April 6, 1926. 1,579,910

J. J. BAUER

METHOD OF AND APPARATUS FOR COMBINATION PRINTING WITH PRINTING ROLLERS

Filed August 25, 1922 2 Sheets-Sheet 1

Fig. 1.

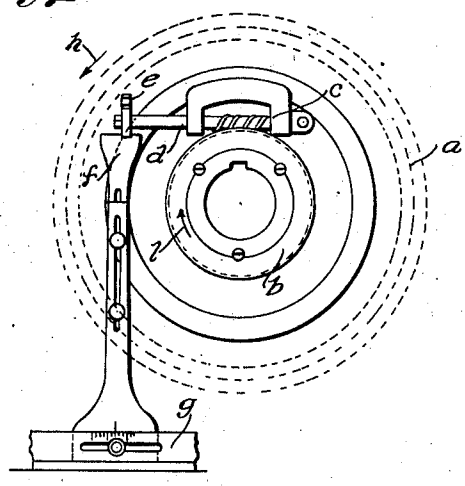


Fig. 2.

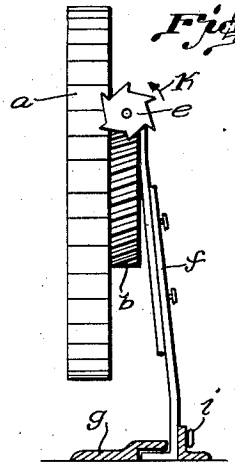


Fig. 3.

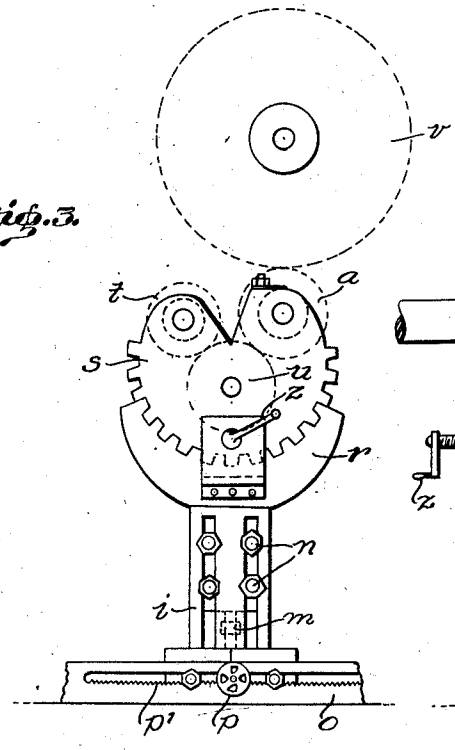
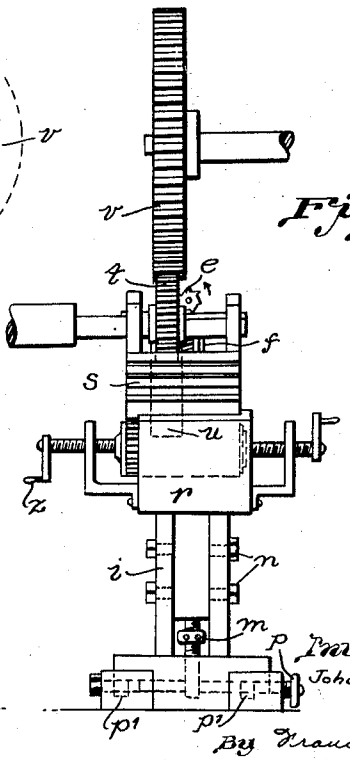


Fig. 4.



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Fig. 5. Fig. 6. Fig. 7. Fig. 8.

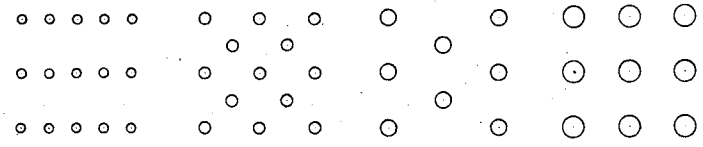


Fig. 9. Fig. 10. Fig. 11. Fig. 12.

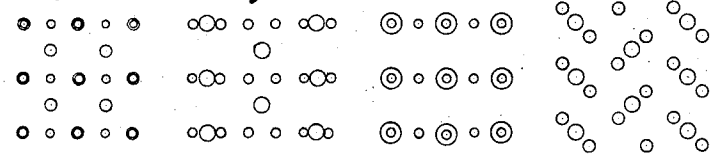


Fig. 13. Fig. 14. Fig. 15. Fig. 16.

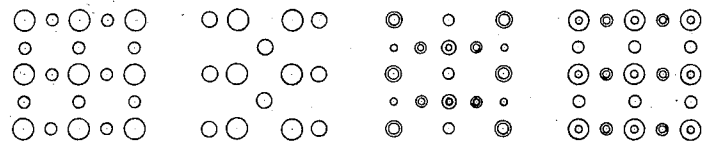


Fig. 17. Fig. 18. Fig. 19.

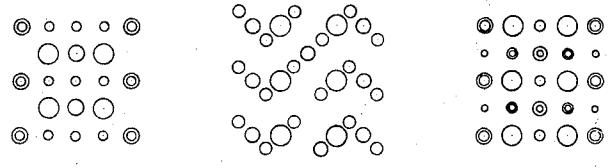
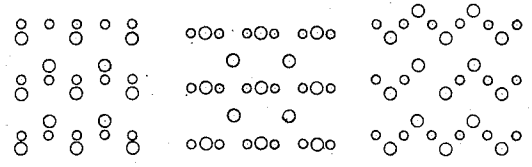


Fig. 20. Fig. 21. Fig. 22.



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UNITED STATES PATENT OFFICE.

JOHANN JOSEF BAUER, OF BUDAPEST, HUNGARY.

METHOD OF AND APPARATUS FOR COMBINATION PRINTING WITH PRINTING ROLLERS.

Application filed August 25, 1922. Serial No. 584,206.

To all whom it may concern:

Be it known that I, JOHANN JOSEF BAUER, a citizen of the Republic of Austria, residing at Szentendrei ut 8123 Budapest III, Hungary, have invented new and useful Improvements in the Method of and Apparatus for Combination Printing with Printing Rollers, of which the following is a specification.

For the process of printing patterns on cardboard, cloth, silk and other fabrics as many printing rollers are required as there are colors in a given pattern. Such rollers have heretofore not been capable of being used for other patterns.

The object of the invention is, on the one hand, to afford a wider range of use for rollers of uniform circumference, and on the other hand to allow of printing simultaneously with rollers of different circumferences. The simultaneous use of rollers of different sizes is not practicable with the methods hitherto used. If, for example, a box wheel of the largest size was inserted, say a wheel with 45 teeth, it was impossible to use at the same time a box wheel with, say 22 teeth. As a matter of fact in view of this limitation wheels with fewer than 27 teeth and more than 45 teeth were never made, so that even if they could have been used in combination the available ratio would only have ranged to 4:3, whereas with my invention rollers can be used having wheels with a ratio of transmission of 2:1.

By combinations of printing rollers prepared according to the new method a large number of different colored patterns can be produced with the same rollers, for which purpose certain definite basic "repeat" values are selected in designing the patterns on the several rollers.

Heretofore no definite system has been followed in regard to the repeat relations; the same varied for each particular pattern, and rollers made for one pattern could not be used for any other.

Assuming as the basic value, for the smallest unit occurring, a square whose sides are 0.5 mm., the repeat in all the patterns, both as regards length and width, will be a simple multiple of this basic length, and the rollers prepared accordingly can be used permutatively for various combinations.

For working according to this method the means for setting the printing rollers in the machine must be adjustable, vertically and horizontally, in accordance with the repeat ratio selected, and this can be done by means of interchangeable wheels having the requisite numbers of teeth.

Combinations of rollers of equal circumference can thus be effected to the fullest extent.

When using rollers of different circumferences in separate bearings, the second roller in the path of the fabric must be connected to the box wheel, the first roller running free, and being rotated by the pull exerted on the cloth by the driven roller. The first roller will, consequently, lag somewhat in relation to the second roller, tending to distort the pattern. To correct this lag I use the mechanism shown in Figs. 1 and 2 of the annexed drawings, Fig. 1 being a side view and Fig. 2 a front view. Figs. 3 and 4 are respectively a side view and a front view of a mechanism for permitting vertical, transverse and angular adjustment of the bearings of the rollers or wheels;

Figs. 5 to 8 inclusive are diagrammatic plan views illustrating four examples of patterns each printed in a single color;

Fig. 9 is a similar view illustrating a combination of the patterns shown in Figs. 5 and 6;

Fig. 10 is a similar view illustrating a combination of the patterns shown in Figs. 5 and 7;

Fig. 11 is a similar view illustrating a combination of the patterns shown in Figs. 5 and 8;

Fig. 12 is a similar view illustrating a combination of the patterns shown in Figs. 6 and 7;

Fig. 13 is a similar view illustrating a combination of the patterns shown in Figs. 6 and 8;

Fig. 14 is a similar view illustrating a combination of the patterns shown in Figs. 7 and 8;

Figs. 15 to 18 inclusive are diagrammatic plan views showing three-color patterns, Fig. 15 illustrating a combination of the patterns shown in Figs. 5, 6 and 7, Fig. 16 illustrating a combination of the patterns shown in Figs. 5, 6 and 8, Fig. 17 illustrating a combination of the patterns shown in Figs. 5, 7 and 8, and Fig. 18 illustrating a combination of the patterns shown in Figs. 6, 7 and 8;

Fig. 19 is a diagrammatic plan view illustrating a four-color combination of the

patterns illustrated in Figs. 5, 6, 7 and 8; and

Figs. 20 to 22 are diagrammatic plan views illustrating variations of the pattern which may be produced by relative displacements of the rollers. This mechanism operates as follows:—

The toothed wheel *a* is rotatable on a brass sleeve having at one end a worm wheel *b* in engagement with a worm *c* carried in bearings secured on the wheel *a*. The shank of the worm has an extension *d* which has at its end a ratchet wheel *e*, which is exchangeable and may have any selected number of teeth. In the course of the rotation of the wheel *a* as indicated in Fig. 1 by the arrow *h* the wheel *e* is carried round, and strikes an abutment *f*, which is vertically adjustable and can also be horizontally adjusted in a slotted support *g* on the foot of the machine, or some other convenient place, the abutment being fixed to this support by means of a set screw *j*. When the wheel *e* strikes the upper straight edge of this abutment it is rotated, as indicated, by the arrow *k* in Fig. 2, and the worm *c* slightly rotates the worm wheel *b* as indicated by the arrow *l*, in the contrary direction to the arrow *h*.

The extent of this backward rotation depends on the extent to which the edge of the abutment *f* engages the ratchet wheel *e*, and this can be regulated by adjusting the abutment on its support *g*.

This device disposes of the necessity of having printing rollers of uniform circumference.

To allow of using box wheels having fewer than 27 teeth together with wheels having more teeth the bearings must be adjustable vertically, transversely and longitudinally, while retaining the requisite strength.

The adjustable bearing shown in Figs. 3 and 4 comprises a frame *i*, which can be vertically adjusted by means of a screw *m*, and made fast by bolts *n*. This frame can also be shifted forwards and backwards on a support *o* by means of racks *p'* formed on said support, the frame carrying a spindle having toothed wheels (not seen in the drawings) engaging said racks, a hand wheel *p* being secured to the spindle for manually rotating the same. The upper part *r* of the frame *i* is arcuate and serrated at its inner circumference, to receive the serrated bearing member *s*, which is of corresponding shape and thickness, serrated to engage the part *r*. This member *s* rests on the frame, locked by the teeth. The member *s* has bearings for three spindles, on two of which there are toothed wheels of equal diameters, the third spindle having a toothed wheel of smaller circumference, which drives the printing roller. Of the two uniform wheels, one designated *a*, is the automatic box wheel, engaged with a driving wheel *v*, and the other, designated *u* drives the box wheel *t*.

For adjusting the bearing according to length of the spindles the part *s* can be shifted by means of worm gear *z*.

The part *s* can be lifted out of the part *r* rotated, and re-engaged, and by adjusting the frame *i* vertically and horizontally the wheel *a* can be engaged with a driving wheel *v* of any desired diameter.

It will accordingly be seen that with the four rollers there can be produced without change of position:—

Four simple, original patterns,
Six different two-color patterns;
Four different three-colored patterns;
One four-color pattern,

that is to say fifteen patterns, whereas heretofore the utility of four rollers was limited to making four simple patterns, because the designs were not based on a system enabling them to be combined. Additional combinations can, of course, be made by shifting the rollers, as is shown, for example, in Figs. 20 to 22.

An important advantage of the invention is that it reduces the necessity of re-engraving the printing rollers, because the uniform scale on which the patterns are designed enables fresh patterns to be produced by permutation. This results in a great saving of material and labor, enabling production to be increased on a scale which can as yet hardly be estimated.

The method can be applied to piece-goods as well as to wall paper and the like.

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

1. The process of printing patterns on fabrics, which consists in subjecting the fabrics to the action of a series of printing rollers each bearing a single pattern, thereby to transfer to the fabrics the circumferential and longitudinal repeat of the single pattern of each of the series as a multiple of a common unit of measure, the length of said repeats being equal to the length of the least of the circumferential and longitudinal repeat of the single pattern.

2. The process of printing patterns on fabrics, which consists in subjecting the fabrics to the action of a series of printing rollers of slightly different diameters each bearing a single pattern, thereby to transfer to the fabrics the circumferential and longitudinal repeat of the single pattern of each of the series as a multiple of a common unit of measure, and retarding the rotation of some of the rollers in relation to the other rollers thereby to compensate for the difference in size of the rollers.

3. In a multi-color printing apparatus, the combination of a rotatable shaft carrying a

printing roller, a sleeve secured to said shaft for rotation therewith, a driven member mounted on said sleeve for rotation relatively thereto and adapted to receive motion from a suitable source of power, and means for locking said member and sleeve for rotation together and adapted to cause a lag in the rotation of the sleeve once during each complete revolution of said driven member.

4. In a multi-color printing apparatus, the combination of a rotatable shaft carrying a printing roller, a sleeve secured to said shaft for rotation therewith, a gear wheel mounted on said sleeve for rotation relatively thereto, means carried by said sleeve and wheel for locking them for rotation together, and means operative once during each complete rotation of said wheel to engage said locking means and cause a lag in the rotation of the sleeve.

5. In a multi-color printing apparatus, the combination of a rotatable shaft carrying a printing roller, a sleeve secured to said shaft for rotation therewith; a driven member mounted on said sleeve for rotation relatively thereto and adapted to receive motion from a suitable source of power, a worm wheel carried by said sleeve, a shaft mounted for rotation in bearings carried by said driven member, a worm carried by said shaft in engagement with said worm wheel, and means for causing a partial rotation of the worm thereby to cause a lag in the rotation of the sleeve once during each complete rotation of the driven member.

6. In a multi-color printing apparatus, the combination of a rotatable shaft carrying a printing roller, a sleeve secured to said shaft for rotation therewith, a driven member mounted on said sleeve for rotation relatively thereto, a worm wheel carried by said sleeve, a shaft mounted for rotation in bearings carried by said driven member, a worm carried by said shaft in engagement with said worm wheel, and adjustable means for causing a partial rotation of the worm thereby to cause a lag in the rotation of the sleeve once during each complete rotation of the driven member.

7. In a multi-color printing apparatus, the combination of a rotatable shaft carrying a printing roller, a sleeve secured to said shaft for rotation therewith, a driven member mounted on said sleeve for rotation relatively thereto, a worm wheel carried by said sleeve, a shaft mounted for rotation in bearings carried by said driven member, a worm carried by said shaft in engagement with said worm wheel, a ratchet wheel carried by said worm shaft for rotation therewith, and a stop member adapted to engage said ratchet wheel once during each complete rotation of said driven member thereby to cause a partial rotation of said worm and produce a lag in the rotation of the sleeve.

8. In a multi-color printing apparatus, the combination of a rotatable shaft carrying a printing roller, a sleeve secured to said shaft for rotation therewith, a driven member mounted on said sleeve for rotation relatively thereto, a worm wheel carried by said sleeve, a shaft mounted for rotation in bearings carried by said driven member, a worm carried by said shaft in engagement with said worm wheel, a ratchet wheel removably carried by said worm shaft for rotation therewith, and an adjustable stop member adapted to engage said ratchet wheel once during each complete rotation of said driven member thereby to cause a partial rotation of said worm and produce a lag in the rotation of the sleeve, the organization being such that the extent of said lag may be varied.

In testimony whereof I have signed my name to this specification.

JOHANN JOSEF BAUER.