and 25–26 are similarly fitted with paired gears 40–41 and 42–43, which paired gears are in mesh with one another to provide for counter-rotation of the paper negative guide rolls and of the printing plate guide rolls, the direction of rotation of these rolls being as indicated by the arrows in FIGURE 8.

Also journalled upon the end bearing block 19 are a pair of gears 44 and 45, the gear 44 being in meshing engagement with the gear 38 of the main press roller 21 and the gear 40 of the paper negative guide roll 23, while the gear 45 is in mesh with the gear 39 of the main press roll 22 and the gear 43 of the printing plate guide roll 26.

All of the gears 38 to 45 inclusive are disposed in a common plane spaced inwardly from and extending parallel to the end bearing block 19 and since all of these gears are entrained as described, it will be apparent that upon rotation of one or the other of the main press rollers 21–22, the entire roller system is activated with all of the rollers rotating in unison in the particular arrangement shown. In the arrangement as shown, the main press roller 21 is that which is driven to impart the desired rotation of all of the rollers of the roller assembly and to such end the shaft of the main press roller 21 is extended outwardly beyond the end bearing block 19, as at 46, to receive a main drive gear 47 keyed thereon.

This drive gear 47 is adapted to be driven by the motor gear unit 18 and for this purpose this drive gear 47 is disposed above and in a plane common to that of the end gear 48 of the motor gear unit. This end gear 48 of the motor gear unit is part of the gear reduction drive which is driven by an electric motor 49, suitably mounted upon the table support extension 15 as best shown in FIGURE 2. Of course, any suitable drive mechanism may be employed for driving a gear such as that designated 48, which last mentioned gear is entrained with the gear train of the roller assembly only when the latter is swung downwardly into its operative position as shown in FIGURE 1. It will be understood also that any suitable electrical circuit arrangement may be provided for controlling the operation of the motor drive for the drive gear 48.

As has been pointed out hereinabove, the roller assembly is designed to be swingably mounted upon the work table so that it may be raised out of or lowered into the tray 15 which contains the developing solution. To this end, the rear end of the roller assembly is suitably provided with a pivot shaft 50 having freely projecting opposite end portions respectively adapted to be received in notched seats 51—51 fixedly secured to the top of the work table immediately to the rear of the tray 16. The arrangement is such that the roller assembly may be swung upwardly about the longitudinal axis of the shaft 49 while the same is journalled in its pivotal supports 51—51 into the raised position of the roller assembly as shown in phantom in FIGURE 9. It is in this raised position of the roller assembly that the paper negative and the printing plate are initially introduced into the roller assembly for their subsequent processing in the developing bath. Having initially introduced the paper negative and the printing plate into the paired guide rolls of the roller assembly, the latter as a unit may then be swung downwardly into its full line position shown in FIGURE 9 to effect entrainment of the gears 47 and 48 and so permit motor driven operation of the several pairs of rollers for processing of the sheets as they pass through the developing solution in the tank.

It will be noted that when the roller assembly is swung downwardly into its position as shown in FIGURE 9, its end bearing blocks 18–19 rest upon the bottom of the tray 16 and thus support the roller mechanism with the two pairs of guide rolls completely submerged in the developing solution. The notched pivots 51—51 which receive the supporting shaft of the roller assembly are such as permit easy complete removal of the roller assembly from the table for purposes of cleaning, maintenance and other such servicing as may be required.

Of course, any suitable arrangement may be provided for mounting the roller assembly in position to be swung into and out of the developing solution and to provide for operative entrainment of the drive gear 4 of the motor unit when the assembly is swung into position for feeding the sheets through the processing bath. While any suitable means may be employed for hinging the roller assembly upon a recessed table or other support so that the lower portion of the roller assembly may be submerged in developing solution for processing of the sheets fed through the rollers, it will be noted that in the preferred pivoting arrangement as best shown in FIGURES 4, 5 and 6, the hinge members 51—51, which are fixedly secured to the table or support for accommodation of the hinge shaft 50, are each provided with an L-shaped slot 52 to permit quick-detachable engagement and disengagement of the hinge shaft 48 with the fixed hinge members 51—51.

In order to retain the hinge shaft properly seated in the hinge members for swinging movement of the roller assembly relatively to its support, the top wall 53 of each L-shaped slot is provided with a downwardly projecting teat 54 across which the shaft 50 may be forced as it is pressed into its semi-circular seat 55 formed at the rear end of the L-shaped slot. The hinge members 51—51

may be formed of any suitable material, as will provide the top wall portions **53** thereof with sufficient "give" to permit forced passage of the shaft **48** into and out of its seats **55**.

The roller assembly is so balanced in relation to the hinge axis that when the assembly is swung into its position shown in phantom in FIGURE 9, its center of gravity is disposed rearwardly of the hinging shaft so that the assembly is held in that position by its own weight as it rests against the top edge of the rear wall of its underlying supporting structure. On the other hand, when the roller assembly is swung forwardly about its swinging axis, its center of gravity shifts forwardly of the hinge shaft and so of its own weight the assembly is held by the underlying tray **16** in its operative upright position shown in full lines in FIGURE 9. Thus, there is no necessity for employing special locking devices to retain the roller in either of its two extreme positions.

The swingable roller assembly of the apparatus of the present invention completely eliminates the need for any auxiliary guides or guide devices such as have characterized previous types of apparatus for producing offest printing plates.

From the foregoing it will be apparent that all of the operative parts of the apparatus for feeding the sheets to be processed through the developing solution, namely the roller system, the gear train and the motor unit, are precisely indexed relatively to one another in operation of the apparatus and yet are severally separable from one another and from the main support therefor for ease of cleaning, replacement of parts and other servicing as may be necessary. Moreover, the roller system constitutes a self-contained assembly which, when entrained with the driven shaft of the motor unit as hereinbefore described, operates in and by itself to receive and transport the sheets through the processing bath.

In operation of the apparatus, the roller assembly **10** is initially swung upwardly into its position shown in phantom in FIGURE 9, in which position, of course, the roller system, including its gear train, is so completely free of the motor drive unit that conjoint rotation of the main press roller and of the paper negative and printing plate guide rollers may be effected manually by hand rotation of the drive gear **47**. In this position of the roller assembly the two sets of guide rolls are disposed with their bights in convenient position to receive the leading edges of the paper negative N and the printing plate P, which edges are inserted into the bights of these guide rolls to an extent just sufficient for each sheet to be firmly grasped between the rolls. Since the roller axes are all exactly parallel, insertion of the sheets N and P into the bights of the guide rollers **23–24** and the guide rollers **25–26** with their leading edges parallel to one another and to the roller axes and with their longitudinal side edges in spaced parallel relation to provide the developed plate with the requisite top and side margins is all that is necessary to insure subsequent feeding of the sheets in proper registry one with the other through the developing bath.

The top margin of the developed positive plate serves of course as the gripping edge necessary for proper insertion and retention of the plate in the platen rolls of the printing apparatus in which it is used, the length of such margin being dependent upon the extent to which the leading end of the plate P enters the nip of the main press rollers **21** and **22** in advance of the corresponding end of the copy negative N. The lead of the plate P with respect to the negative N is probably best illustrated in FIGURE 10, it being understood of course that the lead may be changed to greater or less extent by changing the location of the negative feed rolls **23–24** relatively to that of the plate feed rolls **25–26**.

In order to insure parallel relation of the side edges of the negative N and the plate P with respect to one another and orthogonal relation thereof to the roller axes, the side bearing block **18** is preferably provided with a pair of guide members **56** and **57** which respectively project inwardly of the block **18** and provide surfaces against which the left hand edges of the sheets may bear as the same are fed into and through the roller system. These guide members are of different thicknesses, the member **56** being thicker than the member **57**, so that the inner surfaces thereof are relatively offset for a distance equal to the desired offset between the side edges of the sheets fed into the apparatus. Thus, the side edge of the negative N, as it rides along the guide surface of the member **56**, is maintained in inwardly spaced parallel relation to the edge of the plate P as the latter simultaneously rides along the guide surface of the member **57**. The guide surfaces of the members **56** and **57** are, of course, both sufficiently offset inwardly of the bearing block **18** to insure that the side edges of the sheets fed into the roller system are contained within the effective lengths of the main press rollers to insure that the same operate upon the full widths of the sheets being processed.

Having initially inserted the sheets into the guide rolls as above described, the roller assembly is then swung downwardly into its full line position shown in FIGURE 9 for entrainment with the motor driven gear **48**, whereupon, upon operation of the motor unit, the roller assembly will be driven to simultaneously cause the guide rolls **23–24** to feed the paper negative N and the guide rolls **25–26** to feed the printing plate P to and between the main press rollers **21–22**, the rotation of these several pairs of counter-rotating rolls being all so related that they conjointly operate to smoothly feed the sheets through the system at a uniform linear rate of speed. Since the feed rolls **23–24** and **25–26** are completely submerged in the developing solution during operation of the apparatus, it will be apparent that the sheets will be processed as they are fed through the solution to the main press rollers between which they are pressed together for transfer of the material from the negative to the printing plate. Upon complete ejection of the adhered negative and plate from the main press rollers, the two processed sheets are separated from one another in conventional manner by peeling them apart.

It will be noted that the paper negative is fed by its guide and feed rolls **23–24** along an upwardly inlined path in a plane which intersects the plane of travel of the printing plate from the guide and feed rolls **25–26** to the main press rolls **21–22**. Since the several paired feed rolls are so positionally related and geared as to insure uniform linear speed of travel of the two sheets to and through the main press rollers with the leading edge of the printing plate advanced forwardly of the corresponding end of the negative, it will be apparent that the printing plate will be engaged by the main press rollers prior to engagement therewith of the copy negative, and thus the printing plate will afford a surface for guiding and leading the more flexible copy negative into the bight of the main press rollers. Also, since the printing plate is formed of metal and so is constrained to move vertically upward from the rolls **25–26** to the main press rollers **21–22**, its leading end passes into and between the latter rollers with minimum tendency for it to curl out of shape and so provides a smooth unbuckled guide surface which facilitates in turn smooth passage of the copy negative into and through the main press rollers in unwrinkled surface contact with the printing plate.

Additionally, because of the fact that this length of the paper negative N submerged in the developing solution has its exposed surface fully and freely exposed at all times to the developing solution in the tray, the silver salts freed from the negative upon its development drop away from its exposed surface and are washed from the surface of the plate P as the latter moves vertically upward from the guide rolls **23–24** to the main press rollers **21–22**.

It will be understood, of course, that the present invention is susceptible of various changes and modifications which may be made from time to time without depart-

ing from the general principles or real spirit of this invention, and that it is intended accordingly to claim the same broadly as well as specifically as indicated by the appended claims.

What is claimed as new and useful is:

1. An apparatus of the character described for producing offset printing plates comprising in combination a roller assembly including a first pair of counter-rotating rolls for feeding a previously exposed copy negative therebetween, a second pair of counter rotating rolls for feeding therebetween a printing plate to which the latent image on the copy negative is to be transferred and a third pair of counter-rotating main pressure rolls for commonly receiving and pressing therebetween the sheets fed through said first and second pairs of rolls, said rolls being interconnected for synchronous rotation about parallel axes with the nips of the first and second pairs of rolls spaced from one another and to one side of the common plane of the axes of the main pressure rolls, means for synchronously driving said several pairs of rolls for conjointly feeding said sheets through the roller assembly at a predeterminedly fixed linear speed of travel, means for supplying processing solution to said sheets as the same pass through said first and second pairs of rolls and toward said main pressure rolls, and means for swingably mounting said roller assembly for movement into an elevated position free of said processing solution or into a lowered position in which the first and second pairs of rolls are completely immersed in said solution for processing of the sheets passing through said several pairs of rolls.

2. An apparatus according to claim 1 wherein said means for synchronously driving the several pairs of rolls is rendered operable only when said roller assembly is in its lowered position.

3. An apparatus of the character described for producing offset printing plates comprising in combination, a main support, having a well therein for containing a processing solution, a roller assembly mounted upon said support for movement thereof into and out of said solution, said assembly including two spaced pairs of counter-rotating rolls for respectively feeding a copy negative and a positive printing plate simultaneously through said solution in spaced relation, and a third pair of counter-rotating main pressure rolls for receiving and pressing therebetween the two sheets fed thereto by said first-mentioned two pairs of rolls, all of the rolls of the assembly being rotatable about parallel axes and being relatively disposed with the nips of the main pressure rolls and of the printing plate feed rolls lying in a common plane and the nip of the negative copy feed rolls lying in a plane inclined with respect to and intersecting said common plane at a point located between the nips of said main pressure rolls and printing plate feed rolls, and means for driving said several pairs of rolls synchronously and at uniform linear surface speed.

4. An apparatus according to claim 3 wherein said first-mentioned two pairs of rolls are disposed to one side of and in spaced relation with respect to the pair of main pressure rolls and wherein the roller assembly is swingably mounted upon its support whereby it may be swung upwardly out of said solution to present said two pairs of rolls frontally of said main pressure rollers for insertion of said sheets respectively into the nips of said two pairs of rolls and then be swung downwardly to submerge said two pairs of rolls in said solution for processing of the sheets as they are fed through the roller assembly.

5. An apparatus according to claim 3 wherein the drive means for said roller assembly includes means interconnecting all of the rolls thereof for conjoint rotation thereof and a motor driven member detachably engageable with said interconnected drive means of the assembly, said motor driven member being mounted upon said support for the roller assembly adjacent one end of the latter.

6. An apparatus according to claim 3 wherein the copy negative feed rolls are spaced laterally of the printing plate feed rolls to provide a greater nip-to-nip distance between the main pressure rolls and the copy negative feed rolls than that between the main pressure rolls and printing plate feed rolls, whereby upon passage of the two sheets being processed through the apparatus, the printing plate serves as a backing for guiding the negative copy into the nip of the main pressure rolls.

7. An apparatus according to claim 3 wherein the well in the support includes a removable tray for containing processing solution and adapted to support the roller assembly in position when it is swung into its operative position.

8. An apparatus according to claim 3 including separable interengaging hinging elements respectively carried by said roller assembly and said support for permitting swinging movement of the assembly into and out of said solution and for permitting complete separation of the roller assembly from its support.

9. An apparatus according to claim 3 wherein said three pairs of rolls are all journalled in end bearing blocks each of which commonly receives the corresponding ends of the rolls, and wherein one roll of each pair is journalled for rotation about a relatively fixed axis and the other roll is journalled for rotation about a parallel axis positionally adjustable toward and away from said fixed axis rotatable roll, means being included in said bearing blocks for biasing the adjustable roll relatively to the fixed axis roll of each pair for varying the pressure therebetween with their axes substantially parallel.

10. An apparatus of the character described for producing offset printing plates comprising in combination, a main support having a well for containing a processing solution, a roller assembly including a first pair of counter-rotating rolls for feeding a previously exposed copy negative therebetween and a second pair of counter rotating rolls for feeding therebetween a printing plate to which the latent image on the copy negative is to be transferred, both of said pairs of rolls being interconnected for synchronous rotation about parallel axes with the nips thereof spaced from one another to respectively receive said copy negative and said printing plate with their leading ends spaced apart and in longitudinally offset relation, means for swingably mounting said roller assembly for movement toward and away from said well, a third pair of counter-rotating main pressure rolls for synchronous rotation with and about axes paralleling those of said first and second pairs of rolls, the nip of said third pair of pressure rolls being spaced from the nips of said first and second pairs of rolls in the direction of travel of said copy negative and printing plate through said processing well, and means for synchronously driving said several pairs of rolls for conjointly feeding said sheets through the processing well at a predeterminedly fixed linear speed of travel.

11. An apparatus according to claim 10 wherein said means for synchronously driving the several pairs of rolls is rendered operable only when said roller assembly is moved into position by swinging movement thereof toward said well.

12. An apparatus of the character described for producing offset printing plates comprising in combination, a main support, having a well therein for containing a processing solution, a roller assembly mounted upon said support for movement thereof into and out of two different positions, said assembly including two spaced pairs of counter-rotating rolls for respectively feeding a copy negative and a positive printing plate simultaneously through said solution in spaced relation, all of the rolls of the assembly being rotatable about parallel axes and being relatively disposed with the nips of said two spaced pairs of rolls so relatively spaced as to respectively receive and feed therethrough said copy negative and said positive printing plate with the forward edge of the printing plate in leading relation to the corresponding edge of the copy negative, a pair of counter-rotating main pres-

sure rolls for receiving and pressing therebetween the two sheets fed thereto by said two spaced pairs of rolls, and means for driving said several pairs of rolls synchronously and at uniform linear surface speed for conjoint movement of said copy negative and positive printing plate through said well-contained processing solution.

13. An apparatus according to claim 12 wherein the drive means for said roller assembly includes means interconnecting the same with the main pressure rolls for conjoint rotation thereof and a motor driven member detachably engageable with said drive means, said motor driven member being mounted upon said support for the rollers assembly adjacent one end of the latter.

14. An apparatus according to claim 12 wherein the copy negative feed rolls are so relatively spaced as to provide a greater nip-to-nip distance between the main pressure rolls and the copy negative feed rolls than that between the main pressure rolls and printing plate feed rolls measured along the path of travel of said negative copy and said printing plate, whereby upon passage of the two sheets being processed through the apparatus, the leading edge of the printing plate serves to back up

and guide the leading edge of the negative copy into the nip of the main pressure rolls.

15. An apparatus according to claim 12 wherein said three pairs of rolls are all journalled in end bearing members, and wherein one roll of each pair is journalled for rotation about a relatively fixed axis and the other roll is journalled for rotation about a parallel axis positionally movable toward and away from said fixed axis rotatable roll, biasing means being included in said bearing members for resiliently urging the movable roll of each pair toward and into engagement with its associated roll revolvable about a fixed axis.

References Cited by the Examiner

UNITED STATES PATENTS

2,792,768	5/1957	Ludwig	95—89
3,142,241	7/1964	Limberger	95—89
3,143,056	8/1964	Limberger	95—89

NORTON ANSHER, *Primary Examiner.*

C. B. PRICE, *Assistant Examiner.*