This invention relates to apparatus for photographically reproducing designs for rollers used in textile printing.

The use of the apparatus is based upon the well known process in the course of which a photographically positive and negative of the design must first be obtained and placed in coincidence perfectly with each other, so that after moving either the positive or the negative in any direction, part of the outline of the figure or pattern in the design is uncovered, and being in this position, is printed on to a film or plate sensitive to light.

Whereas formerly this movement could only be performed point by point, the new apparatus employs a continual circular movement, during which the exposure is made. It is possible to alter the width of the outlines from zero to any desired width.

The apparatus according to the invention is illustrated by way of example in the accompanying drawing.

Fig. 1 is a part vertical section through the apparatus on the line 1—1 of Fig. 2. Fig. 2 is a part top plan view partly in horizontal section on the line 2—2 of Fig. 1.

In a fixed frame R2 a plate P2 of transparent material is secured. The negative Ne is secured to this plate by means of an adhesive. On the lower frame R3 rests the upper frame R4 carrying a further transparent plate P3, on the lower side of which is secured the positive Po also by means of an adhesive. Both the positive and the negative are secured only at the edges. Between the plate P4 and the positive Po there is a light sensitive film F. While the lower frame is fixed, the upper frame can be displaced in such a manner that each point thereof describes a circle of the same radius. This is done by means of the double eccentrics Ei, Di or Ei, Di. The inner eccentrics E1 or E2 are mounted eccentrically on pins Z1 or Z2 which pass through the frame R2. The outer eccentrics D1, D3 can be adjusted with respect to the inner eccentrics E1, E3, whereby the total eccentricity can be adjusted. The eccentricity of the inner eccentric E1 is equal to that of the outer eccentric D1 with respect to the inner eccentric E1. In the zero position the two eccentrics are oppositely directed so that the total eccentricity is equal to zero. By adjusting the outer eccentric with respect to the inner, or vice versa, the total eccentricity can be varied from the zero position. The maximum eccentricity corresponds to the greatest displacement of the frame R2 with respect to the frame R3 and consequently to the greatest breadth of contour.

Then the plates P1 and P2 are so adjusted that in the zero position of the double eccentrics the positive Po and the negative Ne exactly coincide, and if then the upper frame is displaced parallel to itself by the breadth of the contour (corresponding to the double eccentricity of the double eccentrics) and then the upper frame is given the circular movement by means of the double eccentric with a radius corresponding to the total eccentricity, the desired contour of the drawing will be printed on the sensitive film. It is obvious that the maximum total eccentricity corresponds to the greatest breadth of the contour, so that it is possible to vary the breadth of the contours from zero up to the desired value by simply adjusting the outer eccentric with respect to the inner, or vice versa. This adjustment is effected by means of the borings F1' and F2' which are arranged in a semi-circle in the disc-like extensions of the outer eccentric, and in each of which a fixing pin Fi or Fi' is fixed, each of which is axially guided in a disc-like extension of the corresponding inner eccentric. Through an annular flange on the disc enlargement of the eccentric D1 or D2 passes also a pin Si or Si' which can be fixed in a boring of the frame R3. The position in which this fixing is effected corresponds to the zero position, that is, the position in which the total eccentricity is zero, that is, where the middle point of the outer eccentric D1 or D2 coincides with the axis of the pin Zi or Z2. In this position the fixing pin Fi or Fi' projects into the first boring of the semi-circular ring of holes F1' or F2'.

When using the arrangement according to the invention first the outer eccentric is brought into the zero position and fixed there by means of the pin Si or Si'. By means of the screws S1 and S2 the plate P1 is then adjusted so that the positive Po exactly coincides with the negative Ne. Then the fixing pins Fi and Fi' are released and by rotating the eccentrics Ei or Ei the upper frame is displaced parallel to itself by the desired breadth of contour. At the same time the total eccentricity is thereby adjusted. Then the eccentrics Ei or Ei are coupled with the eccentrics D1, D2 by means of the fixing pins Fi and Fi and the pins Si or Si are released. After this the continuous rotary movement of the double eccentrics Ei, Di and Ei, Di, which are now coupled together, can take place. This rotary movement is obtained by means of the crank K driving the shaft W on
which are two worms Sch engaging in worm wheels Sr on the pins Z1, Z2. On account of this continuous movement of the two double eccentrics, the upper frame R1 is displaced in such a manner that each of its points describes a circle about the original middle position, the radius of which circle corresponds to the breadth of contour.

As already mentioned, the inner and outer eccentrics are so constructed that their relative eccentricities are equal. In the zero position the eccentricities are oppositely directed, so that a rotary movement of the double eccentric in this position produces no displacement of the upper frame R1.

The outer eccentric D1 is guided in a circular opening of the upper frame, while the inner eccentric D2 is guided in a parallel guide on the upper frame. By means of this arrangement the displacement of the upper frame parallel to itself is ensured.

I claim:

1. Apparatus for the photographic reproduction of outlines for rollers used in textile printing by means of a negative and a positive of the original, superposed one on the other, said apparatus comprising the combination of a negative frame and a positive frame arranged in superposed relationship with means for imparting a circling movement to one of said frames, so that each point of the area enclosed by the frame describes a circle having a radius equal to the thickness of the outline, said means comprising an outer eccentric operatively connected to said frame and an inner eccentric inside said outer eccentric, one of said eccentrics being rotatable with respect to the other eccentric into and out of a zero position in which the centre of rotation of the inner eccentric coincides with the centre of the outer eccentric, so that by turning the one eccentric relatively to the other, the throw of the outer eccentric can be adjusted to correspond to the desired thickness of the outline, releasable means for securing the outer eccentric to one another so as to prevent relative rotary movement thereof during the continuous rotary motion of the inner eccentric.

2. Apparatus for the photographic reproduction of outlines for rollers used in textile printing by means of a negative and a positive of the original, superposed one on the other, said apparatus comprising the combination of a negative frame and a positive frame arranged in superposed relationship with means for imparting a circling movement to one of said frames, so that each point of the area enclosed by the frame describes a circle having a radius equal to the thickness of the outline, said means comprising a pair of outer eccentrics spaced from one another and engaging the frame at one side thereof, an inner eccentric inside each of said outer eccentrics and rotatable relatively to the outer eccentric into and out of a zero position in which the centre of rotation of the inner eccentric coincides with the centre of the outer eccentric, so that by turning the inner eccentric relatively to the outer eccentric, the throw of the outer eccentric can be adjusted to correspond to the desired thickness of the outline, releasable means for securing the outer eccentric to the frame during the adjustment of the throw of the eccentrics, actuating means for rotating the eccentrics in unison and means for securing the inner and outer eccentrics to one another so as to prevent relative rotary motion thereof on said actuating means being operated to produce continuous rotation of the inner eccentrics to effect the circling movement.

3. Apparatus for the photographic reproduction of outlines for rollers used in textile printing by means of a negative and a positive of the original, superposed one on the other, said apparatus comprising the combination of a negative frame and a positive frame arranged in superposed relationship with means for imparting a circling movement to one of said frames, so that each point of the area enclosed by the frame describes a circle having a radius equal to the thickness of the outline, said means comprising a pair of outer eccentrics spaced from one another and engaging the frame at one side thereof, an inner eccentric inside each of said outer eccentrics and rotatable relatively to the outer eccentric into and out of a zero position in which the centre of rotation of the inner eccentric coincides with the centre of the outer eccentric, so that by turning the inner eccentric relatively to the outer eccentric, the throw of the outer eccentric can be adjusted to correspond to the desired thickness of the outline, releasable means for securing the outer eccentric to the frame during the adjustment of the throw of the eccentrics, actuating means for rotating the eccentrics in unison and means for securing the inner and outer eccentrics to one another so as to prevent relative rotary motion thereof on said actuating means being operated to produce continuous rotation of the inner eccentrics to effect the circling movement.
vent relative rotary motion thereof during the continuous rotary motion of the inner eccentric.

6. Apparatus for the photographic reproduction of outlines for rollers used in textile printing by means of a negative and a positive of the original, superposed one on the other, said apparatus comprising the combination of a negative frame and a positive frame arranged in superposed relationship with means for imparting a circling movement to one of said frames, so that each point of the area enclosed by the frame describes a circle having a radius equal to the thickness of the outline, said means comprising an outer eccentric operatively connected to said frame an inner eccentric inside said outer eccentric, one of said eccentrics being rotatable with respect to the other eccentric into and out of a zero position in which the centre of rotation of the inner eccentric coincides with the centre of the outer eccentric, so that by turning the one eccentric relatively to the other, the throw of the outer eccentric can be adjusted to correspond to the desired thickness of the outline, releasable means for securing the outer eccentric to the frame during the adjustment of the throw of the eccentric, means for imparting continuous rotary motion to the inner eccentric for producing the circling movement and means for releasably securing the inner and outer eccentrics to one another and comprising a flange on the outer eccentric, a flange on the inner eccentric, one of said flanges having a hole therein and the other flange a series of circumferentially spaced holes located therein so as to register successively with the first mentioned hole on the one eccentric being turned relatively to the other to vary the throw of the outer eccentric, and a pin adapted to be passed through the holes in the flanges, so as to prevent relative rotary movement of the eccentrics during the continuous rotary motion of the inner eccentric.

7. Apparatus for the photographic reproduction of outlines for rollers used in textile printing by means of a negative and a positive of the original, superposed one on the other, said apparatus comprising the combination of a negative and a positive frame arranged in superposed relationship with means for imparting a circling movement to one of said frames, so that each point of the area enclosed by the frame describes a circle having a radius equal to the thickness of the outline, said means comprising a pair of outer eccentrics spaced from one another, the frame having a circular opening therein at one side for engagement by one of said outer eccentrics and a slot guide therein at the same side for engagement by the other outer eccentric, an inner eccentric inside each of said outer eccentrics and rotatable relatively to the outer eccentric into and out of a zero position in which the centre of rotation of the inner eccentric coincides with the centre of the outer eccentric, so that by turning the inner eccentrics relatively to the outer eccentrics, the throw of the outer eccentrics can be adjusted to correspond to the desired thickness of the outline, releasable means for securing the outer eccentrics to the frame during the adjustment of the throw of the eccentrics, actuating means for rotating the inner eccentrics in unison and means for securing the inner and outer eccentrics to one another so as to prevent relative rotary motion thereof on said actuating means being operated to produce continuous rotation of the inner eccentric to effect the circling movement.

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