Sept. 20, 1932. A. TAUSZ ET AL 1,878,347

PROCESS AND APPARATUS FOR PREPARING PRINTING ROLLERS

Filed Jan. 29, 1929

Fig. 1

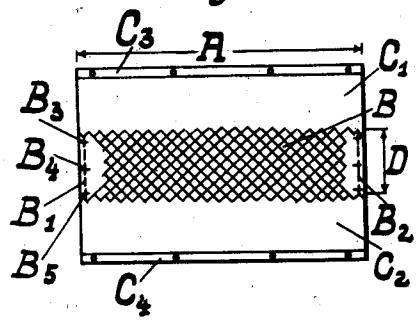
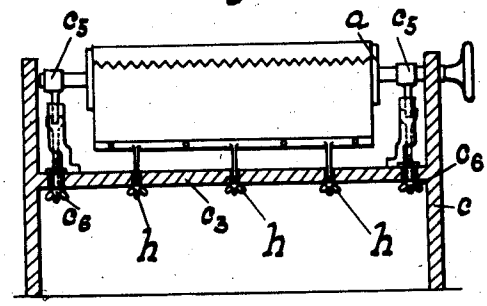


Fig. 2



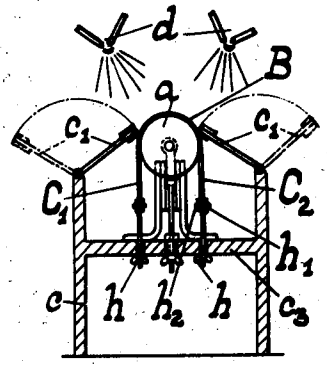


Fig. 4

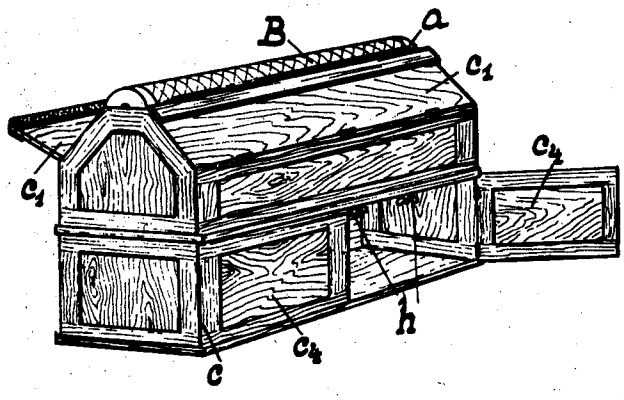


Fig. 3

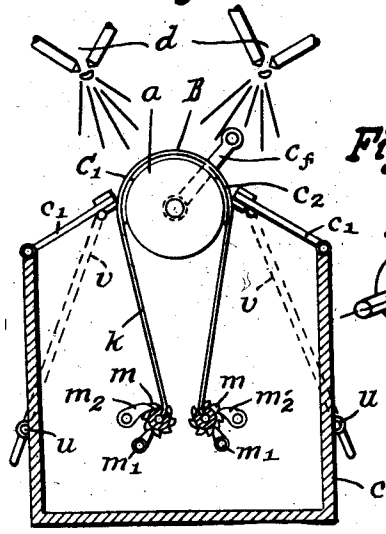


Fig. 6.

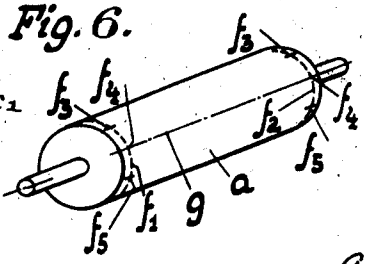


Fig. 5.

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UNITED STATES PATENT OFFICE

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PROCESS AND APPARATUS FOR PREPARING PRINTING ROLLERS

Application filed January 29, 1929, Serial No. 335,931, and in Hungary December 12, 1928.

This invention relates to the production of etched printing rollers having a design formed of design elements which are repeated indefinitely by the photographic contact printing method, one and the same film provided with the design elements to be printed photographically and adapted when placed round the periphery of the roller broadside on, to cover an aliquot part of the circumference of the printing roller, being printed from successively so as to form a number of adjacent sections in register until the entire periphery of the roller has been covered with photographically printed design elements.

In the previous proposal for carrying out this method, which up to now has constituted the most adequate known technical solution in the art of photo-mechanical production of printing rollers for printing textiles and wall papers, the film which is placed round a portion of the periphery of the roller consists normally of a single design element, or at least comprises such a small number of design elements that the film only extends over a very small fraction of the length of the roller. This method has the drawback that for carrying it out a complicated and expensive machine fitted up after the manner of a transferring machine is necessary, without exact register between the adjacent photographic prints being obtainable with certainty, either in the axial or in the circumferential direction, for the reason among others that the film forms the bottom of a box containing the illuminating lamp, so that exact register of a fresh print with a print already produced, before exposure, cannot be satisfactorily regulated. The known process is unsatisfactory in practice since for completely covering a roller with design elements, anything from 50 to 200 successive exposures are necessary, which altogether necessitates a working time of many hours, so that in comparison with the hitherto practiced and preferred mode of transferring by means of steel rollers any appreciable gain in the way of reducing the time and cost of production is hardly to be expected. A drawback which weighs heavily with the process referred to is this that the sensitized layer which covers the printing roller, and which as is well known usually consists of chrome albumin, becomes locally heated to such an extent during the protracted exposure to the printing light that it is subjected to a kind of tanning action, which, as is well known, will alter the sensitivity of the layer in a manner and to an extent which cannot be foreseen. From this it follows that in the case of the known process it is impossible to obtain the uniformity in the photographic prints which is absolutely necessary for the production of perfect printing rollers.

Owing to the above mentioned drawbacks is due the fact that in the industry, notwithstanding the fact that the problem of producing printing rollers for textile and wallpaper printing by photo-mechanical means has occupied the attention of those skilled in the art for many decades, the application of the designs to the printing rollers by hand engraved steel rollers is to the present day adhered to.

By means of the present invention, the above mentioned drawbacks are removed and all the practical requirements of the industry are met to the fullest extent, the process according to the invention being characterized by this that the film employed to be printed from successively on the periphery of the roller so as to form a number of adjacent sections in register, and which is placed round the periphery of the roller broadside on so as to cover an aliquot part of the circumference of the roller is a transparent band on which the design to be printed on the printing roller consists of such a number of design elements that the length of the film is substantially equal to that of the printing roller to be produced. As by this means the

placing in register of successive prints axially of the roller hitherto necessary is dispensed with, on the one hand the most exact register in the axial direction is always automatically obtained and on the other hand for the same reason a simple and cheap box of non-transparent material with bearings for the bearing journals of the printing roller is sufficient, said box permitting the exact registration to be effected with the naked eye before the exposure, since the film which covers the entire length of the roller no longer requires to form the bottom of a box. As, moreover, the entire periphery of the roller can be completely covered with from two to four printings, the entire time occupied in effecting the exposures amounts only to a few minutes, during which the sensitized layer cannot suffer from any unfavorable deterioration.

The invention is more particularly explained with reference to the constructional examples shown in the accompanying drawing, in which Fig. 1 shows a view of the film used in the process; Figs. 2 and 3 show diagrammatically two sections of an arrangement for extending the contact prints in successive operations according to the invention; Fig. 4 shows the same arrangement in perspective view, while Fig. 5 shows the printing roller to be made, in perspective. Fig. 6 shows a modification of Fig. 3.

In carrying out the process, a printing roller is employed on which the light-sensitive layer which is of a known kind and may for instance be chrome albumin is distributed perfectly evenly in known manner.

After the cylindrical surface of the printing roller has been rendered light-sensitive, the flexible film shown in Fig. 1 is laid directly on the said cylindrical surface, the design elements on the film being printed by causing light to pass through the film on the light-sensitive cylindrical surface.

The film shown in Fig. 1 contains such a number of design elements that its length A is substantially equal to the axial length of the printing roller *a* (Fig. 5). The film B consists of a translucent positive or negative. A positive is used for making an intaglio printing roller and a negative for producing a relief printing roller.

The extensions C_1 and C_2 (Figs. 1 and 2) represent non-translucent, for instance blackened bands, the inner edges of which lie closely adjacent the outline of the particular design, said bands forming a single piece with the film B or being separate pieces which are united with the same, for instance by means of an adhesive. In the circumferential direction the film B contains as many design elements as will enable its height D to be an aliquot part of the circumferential length of the printing roller *a*, being at the maximum half the circumferential length.

In the following part of the specification and in the claims, the term "film" signifies any flexible and translucent or transparent support of any suitable material, for instance also oil paper, gelatine, and so on. The term "design element" used in the following specification and in the claims signifies not only pictures in the ordinary sense of the word but also all kinds of drawings, ornamental patterns, designs and the like, such for instance as are used in intaglio printing on textile fabrics and wall papers, and in which also portions of text may appear in some cases.

In Figures 2 and 3 *a* is the printing roller, arranged so as to be partly within a box *c*, the walls of which are closed in a light-tight manner.

The box *c* has two hinged covers *c'* which rest on either side against the non-translucent extensions C_1 and C_2 of the film B wrapped round the printing roller *a* along a generatrix, so that only that portion of the periphery of the printing roller round which the film is wrapped is exposed to the action of the printing lamps *d*.

Before the printing roller *a* is inserted into the apparatus shown in Figures 2 and 3, two registering circles f', f_2 are marked in a machine like a lathe at the two ends of the printing roller, at places (as shown in Fig. 5) lying outside the portion of the surface of the printing roller used for printing, and on the film B, corresponding exactly to the axial distance between the said two circles f', f_2, two parallel lines B', B_2 are drawn (Fig. 1). On these two lines registering points B_3, B_4, B_5 are marked and corresponding exactly to the relative distance between these points, registering points f_3, f_4, f_5, are marked on the registering circles f', f_2. On the printing roller a generatrix *g* may also be marked which may correspond to one edge or to the centre line of the film B.

The printing roller *a* prepared in the above manner and the correspondingly prepared film are thereupon mounted in the arrangement shown in Figures 2 to 4.

In order to ensure that the film B shall lie closely at all places of the part of the roller periphery in question, the film may be tensioned by means of screws *h*. These screws are supported on a partition c_3 of the box *c* and act on two rails h_1, h_2, between which the edge C_3 or C_4 of the non-translucent extension C_1, C_2 of the film B is clamped. The tightening screws *h* are distributed over the length of the printing roller and the box *c* is provided on both sides with doors c_4, so that each of the screws *h* can be tightened individually as required.

For carrying out the photographic printing, the film B is set upon the printing roller *a* with registering lines B_1, B_2 and the registering points B_3, B_4, B_5 provided on the film

B exactly and respectively covering and registering with the registering circles f_1, f_2 and the registering points f_3, f_4, f_5 provided on the said printing roller. Thereupon the screws h or c_6 have to be tightened suitably and the covers c' as well as the doors c_4 have to be closed. Now, photographic printing may be carried out by means of the lamps shown diagrammatically at d. After sufficient exposure the lamps d are put out and the screws h or c_6 are sufficiently loosened to enable the printing roller a to be turned through 120° (assuming the film to be wrapped being a third of the circumference of the roller) and three points adjacent to the points f_3 or f_5, (Fig. 5) which have been previously marked off on the registering circles f', f_2 provided on the printing roller a in the same manner as the points f_3, f_4, f_5, are placed under the registering points B_3, B_4, B_5 of the film B, whereupon a fresh exposure is made in the manner described, and so on. By thus repeating the above described operation, for instance twice or three times (depending upon the measure D of the film, Figure 1 in relation to the circumference of the roller a) the whole periphery of the roller a is covered by design elements suchwise that the said design elements repeat indefinitely in exact register with each other.

The bearings c_5 for the journals of the printing roller a are adjustable in height in the box c by means of screws c_6, so that, for turning the printing roller a, it is only necessary to lower the bearings c_5 and with them the roller itself, whereupon, after the printing roller has been turned, it is raised again by means of the screws c_6. In this way the time-wasting which would otherwise occur by the loosening of the large number of tightening screws h at each turning of the roller a can be avoided, the screws h rendering possible to effect any subsequent tightening up locally, which may be required.

Another way of causing the film B to rest closely on the printing roller a during the printing operation is shown in Figure 6. In this example, after the film B has been laid accurately on the registering marks of the printing roller a mounted in the box c, a translucent and flexible band k, made for instance of Para rubber (Brazilian rubber) is laid around the film parts B, C_1, C_2, the edges of which band are each fixed to a roller m which can for instance be turned by a hand operated crank m' and be locked in position by a detent m_2. The band k only extends round about half the circumference of the printing roller. By this means the band k is made to rest in close contact all over with the film B on the one hand and the film band in turn is pressed into close contact all over the periphery of the printing roller by tightening up the band k, while if the roller a were completely encircled by the band k, the friction would be increased to such an extent that when the band k is tightened up the action of the tension produced thereby would no longer extend to the upper middle parts of the film B. After the printing operation has been completed, the band k is eased off, the roller a turned for instance by means of a hand-operated crank c_7, the film B again accurately brought into register and the band k given the requisite tension, whereupon a further section of the printing roller may be exposed and so on.

Of course, if desired, tensioning of the translucent band k of the printing roller a according to Figure 6 may be also effected by means of clamping rails h', h_2 and a series of screws h as shown in Figures 2 and 3 for the film extensions C_1, C_2, and on the other side, tensioning of the film B may be effected instead of the clamping rails h', h_2 as shown in Figures 2 and 3 by means of rollers m and locking devices m' m_2 as shown in Figure 6 for the translucent band k.

The small rollers m may conveniently also be mounted at the ends of the hinged covers c, which rest on the film parts C_1, C_2.

The hinged covers c' can be provided with members (such as the screws u and pull rods v shown in broken lines in Fig. 6) by means of which they can be fixed in their closed position, in order to ensure light-tight closure of the interior of the box c during the photographic printing.

The film B can be made in any suitable known manner.

Many modifications of the examples of the invention described are of course possible without departing from the spirit of the invention.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:

1. In the art of producing an etched printing roller having a continuous design formed upon its surface which comprises a continuous succession of design elements, those steps which consist in photographically printing said design elements successively upon aliquot parts of the circumferential dimension of the printing roller, said printing being accomplished in each stage by the same light transparent film, said film being provided with said design elements and being held in close contact with the light sensitive surface of the roller during each photographic printing operation, the relative portions of said roller and of said film being shifted after each printing operation in order to cause said film to contact with the next aliquot part of the said roller, said relative shift being solely in a circumferential direction.

2. In the art of producing an etched printing roller having a continuous design formed upon its surface which comprises a continu-

ous succession of design elements, those steps which consist in photographically printing said design elements successively upon aliquot parts of the circumferential dimension of the printing roller, said printing being accomplished in each stage by the same light transparent film, said film being provided with said design elements and being held in close contact with the light sensitive surface of the roller during each photographic printing operation, the relative portions of said roller and of said film being shifted after each printing operation in order to cause said film to contact with the next aliquot part of the said roller, the length of the film being substantially equal to the effective length of the printing roller.

3. In the art of producing an etched printing roller having a continuous design formed upon its surface which comprises a continuous succession of design elements, those steps which consist in photographically printing said design elements successively upon aliquot parts of the circumferential dimension of the printing roller, said printing being accomplished in each stage by the same light transparent film, said film being provided with said design elements and being held in close contact with the light sensitive surface of the roller during each photographic printing operation, the relative portions of said roller and of said film being shifted after each printing operation in order to cause said film to contact with the next aliquot part of the said roller, the film being held in position during each printing operation by means of opaque end members.

4. In the art of producing an etched printing roller having a continuous design formed upon its surface which comprises a continuous succession of design elements, those steps which consist in photographically printing said design elements successively upon aliquot parts of the circumferential dimension of the printing roller, said printing being accomplished in each stage by the same light transparent film, said film being provided with said design elements and being held in close contact with the light sensitve surface of the roller during each photographic printing operation the relative portions of said roller and of said film being shifted after each printing operation in order to cause said film to contact with the next aliquot part of the said roller, said film being provided with transverse signal marking means which are caused to register during each stage with corresponding signal marking means transversely arranged on the printing roller.

5. In the art of producing an etched printing roller having a continuous design formed upon its surface which comprises a continuous succession of design elements, those steps which consist in photographically printing said design elements successvely upon aliquot parts of the circumferential dimension of the printing roller, said printing being accomplished in each stage by the same light transparent film, said film being provided with said design elements and being held in close contact with the light sensitive surface of the roller during each photographic printing operation, the relative portions of said roller and of said film being shifted after each printing operation in order to cause said film to contact with the next aliquot part of the said roller, the film being held in position during each printing operation by means of opaque end portions, said opaque end portions being subjected to tension during each printing operation, the length of said film being equal to the effective length of said printing roller, so that said roller is shifted relative to said film solely in the circumferential direction.

6. In the art of producing an etched printing roller having a continuous design formed upon its surface which comprises a continuous succession of design elements, those steps which consist in photographically printing said design elements successively upon aliquot parts of the circumferential dimension of the printing roller, said printing being accomplished in each stage by the same light transparent film, said film being provided with said design elements and being held in close contact with the light sensitive surface of the roller during each photographic printing operation, the relative portions of said roller and of said film being shifted after each printing operation in order to cause said film to contact with the next aliquot part of the said roller, said film occupying not more than one-half the circumferential dimension of the roller during each printing operation and being held taut during each printing operation by tensional force acting upon the ends thereof, the length of said film being equal to the effective length of said printing roller, so that said roller is shifted relative to said film solely in the circumferential direction.

7. A device for producing an etched printing roller having a continuous design formed upon its face which comprises a continuous succession of design elements, said device comprising a light-tight casing having an opening therein, bearing means for the roller to be etched located within said casing, said bearing means being adapted to hold said roller in operative relationship to said opening so that its edges are closely adjacent the circumference of said printing roller, the edges of said opening being substantially parallel to the longitudinal axis of the roller and being separated from each other for a distance corresponding to an aliquot portion of the circumferential dimension of said roller so that said aliquot portion projects from said light-tight casing, and holding

means located within said casing and adapted to hold a flexible member against a portion of the periphery of said roller including the projecting portion thereof, said flexible member comprising a light permeable portion which is provided with said design elements and which is held in contact with said projecting portion by said holding means, the length of said edges being at least equal to the length of the printing portion of the roller.

8. A device for producing an etched printing roller having a continuous design formed upon its face which comprises a continuous succession of design elements, said device comprising a light-tight casing having an opening therein, bearing means for the roller to be etched located within said casing, said bearing means being adapted to hold said roller in operative relationship to said opening so that its edges are closely adjacent the circumference of said printing roller, the edges of said opening being substantially parallel to the longitudinal axis of the roller and being separated from each other for a distance corresponding to an aliquot portion of the circumferential dimension of said roller so that said aliquot portion projects from said light-tight casing, and holding means located within said casing and adapted to hold a flexible member against a portion of the periphery of said roller including the projecting portion thereof, said flexible member comprising a light permeable portion which is provided with said design elements and which is held in contact with said projecting portion by said holding means, the walls of said casing adjacent said opening comprising movable sections, the length of said edges being at least equal to the length of the printing portion of the roller.

9. A device for producing an etched printing roller having a continuous design formed upon its face which comprises a continuous succession of design elements, said device comprising a light-tight casing having an opening therein, bearing means for the roller to be etched located within said casing, said bearing means being adapted to hold said roller in operative relationship to said opening so that its edges are closely adjacent the circumference of said printing roller, the edges of said opening being substantially parallel to the longitudinal axis of the roller and being separated from each other for a distance corresponding to an aliquot portion of the circumferential dimension of said roller so that said aliquot portion projects from said light-tight casing, and holding means located within said casing and adapted to hold a flexible member against a portion of the periphery of said roller including the projecting portion thereof, said flexible member comprising a light-permeable portion which is provided with said design elements, said flexible member also comprising opaque end portions continuous with said light-permeable portion, said holding means being adapted to exert tension on said end portions in order to hold said light-permeable portion in contact with said projecting portion, the length of said edges being at least equal to the length of the printing portion of the roller.

10. A device for producing an etched printing roller having a continuous design formed upon its face which comprises a continuous succession of design elements, said device comprising a light-tight casing having an opening therein, bearing means for the roller to be etched located within said casing, said bearing means being adapted to hold said roller in operative relationship to said opening so that its edges are closely adjacent the circumference of said printing roller, the edges of said opening being substantially parallel to the longitudinal axis of the roller and being separated from each other for a distance corresponding to an aliquot portion of the circumferential dimension of said roller so that said aliquot portion projects from said light-tight casing, and holding means located within said casing and adapted to hold a flexible member against a portion of the periphery of said roller including the projecting portion thereof, said flexible member comprising a light-permeable portion which is provided with said design elements, said flexible member also comprising opaque end portions continuous with said light-permeable portion, said holding means being adapted to exert tension on said end portions in order to hold said light-permeable portion in contact with said projecting portion, said bearing means being adjustable so that the tension on said flexible member can be regulated by the adjustment of said bearing means, the length of said edges being at least equal to the length of the printing portion of the roller.

11. A device for producing an etched printing roller having a continuous design formed upon its face which comprises a continuous succession of design elements, said device comprising a light-tight casing having an opening therein, bearing means for the roller to be etched located within said casing, said bearing means being adapted to hold said roller in operative relationship to said opening so that its edges are closely adjacent the circumference of said printing roller, the edges of said opening being substantially parallel to the longitudinal axis of the roller and being separated from each other for a distance corresponding to an aliquot portion of the circumferential dimension of said roller so that said aliquot portion projects from said light-tight casing, and holding means located within said casing and adapted to hold a flexible mem-

ber against a portion of the periphery of said roller including the projecting portion thereof, said flexible member comprising a light permeable portion which is provided with said design elements and which is held in contact with said projecting portion by said holding means, said holding means comprising a series of tensioning members which can be independently actuated, the length of said edges being at least equal to the length of the printing portion of the roller.

In testimony whereof we affix our signatures.

ALEXANDER TAUSZ.
FRANZ STÉHLIK.