Oct. 5, 1965 J. GÖRIG 3,210,186

INTAGLIO PRINTING SCREEN FOR SUPERIMPOSING WITH AUTOTYPY SCREEN POSITIVES IN THE PRODUCTION OF ETCHINGS FOR AUTOTYPICAL INTAGLIO PRINTING

Filed Nov. 29, 1960 9 Sheets-Sheet 1

Fig. 1

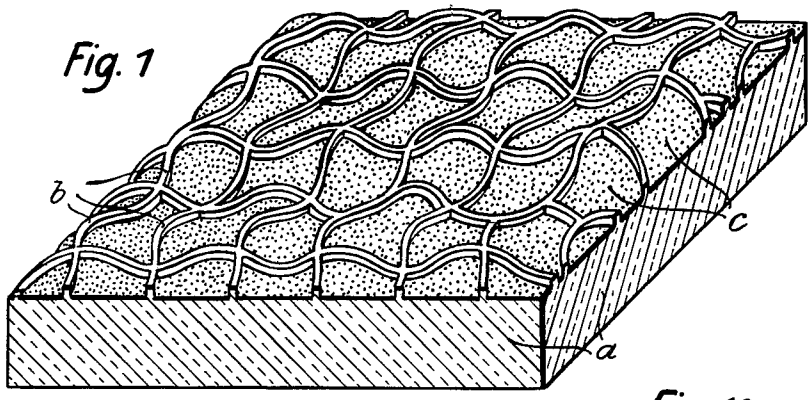

Fig. 10

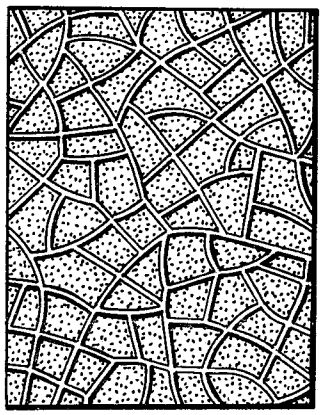

Fig. 9

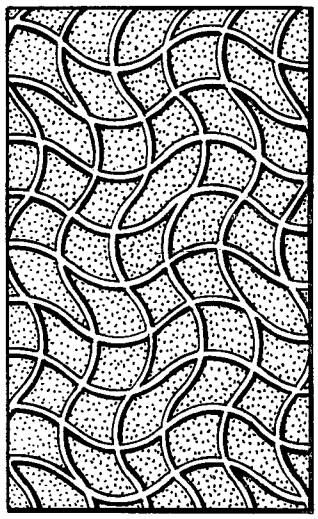

Fig. 11

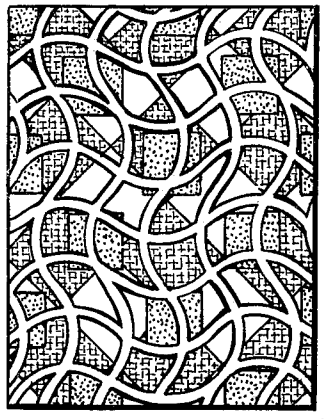

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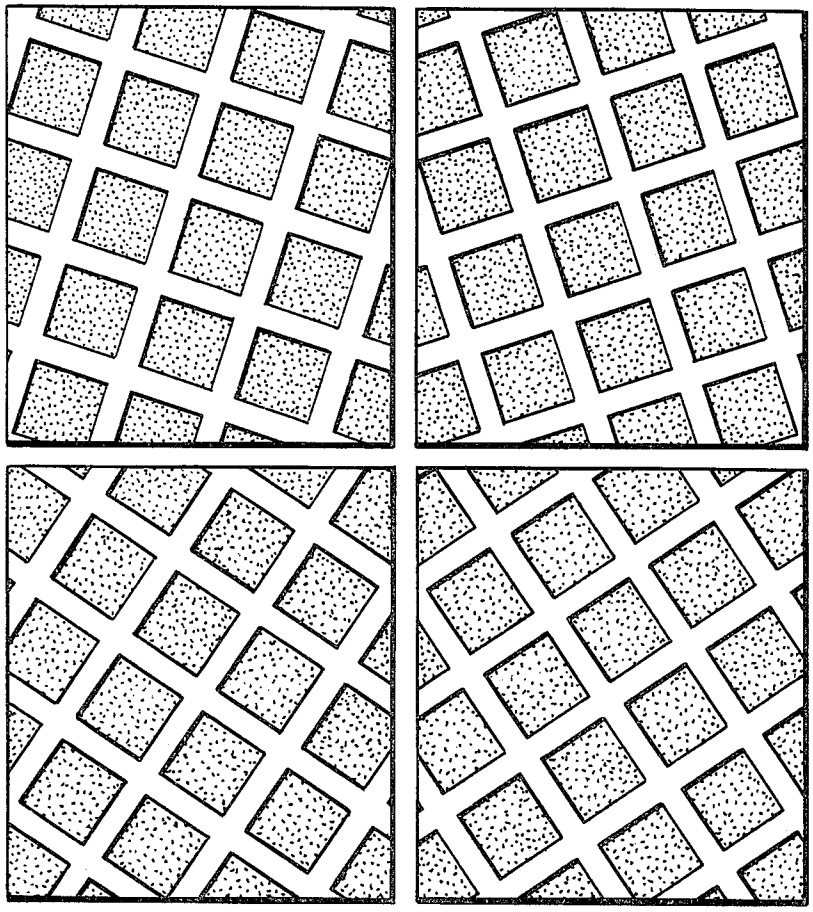
Fig. 2



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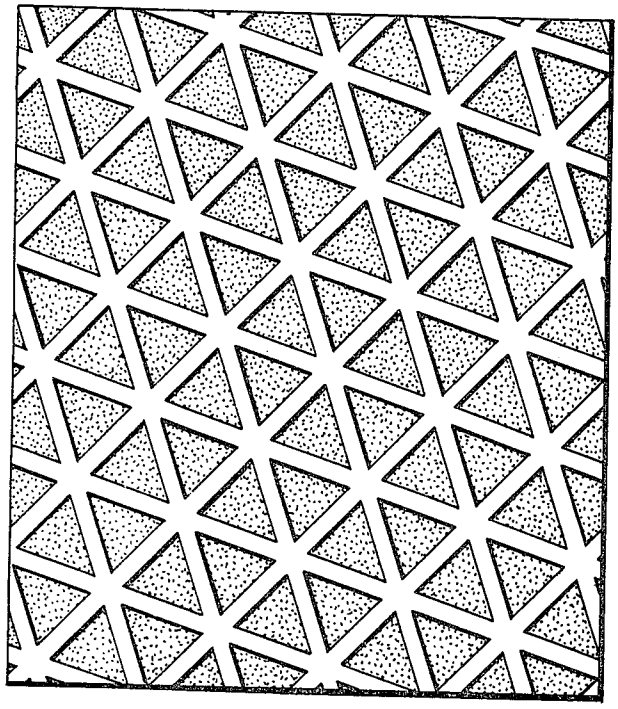

Fig. 3

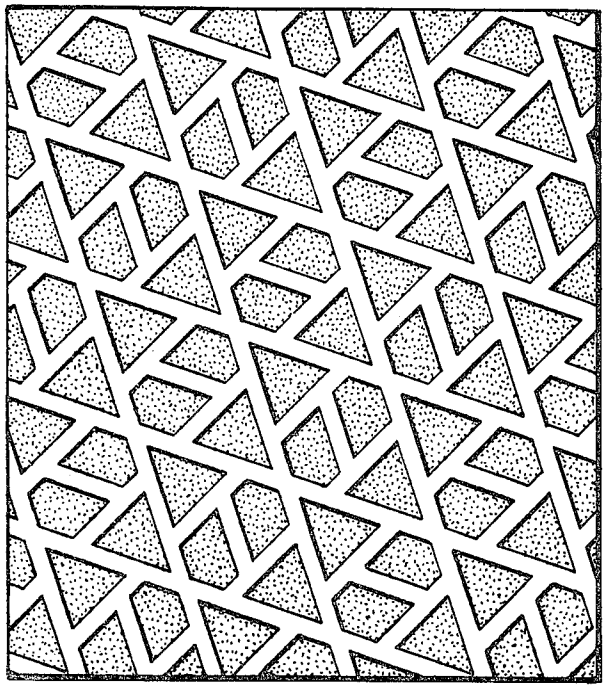

Fig. 4

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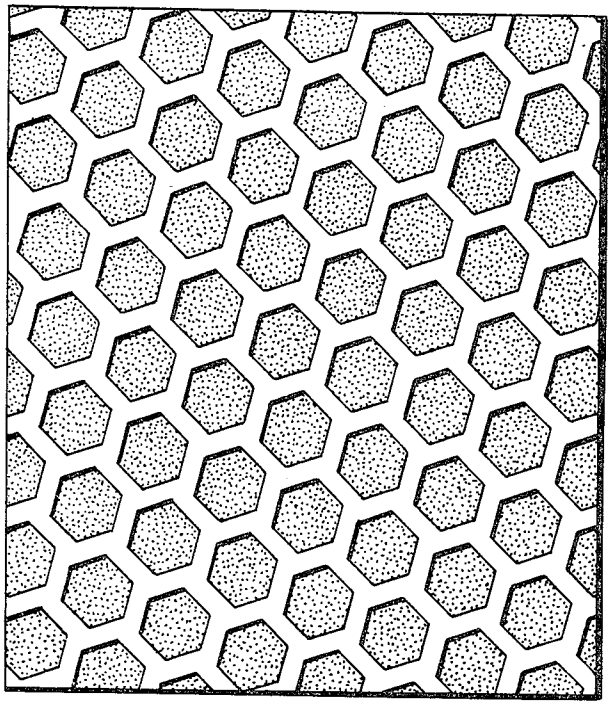

Fig. 5

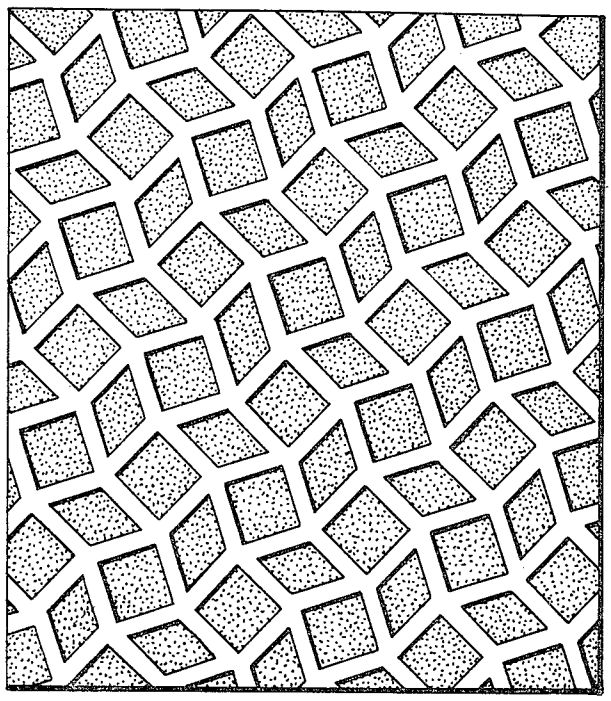

Fig. 6

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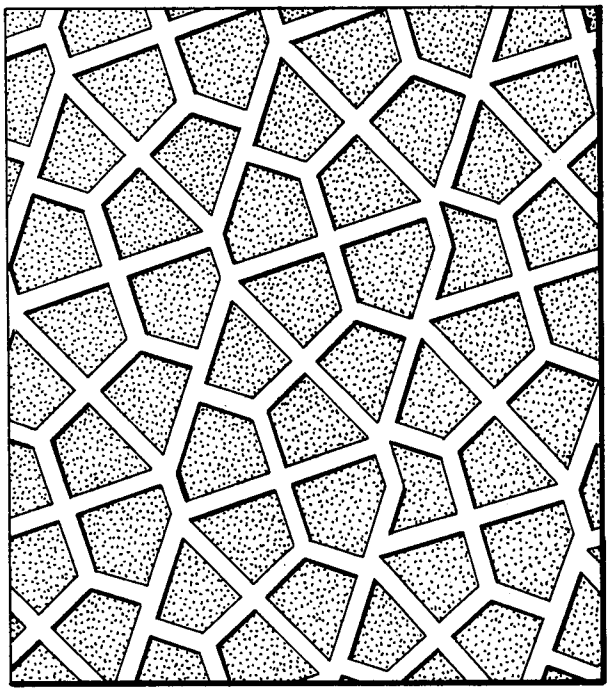

Fig. 7

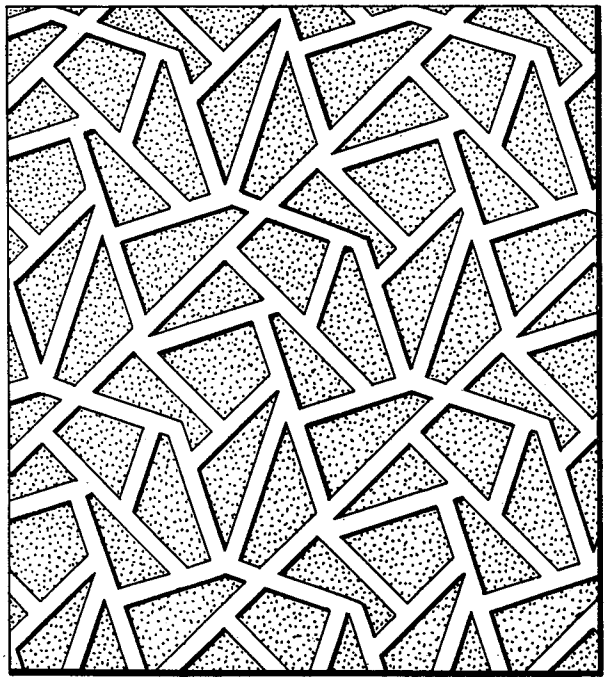

Fig. 8

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Fig. 12

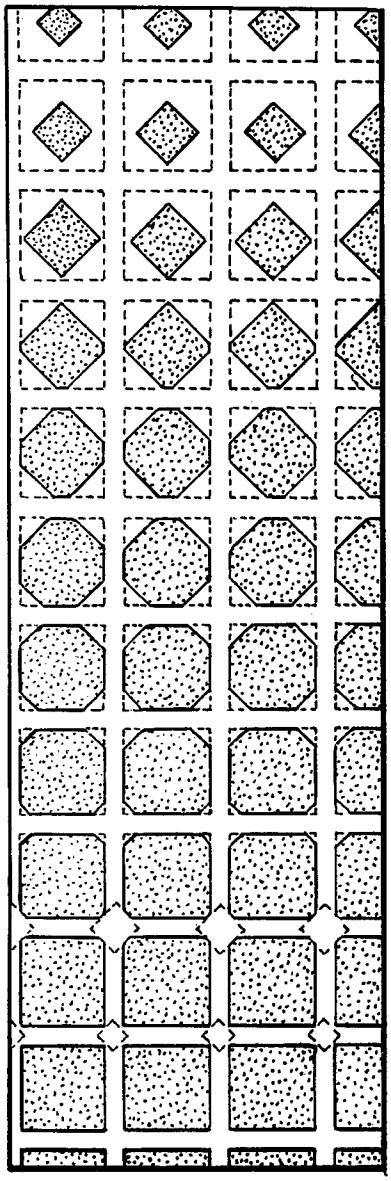

Fig. 13

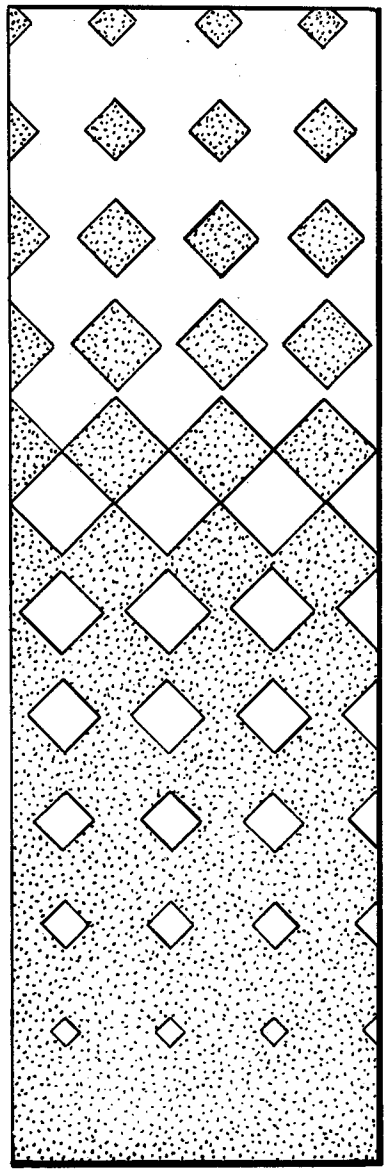

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Fig. 14

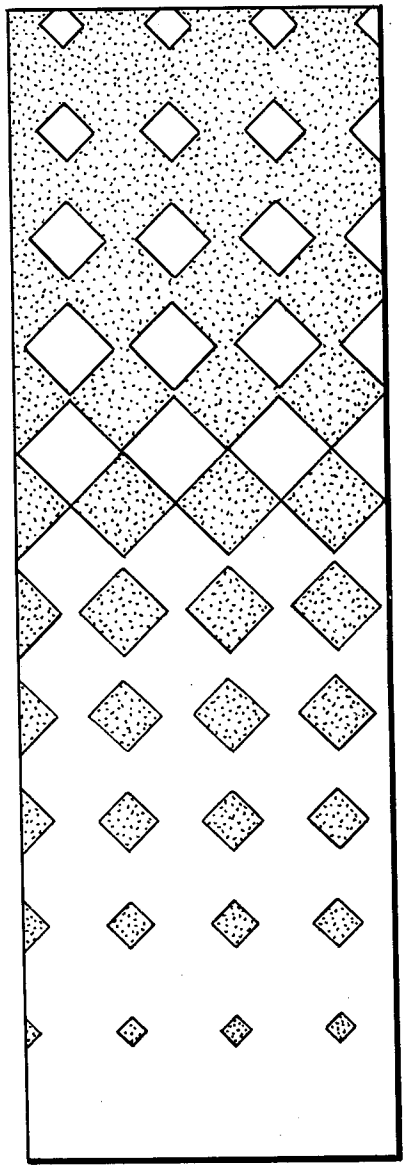

Fig. 15

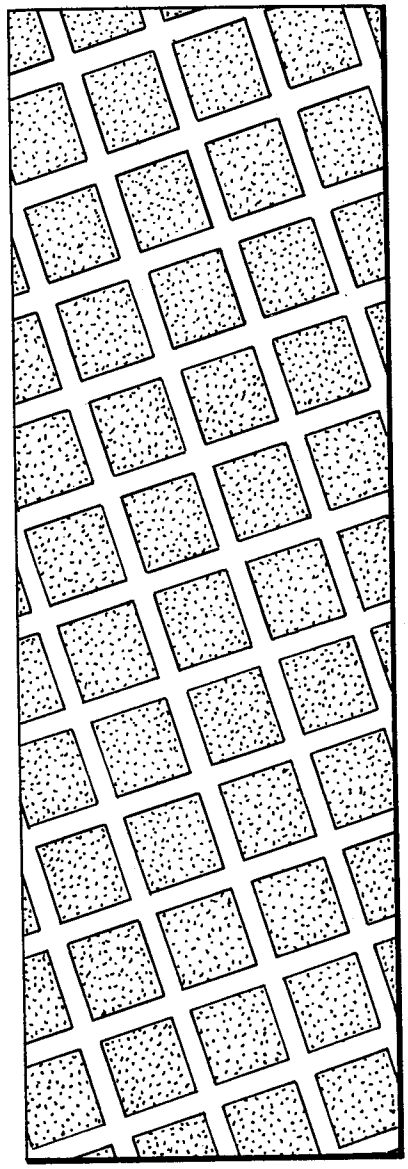

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Fig. 16

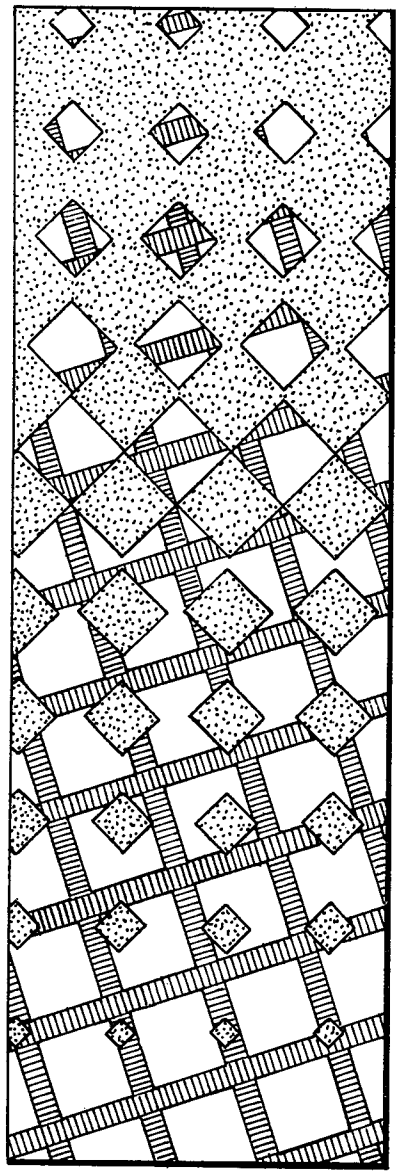

Fig. 17

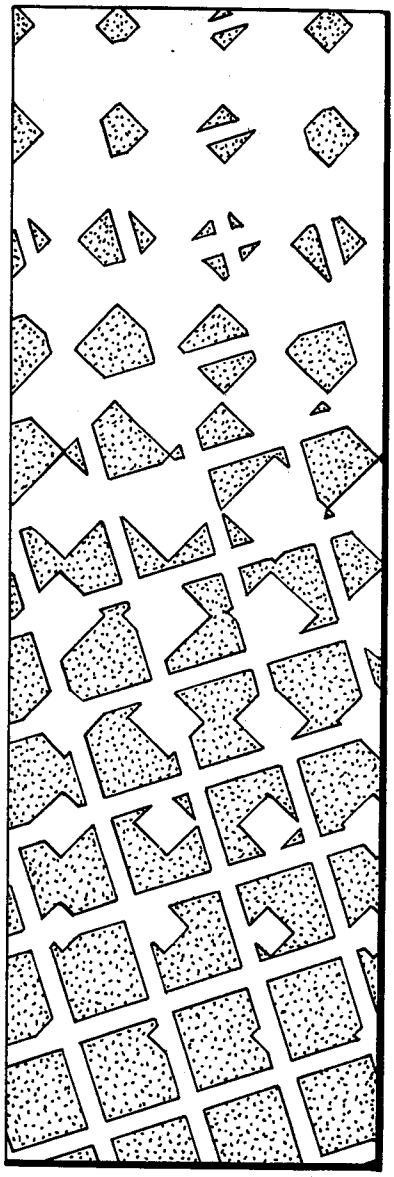

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Fig. 18

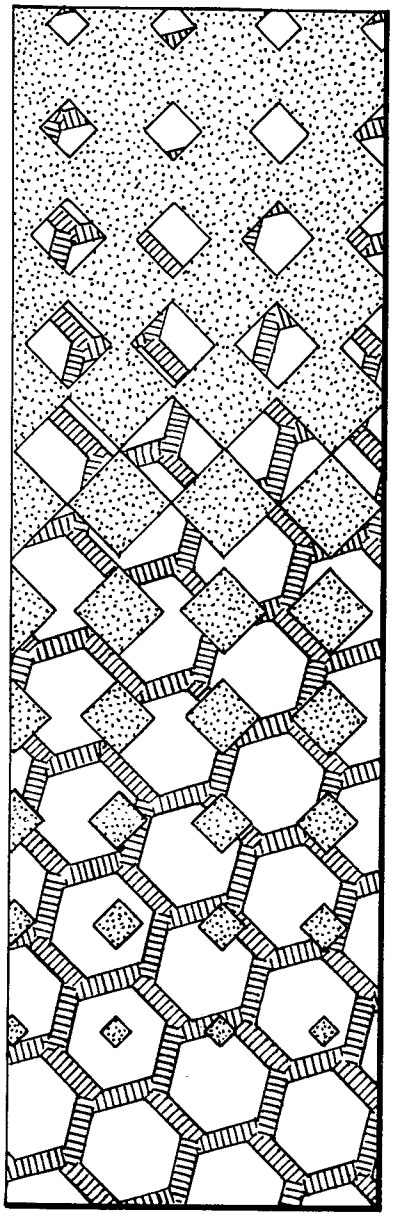
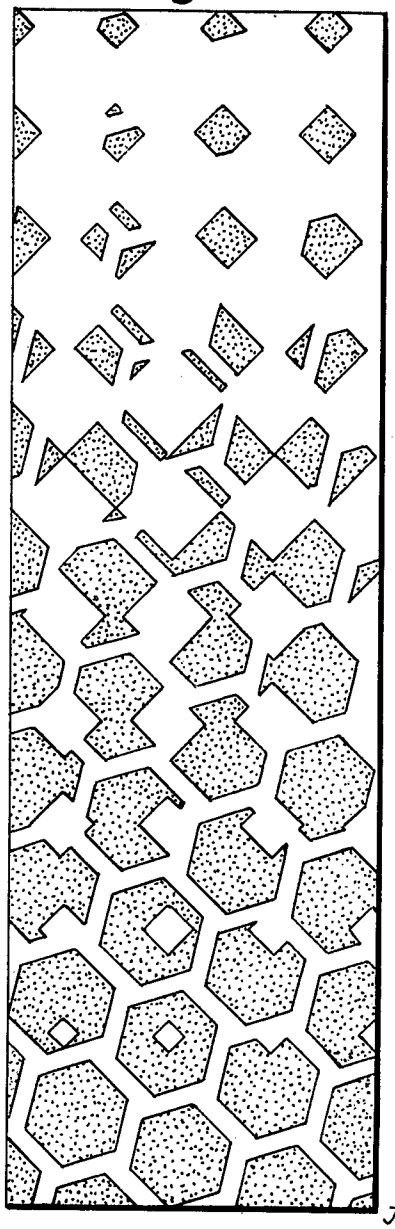


Fig. 19



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United States Patent Office 3,210,186 Patented Oct. 5, 1965

3,210,186

INTAGLIO PRINTING SCREEN FOR SUPERIMPOSING WITH AUTOTYPY SCREEN POSITIVES IN THE PRODUCTION OF ETCHINGS FOR AUTOTYPICAL INTAGLIO PRINTING

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Claims priority, application Germany, Dec. 3, 1959, G 28,501
6 Claims. (Cl. 96—32)

In intaglio printing, it is necessary that doctor areas or bars be present on the surface of the intaglio printing cylinder between the individual ink-bearing hollows, relieved areas or so-called cuplets, so that the elastic doctor will not press into the cavities and so that the ink will not be removed from the cuplets. Therefore, as is known, the usual autotypical dividing-up of the image (as used in book printing and offset printing) is not suitable for doctor intaglio printing, because the shadows of the image lack the screen lines which form such doctor bars or areas.

A number of processes are known for the production of screened copy patterns, in which the shadows of the image contain doctor-bar-forming screen lines. For example, for copying the screen in the film positive, one can take a preliminary exposure of the screen, and later copy the image itself. Today such screened diapositives are generally called "autotypical intaglio printing diapositives," but this designation is incorrect, because the dividing-up of the image does not correspond to that known from book printing or offset printing. In the following, therefore, the expression "surface variable" will be used, more correctly, in place of "autotypical," because here the expansion of the surfaces of the individual image elements is varied according to the value of the tone, in contrast to conventional intaglio printing, where the value of the tone varies with the depth of the printing element. However, as compared to customary autotypy, these screen diapositives have the disadvantage that an estimate of their tonal value can be formed only with great difficulty or not at all, for, as a result of the copied intaglio printing screen lines, the screen diapositives for the surface-variable intaglio printing appear weak and faint and give a retoucher hardly any possibility of recognizing whether the tonal values are correct. In the case of genuine autotypy—for example, for offset printing—a dark surface in the screen positive is covered and so exhibits no screen elements and a three-quarter tone is recognizable and judgable as such, but in the case of a screen positive for the variable-surface screen intaglio printing a dark surface has only the same effect as a three-quarter tone, because it is intermixed with the bright screen lines which form the doctor bars, and for the same reason a three-quarter tone of the image pattern in such a screen diapositive appears approximately only as a half-tone.

In conventional intaglio printing with genuine half-tones, the tonal values in the diapositives are judgeable and therefore the above-mentioned difficulties are not present for the retoucher. In spite of this, naturally, retouching mistakes are unavoidable and are only detectable when pressure is applied to take a proof. However, in intaglio printing, etchings for the preparation of proofs are made from the retouched half-tone positives only in the rarest cases in order to detect mistakes in the retouching of the half-tone positives and to correct these mistakes before the preparation of the etchings for the printing of the edition. In intaglio printing, the preparation of proof etchings is very expensive and time-consuming, and for this reason proof etchings for proof purposes are not customarily made. However, the result then is that

mistakes in the retouching of the half-tone diapositive are only detectable after the collective printing of the partial color images for the printing of the edition. A correction then is possible only on the finished printing cylinder, which is very time-consuming and necessitates a corresponding standstill of the entire intaglio printing machine. This disadvantage is also present in the process for the variable-surface screen intaglio printing, because in general, for the same reasons, no proof etchings for proof purposes are made of these screen diapositives. To attempt a way of the difficulty by preparing proofs from the screen diapositives for the variable-surface screen-intaglio printing in the offset printing process is not practicable. The resulting offset proof would correspond to the screen diapositive—that is, would make a weak and fuzzy impression—and would offer the retoucher exactly as little basis for determining the correctness of the work undertaken as the inspection of the screen positive itself; the actual printed result of the etching differs, again, significantly in tonal values from the offset proof.

A further disadvantage in hitherto-known methods for the variable-surface screen intaglio printing consists in the fact that, in the etching, the pages of the text and the illustrations would likewise have to have doctor-bar-forming screen lines. Thus, photographic negatives of the text pages and the inserts such as advertisements would have to be prepared, into which negatives the intaglio printing screen is to be copied; then the screen diapositives would have to be produced, and this would have to be carried over photomechanically onto the intaglio printing cylinder. Aside from the expenditure of labor, this method would necessitate a great consumption of photographic material. In the methods used at present for the surface-variable screen intaglio printing these difficulties are avoided, since only the partial color images, yellow, red, and blue, are prepared according to the variable-surface method, but the black image is prepared according to the hitherto-customary method on a fourth cylinder.

According to a known proposal, the doctor-bar-forming screen lines are copied, for the production of surface-variable intaglio print forms, into the image shadows of a screen positive. This necessitates three reproductions, and the autotypy screen and a normal intaglio printing screen are copied together into the diapositive, whereby the intaglio printing cross screen is produced in the same optical adjustment of the photograph taking apparatus as in the production of the first reproduction. Thus value is placed on the fact that the screen lines of the two screens come to congruence, so that no screen elements of the autotypy are overlapped by the intaglio printing screen lines. Moreover, this known method does not avoid the difficulty of retouching the color values, because, as a result of the copying of the intaglio printing cross-screen in the autotypy in the image shadows, a brightening takes place, which gives occasion for deceptions.

The present invention avoids this danger by reason of the fact that the doctor-bar-forming intaglio printing screen does not copy into the autotypy screen positive but is first united with the autotypy positive after retouching. This is suitably accomplished by copying the retouched screen positive on a light-sensitive material, particularly the so-called pigment paper, and, either before or after, the doctor-bar-forming screen is superimposed with the autotypy image in this material.

In the known copying of intaglio printing screens into autotypy negatives or positive, it is necessary that the intaglio printing screen lines lie exactly between the free-standing screen dots of the autotypy, and, in order to accomplish this, precision apparatus and precision labor

must be used, as well as time-consuming work processes. On the other hand, if according to the invention the intaglio screen is "superimposed" with the autotypy screen, this expression means that no attention need be paid to this orientation, but, rather, the intaglio printing screen can be displaced to one side or the other by one millimeter or less with relation to the autotypy screen. On the other hand, however, the invention recognizes the fact that superimposed lines and cross-line screen give rise to disturbing moiré if the lines of the two screens come to lie at an unfavorable angle over one another; the requirement for the avoidance of the formation of moiré, that at the adjacent congruence points of two superimposed screens the lines cross at different angles, can be fulfilled according to the invention by the fact that the doctor-bar-forming screen is displaced by a suitable angle—for example, of 30 to 60 degrees—with relation to the angular position of the screen lines of the autotypy positive.

The cross line intaglio printing screens used for the production of half-tone etchings have, as is known, an angular position of 45 degrees. These screens can be used for the superimposition of the autotype screen positives with the angular positions of 15 degrees and 75 degrees. For the superimposition of the autotype screen positives with the angular position of 45 degrees, doctor-bar-forming screens with an angular position of 15 degrees or 75 degrees must be prepared. If the yellow partial color of an autotype screen reproduction with an angular position of 90 degrees is to be produced, then, for the superimposition with a doctor-bar-forming screen, an angular position of 60 degrees or 30 degrees is required, in order to prevent the formation of moiré.

In place of the use of three doctor-bar-forming screens with varying angular positions for the superimposition of autotype screen positives—for example, with three partial color images—only one screen network may be used. In order to avoid the formation of moiré, then, of course, the doctor-bar-forming screen plate of the screen network must be prepared from lines and/or spaces of the same angular positions, in which the various autotype screen reproductions of the individual colors are produced; for example, from lines with the angular positions of 15, 45, and 75 degrees, or from lines with two of the three mentioned angular positions.

It is understood that the above-mentioned angular positions are generally customary but are only examples. Thus it is conceivable, without anything further, that the individual color reproductions—for example, at angular positions of 10, 40 and 70 degrees, or also of 20, 50 and 80 degrees—are prepared. In the process according to the invention, then, of course, it is possible to depart from these other angular positions.

When, in the present description and in the patent claims, mention is made of "angular positions of 15, 45, 75 degrees, etc.," these angle designations are to be understood as used in ordinary reproduction technique, where only the angular position of the lines of one direction—for example, 45 degrees—is designated, while the lines crossing these lines are at an angle of 135°. When, thus, in the present case an angular position of, for example, 15° is mentioned, it is to be understood that the other lines of the same screen form an angle of 105°, and, when 75° is mentioned, it is understood that other lines of the screen travel at an angle of 165 degrees.

For an understanding of the invention, it is assumed to be a known fact, in the reproduction of autotype screen positives, that in multi-color printing the formation of moiré is avoided if the angle of the screen lines of the partial color images are removed from one another by 30 or 60 degrees. In general, angular positions of 15°, 45°, and 75° are selected, while, for the yellow partial color image, an angular position of at most 90° is selected. However, it has previously been proposed that the partial color images for the black and the yellow partial colors should have angular positions of 15°.

As has been brought out in the preceding description one and the same screen network can be used for the superimposition of, for example, three partial color images, if it (the screen network) is prepared from lines and/or spaces of the same angular positions as those of the autotype screen reproductions. The intaglio printing screen according to the invention may thus be formed from three bands of parallel lines, whereby the angular position of the three bands amounts to 15°, 45°, and 75°. However, it is possible also to take into consideration networks which are formed from interrupted bands of lines—possibly in combination with continuous bands of lines traveling at another angle., Thereby the individual lines of the interrupted band of lines may be displaced parallel with relation to one another.

The number of bands of straight lines, of which sections of lines may be used for the formation of the intaglio printing screen, may be more than three, particularly if the bands of lines are interrupted and are united with sections of lines of the other band of lines to form connected, irregular lines. If the number of bands of lines on which sections of lines are to be combined is increased still further, then screen patterns are obtained in which congruent screen element forms recur with less frequency—that is, at increasingly greater distances—and, finally, if one entirely gives up the parallelness of the sections of lines enclosing or surrounding the screen elements, a completely asymmetrical screen is the end result or final development. Such asymmetrical screens may be used according to the invention, if desired, whereby, however, the effect obtained with the use of the different screen patterns is not unconditionally the same in all cases of use.

An asymmetrical line screen to be used according to the invention differs on one hand from known lines and cross line screens, in which the screen lines travel rectilinearly (or in straight lines) and intersect at a constant angle—for example, a right angle—by the irregularity or asymmetry of the lines, and, on the other hand, it differs from a known type of grain screen by the fact that the screen elements likewise are irregular but in any case form connected lines; that is, they form a network. This network may, for example, consist of regularly-curved intersecting lines or also of irregular, broken straight lines; that is, of a network in which the straight lines on both sides end in other straight lines crossing each other at various angles.

If such an asymmetrical screen is covered over or masked with a symmetrical screen, such as a line screen or a cross line screen, then a disturbing moiré results, because lines cross each other at varying angles at the covering points of the two screens. In comparison with the known grain screens, however, there is the difference that the lines of the asymmetrical network are connected, and therefore, in carrying over to the printing form, they permit the connected doctor bars, required for intaglio printing, to be formed. Consequently, the dividing-up of the image may be carried out with the autotype screen used for ordinary autotypography—for example, offset printing—which leads to a checkered screen pattern autotype screen, whereby the customary valuation inspection of the tonal values by the retoucher is assured. Therefore the so-screened diapositives can be copied in the offset process, and a proof can be taken and can be further corrected, if necessary, in accordance with the result of the proof. Thus, before proceeding with the etching for the printing form for printing the edition, the screen disapositives can be unobjectionably corrected in their tonal values. The doctor bars, which are lacking in the ordinary autotype screens, but are necessary in intaglio printing, are copied or formed by means of the asymmetrical network screen into the light-sensitive layer of the so-called pigment paper, and preferably before the copying of the screen image. Consequently, as hitherto, the text pages can be used as proofs on sheets of cellulose hydrate (cellophane).

In place of the embodiment described in the preceding description, in which the network screen according to the invention is copied into the light-sensitive layer of the pigment paper for the production of the doctor bars, and the dividing-up of the image is performed with an ordinary autotype screen, one may proceed in the reverse manner; that is, one may perform the dividing-up of the image with an asymmetrical network screen according to the invention and use it for producing the doctor bars of the previous symmetrical screens; for example, a cross line screen. Further, however, there is the possibility of performing the dividing-up of the image for the screen diapositive with an asymmetrical network screen and of performing the formation of the doctor bars likewise with the asymmetrical network screen, preferably, however, one of a different structure.

In the following, the invention is explained more in detail with reference to the drawings, which disclose various embodiments as examples, but are not to be understood in any limiting sense.

FIG. 1 is a perspective view of a fragment of a screen plate according to the invention;

FIG. 2 shows a known type of intaglio printing screen with lines intersecting at right angles, but with the angular positions of 15°, 75°, 30° and 60°;

FIG. 3 shows a screen network composed of three parallel bands of straight lines with the angular positions 45°, 105° and 165°;

FIG. 4 shows a screen network with continuous lines of 105° and 165° and interrupted lines of 45°, 105° and 165°;

FIG. 5 shows a doctor-bar-forming screen network of regular hexagons as the basic elements, whereby the lines have angular positions of 15°, 75° and 135°;

FIG. 6 shows a screen network of rhombs and squares, whereby the lines have angular positions of 15°, 45°, 105° and 135°;

FIG. 7 shows a screen network composed of lines with angular positions of 15°, 45°, 75°, 105°, 135° and 165°;

FIG. 8 shows the transition between a symmetrical network of the above-mentioned angular positions and an asymmetrical network;

FIG. 9 shows, in plan view, a screen composed of intersecting wavy lines;

FIG. 10 shows, in plan view, a form of screen which is assembled from asymmetrically-curved lines and straight lines;

FIG. 11 shows a screen positive with black light-impervious dots and a screen positive with light-transmitting dots mounted over one another and penetrated by (intermixed with) asymmetrical screen lines according to FIG. 9;

FIG. 12 shows an autotypographical screen positive with intaglio printing screen lines of known type copied into the image shadows; and

FIGS. 13 to 19 illustrate the production of intaglio printing forms by use of the invention.

As is seen from FIG. 1, the screen according to the invention consists, in the customary manner, of a translucent plate *a*, preferably of glass, on the upper surfaces of which the screen lines *b* stand out in relief, while the surface elements *c* enclosed by the screen lines appear as grooves (hollows) and are blackened. The number of lines is generally between 36 and 120 lines to the centimeter and, to a certain degree, conforms to the number of lines of the autotype screen to be used in combination. Generally, the number of lines is determined by the quality of the work to be printed.

As the examples disclosed in FIGS. 2 to 11 show, the screen structure may be fundamentally of every different kinds, for the only essential is that no disturbing moiré can originate within the same image area in the finished etching or in the finished image; therefore the screen lines of the various patterns may not travel parallel with the lines of the autotype screen or may not intersect

at too acute an angle. On the other hand, however, the screen lines must be connected together, so that they produce continuous doctor bars or areas on the printing cylinder over its entire width.

When doctor-bar-forming screen networks composed of regularly recurring basic elements with only two screen angular positions are used, then care must be taken to avoid a formation of moiré by seeing that none of the two angular positions forms a number of adjacent screen elements with continuous lines, as FIG. 6 shows by way of example. It is clear that each screen element is displaced by a certain angular position with relation to the other element with identical angular position. In each case it is important that the autotype screens are superimposed at the correct angle with the intaglio printing screen. In the embodiment shown in FIG. 2, it is assumed that the autotype screen (not shown therein) has the angular position of 45°, so that it is to be superimposed with an intaglio printing screen of 15° or 75°. However, if, for example, in multi-color printing, the autotype screen of one color—for example, blue—having an angle of 45°, is selected for the individual partial color but for the red partial color and the black plate an angular position of 15° and 75° is selected, and an angular position of 90° for the yellow partial color is used, then the disclosed intaglio printing screens according to the invention must be turned by a corresponding angle or must be displaced, so that the angular position of the doctor-bar-forming screen deviates from the angular position of the autotype screen by 30° or 60°.

FIGS. 3 to 7 show screen networks which are uniformly adapted for superimposition of the autotype screen diapositive with angles of 15°, 45° and 75°; that is, they can be used for all three colors.

Also, on account of its strong irregularity, the screen network of FIG. 8 may be used for superimposition of the various autotype screen partial colors.

The screen composed of intersecting wavy lines according to FIG. 9 may likewise be used for superimposing over all the autotype screen partial colors independently of the angular position. The same holds true for the screen of FIG. 10, which is assembled from asymmetrically-curved lines and straight lines.

FIG. 11 discloses the use of the invention in a so-called "duplex autotype." In duplex autotypography, the reproduction of the image is done in two colors, the so-called "depth" and so-called "tone." In book printing and in offset printing, two printing forms are needed for the printing of duplex autotypographies, one for the depth and one for the tone, and a printing process is required for each color if the work is performed on a one-color machine. With the use of an asymmetrical screen for the formation of the doctor areas or bars, the two colors, depth and tone, may be united in one printing form in intaglio printing according to the invention, whereby also only one printing process is necessary. The uniting of the two colors in one printing form is made possible when the screen positive for the depth has black, light-impervious dots, but the screen positive for the tone has translucent dots with a certain gray value, and when both of the positives are mounted one over another and copied together onto the light-sensitive layer (pigment paper). In the etching of the printing forms, the black dots of the screen positive etch the depth first, while the etching of the translucent dots of the screen positive for the tone occurs later, corresponding to their gray values, and therefore the tone-dots are less deep. Thus is obtained a printing form according to FIG. 11, in which the screen image for the depth is etched correspondingly deep and the screen image for the tone is etched less deep, and both are penetrated by (intermixed with) the asymmetrical screen network.

FIG. 12 represents an autotypography screen positive with intaglio printing screen lines copied into the image depth according to a known proposal. As already

mentioned, such a copying is possible only with the use of special costly precision apparatus and large expenditures of labor and material. For these reasons, this known process has attained no significance in practice.

In the representation of the production of an intaglio printing form according to the invention in FIGS. 13 to 19, it is assumed that the partial color image—for example, for the color blue—is photographed with an autotype screen of 45°. FIG. 13 shows a cut-out from a point of transition from a bright to a dark color tone made with such an autotype screen positive, but, of course, on a greatly enlarged scale, as in all the other figures. FIG. 13 shows an autotype screen positive with the angular position of 45°. FIG. 14 shows the copy from the autotype screen positive of FIG. 13 on pigment paper (black is the exposed gelatin, and white is the unexposed gelatin). FIG. 15 shows an intaglio printing cross-line screen with the angular position of 15° (displaced by 30° from the autotype screen) according to the invention. FIG. 16 shows the pigment copy of FIG. 14, additionally superimposed with the copied intaglio printing screen of FIG. 15. The cross-hatched lines now are also exposed gelatin. FIG. 17 shows an etching. White is the surface of the copper, black is the etched autotype screen positive of FIG. 13, overlaid with the intaglio printing screen of FIG. 15. FIG. 18, again, shows the pigment copy according to FIG. 14, additionally overlaid with the screen of FIG. 5. FIG. 19 shows the etching. White is the upper surface of the copper, black is the etched autotype screen positive of FIG. 15, overlaid with the intaglio printing screen of FIG. 5.

Etching of the pigment copy according to FIG. 15 is performed in the usual manner—for example, on a copper cylinder—so that an image corresponding to FIG. 16 results. The white fields here signify the upper surface of the copper, while the black fields are the indentations or little cups originating from the etching. It is clear that in the bright tone the autotype screen elements predominate, while in the dark tone the deepened surface is subdivided by the bars of the intaglio printing screen. Because of the various angular positions of the two screens, however, the adjacent screen elements have different forms, so that no moiré appears in the print prepared by the intaglio printing cylinder according to FIG. 16.

I claim:

1. The process of making a set of intaglio printing surfaces for multi-color half-tone intaglio printing from a set of color separations comprising the steps of

(a) producing individual half-tone diapositives for each color separation by superposing on a positive print of each separation an autotype screening which is of the same form for each separation but wherein the lines of the screen pattern in the several separations have predetermined angular relationships to the screen pattern lines in the other diapositives to avoid formation of moiré,

(b) then retouching each screened diapositive as required,

(c) subsequently making a photographic copy of each screened diapositive on a separate piece of pigment paper,

(d) exposing each piece of pigment paper to light through intaglio screen, said screen having a pattern of irregular transparent lines joining one another at angular intersections corresponding to all the said pre-determined angular relationships between the several autotype screen patterns formed on the individual half-tone diapositives, and then

(e) transferring the doubly screened image from each pigment paper onto a separate metallic surface to provide a resist on such surface and etching each surface.

2. The process defined in claim 1 wherein in step (a) the autotype screen lines formed on the several half-tone diapositives are angularly related at angular intersections of at least one of 15°, 45° and 75°.

3. An intaglio printing screen for use in forming doctor bar surfaces on an intaglio printing surface, comprising a transparent screen body member, opaque portions formed on a surface of said body defining therebetween a network of doctor bar forming transparent discontinuous lines, the sections of such lines being joined to at least one other section of another line to form a completely asymmetrical and continuous screen network.

4. An intaglio printing screen as defined in claim 3 wherein said screen lines are arranged in angular positions of 30° and 60° relative to the edges of the screen.

5. An intaglio printing screen as defined in claim 3 wherein said screen lines are arranged in angular positions of 15° and 75° relative to the edges of the screen.

6. An intaglio printing screen as defined in claim 3 wherein said discontinuous lines are arranged as three separate bands of parallel lines intersecting each other at angles of 15°, 45° and 75°.

References Cited by the Examiner

UNITED STATES PATENTS

1,375,659	4/21	Illig	96—116
2,039,195	4/36	Stirling	96—38 X
2,148,519	2/39	Wilkinson	96—38
2,159,588	5/39	Gorig	96—38
2,405,291	8/46	Corbett	96—116
2,811,444	10/57	Wattier	96—37
3,024,111	3/62	Sportelli	96—45
3,085,878	4/63	Archer	96—118

FOREIGN PATENTS

16,447	12/03	Great Britain.
421,529	1/35	Great Britain.
488,463	7/38	Great Britain.
497,194	12/38	Great Britain.
770,864	3/57	Great Britain.
102,777	11/22	Switzerland.

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