Aug. 6, 1940. G. H. TILLETT 2,210,474

COLOR PRINTING WEB

Filed Jan. 31, 1939 4 Sheets-Sheet 1

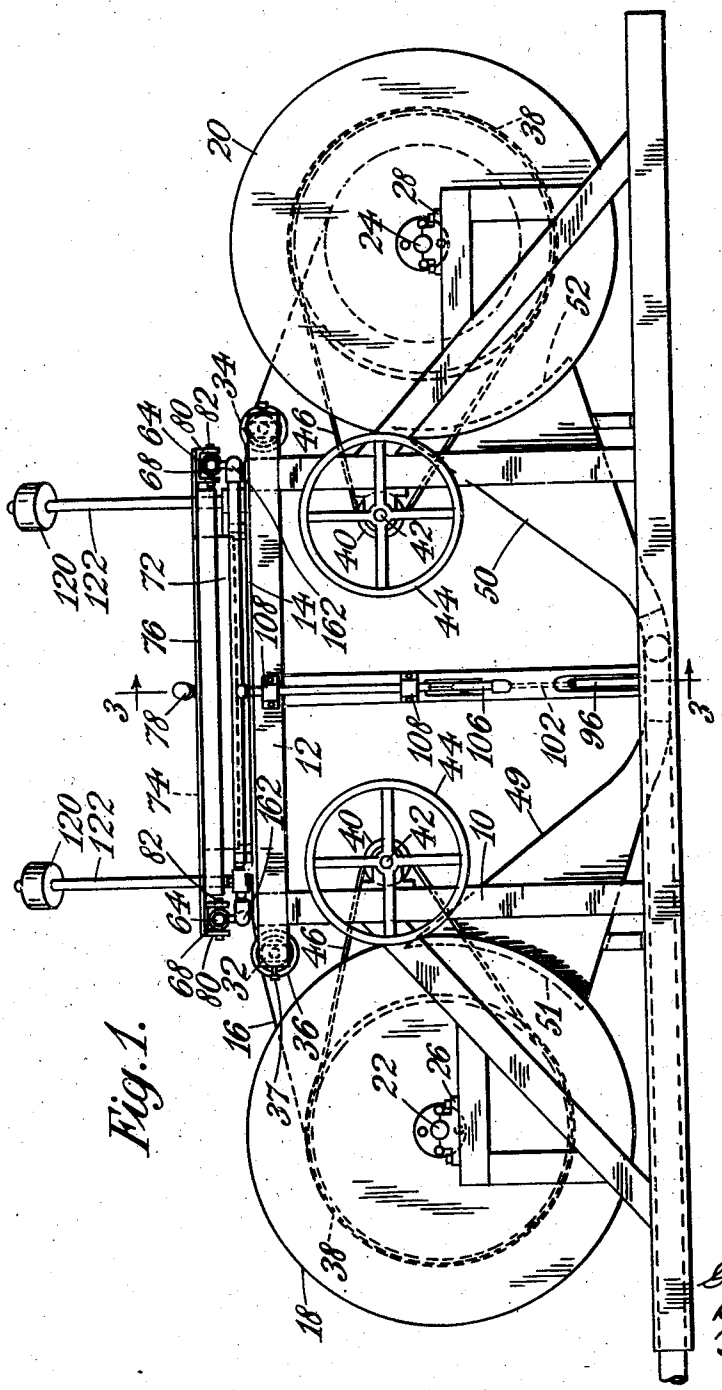

Fig. 1.

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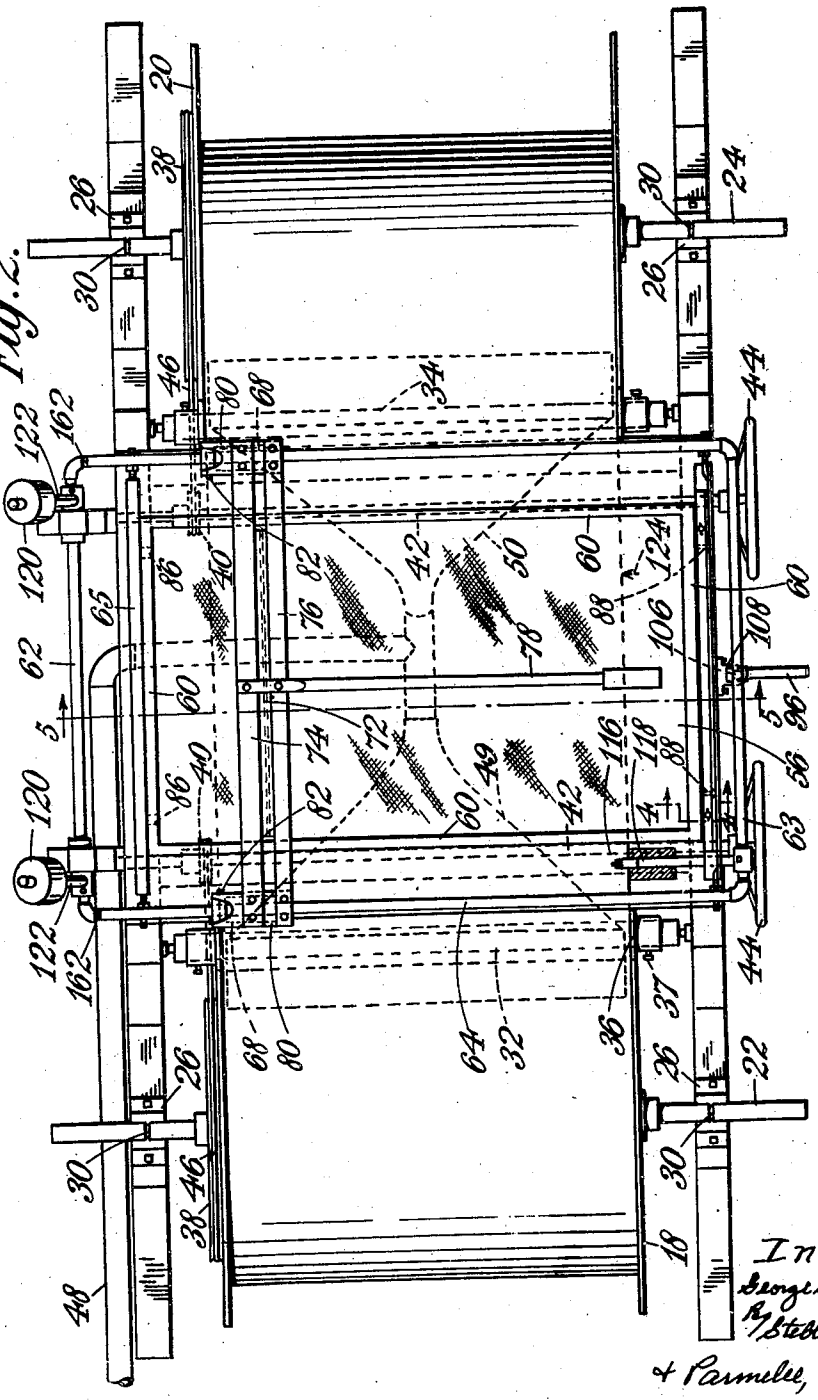
Fig. 2.



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COLOR PRINTING WEB

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Fig. 3.

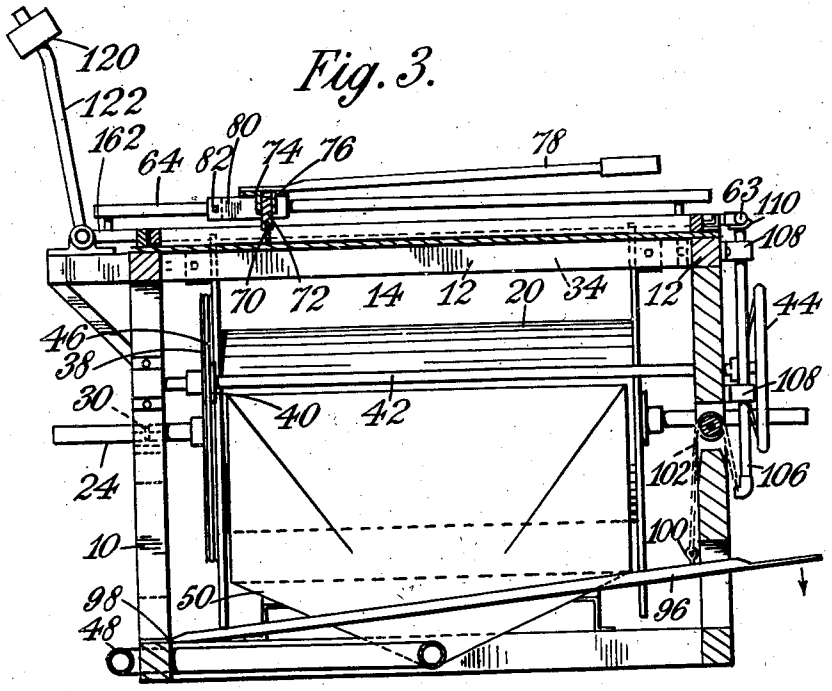


Fig. 4.

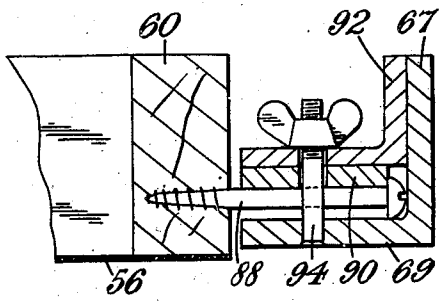
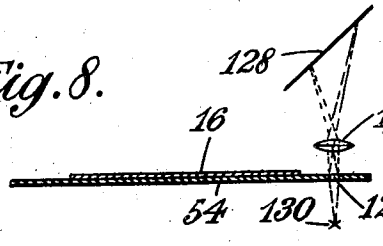


Fig. 8.



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COLOR PRINTING WEB

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Fig. 5.

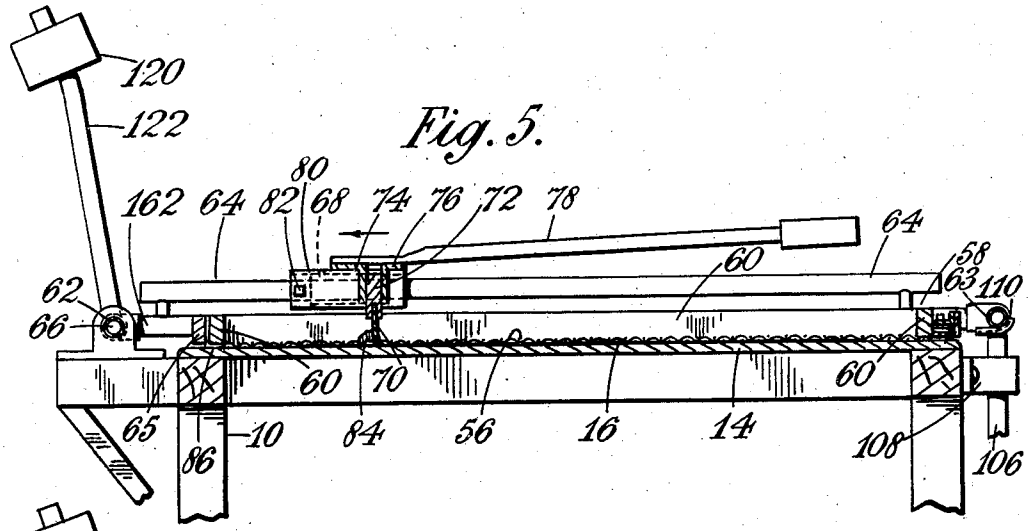


Fig. 6.

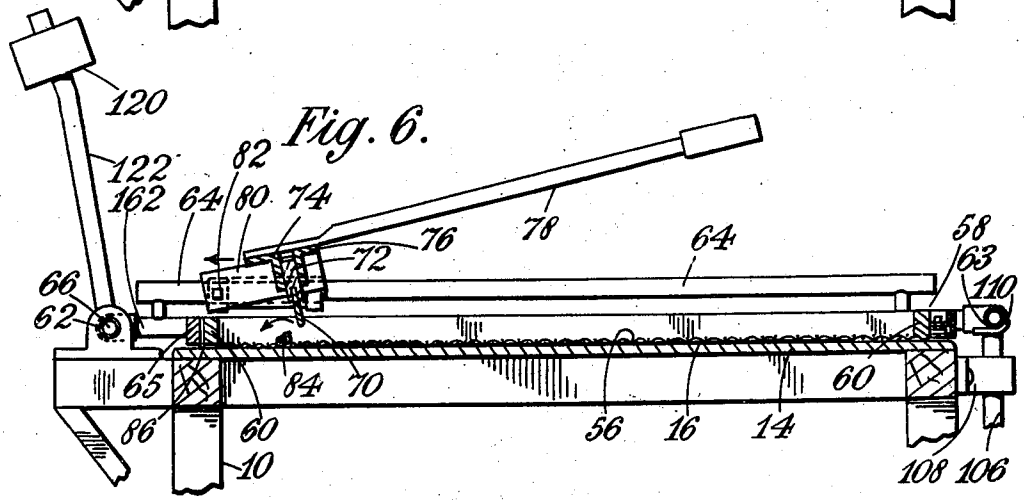
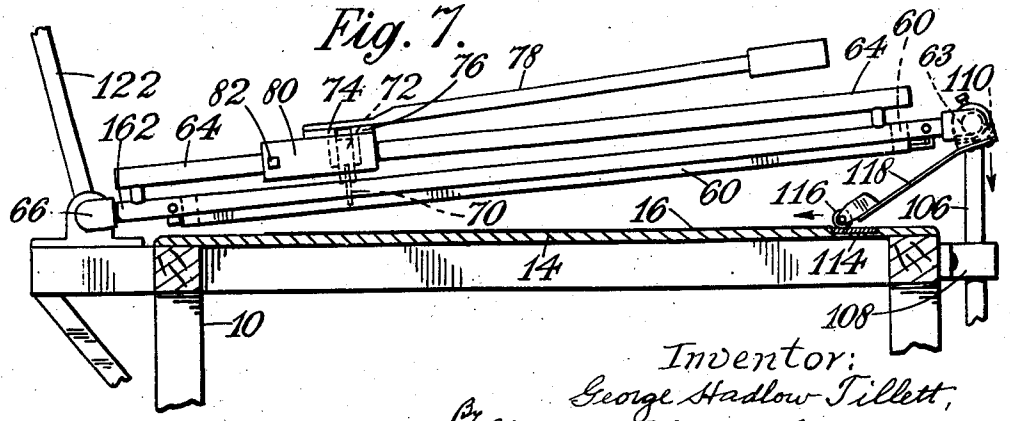


Fig. 7.



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UNITED STATES PATENT OFFICE

2,210,474

COLOR-PRINTING WEB

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Application January 31, 1939, Serial No. 253,937
In Great Britain February 5, 1938

6 Claims. (Cl. 101—126)

This invention is for improvements in or relating to color-printing machines for printing repeat patterns by means of a stencil upon continuous lengths of fabric, paper or the like, hereinafter referred to generally as webs, and methods of color-printing the same.

Heretofore, such webs have been hand printed on long trestles or tables, by means of a manually-operated stencil, such as a silk screen, mounted in a frame, and the present invention has for its main object to provide an improved method of color-printing webs by means of stencils which shall effect a very considerable saving of time and labour as compared with the methods used heretofore.

Another object is to provide an improved color-printing machine for printing webs by means of a stencil which shall occupy a very much smaller space, and can be operated at a much higher speed than the apparatus used heretofore.

According to the invention there is provided a method of color-printing webs by means of a stencil through which the ink is supplied to an underlying web on a supporting bed, consisting in feeding the web intermittently over the bed after one printing operation a distance equal to the width of the print measured in the direction of length of the web, and printing the web after each intermittent feed thereof, whereby the web has applied to it a plurality of repeats adjacent to one another.

Alternatively, the method may consist in feeding the web after one printing operation a distance equal to twice the width of the print measured in the direction of length of the web, then printing on the web again and so on, whereby the web has applied to it a plurality of spaced repeats that alternate with spaces of the same width as the repeats, and then reversing the direction of feed of the web and printing alternate repeats at the spaces in register with the first-mentioned spaced repeats.

Preferably, the web, when being provided with the said spaced repeats, is unwound from a feed roll, passes over the bed and is wound up on a take-up or batching roll, which serves as a feed roll when the direction of feed is reversed and the alternate repeats are printed.

Conveniently, two cylinders or drums alternately serve one as a feed roll, and the other as a take-up roll for the web.

The invention also provides a machine for color-printing webs comprising a bed for supporting the web to be printed, a pivoted stencil frame carrying a stencil movable into and out of an operative position in relation to the web on the bed for use in intermittently printing repeats on the web in the direction of its length, and feed means for intermittently feeding the web over the bed.

Feed means may be arranged to feed the web intermittently over the bed in opposite directions.

Preferably, the feed means comprises a combined take-up and feed batching roll, and means for rotating it to receive the web after it has been printed with a plurality of adjoining repeats, or a plurality of spaced repeats that alternate with spaces of the same width as the repeats.

The feed means may comprise two combined feed and take-up batching rolls each serving alternately for feeding and taking up the web as set forth in the preceding paragraph during the printing of the spaced and alternate repeats.

The improved machine is preferably used with a web affixed, while flat, by adhesive to a flat carrier band, and the feed means preferably comprises a feed roll and take-up roll each of such a diameter that when the band lies on it, the curvature is such that the difference in length of the radii of curvature of the web and band is negligible as regards its effect on the relative degree of tension to which the web and band are subjected due to their curvature.

The web may extend over the bed between two batching rolls at opposite ends of the bed, and may pass over positioning means for positioning the web, with or without a carrier band therefor, on the bed in a direction transversely of the direction of travel of the web.

Each batching roll may be provided with means for supplying conditioned air to the printed web on it.

The invention will now be described by way of example with reference to the accompanying drawings, wherein:

Figure 1 is an elevation showing one form of color-printing machine according to the invention for carrying the improved method into practice,

Figure 2 is a top plan view thereof, and

Figure 3 is a vertical section taken on the line 3—3 in Figure 1, and

Figure 4 is an enlarged detail sectional view taken on the line 4—4 in Figure 2;

Figure 5 is a sectional elevation, on a scale larger than that of Figures 1 to 3, taken on the line 5—5 in Figure 2, showing the stencil frame with a squeegee in one position thereof, and

Figure 6 is a like view of the parts shown in

Figure 5, but with the squeegee in another position, and

Figure 7 is a side elevation of the lifted stencil frame, and

Figure 8 is a diagrammatic sectional view on an enlarged scale illustrating a carrier band carrying the web to be printed on, and optical registering means for the web.

Like reference characters designate like parts throughout the several views.

Referring first to Figures 1 to 3, a color-printing machine for printing fabrics and the like according to the method described above, comprises a main frame having legs 10 carrying an upper horizontal portion 12 which carries a horizontal table or bed 14 for supporting a web 16 to be printed upon in color by means of a stencil mounted on a stencil frame as described hereinafter. Two batching rolls 18, 20 are respectively journalled by means of spindles 22, 24 in bearings 26, 28, respectively, on the frame at its ends. Each of these rolls 18, 20 is in the form of a cylinder or flanged drum of relatively large diameter, e. g. 3 feet, and serves for feeding the web to be printed over the bed 14, or taking up the printed web, or both feeding and taking up the web. As shown at 30, the spindles may have annular grooves for receiving co-operating annular ribs of the bearings and thereby positioning the rolls in the frame in the axial direction of their spindles.

Positioning means for positioning the web 16, with or without a carrier band, on the bed in a direction transversely of the length of the web, comprises two guide rollers 32, 34, situated between the ends of the bed 14 and the rolls. These rollers 32, 34 carry flanged collars 36 slidable along them and carrying fixing screws 37. The distance between the two flanges of each of these rollers is equal to the width of the web, or of the band carrying the latter.

The batching rolls 18, 20 may be rotated in any convenient manner. As illustrated, a manually-driven belt drive of similar construction is provided for each roll. Each belt drive comprises a grooved pulley 38 of relatively large diameter on one end of the drum, and a smaller grooved pulley 40 fast on a shaft 42 that is journalled in the frame and carries at the front side of the latter, a hand wheel 44, a belt 46 or other flexible transmission member being carried by the pulleys 38, 40. By rotating one or other of the hand wheels 44, the web 16 can be fed in either direction over the bed 14.

In some cases, the rolls 18, 20 may be power-driven, e. g. by an electric motor, and may be geared together by gearing, such as a spiral friction drive or chain gear which admits of "slip," so that the peripheral speeds of the two rolls shall be uniform even when their diameter changes owing to variation in the amount of web wound on them.

When power driven, there may be combined with each batching roll or drum, braking means, not shown, for instantaneously stopping it when desired; the brakes may be operated by a spring and held off against the action of the spring by an electromagnetic device which controls a catch. The electric circuit may be of known arrangement, but may pass through contacts arranged immediately above the path of the web over the bed, so that when other contacts placed on the web arrive at a predetermined situation they complete the electric circuit, thereby operating the catch for the brakes and allowing the latter to stop the rotation of the rolls. As described hereinafter, at each printing operation by means of the stencil there may be printed on the edge of the web or on its carrier band a small mark of an electrically-conducting material, e. g. graphite, black lead or gold size mixed with a conductor, which operates as an electric contact piece when it reaches the circuit-opening position referred to above.

Each batching roll is preferably provided with means for supplying conditioned, e. g. dry, air to the printed web thereon. This means may comprise a supply conduit or trunk 48 for supplying fluid drying medium, e. g. hot or cold air, to two chambers 49, 50 having outlets 51, 52, respectively, which embrace the rolls at their peripheries. Conditioned air escaping from the chambers 49, 50 may serve to dry the printed web before it is actually rolled round one of the batching rolls.

Before being inserted into the machine, and before being printed, the web, which may be a textile fabric such as cotton, linen, natural silk or artificial silk, or wool, is preferably fixed by an adhesive, such as gum, to a carrier band which preferably consists of relatively stiff material, such as linoleum, American cloth, rubberised woven fabric such as duck, or stiff paper which may be waxed or waterproofed. A fragment of such a carrier band 54, together with the web 16 affixed thereto, is diagrammatically illustrated in Figure 8 on an enlarged scale.

When the carrier band 54 is waxed, the web 16 may in some cases be fixed by means of a heated roller without the use of an additional adhesive. Stiff paper, known in the trade as "glazed buff casing," is suitable as a carrier band; it may contain casein for waterproofing it. When supported on such a carrier band, the web is stiff in a transverse direction and can be correctly positioned on the bed 14 by the discs or flanges 36 on the guide rollers 32, 34.

As shown most clearly in Figures 5 and 6, a stencil 56, such as a silk screen, is carried in a stencil frame designated generally 58. This frame 58 carries a rectangular mount 60, e. g. of wood, having the stencil 56 at its underside. A rectangular frame having a rear end member 62, side members 162, and a front end member 63, preferably of metal, is pivotally mounted by means of its rear end member 62 at 66 on the upper part 12 of the main frame. A second rear end member 65, and a second front end member 67 are adjustable endwise in this frame 62, 162, 63 by means of nut-equipped screws fixed to their ends. The side members 162 carry guide rails 64 constituted by metal tubes, and two sleeves 68 constituting bearings are slidable one along each rail. These sleeves 68 may make a sliding fit with the rails 64, or, alternatively, rotatory bodies, such as steel balls, may be arranged within each sleeve, in which case closure means at the ends of the sleeves will preferably be provided for retaining the balls therein. A squeegee 70, constituted by a strip of rubber carried by a bar 72 forming the head of the squeegee, is reciprocable over the stencil, and is mounted on the sleeves 68 so as to be freely slidable in the stencil frame from one end thereof to the other. As illustrated, two bars 74, 76, each of inverted L-shape in cross-section, carry the bar 72 of the squeegee between them, and are operatively connected to the sleeves 68.

The squeegee is provided with a handle member 78 that is relatively long, e. g. substantially as

long as the width of the web, so that an operator at the front side of the machine can readily reciprocate the squeegee the entire length of the stencil between its front and rear ends. This handle member 78 also constitutes lifting means for lifting the squeegee 70 at the end of its outward stroke over the mass of color or ink swept in front of it over the stencil. As shown most clearly in Figure 1, the two bars 74, 76 are fixed at their ends to the top of shoes 80 of inverted U-section which lie along and embrace the sleeves 68 and are pivoted to their ends at 82. Consequently, when the handle member 78 is lifted to the position shown in Figure 6, the squeegee 70 can be moved from the front to the rear side of the mass of color indicated at 84 that may have collected near the rear end of the screen during the printing operation.

The mount 60 carrying the stencil 56 may be supported in the stencil frame in any convenient manner. As illustrated, the rear end of this mount is supported by two lugs 86 fixed to the member 65 of the stencil frame, while, as shown most clearly in Figure 4, the front end of the mount 60 carries two headed screws 88 extending forwardly from it. The member 67 of the stencil frame is of L-section, on the lower horizontal web 69 of which the screws 88 rest and support the mount 60. In order to fix these screws 88 in position, a flat bar 90 is placed over them, and an L-shaped bar 92 is placed thereon. These bars are perforated to receive nut-equipped studs 94 which are carried by the horizontal limb 69 of the member 67.

Lifting means is provided for rocking the stencil frame upwards and thereby lifting the stencil 56 away from the web beneath it. As shown most clearly in Figures 1, 3 and 7, this lifting means comprises a treadle member 96 that is pivoted at 98 at the rear side of the main frame and extends towards the front side where it is attached at 100 to one end of a cord 102, chain or the like that is carried by a pulley 104 and has its other end connected to the lower end of a vertical lifting rod 106 that is movable in guides 108 on the main frame and has at its upper end a shoe 110 supporting the front end member 63. By depressing the front end of the treadle 96 with the foot, the stencil frame can be readily lifted from its operative position shown in Figures 5 and 6 to its elevated position shown in Figure 7, in which position the printed web can be readily removed from the machine and a new one inserted. If desired, the lifting means of the stencil frame may be manually operable.

Means for marking the web or its carrier band for registering purposes is provided at any convenient situation on the top of the main frame. As shown most clearly in Figures 2 and 7, a marking device comprises an inked pad 114 provided on the bed 14 at a situation adjacent to the front longitudinal edge of the web. An inking roller 116 carried by a blade spring 118 attached to the under side of the end member 63 of the stencil frame is so arranged that when the stencil frame is lifted in its position shown in Figure 7, the ink roller 116 is on the pad 114, but when the stencil frame is lowered, the roller runs on to the web 16, or its carrier band, and makes a mark, which may be electrically conducting, thereon.

When the machine is in use, the web 16 alone, or the carrier band 54 with the web 16 on it, is wound almost completely on to one batching drum and printing is commenced at one end of the web. The first impression is made by lowering the stencil frame, and reciprocating the squeegee 70 after color has been supplied to the top face of the stencil, whereupon the stencil is rocked upwards by the described lifting means, this movement preferably being assisted by one or more counterweights 120 each adjustably carried by an arm 122 fixed to the stencil frame at its rear end. The web is then fed forwards a distance equal to the width of the print measured in the direction of length of the web, whereupon the stencil is lifted again, the web is fed forwards the same distance, and so on, whereby the web has applied to it a plurality of repeats adjacent to one another. Each time the stencil is lowered, a mark is made by the printing roller 116 on the web or its band, and when the web is fed forward, this mark is placed into register with an index 124 marked on the top of the bed 14, as shown in Figure 2. When commencing printing of a web, the index 124 will be placed at such a distance from the marking roller 116 that it is exactly equal to the width of a repeat to be printed.

Instead of printing the repeats adjacent to one another, the machine may be so operated by turning a batching roll that the web is fed forwards each time a distance equal to twice the width of the print measured in the direction of length of the web, so that the web has applied to it a plurality of spaced repeats that alternate with spaces of the same width as the repeats. The web, provided with spaced repeats, will then be fed intermittently over the bed again, in the same or in the opposite direction, and the alternate repeats will be printed at the spaces in register with the first-mentioned spaced repeats. If the direction of feed is reversed, the batching drum on which the web is first taken up becomes a feed drum, and the web provided with adjacent repeats along its length is wound up on the drum first used which becomes a take-up drum. This operation may be repeated as many times as is necessary for providing a finished pattern on the web, depending on the number of colors that have to be used.

When an electric motor is used for operating the machine, electrical contacts may be arranged to co-operate with printed graphite or the like on the band which are preferably movable so that adjustments of the control can be made. Also, provision may be made that the operation of raising the stencil frame ensures that brakes provided on the motor-driven drums shall be released therefrom.

Owing the the drums being readily detachable from their bearings, either of them can be used as a batching drum, on to which an unprinted web can be wound in the first instance to serve as a feed drum. Instead of winding the web, with or without its carrier band, on to one of the two batching drums, however, when commencing the printing of a web, the same may be unwound from a separate feed spindle distinct from the batching drums mounted in any convenient position at the feed-end of the bed.

The squeegee with its head and supporting bar is preferably so heavy that when an operator pushes it by means of its long handle member, sufficient pressure is exerted under gravity by the squeegee on the stencil, without the operator having to exert any manual downward pressure for effecting the printing operation. If desired, the pressure under gravity can be varied by adding weights to or removing them from the squee-

gee, or by using parts, such as squeegee heads, of light or heavier materials.

In some cases, optical positioning means may be provided for registering purposes. As diagrammatically shown in Figure 8, such positioning means may comprise a mark in the form of a hole 126 in the carrier band 54, and optical enlarging means for producing an enlarged image of the mark on a screen 128 or like surface visible by the operator. This enlarging means may comprise a source of light 130 below the bed for directing a beam of light through the hole on to the screen situated above the machine. If desired, a magnifying lens 132 may be situated between the screen and the hole. The stencil frame may carry a punch, not shown, for punching a hole in the carrier band each time the stencil is lowered for performing a printing operation. When commencing printing of a web, two holes accurately spaced apart the correct distance according to the repeats are made in the carrier band, the first serving for the production of an image in the form of a circular disc of light on the screen, and the second preferably being punched when printing the first repeat. Before feeding the web, a positioning circle or other permanent mark may be drawn on the screen 128 to correspond with the image of the hole enlarged by the lens. This enables the operator to move the carrier band until the enlarged image formed by the second hole registers exactly with the circle or other mark drawn on the screen.

Various modifications may be made in the details of construction described above without departing from the invention. For example, in some cases the axis of pivoting of the stencil frame may lie transversely of the direction of length of the web. Also, paper and other material, e. g. linoleum, may be printed in a like manner with color or colored ink.

I claim:

1. A method of color-printing webs by means of a stencil, through which the color is supplied to an underlying web on a supporting bed, comprising the steps of feeding the web over the bed in one direction after one printing operation a distance equal to twice the width of the print measured in the direction of length of the web, printing the web again, then feeding the web the same distance in the same direction and printing on it again, and so on, whereby the web has applied to it a plurality of spaced repeats that alternate with spaces of the same width as the repeats, and then intermittently feeding the web provided with spaced repeats over the bed and printing alternate repeats at the spaces in register with the first-mentioned spaced repeats.

2. A method of color-printing webs according to claim 1, wherein, after printing the first-mentioned spaced repeats, the direction of feed of the web is reversed for printing the alternate repeats.

3. A method of color-printing webs by means of a stencil, through which the color is applied to an underlying web on a supporting bed, comprising the steps of feeding the web from a feed roll over the bed in one direction after one printing operation a distance equal to twice the width of the print measured in the direction of length of the web, printing the web again, then feeding the web the same distance in the same direction and printing it again, and so on, winding on a take-up roll the web having applied to it a plurality of spaced repeats that alternate with spaces of the same width as the repeats, then using the take-up roll as a feed roll and intermittently feeding the web provided with spaced repeats over the bed in the opposite direction and printing alternate repeats at the spaces in register with the first-mentioned repeats, and taking up the web provided with adjacent repeats on the first-mentioned feed roll.

4. A machine for color-printing webs, comprising a bed for supporting the web to be printed, a pivoted stencil frame carrying a stencil movable into and out of an operative position in relation to the web on the bed for use in intermittently printing repeats on the web in the direction of its length, feed means for intermittently feeding the web over the bed, and automatic marking means comprising a marking member that is carried by the stencil frame, which marking means contacts the web and marks it each time the stencil is moved from its inoperative to its operative position in relation to the web.

5. A machine for color-printing webs, comprising a bed for supporting the web to be printed, a pivoted stencil frame carrying a stencil movable into and out of an operative position in relation to the web on the bed for use in intermittently printing repeats on the web in the direction of its length, feed means for intermittently feeding the web over the bed, and automatic marking means for marking the web, which marking means comprises an inked pad fixed in relation to the web, and an inking roller that is carried by the stencil frame and is movable from off the pad towards the web, when the stencil is placed on to the web, and is returned to the pad when the stencil is removed from the web.

6. A machine for color-printing webs, comprising a bed for supporting the web to be printed, a stencil frame carrying a stencil movable into and out of an operative position in relation to the web on the bed for use in intermittently printing repeats on the web in the direction of its length, feed means for intermittently feeding the web over the bed, two bearings slidable freely on the stencil frame in a direction lying transversely of the length of the bed, and a squeegee carried by said bearings, which squeegee has a handle member substantially as long as the width of the web, and is pivotally mounted on said bearings.

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