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Martin

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[54] **ETCHING PRESS**

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[51] **Int. Cl.** **B41f 3/00,** B41f 3/58

[58] **Field of Search** 101/55, 133, 146, 158, 101/161, 162, 173, 186, 187, 189, 191, 192, 214, 215, 253, 282, 283, 284, 285; 74/89.15

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[57] **ABSTRACT**

An etching press comprising an upper pressure roller rotatably mounted on a machine frame and a positively driven platen mounted on the frame for reciprocating movement under the pressure roller in a horizontal plane. The platen has a substantially smooth lower bearing surface, and is supported by a lower pressure roller in engagement therewith, disposed directly opposite the upper roller. In addition, first and second supplementary support rollers are disposed below the platen, and engageable with the lower surface thereof at points upstream and downstream respectively of and close to the point thereon engaged by the lower pressure roller. The lower surface of the platen has rack means engageable with drive gearing carried by a shaft rotatably mounted on the frame. The shaft is turnably driven by planetary gearing, power operated by a manually operable crank handle. The upper pressure roller is vertically adjustable for advancing movement downward toward the upper surface of the platen, and can be advanced by vertical screw means on which adjustable stops and cooperable indicator devices are carried. This enables the operator to accurately preset the position of the upper roller to a predetermined point, thus yielding a high degree of impression accuracy and repeatability.

2 Claims, 5 Drawing Figures

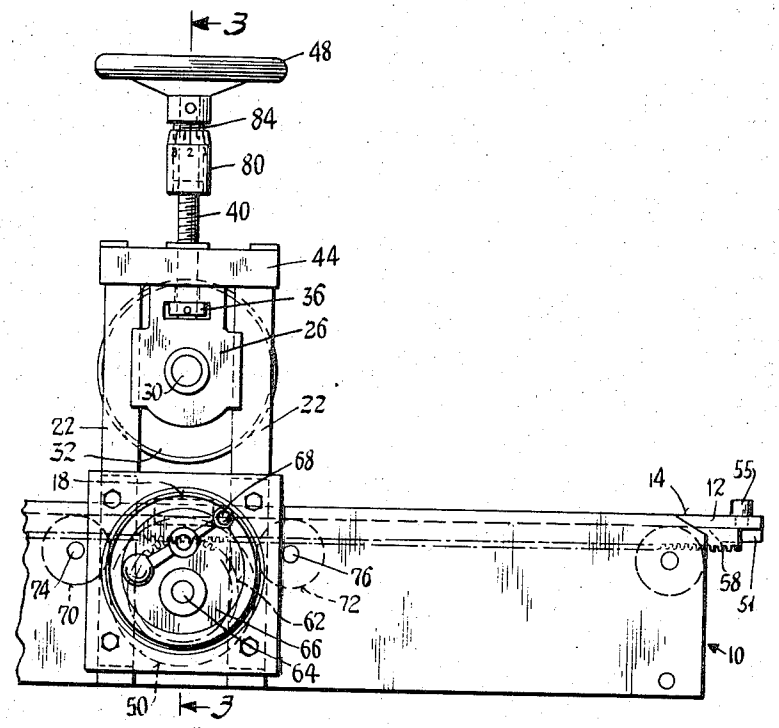
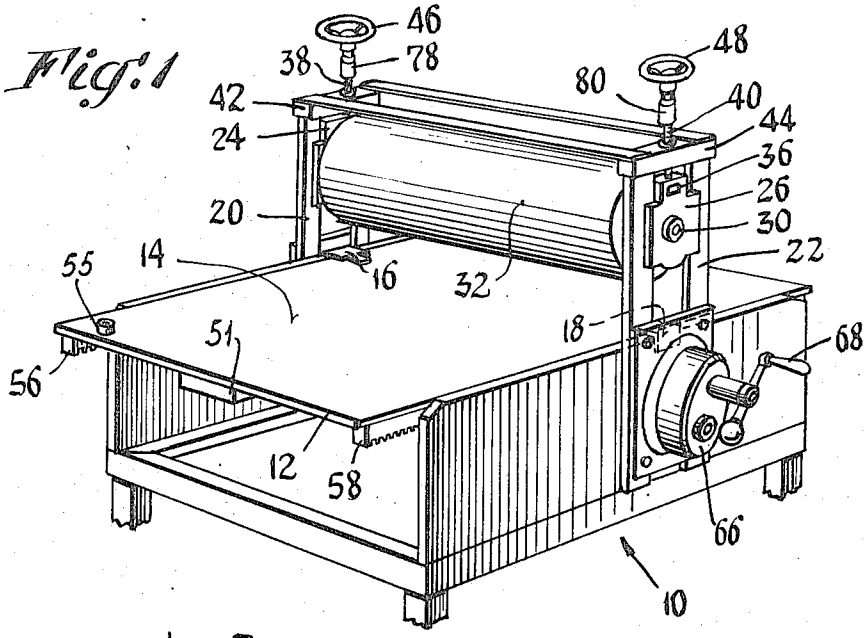


Fig. 1


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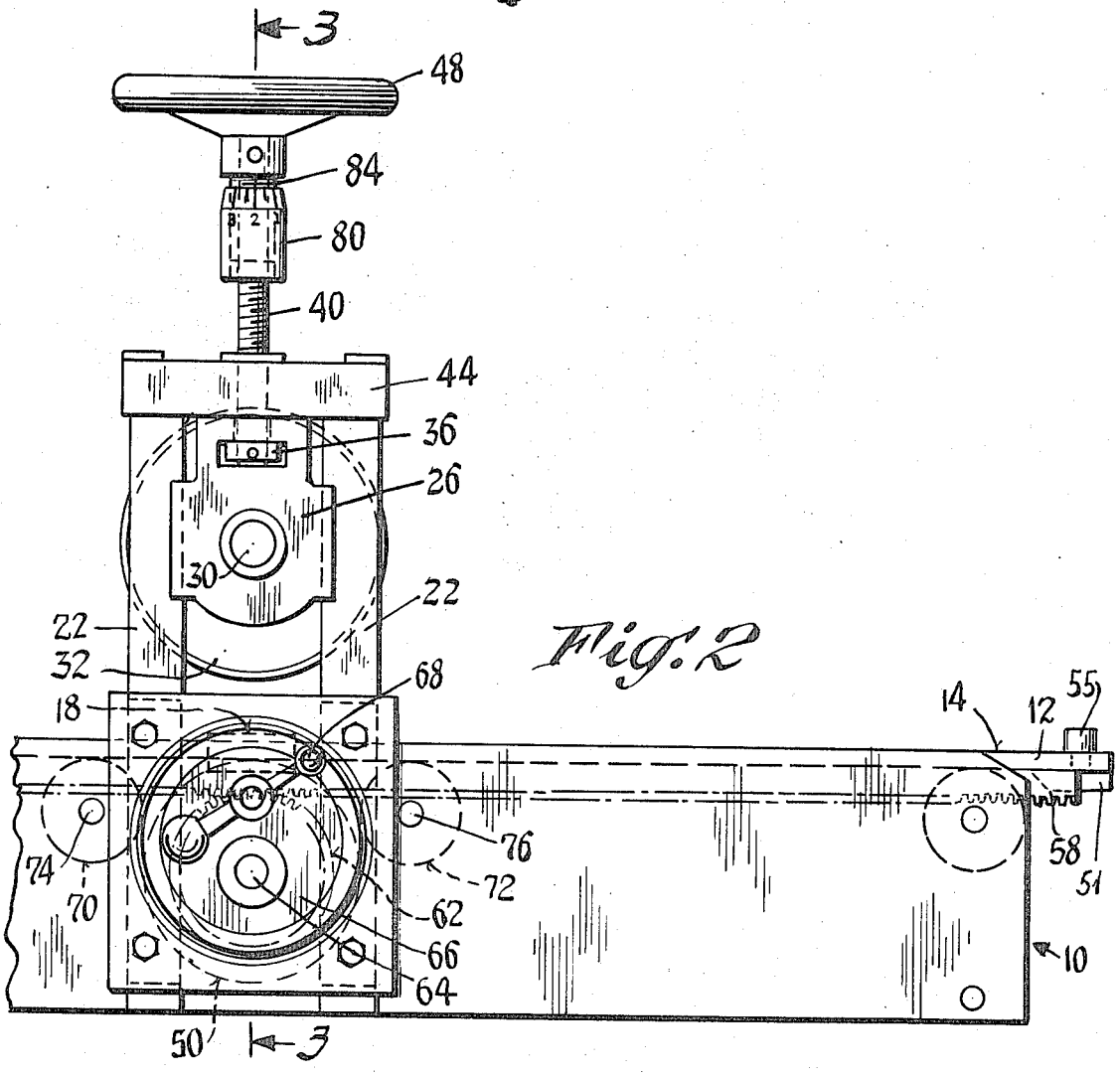
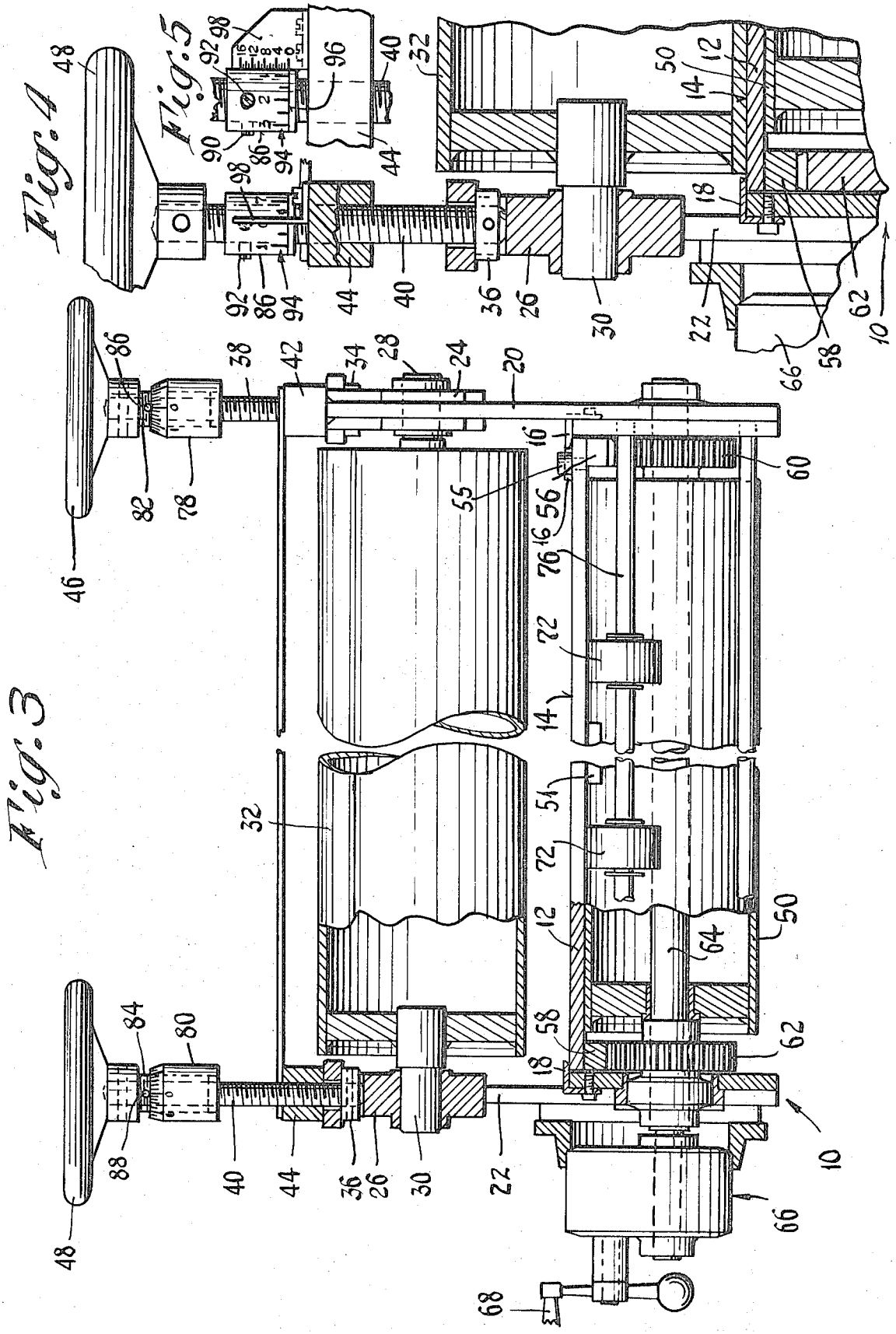

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Fig. 2


Fig. 3
Fig. 4
Fig. 5

ETCHING PRESS

BACKGROUND

This invention relates to etching presses, and more particularly to presses of the type wherein a flat platen is movable horizontally between upper and lower rollers, to effect the impressions. In the past a number of etching presses have been proposed and constructed. These prior presses have employed a flat reciprocatable platen supported on a machine frame by a main lower roller and by a series of smaller guide rollers disposed along lateral edge portions of the platen. In most cases a main upper roller was advanceable toward and engageable with the top surface of the platen. In all constructions heretofore proposed, either the upper roller or the lower roller was turnably driven by means of a hand crank or other power driven device, and the platen was advanced by frictional engagement with the driven roller. In the operation of the press, an inked etching plate was placed on the platen face up with a sheet of paper of the desired size carried thereon, and both were covered by a felt blanket. For the first "run," the proper positioning of the upper roller above the top surface of the platen was estimated and adjustment thereof was made by the operator. Then, either the upper or the lower roller was manually driven by a hand crank, thus frictionally advancing the platen and the etching plate, and felt blanket to bring the assemblage into engagement with the upper roller, and thereby transfer an impression from the etching plate onto the paper.

Devices of the type described above suffered from a number of drawbacks and disadvantages. First, the platen had to be constructed from exceptionally heavy gauge iron or steel so as to minimize bending which tended to occur. This bending was most severe in the vicinity of the upper and lower rollers but was displaced slightly upstream or downstream, depending on the direction of feed of the etching assemblage. Such bending of the platen frequently resulted in deterioration of the finished "etchings." Second, in cases where the upper roller was driven at one end by a chain and sprocket, the pull-force of the chain tended to misalign the axis of rotation of the upper roller such that the latter no longer rotated about an axis perpendicular to the direction of travel of the platen. As a result, a component of the force driving the platen was directed sideways with respect to its path of travel, which caused skewing of the platen. This condition also impaired the quality of the finished etchings. In addition, although indicator devices have been used previously in order to pre-set a desired position of the upper roller above the platen, there has been no means of positively limiting the advance of the upper roller toward the platen once an optimum predetermined position had been obtained through trial and error. Thus, there have been significant problems which arose in the use of etching presses heretofore proposed.

SUMMARY

The above drawbacks and disadvantages of prior etching presses are obviated by the present invention, which has for an object the provision of a novel and improved press construction which is especially simple while being particularly effective in its operation, and which enables a higher degree of impression uniformity

to be obtained than was heretofore possible from conventional presses of the past, thereby providing greatly improved reliability and repeatability, even over long periods of time. A related object is to provide a novel etching press which reduces to an absolute minimum all non-uniformity in etchings due to skewing of the platen and due to bending of the platen in areas immediately upstream or downstream from the location of the upper pressure roller.

The above objects are accomplished by the provision of an etching press structure having a unique, positively driven platen which is supported on the machine frame by a main lower pressure roller in conjunction with one or more supplementary support rollers disposed immediately upstream or downstream from the main lower roller. In one embodiment of the invention, the platen is provided with a pair of racks disposed on opposite edges of its lower surface, the racks being engageable by drive gears turnably mounted on the frame. The drive gears are driven by a hand crank through a planetary gear box. The platen has a smooth lower bearing surface engageable by the main lower pressure roller and by supplementary support rollers immediately adjacent thereto.

The above objects are further accomplished, in one illustrated embodiment of the invention, by a novel adjustable stop means which is cooperable with the advancing adjustment screw that controls the position of the upper pressure roller with respect to the upper surface of the platen. The stop means comprises a threaded barrel adjustably carried on a finely threaded portion of the advancing adjustment screw, and thus constitutes a positive adjustable stop for the latter. The stop means further includes an indicator device carried by the screw to enable precise setting and resetting of the adjustable stop means to predetermined positions.

The entire, overall above construction has a number of distinct advantages. For one thing, the supplementary support rollers greatly minimize bending or deformation of the areas of the platen immediately adjacent the lower pressure roller during the pressing operation. Another advantage resides in the permissible use of a relatively lighter weight and thinner platen than was heretofore possible, because by the present invention less dependence is placed upon the strength or rigidity of the platen since substantial additional support is provided by the supplementary support rollers. In addition, when the platen is positively driven along both edges as in the present invention, there is considerably less tendency for skewing to occur.

Still other features and advantages will hereinafter appear. In the accompanying drawings, illustrating several embodiments of the invention:

FIG. 1 is a perspective view looking from the front of the etching press of the present invention, illustrating the positively driven platen and the adjustable stop means for limiting the advance of the upper roller downward toward the platen.

FIG. 2 is a side elevational view of the press, illustrating the supplementary support rollers disposed below the driven platen.

FIG. 3 is a vertical sectional view taken on the line 3—3 of FIG. 2.

FIG. 4 is a fragmentary sectional view illustrating a micrometer indicator device for indicating the position

of the upper roller, constituting another embodiment of the invention.

FIG. 5 is a fragmentary side elevational view of the micrometer indicator device of FIG. 4.

Referring first to FIG. 1 there is shown an etching press comprising a machine frame generally designated by the numeral 10 and a substantially flat platen 12 mounted on the frame for reciprocating movement with respect thereto. A good sliding fit is provided between the platen 12 and the frame sides which border the edges thereof, thereby to effect an accurate guide for the platen along its path of movement. The platen has a smooth upper surface 14 to accommodate the etching assemblage to be pressed. A pair of platen "hold downs" 16 and 18 carried on the frame prevent the platen from tipping up when it is disposed toward an extreme end of the frame. The frame 10 has a pair of upright support members 20, 22, each member having a longitudinal edge constituting a guide for carriages 24, 26 respectively, which are slidably movable there-along. The carriages 24, 26 are provided with self-aligning bearings 28, 30 which rotatably carry an upper pressure roller 32 having a smooth cylindrical surface and preferably constructed of steel. The carriages 24 and 26 are further provided with thrust bearings 34, 36 respectively, to which are turnably connected screws 38, 40, constituting force transmitting members. The upright support members 20, 22 have bridges 42, 44 respectively, which have been drilled and tapped to receive the screws 38 and 40. Rigidly fastened respectively to the screws 38 and 40 are capstans 46, 48 to enable manual adjustment of the position of the roller 32. By the above arrangement, the roller 32 can be positively advanced downward toward the upper surface 14 of the platen 12, and positively retracted upward and away from the upper surface 14 thereof by means of the thrust bearings 34, 36, the screws 38, 40 and the capstans 46, 48.

Referring to FIGS. 2 and 3 a lower pressure roller 50 is rotatably carried by the frame 10, being disposed immediately below the platen 12 and opposite the upper pressure roller 32, and being engageable with the smooth lower surface of the platen 12. The lower roller 50 provides support and counter pressure to the platen 12 at a point directly opposite the point of engagement thereon by the upper roller 32. Referring to FIGS. 1 and 2, there are provided end stops 51 centrally disposed at opposite ends of the lower surface of the platen to prevent the operator from driving the latter off the machine. The stops are adapted to engage the lower pressure roller 50 when the platen is driven toward either extreme end position. The edges of the stops 51 facing the lower pressure roller 50 are bevelled to present a broad surface to the latter during engagement therewith. The stops can be fabricated from aluminum, nylon or brass, and are secured to the platen 12 by means of bolts (not shown.) Additional safety stops 55 comprising a screw extending above the upper surface of the platen are provided. They are disposed at opposite ends of the platen and are in line with the platen "hold down" 16. In the event that either of the main end stops 51 fails, the corresponding additional stop will subsequently engage the platen "hold down" 16, and prevent the platen from being driven further.

In accordance with the present invention there is provided a novel positive drive means connected with the frame 10, for positively drivingly reciprocating the platen 12 along its path of travel, said means comprising racks 56 and 58 disposed along and rigidly fastened to the opposite edge portions of the lower surface of the platen 12, and comprising a pair of drive gears 60 and 62 rigidly fastened to and carried by a shaft 64 which is turnably mounted on the frame 10, said drive gears being respectively engageable with the racks for imparting driving power thereto and hence to the platen 12. During manual operation of the press, the platen "hold downs" 16 and 18 maintain the mesh between the racks 56 and 58 and the drive gears 60 and 62 respectively. The shaft 64 is preferably driven by a planetary gearing 66 which in turn is driven by power actuated means including a manually engageable member designated 68, the planetary gearing 66 providing a mechanical advantage between the member 68 and the drive gears 60 and 62. The above arrangement wherein a pair of drive gears 60 and 62 respectively engage racks 56 and 58 disposed on opposite edges of the lower surface of the platen 12 provides a positive balanced drive force to the platen along two parallel axes and thus tends to minimize skewing between the platen 12 and frame 10. Since both drive gears 60 and 62 are driven by the shaft 64 which is in turn driven by the planetary gearing, side loading of the platen is eliminated and, as a result, skewing is minimized. Because the platen is driven uniformly along both edges, it always advances at right angles to the axes of the upper and lower pressure rollers. By this arrangement, each of the rollers is free to turn about its own axis, whereby each provides pressure in pure rolling action. It is to be noted that the position of the platen is directly related to the orientation of the manually engageable member 68, since the platen is directly driven by a positive gear arrangement which is in turn powered by the member.

By the present invention there is further provided supplemental support rollers 70, 72 turnably carried by shafts 74 and 76 respectively on the frame 10. The rollers 70, 72 are engageable with the smooth lower surface of the platen 12, which constitutes an advantageous bearing surface. The rollers specifically engage the lower surface of the platen 12 at points respectively immediately upstream and downstream from the point engaged by the main lower pressure roller 50, and thus provide additional support to the platen 12 to thereby minimize bending which tends to occur at these points during the pressing operation, particularly when the upper roller 32 and platen 12 just begin to engage the etching assemblage (not shown). The supplemental support rollers 70, 72 are free to turn on the shafts 74, 76, providing support in a direction substantially normal to the plane of the lower surface of the platen 12. The supplemental support rollers are so disposed as to oppose the force applied to the platen through the etching assemblage by the upper pressure roller when the assemblage is being pressed, whereby the line of force which causes the bending of the platen falls within the respective support roller.

As shown in FIG. 3, the supplemental rollers 72 (70 in FIG. 2) are spaced inwardly from the ends of the lower pressure roller 50 by a distance which is substantially equal to the diameter of the lower pressure roller, thereby to provide increased support for the platen 12 at areas located inwardly of the longitudinal side edges thereof. The racks 56, 58 constitute a stiffening means

for the longitudinal side edges. By the above arrangement there is had an advantageous support of the platen which minimizes bending of the latter.

Further in accordance with the invention there is provided a novel adjustable stop means connected with the screws **38** and **40** to limit the downward advance of the upper pressure roller **32** toward the upper surface of the platen **12.** This stop means comprises a pair of adjustable threaded members or barrels **78, 80** carried by and cooperable with special, finely threaded portions of the screws **38** and **40** respectively. As can best be understood by referring to FIG. **3,** the barrels **78, 80** are turnably carried on threaded collars **82, 84** disposed on the screws **38, 40.** The barrels and collars have a fine thread pitch compared to that of the screws **38, 40** thus enabling a fine degree of adjustment of the barrels on the latter. The collars **82, 84** are further provided with indicia **86, 88** to indicate the longitudinal position of the barrels with respect to the collars. The barrels **78, 80** also have indicia disposed around the periphery of each to indicate the rotary position thereof with respect to the collars **82, 84.** By the above arrangement, the barrels **78, 80** may be positioned with respect to the screws **38, 40** so as to enable the operator to limit the downward advance of the upper pressure roller **32** toward the platen **12.** At such time as a satisfactory pressing has been obtained, through several trial runs, the precise positions of the upper pressure roller **32** can be noted and recorded by simply advancing the barrels **78, 80** (in a downward direction) into engagement with the bridges **42, 44.** Once the optimum position of the upper pressure roller **32** is determined the positions of the barrels can be set and precisely recorded, thus enabling resetting of these press conditions for subsequent etchings employing the same etching assemblage. As a result, it is possible to achieve highly uniform results which heretofore were not generally obtainable without the expenditure of excessive time and effort by the press operator. In addition, the waste in material resulting from repeated attempts to obtain satisfactory impressions is greatly minimized.

FIG. **4** illustrates another embodiment of the invention wherein there is shown a novel micrometer means for indicating the relative position of the screw **40** and upper pressure roller **32** with respect to the platen **12** and machine frame **10.** The micrometer means comprises a barrel **86,** the position of which can be adjusted and fixed with respect to the screw **40** by means of adjustment set screws **90, 92.** The barrel preferably has graduation lines **94** and indicia for indicating the rotary position thereof and has a transverse reference line **96.** In addition, the machine frame carries a bracket **98** having graduation lines generally parallel to the reference line **96.** The barrel and bracket thus can provide an accurate indication of the spacing between the roller **32** and the platen **12.** It will be readily understood that the indicator means illustrated in FIGS. **4** and **5** can be substituted for the stop means illustrated in FIGS. **1–3.**

Calibration of the indicator illustrated in FIGS. **4** and **5** is easily effected. With the set screws **90, 92** loosened, the upper roller **32** is brought into snug engagement with the platen upper surface **14** by adjusting the screws **38, 40.** The barrel **86** is then moved vertically such that the reference line **96** therein coincides with the "zero" line on bracket **98.** Set screws **90, 92** are then tightened, and the adjustment is complete. The barrel graduation lines **94** illustrated each represent five-thousandths of an inch, and the graduations on bracket **98** are calibrated in 0.040 inch increments, as shown. Thus, by the above arrangement, it is possible to check the calibration of the press and then set the upper roller **32** to a predetermined position with a high degree of accuracy.

It will now be understood from the foregoing that I have provided a novel and improved etching press which effectively minimizes skewing of the platen by providing a direct, positive, balanced drive arrangement therefor. Further, by employing additional supplemental support rollers, bending of the platen is minimized and a greater degree of etching uniformity is obtained. It is to be noted that in the present construction, the upper and lower pressure rollers serve only to apply pressure in a direction perpendicular to the platen surface and not to provide drive for the platen. In addition, a high degree of resettability is achieved by the unique stop means and indicator devices carried by the force transmitting members, enabling accurate adjustment of the position of the upper pressure roller. The present invention etching press is thus seen to represent a substantial advance and improvement in this field.

Variations and modifications are possible, without departing from the spirit of the invention.

I claim:

1. An etching press, comprising in combination:

a. a machine frame,

b. a substantially flat platen having a smooth upper surface mounted on said frame for reciprocating movement in a horizontal plane with respect thereto,

c. an upper pressure roller disposed adjacent the upper surface of said platen,

d. means for rotatably mounting said pressure roller for free-wheeling movement on said frame,

e. means for positively advancing said roller downward toward the upper surface of said platen and for positively retracting said roller upward and away from said upper surface, to thereby enable selective engagement of the latter and the roller, and

f. adjustable stop means connected with said immediately preceding means to positively limit to predetermined positions the advance of said roller downward toward the upper surface of said platen,

g. said means for advancing said roller toward the upper surface of said platen comprising a pair of threaded members affixed to the machine frame and a pair of screws respectively turnable in said threaded members and extending adjacent the ends of the rollers,

h. said stop means including threaded barrels carried by the screws and turnably adjustable with respect thereto, and having graduations for indicating their rotary positions.

2. An etching press, comprising in combination:

a. a machine frame,

b. a substantially flat platen having a smooth uper surface, said platen being mounted on said frame for reciprocating movement in a horizontal plane with respect thereto, said platen having oppositely disposed longitudinal edges,

c. an upper pressure roller rotatably mounted on the frame and engageable with the upper surface of said platen,

d. positive drive means including rack elements on said opposite edges of the platen, and including pinions engaged with said rack elements and carried by the frame, for drivingly reciprocating said platen along its path of travel,

e. said platen having a substantially smooth lower bearing surface,

f. a lower pressure roller rotatably mounted on the machine frame and engaging said lower bearing surface of the platen at a point substantially opposite the upper roller to provide counter pressure to the lower surface of the platen and to reinforce the latter,

g. a supplemental support roller rotatably carried by the machine frame at one side of said lower pressure roller and closely juxtaposed thereto, said supplemental roller being in continuous engagement with the smooth lower bearing surface of the platen at a point thereon immediately upstream from the point engaged by the lower pressure roller to assume stresses imposed on the platen and to minimize warping of the latter during the pressing operation,

h. a second supplemental support roller rotatably mounted on the machine frame at the other side of said lower pressure roller and closely juxtaposed thereto, said second supplemental roller being in continuous engagement with the smooth lower bearing surface of the platen at a point thereon immediately downstream from the point engaged by the lower pressure roller so as to share with the first supplemental roller the said stresses experienced by the platen,

i. said supplemental rollers being spaced inwardly from the said longitudinal edges of the platen and with said lower pressure roller providing a multipoint support for the platen, portions of which support are over an area located beyond the pressure points imposed by the upper pressure roller whereby warping of the platen is reduced,

j. a pair of shafts on the frame, respectively carrying said first and second supplemental rollers, and

k. third and fourth supplemental rollers respectively carried by said shafts and positioned to be closely juxtaposed to said lower pressure roller and respectively spaced from said first and second supplemental support rollers,

1. all of said supplemental rollers being spaced from the respective ends of the lower pressure roller by a distance substantially equal to the diameter of the lower pressure roller.

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