Aug. 2, 1960 R. KRAFT 2,947,246

SCREEN PRINTING MACHINE COMPRISING ENDLESS TEMPLATES

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FIG. 1

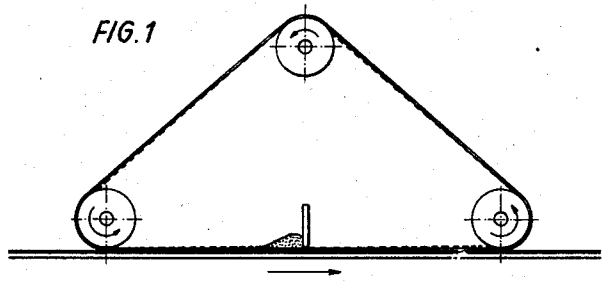


FIG. 2

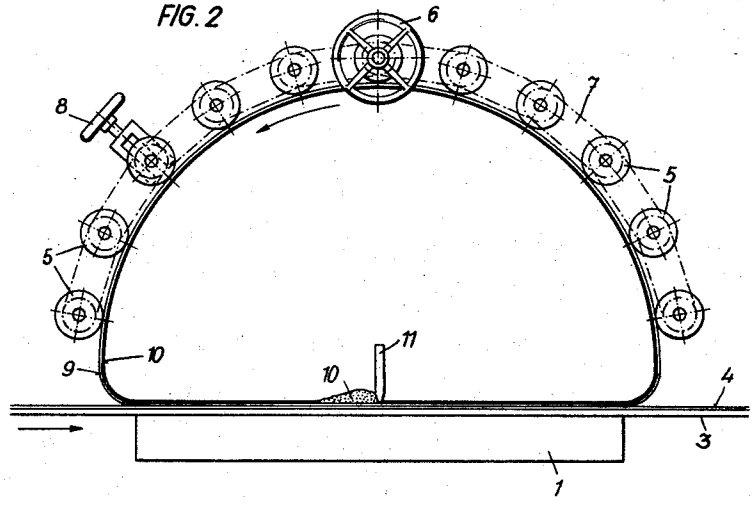
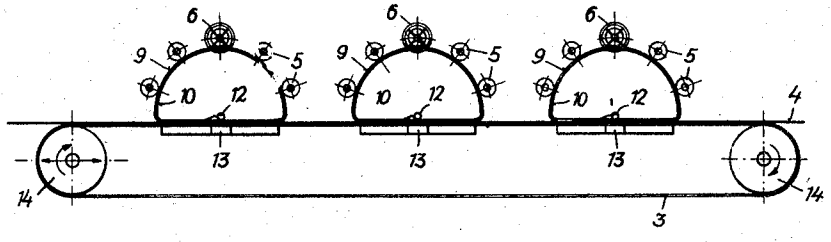



FIG. 3




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FIG. 4

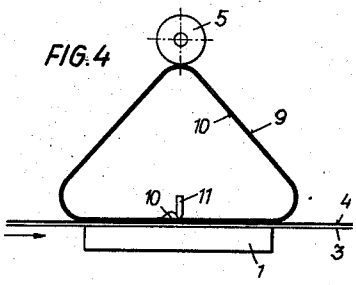



FIG. 5

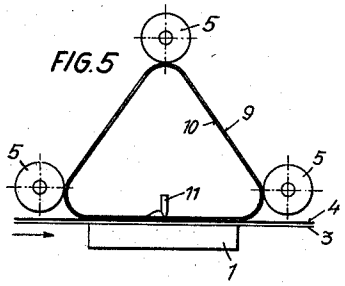



FIG. 6

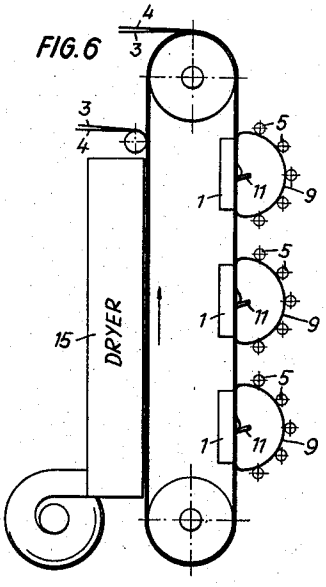



FIG. 7

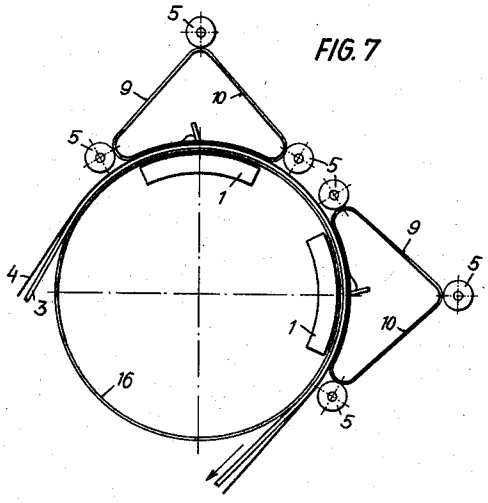
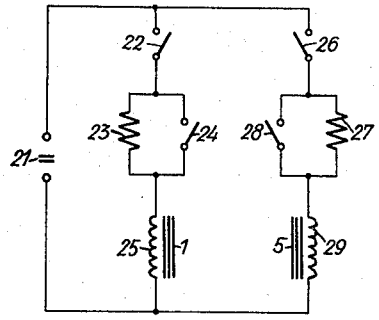



FIG. 8




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# SCREEN PRINTING MACHINE COMPRISING ENDLESS TEMPLATES

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11 Claims. (Cl. 101—122)

In screen printing machines comprising endless templates, difficulties were previously involved in the storage of the template belts because the material which remains on the inside of the templates behind the doctor means, namely, ink, binder or other material, such as kaolin for paper treatment of etching agents for textiles was forced by the guide rollers through the template to the outside thereof and gave an undefined, smeared appearance to the outline of the patterns. This is diagrammatically shown by way of example in Fig. 1. The material to be printed is pasted on a blanket and printed by means of a template moved around three rollers arranged in a triangle. The ink or binder or other material is applied from the inside and scraped by means of a doctor. As is apparent from the drawing, ink remains nevertheless on the inside of the template. This ink accumulates near the right-hand tension roller to form a wedge, which is then forced through the template to the outside thereof. Similar wedges form at the two other tension rollers so that the endless template comprises on the outside ink or binder forced through the template and the patterns are not reproduced with the desired definition on the material to be printed.

This known screen printing machine has the additional disadvantage of requiring a device which ensures synchronism between the blanket with the material pasted thereon and the endless template. In multi-colored printing using several template belts, therefore, it is extremely difficult to provide registry of the patterns produced by the several templates. Besides, it is not very simple to exchange templates because the tension rollers lie on the inside thereof. It is diffcult to bring the endless template belt into contact with the blanket and the material pasted thereon because the tension roller shown on the right in the drawing squeezes the scraped patterns whereas the tension roller shown on the left in the drawing transmits the ink etc. urged to the outside of the belt in an undesirable manner unto the material.

It is an object of the invention to eliminate these disadvantages of the known screen printing machine. With this object in mind it is proposed to use templates of material which is responsive to magnetic forces and to provide externally disposed magnetic (permanent-magnetic or electromagnetic) rollers for guiding the templates and a magnetic (permanent-magnetic or electromagnetic) faceplate as a blanket printing table. Thus all disadvantages of the internal tension rollers are eliminated. A suitable material for the templates is steel or iron wire mesh having a corrosion resisting surface, or even one of the usual materials if iron powder or the like is added to the template varnish.

Fabrics for printing templates which consist partly or entirely of metal wire have already been proposed but only for improved wear, not in combination with permanent-magnetic or electromagnetic rollers and/or faceplates.



Illustrative embodiments of screen printing machines constructed according to the invention are shown in the drawings in diagrammatical side elevation.

Fig. 2 is a machine for two-color printing,

Fig. 3 is a machine for three-color printing, with arcuately arranged rollers just as that of Fig. 2.

Fig. 4 shows a machine having only one roller.

Fig. 5 shows the machine comprising three rollers arranged in a triangle.

Fig. 6 shows a machine for three-color printing having a vertical arrangement of the faceplate tables, and

Fig. 7 shows a machine for two-color printing having printing tables in a circular arrangement.

Fig. 8 is a circuit diagram showing the means for controlling the magnetic condition of the printing table and guide rollers.

In all figures, like parts bear like reference numerals.

The embodiment according to Fig. 2 comprises an electromagnetic faceplate table **1**, over which the material **4** pasted onto the blanket **3** is moved. Above the faceplate table an arcuate series of rollers **5** is mounted on an appropriate frame, which are also magnetizable by electromagnets, not shown. Each roller **5** is connected by an endless drive chain to the adjacent roller. One of the rollers **5**, e.g., the middle one, carries a handwheel **6** for adjusting the template in the manner to be described hereinafter. The roller frame **7** can be laterally displaced by an additional handwheel **8**.

As has been mentioned hereinbefore the endless template **9** is responsive to magnetic forces and when the electromagnet is energized the template is forced against the arcuately arranged rollers **5** and the faceplate table **1**. Thus, the template is caused to assume approximately the configuration shown in Fig. 2. The ink, the binder **10** or other substance are again applied in the usual manner to the inside of the template. **11** is a suitable doctor of any desired type.

To adjust the template in the longitudinal direction the printing table **1** is only slightly energized whereas the rollers **5** are fully energized. The handwheel **6** can now be turned to displace the templates in the longitudinal direction into registry with the patterns of the preceding or succeeding template belts. By means of the handwheel **8** the frame for the templates can be laterally displaced when the printing table **1** is only slightly energized. Thus the template can be given the correct lateral adjustment. Then, the printing table **1** is fully energized and the material is caused to run through the machine. The template is strongly forced against the printing table **1** by the electromagnetic forces acting through the blanket **3** and the goods **4** and follows without slip the movements of the driven blanket **3** and the material **4** pasted thereon, whereby it slides over the printing table and is colored with the ink **10** etc. applied to the inside. Because the template is guided only on the outside, the above-mentioned soiling of the outside of the template by ink etc. forced through the template is no longer possible.

Another advantage of the construction according to the invention resides in that the templates can easily be replaced because no machine part is arranged inside the template with the exception of the doctor means.

Fig. 3 shows the construction of a machine for three-color printing. Each of the three inking devices comprises a stationary doctor consisting of a doctor roller **12** and a magnetic beam **13**. The endless blanket **3** runs around the two blanket rollers **14**, one of which is continuously driven whereas the other one serves for printing the blanket.

Only a single roller **5** is provided in the embodiment of Fig. 4. When the electromagnets are are energized the template **9** with the color **10** applied on the inside are

pulled against the faceplate 1 and upwardly through the roller 5 to assume the triangular configuration shown in the drawing.

The embodiment shown in Fig. 5 differs from that of Fig. 4 only in that two additional rollers 5 are arranged on the two lower corners of the triangle formed by the template.

Fig. 6 shows a three-color printing machine which differs from that of Fig. 3 only in that the faceplate tables 1 are vertical so that the three inking devices are arranged one below the other. Hence, the material is printed in a vertical condition. A drier 15 is associated with the opposite run.

Fig. 7 shows a machine for two-color printing, in which the printing tables 1 consisting of segments of a circle are arranged within a hollow cylinder 16 which consists of nonmagnetic material of low wall thickness and is freely rotatably driven.

Fig. 8 shows a circuit diagram of means for independently controlling the magnetic condition of the printing table 1 and of the rollers 5, only one of which is shown, respectively.

A direct current source 21, e.g., the output of a rectifier (not shown) has two parallel circuits connected thereto. The first of these circuits comprises in series a switch 22, a resistor 23 which can be shunted by a switch 24, and a magnet coil 25 associated with the face plate 1. The second circuit includes, again in series, a switch 26, a resistor 27 which can be shunted by a switch 28, and a magnet coil 29 associated with the roller 5. The full energization applied to the coils 25 and 29 when the switches 22, 24, 26 and 28 are closed can be selectively reduced by opening the switch 24 and/or 28. It is understood that the switches 22, 24, 26, 28 can be combined in a single cam-controlled switch which will automatically perform the desired switching operations in a predetermined cycle, as will be understood by a man skilled in the art.

Various modifications are possible within the scope of the invention. For instance, the electromagnets could be replaced by permanent magnets which can be disengaged. Instead of the flat printing table, a roll could be used around which the material and the template are moved.

What is claimed is:

1. A screen printing machine which comprises a magnetizable printing table, at least one endless template of material responsive to magnetic forces, magnetic rollers engaging the outside of said template for guiding said template past said table adjacent thereto to cause it to be attracted by magnetic forces produced by said table, and means for moving material to be printed between said template and said printing table to cause said template to be moved in the same direction and at the same speed as said material.

2. A screen printing machine as set forth in claim 1, in which said printing table comprises permanent-magnetic means for producing said magnetic forces.

3. A screen printing machine as set forth in claim 1, in which said printing table comprises electromagnetic means for producing said magnetic forces.

4. A screen printing machine as set forth in claim 1, in which said magnetic rollers comprise permanent-magnetic means.

5. A screen printing machine as set forth in claim 1, in which said magnetic rollers comprise electromagnetic means.

6. A screen printing machine as set forth in claim 1, in which at least one of said magnetic rollers is spaced from said printing table.

7. A screen printing means as set forth in claim 1, in which said printing table and said rollers comprise electromagnetic means, and which comprises means for energizing said electromagnetic means and control means for independently varying the energization of said electromagnetic means of said printing table and rollers, respectively.

8. A screen printing machine as set forth in claim 1, which comprises means arranged to couple said rollers for rotation.

9. A screen printing machine as set forth in claim 1, in which said means for moving said material comprise a blanket, which is at least partly vertically disposed.

10. A screen printing machine as set forth in claim 1, which said magnetic table comprises arcuate segments of a circle, there being a hollow cylinder consisting of nonmagnetic material having a thin wall surrounding said table and being freely rotatably driven by said moving means.

11. A screen printing machine as set forth in claim 1, which comprises means for independently modifying the magnetic condition of said printing table and rollers, respectively.

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