

May 1, 1928.

H. C. KESSLER, JR

1,668,322

MACHINE FOR PRINTING DESIGNS ON FLOOR COVERING.

Filed April 12, 1927

4 Sheets-Sheet 1

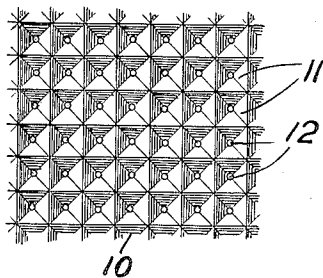


FIG. 1.

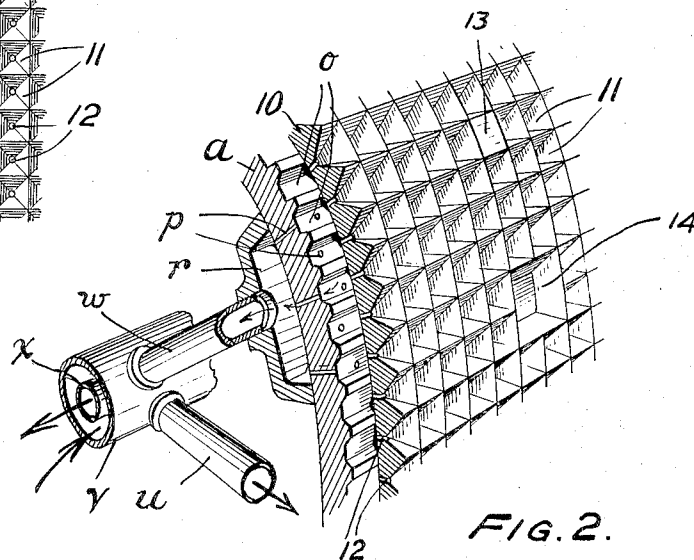


FIG. 2.

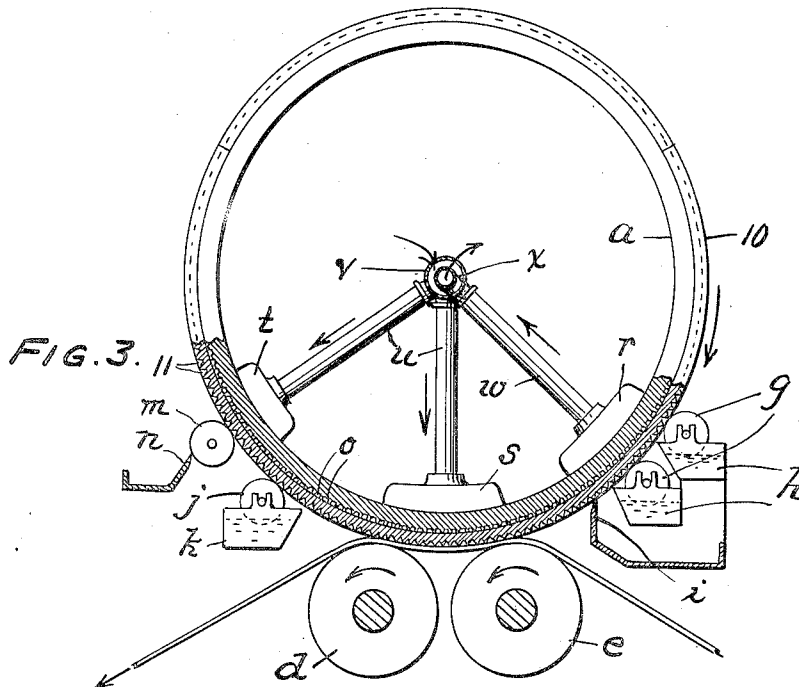


FIG. 3.

WITNESS:

*Robert R. Mitchell*

INVENTOR

*Harry C. Kessler, Jr.*

BY

*Bueller and Harding*  
ATTORNEYS.

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4 Sheets-Sheet 2

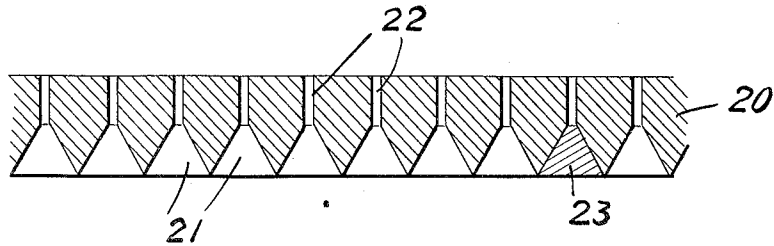


FIG. 4.

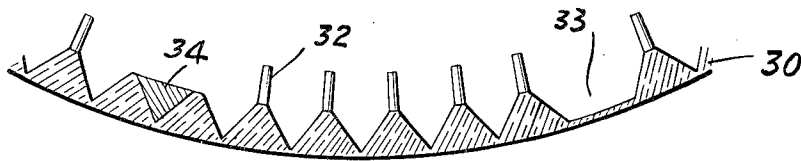


FIG. 5.

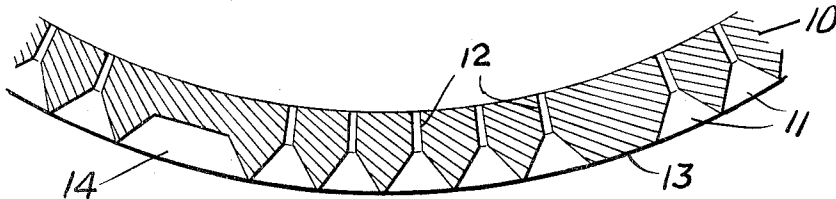
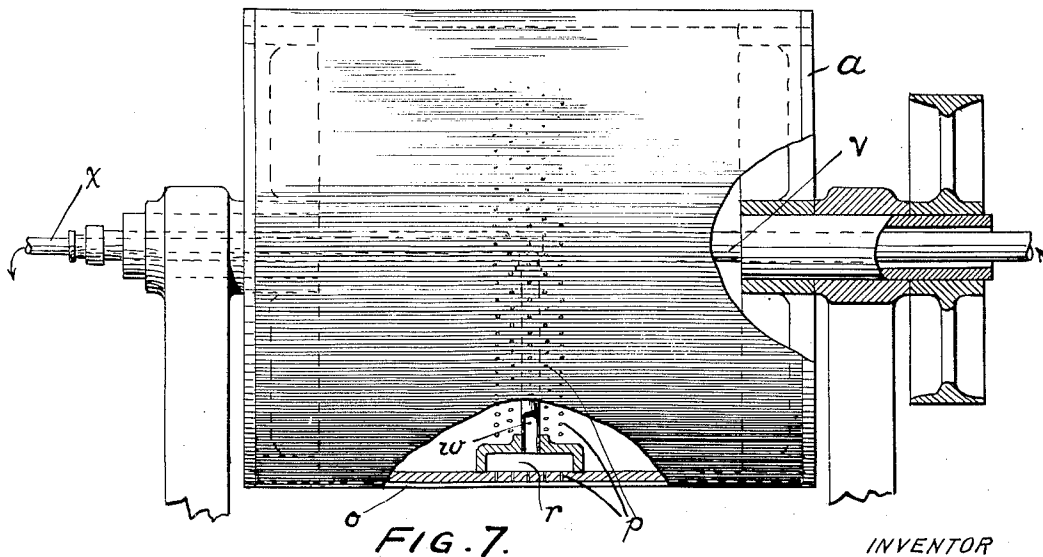


FIG. 6.



INVENTOR

WITNESS:

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MACHINE FOR PRINTING DESIGNS ON FLOOR COVERING

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4 Sheets-Sheet 3

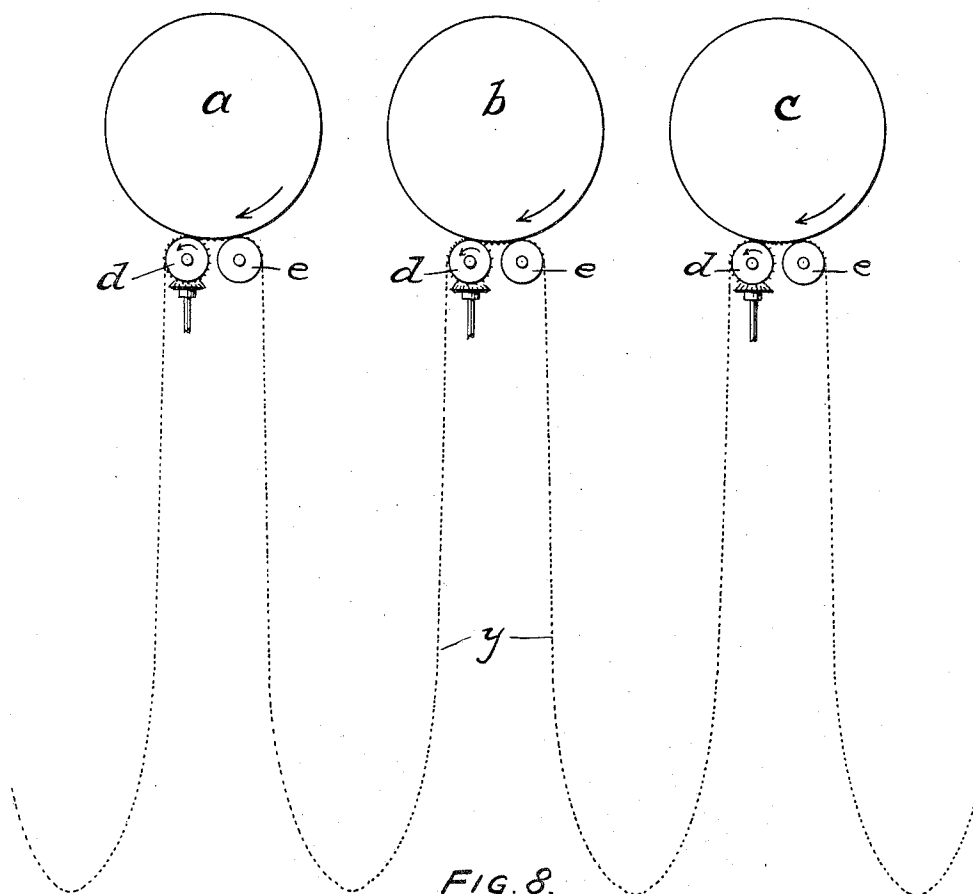


FIG. 8.

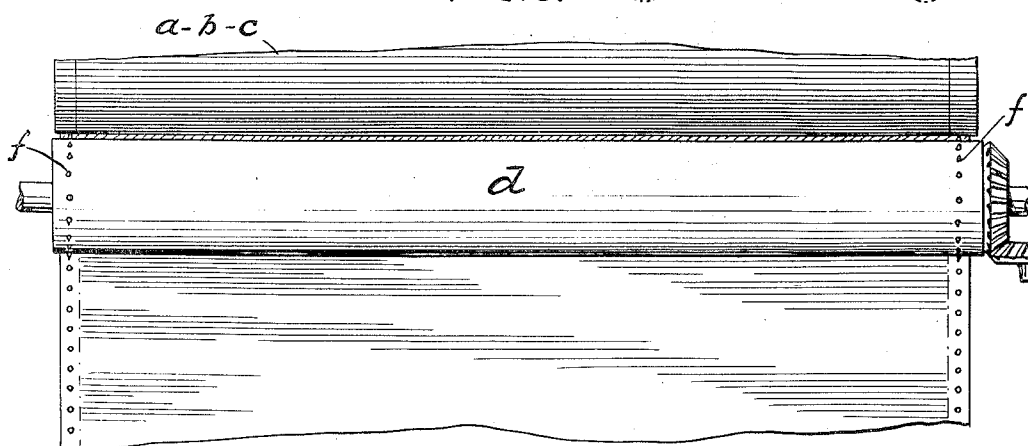


FIG. 9.

WITNESS:

*Robert R. Kitchel*

INVENTOR

*Harry C. Kessler, Jr.*

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MACHINE FOR PRINTING DESIGNS ON FLOOR COVERING

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4 Sheets-Sheet 4

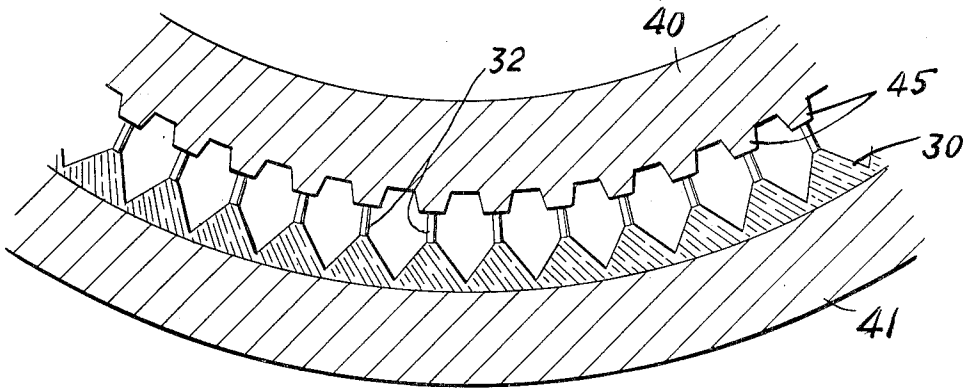


FIG. 10.

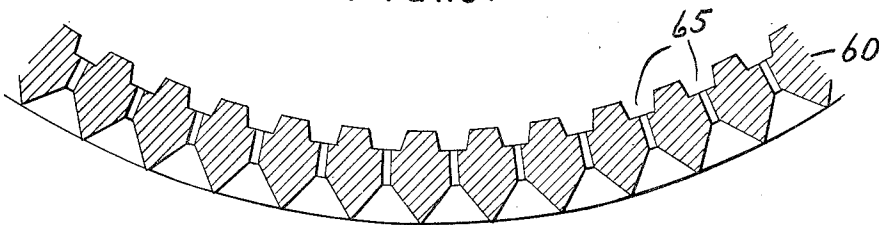


FIG. 11.

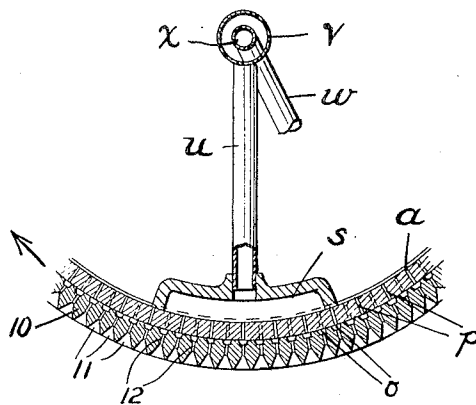


FIG. 12.

WITNESS.

*Robt. R. Mitchell.*

INVENTOR

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ATTORNEYS.

Patented May 1, 1928.

1,668,322

# UNITED STATES PATENT OFFICE.

HARRY C. KESSLER, JR., OF WARRINGTON, PENNSYLVANIA.

MACHINE FOR PRINTING DESIGNS ON FLOOR COVERING.

Application filed April 12, 1927. Serial No. 183,023.

One of the objects of my invention is to provide a machine for printing felt base floor covering, linoleum, other floor covering and sheet material generally, in a variety of colored designs. It is intended that the machine shall be operative with ink or other liquid coloring matter, but it is intended that the machine shall be particularly applicable to the use of those nitrocellulose compositions, known somewhat inaccurately as cotton lacquers, which are now in general use as substitutes for paints and varnishes and which are adapted to be applied to surfaces, such as automobile bodies, by means of a spray. The quick drying qualities of these compositions, which give them a decided advantage, over paints and varnishes in many uses, make it difficult to adapt them to color-printing. My improved machine is, however, especially adapted to utilize such compositions in multi-color printing on sheet material unwound from rolls, and, in fact, advantage is taken of the quick-drying properties of the compositions to enable the different colors to be applied successively, but in a continuous operation, with provisions for drying after the application of one color and before the application of the next color, and so that the printed product will be, at the conclusion of the operation, in finished condition ready for transportation and use.

Preferred embodiments of the invention are shown in the drawings, in which—

Fig. 1 is a face view of a section of a printing block.

Fig. 2 is a fragmentary perspective view, partly broken away, of one of the cylinders, a printing block applied thereto, and means providing air conduits and channels communicating with the pockets of the printing block.

Fig. 3 is an end view, partly in section, of a cylinder carrying printing blocks and of the ink-supplying, sheet-feeding, and residual ink-removing devices associated therewith.

Fig. 4 is a longitudinal section of a part of a die from which the matrix for the printing block is formed.

Fig. 5 is a similar view of a part of such matrix.

Fig. 6 is a similar view of a part of such printing block.

Fig. 7 is a side elevation of a cylinder.

Fig. 8 is a diagram showing an end view

of a number of cylinders and the feed rolls associated therewith, and showing the way in which the linoleum or other sheet material is fed to and from each cylinder.

Fig. 9 is a bottom view of a positively driven feed roll and of part of the corresponding cylinder.

Fig. 10 is a longitudinal section of part of the mold blocks with a matrix between them, the mold being adapted to form a channeled printing block.

Fig. 11 is a longitudinal sectional view of part of the printing block formed in the mold of Fig. 10.

Fig. 12 is a cross-sectional view of part of a smooth faced cylinder and of the printing block of Fig. 11 applied thereto.

In Fig. 8 is shown a series of rotatable cylinders, *a*, *b* and *c*, carrying printing blocks on their peripheries (as hereinafter described). Adjacent to the periphery of each cylinder is a pair of feed rolls or pulleys *d* and *e*, of which one (*d*) should be positively driven and the other (*e*) should be an idler. Each driven pulley *d* is provided, at each opposite end, with a circumferential row of sprocket pins *f* adapted to engage spaced apart holes near the longitudinal edge of a sheet of linoleum of indefinite length. Thereby the linoleum is fed into printing contact with the inked face of the cylinder at a rate precisely corresponding to the peripheral speed of rotation of the cylinder.

In passing from one cylinder to another, the sheet material is shown as being allowed to form itself into a festoon *g*. The festooned length of sheet material should be a definite one. Assuming that two printing blocks, each of an arcuate length of 180°, and each comprising one repeat of the pattern, are applied to each block, the length of the sheet material between one line of printing contact on cylinder *a* and a line of printing contact on cylinder *b* should be an exact multiple of the arcuate length of the printing block. The sprocketed connection between the feed rolls and the sheet material enables the length of material between successive cylinders to be accurately predetermined and maintained constant. The feed rolls may be positioned above the cylinders instead of below them, which modification requires no special illustration, or would be illustrated if the drawing were inverted. It is not intended to exclude the

provision of guide or supporting rolls over which the sheet material may travel in going from one cylinder to the next, but such provision is not required if the feed rolls are arranged beneath the cylinders. It is decidedly preferred to associate a plurality of feed rolls with each cylinder, so that the sheet material may contact with the printing block on the cylinder for a measurable time, although a line contact as distinguished from a segmental contact might be operative.

Each printing block 10 (see Figs. 1, 2, 3 and 6) should be of a length about equal to that of the cylinder. Each printing block is of segmental shape and its concave side conforms, in shape and size, to the periphery of the cylinder and should have such width, measured in the direction in which it is curved, that an equal number of them (two or more) will just encircle the cylinder. Each block is provided with a number of recesses or pockets 11 opening on the convex side of the block. As shown, the pockets are square in cross-section and pyramidal, or frusto-pyramidal, in shape, the bases of the pyramids (the mouths of the pockets) opening on the convex or outer face of the block while the apices of the pyramids (the contracted bottoms of the pockets) communicate with the back of the block by means of orifices 12. Adjacent walls of adjacent pockets slope toward about a common line; that is, the mouths of adjacent pockets are, preferably, spaced apart only nominal distances. The pockets are arranged in intersecting rows which (if the mouths of the pocket are square, as shown) extend lengthwise and circumferentially. The pockets may have other cross-sectional contours and the rows may extend in other directions. For example, they may be hexagonal, in which case the pockets would be arranged in rows extending in three different directions.

If it is intended that an entire block shall print a single color, the entire surface of the block should be pocketed, as shown in Fig. 1. If, however, it is desired to print only on predetermined fractional areas of the surface of the sheet material (as in the printing of designs), the remaining areas should be blocked out in one or both of two ways. If the area to be blocked out is small, I prefer that it should be done, as shown at 13 in Figs. 2 and 6, by making this area of the block solid. If the area to be blocked out is comparatively large, it is feasible to do it by making one large and imperforate pocket, as shown at 14 in Figs. 2 and 6; it being impossible for a large size pocket to fill with ink, or to remain filled with ink until it contacts with the surface of the sheet material.

The preferred method of manufacturing

the blocks will be hereinafter described. Assuming that the blocks have been made, as described, by any method, they are secured to the surface of the cylinder, as shown in Figs. 2 and 3. As the cylinder rotates it contacts with one or more rollers *g, g*, rotating in one or more reservoirs *h h* containing the color solution to be applied to the linoleum. I shall refer to this solution hereinafter as ink, by which term I intend to include any quick drying ink, any quick drying color solution, and particularly any of the known nitrocellulose solutions or lacquers which, because of their inherent quick-drying properties, are distinctly preferred. As the pocketed areas of the block contact with a roller *g*, they fill with ink. The air-escape orifices 12 in the bottoms of the pockets (which are open to air channels as hereinafter described) prevent the air in the pockets from resisting the inflow of ink; that is, they allow the free outflow of air at the bottoms of the pockets and the free inflow of ink into the mouths of the pockets.

Before the ink-containing pockets contact with the linoleum, they ride over a scraper *i*, which may remove excess ink from the pockets. The main function of the scraper, however, is to remove any ink that may adhere to the plain (unpocketed) surfaces of the printing block.

When the ink-containing pockets reach the feed rollers, the ink therein, or a substantial part thereof, is transferred to the sheet material. The two-roller feed arrangement allows pressure contact between each longitudinal row of ink-containing pockets and the linoleum during a substantial part of a revolution of the cylinder. This may not always be essential, but it insures a transfer of ink from every pocket and a more nearly complete draining of each pocket.

Upon breaking contact with the linoleum, the pockets of the printing block may not be completely drained. To insure complete elimination of ink from these pockets, the printing block, in its further rotation, contacts with a roller *j* turning in a reservoir *k* of a solvent for the ink. Beyond roller *j* a roller *m* removes and carries away the solution, and a scraper *n* removes the solution that has been taken up by roller *m*.

In order that the orifices 12 communicating with the bottoms of pockets 11 may have free vent, channels are formed between the rear face of the block and the periphery of the cylinder. These channels may be formed in the periphery of the cylinder, as shown in Figs. 2, 3 and 7, or in the rear wall of the blocks, as shown in Figs. 11 and 12, and they may extend in any suitable direction. It is preferred, however, that they shall extend longitudinally, for reasons that will hereafter develop, and that there shall be one channel for each longitudinal row of orifices

12. These channels are shown as grooves *o* and they may be vented in any desired way. For reasons that will hereafter appear, I prefer to vent them by providing perforations *p* extending from the bottoms of the grooves through the inner wall of the cylinder and to arrange these perforations in a circumferential row or rows; and if in rows, to arrange the rows within one or more zones of restricted width, as shown in Fig. 7.

The perforations are arranged in a zone of restricted width in order to facilitate the application of air pressure or air suction, as the case may be, at different points in the rotation of the cylinder. Thus, it is desirable to apply suction, which may be slight, to the pockets 11 while they are contacting with the inking rollers *g*. To provide for this, I arrange a stationary suction chamber *r* opening against the inner wall of the cylinder, opposite the inking rollers *g*, so as to exhaust air through the pockets 11, orifices 12, channels *o* and perforations *p*. This suction will be operative, at any given time, only in those pockets 11 that are open to the channels that communicate with the perforations *p* that, at such time, communicate with the suction chamber. In other words, the suction will be operative only in those pockets that, at any given time, are opposite the inking rollers or are just approaching, or leaving, the inking rollers. The number of rows of pockets in which the suction is simultaneously operative obviously depends on the arcuate length of the suction chamber *r*.

It is, or may be, desirable to apply air pressure to the pockets 11 while they are in contact with the linoleum. To provide for this, I arrange, opposite the feed rollers *d* and *e*, a pressure chamber *s* opening against the inner wall of the cylinder. This pressure chamber is of an arcuate length corresponding to the length of linoleum that is in contact with the printing block.

It is especially advantageous to apply air pressure to the pockets 11 after they travel beyond the feed rollers, in order to expel, or facilitate the expulsion of, residual ink. In case a solvent for the ink is applied to the printing block by means of the rollers *j* or otherwise, a pressure chamber *t* is arranged beyond the line of application of the solvent, preferably opposite the solution-removing roller *m* if such a roller be used.

The pressure chambers *s* and *t* may be connected, through radial tubes *u u*, with the tube *v* within the hollow driving shaft of the cylinder, which tube may be suitably connected to a source of pressure. The suction chamber *r* may be connected, through a radial tube *w*, with a tube *x* within the tube *v*, which tube *x* may be connected to a source of suction.

The printing blocks may be made in different ways. One preferred way (reference being made to Figs. 4, 5 and 6) is to provide a die 20, which may be of metal. This die is provided with pockets 21 and orifices 22 corresponding to the pockets and orifices of the printing block to be molded or cast. From this die is produced a matrix 30 of papier-mâché or other suitable flexible material. The matrix is then placed between two curved concentric mold blocks (similar to mold blocks 40, 41, Fig. 10, except that the wall of the inner mold is not grooved). The diameter of the convex wall of the inner mold corresponds to that of the cylinder *a* (or *b* or *c*). The material of which the printing block is formed is molded or cast between the matrix 30 and the inner mold, thereby forming the block 10, a section of which is shown in Fig. 6, and which is adapted to fit the cylinder.

In order to block out any pocket in the printing block 10, a pyramidal-shaped plug 23 having a contour corresponding to a pocket 21, is inserted in such pocket before forming the matrix. The matrix will then be formed with a depression 33 between its pyramidal projections and the printing block 10 will be formed with the unpocketed surface 13.

In order to provide a multi-sized pocket 14 in the printing block, a papier-mâché pyramidal-shaped plug 34 is inserted in spaces between adjacent pyramids of the matrix and the adjacent teats 32 (molds for the orifices 12) are cut off. The printing block will then be formed with the multi-sized imperforate-bottomed pocket 14.

It is possible, and it may be desirable, to form the longitudinal air channels in the inner face of the printing block 10 instead of in the outer face of the cylinder. In such case, the inner mold block has its inner wall provided with longitudinally extending ridges 45, as shown in Fig. 10, and the matrix 30 is so positioned between molds 40 and 41 that the teats 32 abut against these ridges. Hence the molded block 60, Fig. 11, contains longitudinally extending grooves 65, which perform the function of the channels *o* in the cylinder. The cylinder, in such case, is made with a smooth periphery.

In actual practice, the pockets 10 will usually be formed with sides more nearly parallel to the radius, and of greater depth relatively to their width, than the drawings indicate; rather wide and shallow pockets being shown in order to illustrate more clearly the principle of construction. The orifices 12 may be of any length. The pockets may extend virtually to the rear of the printing block, and in that case orifices 12 may be holes of only two dimensions.

The drawings and the foregoing description set forth many details which are not

essential to a practical embodiment of the invention, and it should be understood that they are not to be inferentially imported, when not expressed, into the claims.

5 Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. In a machine for printing designs on felt base floor covering and other sheet material, a rotatable cylinder and an arcuate printing block mounted thereon, said block having a multitude of similar pockets having mouths opening in the convex face of the block, there being orifices opening in the rear of the blocks and communicating with the pockets, an ink-supplying device with which the mouths of the pockets are brought into ink-receiving relation in the rotation of the cylinder, and means to feed the sheet material into contact with successive parts of the face of the block in the rotation of the cylinder.

2. In a machine for printing designs on felt base floor covering and other sheet material, a rotatable cylinder and an arcuate printing block mounted thereon, said block having a multitude of similar pockets having mouths opening in the convex face of the block, there being orifices opening in the rear of the blocks and communicating with the pockets, and air channels between the cylinder and block each communicating with a plurality of said orifices.

3. In a machine for printing designs on felt base floor covering and other sheet material, a rotatable cylinder and an arcuate printing block mounted thereon, said block having a multitude of similar pockets having mouths opening in the convex face of the block, there being orifices opening in the rear of the blocks and communicating with the pockets, and longitudinally extending air channels between the cylinder and block, the cylinder being provided with perforations communicating with said air channels.

4. In a machine for printing designs on felt base floor covering and other sheet material, a rotatable cylinder and an arcuate printing block mounted thereon, said block having a multitude of similar pockets having mouths opening in the convex face of the blocks, there being orifices opening in the rear of the blocks and communicating with the pockets, longitudinally extending air channels between the cylinder and block, the cylinder being provided with perforations communicating with said air channels, and a stationary air chamber opening against the inner wall of the cylinder and communicating, in the rotation of the cylinder, with perforations communicating with successive air channels.

5. In a machine for printing designs on felt base floor covering and other sheet material, a rotatable cylinder and an arcuate

printing block mounted thereon, said block having a multitude of similar pockets having mouths opening in the convex face of the block, there being orifices opening in the rear of the blocks and communicating with the pockets, an ink-supplying device with which the mouths of the pockets are brought into ink-receiving relation in the rotation of the cylinder, means to feed the sheet material into contact with successive parts of the face of the block in the rotation of the cylinder, there being longitudinally extending air channels between the cylinder and block, the cylinder being provided with perforations communicating with said air channels, a stationary air chamber opening against the inner wall of the cylinder and positioned opposite the ink-supplying device, and means providing a conduit through which air may be exhausted from said pockets, orifices, channels, perforations, and air chamber.

6. In a machine for printing designs on felt base floor covering and other sheet material, a rotatable cylinder and an arcuate printing block mounted thereon, said block having a multitude of similar pockets having mouths opening in the convex face of the block, there being orifices opening in the rear of the blocks and communicating with the pockets, an ink-supplying device with which the mouths of the pockets are brought into ink-receiving relation in the rotation of the cylinder, means to feed the sheet material into contact with successive parts of the face of the block in the rotation of the cylinder, there being longitudinally extending air channels between the cylinder and block, the cylinder being provided with perforations communicating with said air channels, a stationary air chamber opening against the inner wall of the cylinder opposite the locus of contact between the face of the block and the sheet material, and means providing a conduit through which air under pressure may be conveyed through said chamber, perforations, channels, orifices and pockets.

7. In a machine for printing designs on felt base floor covering and other sheet material, a rotatable cylinder and an arcuate printing block mounted thereon, said block having a multitude of similar pockets having mouths opening in the convex face of the block, there being orifices opening in the rear of the blocks and communicating with the pockets, an ink-supplying device with which the mouths of the pockets are brought into ink-receiving relation in the rotation of the cylinder, means to feed the sheet material into contact with successive parts of the face of the block in the rotation of the cylinder, and means, located between the ink-supplying device and the locus of feed of the sheet material to the face of the printing

block, adapted to remove superfluous ink from said block.

8. In a machine for printing designs on felt base floor covering and other sheet material, a rotatable cylinder and an arcuate printing block mounted thereon, said block having a multitude of similar pockets having mouths opening in the convex face of the block, there being orifices opening in the rear of the blocks and communicating with the pockets, an ink-supplying device with which the mouths of the pockets are brought into ink-receiving relation in the rotation of the cylinder, means to feed the sheet material into contact with successive parts of the face of the block in the rotation of the cylinder, and means, located beyond the locus of feed of the sheet material to the face of the block, to remove residual ink from the pockets.

9. In a machine for printing designs on felt base floor covering and other sheet material, a rotatable cylinder and an arcuate printing block mounted thereon, said block having a multitude of similar pockets having mouths opening in the convex face of the block, there being orifices opening in the rear of the blocks and communicating with the pockets, an ink-supplying device with which the mouths of the pockets are brought into ink-receiving relation in the rotation of the cylinder, means to feed the sheet material into contact with successive parts of the face of the block in the rotation of the cylinder, an ink solvent supplying device located beyond the locus of feed of the sheet material to the face of the block, and solution-eliminating means located beyond the ink solvent supplying device.

10. In a machine for printing designs on felt base floor covering and other sheet material, a rotatable cylinder and an arcuate printing block mounted thereon, said block having a multitude of similar pockets having mouths opening in the convex face of the block, there being orifices opening in the rear of the blocks and communicating with the pockets, an ink-supplying device with which the mouths of the pockets are brought into ink-receiving relation in the rotation of the cylinder, means to feed the sheet material into contact with successive parts of the face of the block in the rotation of the cylinder, there being longitudinally extending air channels between the cylinder and block, the cylinder being provided with perforations communicating with said air channels, a stationary air channel opening against the inner wall of the cylinder beyond the locus of contact between the face of the block and the sheet material, and means providing a conduit through which air may be conveyed through said chamber, perforations, channels, orifices and pockets.

11. In a machine for printing designs on

felt base floor covering and other sheet material, a rotatable cylinder and an arcuate printing block mounted thereon, said block having a multitude of similar pockets having mouths opening in the convex face of the block, there being orifices opening in the rear of the blocks and communicating with the pockets, an ink-supplying device with which the mouths of the pockets are brought into ink-receiving relation in the rotation of the cylinder, means to feed the sheet material into contact with successive parts of the face of the block in the rotation of the cylinder, there being longitudinally extending air channels between the cylinder and block, the cylinder being provided with perforations communicating with said air channels, an ink solvent supplying device located beyond the locus of feed of the sheet material to the face of the block, a stationary air chamber opening against the inner wall of the cylinder and located beyond the solvent-supplying device, and means providing a conduit through which air may be conveyed through said chamber, perforations, channels, orifices and pockets to facilitate the expulsion of the solution of residual ink and solvent from the pockets.

12. In a machine for printing designs on felt base floor covering and other material, a rotatable cylinder and a printing block of an arcuate contour corresponding to that of the cylinder and mounted thereon, said block having a multitude of similar pockets of pyramidal shape, the mouths of the pockets opening in the face of the block, there being orifices between the narrower bottoms of the pockets and the rear of the block, and air channels communicating with said orifices.

13. In a machine for printing designs on felt base floor covering and other material, a rotatable cylinder and a printing block of an arcuate contour corresponding to that of the cylinder and mounted thereon, said block having a multitude of similar pockets of pyramidal shape, the mouths of the pockets opening in the face of the block, there being orifices between the narrower bottoms of the pockets and the rear of the block, and air channels communicating with said orifices, the adjacent walls of adjacent pockets having their outer edges substantially coincident.

14. In a machine for printing designs on felt base floor covering and other material, a rotatable cylinder and a printing block of an arcuate contour corresponding to that of the cylinder and mounted thereon, said block having a multitude of pyramidal-shaped pockets of like size with substantially contiguous mouths and having unpocketed areas separating certain of the pockets.

15. In a machine for printing designs on felt base floor covering and other material,

a rotatable cylinder and a printing block of an arcuate contour corresponding to that of the cylinder and mounted thereon, said block having a multitude of four-sided pyramidal-shaped pockets of like size arranged in intersecting rows.

16. In a machine for printing designs on felt base floor covering and other material, a rotatable cylinder and a printing block of an arcuate contour corresponding to that of the cylinder and mounted thereon, said block having a multitude of four-sided pyramidal-shaped pockets of like size arranged in intersecting rows, and having also unpocketed areas interrupting rows of pockets.

17. In a machine for printing designs on felt base floor covering and other material, a rotatable cylinder and a printing block of an arcuate contour corresponding to that of the cylinder and mounted thereon, said block having a multitude of relatively small four-sided pyramidal-shaped pockets of like size arranged in intersecting rows and having also relatively large pockets interrupting said rows of pockets, each of said larger pockets having an area substantially equal to the area of a non-fractional plurality of smaller pockets.

18. In a machine for printing designs on

felt base floor covering and other sheet material, a series of rotatable cylinders and arcuate printing blocks mounted thereon, each block having a multitude of similar vented pockets having mouths opening in the convex face of the block, ink-supplying devices associated with the respective cylinders, and sheet-feeding mechanism adapted to bring the sheet material into contact progressively with printing blocks of successive cylinders, said feeding mechanism comprising means to provide, between longitudinal lines of printing contact of successive cylinders, a length of sheet material which is an exact multiple of the arcuate length of a printing block.

19. In a machine for printing designs on felt base floor covering and other sheet material, a rotatable cylinder and an arcuate printing block mounted thereon, said block having a multitude of similar pockets having mouths opening in the convex face of the block and provided with air vents through the rear of the block.

In testimony of which invention, I have hereunto set my hand, at Philadelphia, Pa., on this 8th day of April, 1927.

HARRY C. KESSLER, JR.