

June 2, 1931.

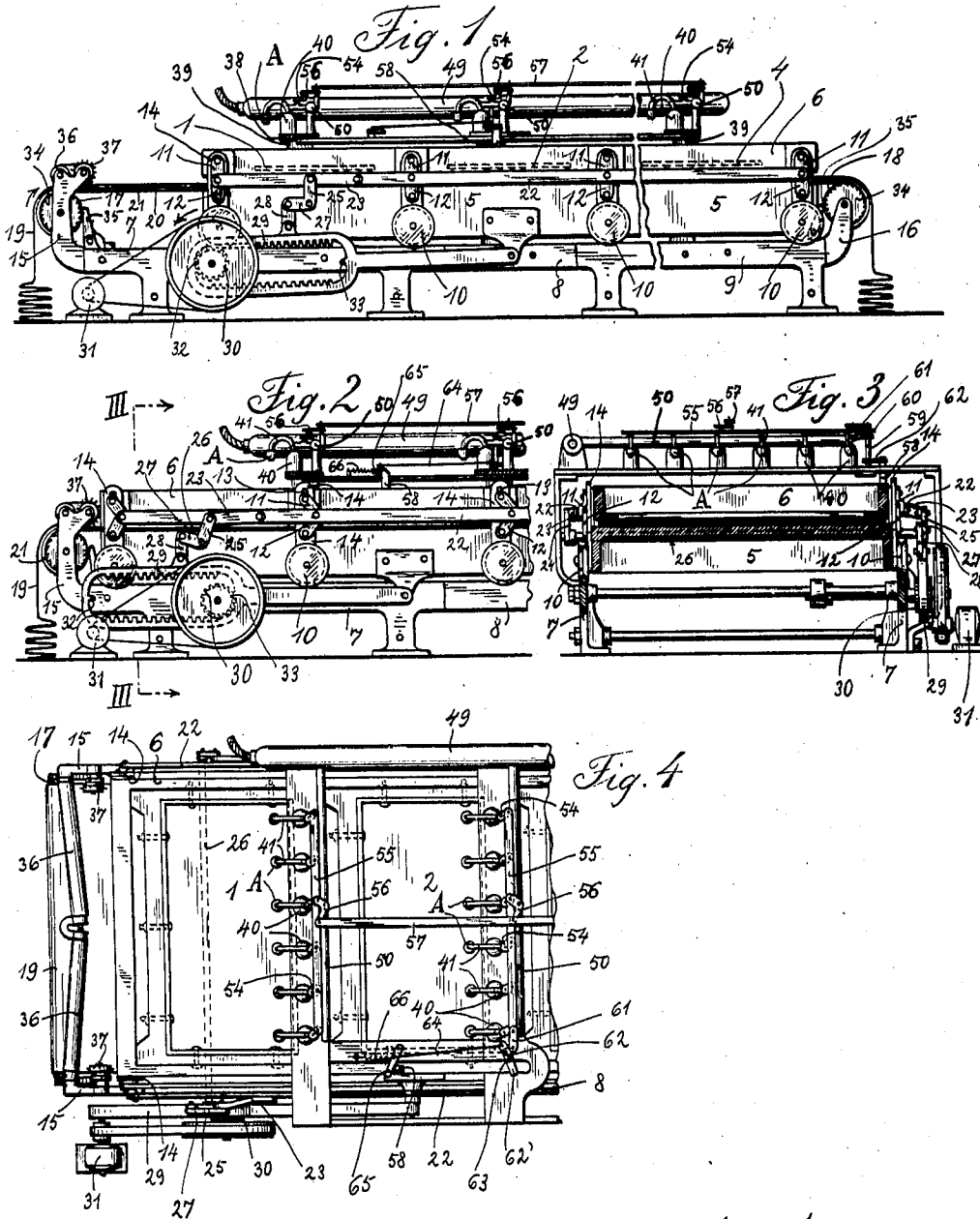
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1,807,979

SPRAYING OF WEBS OF FABRIC AND THE LIKE WITH DIFFERENT COLORS

Filed June 27, 1929

2 Sheets-Sheet 1



Inventor

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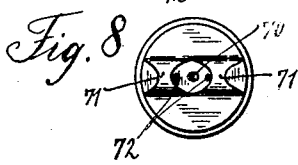
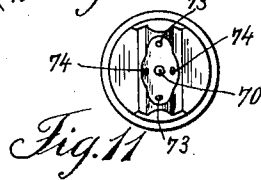
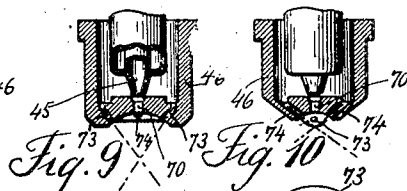
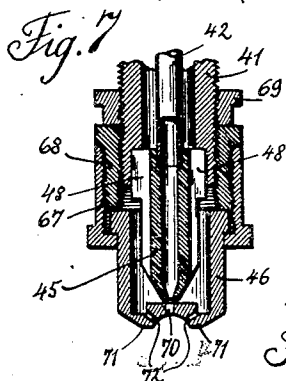
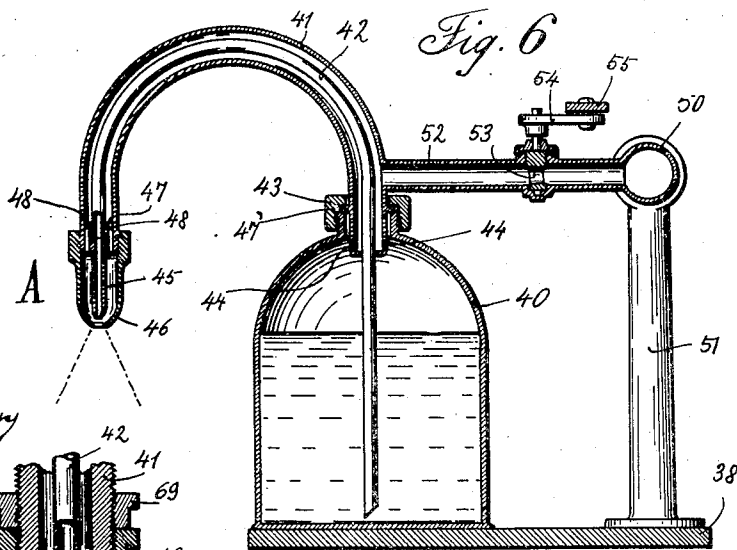
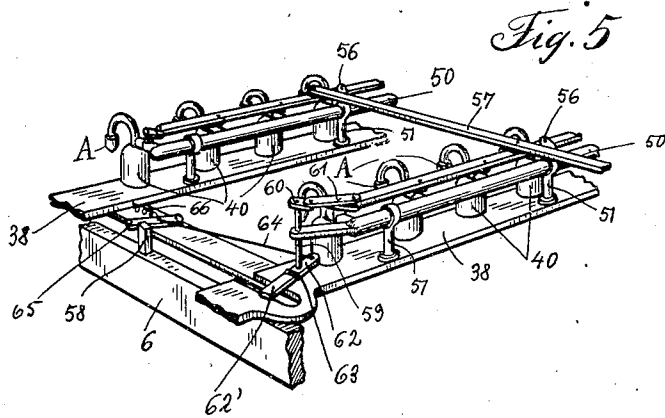


Fig. 12
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UNITED STATES PATENT OFFICE

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SPRAYING OF WEBS OF FABRIC AND THE LIKE WITH DIFFERENT COLORS

Application filed June 27, 1929, Serial No. 374,122, and in Switzerland June 30, 1928.

My invention relates to the method of and apparatus for spraying webs of fabric and the like with different colors.

Methods and machines are well known for dyeing patterns on webs of textile material by means of stencils and dye ejecting nozzles, in which the stencils are fixed and the dye ejecting nozzles are movable thereover and in which the web of material upon which the dye is to be ejected is moved in steps after the ejecting operation.

When applying the dye to webs of material, which are stationary during the dyeing operation, by means of stencils which are fixed there is the disadvantage that after the dyeing or printing operation the ejecting nozzles must be returned to their original position, whilst the web of material with the stencils remains in the position of rest, whereupon the web of material must be subsequently moved in steps under the stencils.

In this operation it is not possible to prevent the web of material from stretching so that designs with accurate dyed or printed edges cannot be obtained. A further disadvantage resides in the fact that whilst the web of material is stationary and the ejecting nozzles are idle there is a considerable loss of time.

My invention enables webs of material to be provided with designs which have accurate printed edges, whereby the operation is accelerated.

According to the present invention a machine for stencilling on webs of fabric or the like by means of stencils and spraying nozzles, wherein during the spraying a group of stencils and the web of fabric are moved forwardly simultaneously and uniformly, whereupon when reaching the end of the movement the web of fabric remains stationary and the stencils are raised from the web of fabric, returned to their original position, and there again lowered onto a fresh portion of fabric, is characterized in that the spraying nozzles are stationary and the stencils are pressed firmly against the web of fabric during the spraying operation and moved forwardly, whereby the web of

fabric is moved therewith in stages during the pressing. The web is moved by means of a stencil frame over a pressure table provided with a cushioning device uniformly and in stages together with stencils pressed thereon under rows of stationary nozzles from which are ejected differently coloured liquids and means are provided which vary the position of the stencils after each operation relatively to the web by an amount corresponding with the field of each separate stencil so that each field of the web corresponding with each of these stencil fields is sprayed successively with the different colors.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming part of this specification, with the understanding, however, that the invention is not confined to any strict conformity with the showing in the drawings, but may be changed and modified so long as such changes and modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:—

Fig. 1 is a side elevational view of a form of construction of the machine at the end of the operation, a part being broken away.

Fig. 2 is a side elevational view of the left hand part of the machine at the beginning of the operation.

Fig. 3 is a sectional view of the machine on line III—III of Fig. 2 looking in the direction of the arrows.

Fig. 4 is a plan view of the left part of the machine.

Fig. 5 is a diagrammatic perspective view of the means for controlling the nozzles.

Fig. 6 is a view of a spraying apparatus in section.

Fig. 7 is a sectional view of a nozzle of a different form of construction to that in Fig. 6.

Fig. 8 is a bottom plan view of the parts shown in Fig. 7.

Figures 9 and 10 are longitudinal sectional

views of a third form of construction of the nozzle.

Fig. 11 is a bottom plan view of the parts shown in Fig. 10 and

Fig. 12 shows diagrammatically the spraying field as obtained by a nozzle according to Figs. 9 to 11.

In the machine there is provided a design stencil 1, 2, 3 and 4, one thereof for each color, which stencils are only apertured at those portions at which the surface of the material is to be sprayed with the colors adapted therefor, so that for example with the last stencil 4 the desired formation of the design is completed. These patterns are not shown in detail in the drawings as they may be of any well known construction.

The spraying of the material through the stencils is effected by means of spraying nozzles A arranged in a fixed position and in a straight line over each stencil, the necessary liquid dye for the stencil or fabric surface being forced through the spraying nozzles. The spraying nozzles are automatically closed or opened at the moment at which the end section of fabric has been sprayed or the first section of fabric is to be sprayed.

The machine is provided with portions 7, 8, and 9 of which the middle portion 8 is removable for the purpose of varying the number of colors to be sprayed. If a design requires more colors than originally contemplated, then for each additional color to be applied a middle portion 8 is fitted between the parts 7, 9, that is to say the machine is lengthened. On the frame 7, 8 and 9 a pressure table 5 is mounted to be moved to and fro by means of rollers 10. The pressure table 5 is connected by means of bell crank levers 11 and 12 to a casing 6 supporting the patterns 1 to 4. The casing 6 is guided in slots 13 of plates 14 which move up and down on the pressure table 5. The pressure table 5 and the casing 6 are fitted to the frame 7, 8 and 9 for the time being.

To the end portions 7 and 8 of the machine frame are secured bearings 15 and 16 in which are rotatably mounted the guide rollers 17 and 18. Over these rollers is guided the web to be coloured, or example a fabric 19, the latter traveling in the direction of the arrows so that it enters at the left on the roller 17 and leaves at the right on the roller 18. Under the web of material there passes an endless flexible metal grid 20, constructed in the form of a sieve, on which is located a fabric or the like band 21 formed as a cushion and corresponding with the widest web of fabric and guided therewith around the rollers 17 and 18.

The grid 20 is loosely mounted between the two rollers 17 and 18 on the pressure table 5 and before the spraying device is set into operation it is pressed firmly on the pressure table 5 by the descending stencil casing 6 and

by means of the stencils 1 to 4. As the web of fabric 19 rests upon the cushion band 21 and is also firmly pressed against the cushion band 21 by the descending stencil casing 6, as well as by the stencils 1 to 4, a firm intimate connection is established between the said parts, 1 to 4, 6, 19, 20, 21 and 5. As at the beginning of the color spraying operation the pressure table 5, for example in the present case, is driven so as to move from right to left, all the parts 19, 20 and 21 which are pressed firmly between the stencils 1 to 4 and the pressure table 5, are also driven so that the spraying of the web of fabric 19 through the stencils 1 to 4, which are adjusted according to the flow of color, is effected slowly and in stages. The cushion band 21, tightly clamped between the web of fabric 19 and the grid 20, is for the purpose of imparting to the material between the latter and the stencils 1 to 4 a tightly closed position. This is accomplished by reason of the resilient cushioning so that the colors sprayed through the opening arranged according to the stencil design do not flow under the stencils and thus cause an indistinct smudged design to be produced on the fabric.

The descending of the stencil casing 6, in the left end position as well as the raising thereof in the right end position, is effected by rods 22 connecting the bell crank levers 11, 21 to each other. The rods 22 are connected by links 23 to levers 24, 25 secured to a shaft 26. The lever 25 is formed as a bell crank lever having one arm 27 connected by means of a link 28 to a double rack 29. The double rack 29 serves for moving the pressure table 5 with the stencil casing 6 to and fro, said rack 29 being pivotally connected to the pressure table 5 and being driven from an electric motor 31 by means of a pinion 30.

When the pressure table 5 with the stencil casing 6, the web of fabric 19, the cushion band 21 and the grid 20 is moved from left to right, the pinion 30 engages the lower part of the double rack 29. When said parts have reached the right end the double rack 29 is moved down by means of a single tooth 32 provided on the latter, causing the upper part of the double rack to engage the pinion 30. By this means the crank levers 11, 12 are extended and the fabric 19 is released from the pressure table 5 and the stencil casing 6, so that on the return movement of the latter parts the fabric 19 remains stationary. When the pressure table has reached its left end position a single tooth 33 of the double rack 29 causes the latter to be raised so that the lower part of the double rack engages the pinion 30 and the fabric 19 is clamped again between the pressure table 5 and the stencil casing 6.

In order that at the time of moving the pressure table 5 and the stencil casing 6 to

the left, the fabric 19 is secured to remain stationary, the rollers 17 and 18 are provided with ratchet pawls 35. In order that the fabric 19 may not contract, it is held throughout by spread out rollers 36 which are mounted in the bearings 15, wheels 37 being provided with points engaging the fabric 19 provided at the edges of the fabric. The wheels 37 are driven by the rollers 36 and press the edges of the fabric 19 firmly against the cushion band 21.

The nozzle portion 45 is connected to the inner tube 42 and is provided with a collar 47, spacing the outer tube 41 from the inner tube 42, the latter having slots 48 which serve to establish communication between the internal space of 41 and the internal space of the sleeve 46. 49 denotes a supply pipe for the compressed air which pipe extends along the machine and above each board 38. It is provided with a branch pipe 50 connected by a support 51 with the board 38. Each of the branch pipes 50 is connected by a pipe 52 to the outer pipe 41 of each dye container 40. In these pipes 52 are fitted valves 53 which are arranged in a row and are connected by levers 54 to thrust rods 55. The thrust rods 55 are connected together by crank levers 56 and a rod 57 and are actuated by the reciprocating movement of the pressure table 5 by means of a projection 58 of the stencil casing 6, in such a manner that as soon as the stencils come into the right end position the valves 53 are closed, and when the stencils are moved from the right into the left end position, the valves 53 are opened. For this purpose a shaft 59 is connected to one of the thrust rods 55 by means of a lever 60 and a link 61. A lever 62 secured to the shaft 59 carries a portion 62' which is connected to the lever by means of a pivot 63 so that it may be moved upwardly. The portion 62' projects into the path of the projection 58. The lever 62 is connected, by means of a pull member 64, to a lever 65, the latter projecting into the path of the projection 58. A spring 66 keeps the pull member always extended.

When the projection 58 is reversed towards the left and a course of work is beginning the projection 58 engages the lever 65 and causes, by means of the pull member, the levers 62, 62' and the shaft 59 to be turned so that the valves 53 are opened. When the projection 58 moves back into its right end position the portion 62' of the levers 62 and 62' yields from the projection 58 and catches again before it, so that at the following return movement the projection 58 causes the levers 62, 62' to be turned and the valves 53 to be closed.

When the valve 53 of a dye container 40 is opened compressed air enters the interior of the tube 41 and from this point it passes through the holes 44 into the dye container 40, thus driving the dye liquid contained in

the latter into the tube 42 and thence to the member 45 of the nozzle A. At the same time compressed air passes through the tube 41 and the slots 44 into the sleeve 46 mixing with the liquid passing out of the nozzle A.

The nozzle, according to the construction shown in Figure 6, produces a circular spray. In order to obtain a more suitable shape for the spray and to permit a more efficient use of the differently colored liquids, the nozzle may be arranged in accordance with the construction shown in Figures 7 and 8. According to the latter construction the nozzle portion 45, similar to that shown in Fig. 6, is also connected to the inner tube 42 and has slots 48 for the passage of the compressed air. The sleeve 46 is secured to a nut 68 by means of a cap nut 67, the nut 68 being screwed on the end of the outer tube 41 and capable of being adjusted on the tube 41 by means of a lock nut 69. In the sleeve 46 there are provided, in addition to the central hole 70, passages 72 which are located at enlargements 71 in the end surface of the sleeve. These passages 72 are arranged diametrically opposite to one another and are inclined downwardly, relatively to the axis of the nozzle. The compressed air already partly mixes in the central hole 70 with the outflowing dye liquid and the conical shape of the outflowing mixture is drawn into an elongated oval by the compressed air, flowing out to the passage 72, so that the spray has a similar shape.

A still further modification in the shape of the spray is obtained by the construction illustratively exemplified in Figures 9 to 12.

Accordingly, the nozzle sleeve 46, which is assumed to be connected to the external tube 41 in the same manner as described above, is provided in addition to the central hole 70 with two pairs of passages 73, 74 in the end wall. The passages are arranged in planes which pass through the axis of the nozzle, and are at right angles to one another. Both the passages 73 and 74 are inclined downwardly towards the axis of the nozzle but the passages 73 are arranged at a steeper angle to the axis than are the passages 74. As a result of this arrangement the mixture flowing out of the hole 70 is first brought into an oval shape by the compressed air passing out of the passages 74 whereupon on further flow of the mixture the compressed air passing out of the passages 73 acts on the mixture and, as these passages are turned through 90° relatively to the first mentioned passages, they also tend to impart to the mixture an oval shape also turned through 90°. However, the action of the compressed air flowing out of the passages 73 is no longer as powerful, by reason of the fact that the free path is longer, a condition which effects to a certain extent a damping of the flowing mixture so that a substantially rectangular spray is produced, as illustrated in Figure 12.

This spray is substantially, uniformly dense by reason of the said damping to its outermost zones so that a uniform spraying of the web is obtained. This shape of the spray also permits a more favorable distribution of the dye containers 40 in that they may be so arranged that the sprays abut one another and lead to an economical use of the various dyes which are used.

The size of the spray may be varied in all the foregoing constructions by adjusting the sleeve 46 relatively to the nozzle portion 45.

The use of compressed air, both as conveying means and as a mixing medium with the dye liquids, has a more certain and uniform effect as regards the application of the dye and by reason of the fine distribution of the dye liquids an economy is obtained.

The drive of the machine or the pressure table may be effected in any suitable manner by means of a transmission and reversing gear mechanism acting in the proportion of 1:2 and being arranged so that the pressure table with all the parts connected thereto operates slowly during the operation or during the spraying with the supply of color and twice as quickly during the idle return movement.

What I claim is:—

1. The herein described method of stenciling upon webs of fabric and the like with different colors, which comprises causing stencils to be pressed firmly against the webs of fabric thereafter simultaneously and uniformly moving the web of fabric and stencils in stages and in a forwardly direction during the pressing, subsequently causing the web of fabric when reaching its end point to remain stationary, then raising the stencils from the web of fabric, and returning them to their initial position, and finally lowering the stencils onto a fresh portion of fabric, and being gripped tightly thereto.

2. A machine of the character described, comprising in combination, a pressure table, stencils in a number equal to that of the colors to be sprayed and movable up and down on the pressure table, means for reciprocating the pressure table with the stencils, means for alternately clamping the web between the pressure table and the stencils during one of said reciprocating movements and then releasing the web at the other of said reciprocating movements, stationary nozzles spraying differently coloured liquids, through said stencils onto the web during the movement of the pressure table and the stencil with the web clamped between them.

3. A machine of the character described, comprising in combination, a pressure table, a stencil casing movable up and down on the pressure table, stencils contained in the stencil casing in a number equal to that of the colors to be sprayed, means for reciprocating the pressure table with the stencil casing and

the stencils, means for alternately clamping the web between the pressure table and the stencil casing during one of said reciprocating movements and then releasing the web at the other of said reciprocating movements, stationary nozzles spraying differently colored liquids through said stencils on the web during the movement of the pressure table and the stencil casing with the web clamped between them.

4. A machine of the character described, comprising in combination, a pressure table, a stencil casing movable up and down on the pressure table, stencils contained in the stencil casing in a number equal to that of the colors to be sprayed, means for reciprocating the pressure table with the stencil casing and the stencils, means for alternately clamping the web between the pressure table and the stencil casing during one of said reciprocating movements and then releasing the web at the other of said reciprocating movements, stationary nozzles spraying differently colored liquids through said stencils on the web during the movement of the pressure table and the stencil casing with the web clamped between them.

5. A machine of the character described, comprising in combination, a pressure table, a stencil casing movable up and down on the pressure table, stencils contained in the stencil casing in a number equal to that of the colors to be sprayed, means for reciprocating the pressure table with the stencil casing and the stencils, means for alternately clamping the web between the pressure table and the stencil casing during one of said reciprocating movements, and then releasing the web at the other of said reciprocating movements, stationary nozzles arranged in a number of rows equal to the number of stencils, each row of nozzles spraying a liquid colored differently from that sprayed from the nozzles of the other rows, and directing the spray from each nozzle through a stencil on the web during the movement of the pressure table and the stencil casing with the web clamped between them.

6. A machine of the character described, comprising in combination, a pressure table, a stencil casing movable up and down on the pressure table, stencils contained in the stencil casing in a number equal to that of the colors to be sprayed, two rollers, an endless flexible metal grid guided around said rollers, a cushion located on the grid, the grid and the cushion being adapted to move the web resting upon a side of the cushion between the pressure table and the stencil casing, means for reciprocating the pressure table with the stencil casing and the stencils, means for alternately clamping the web between the pressure table and the stencil casing during one of said reciprocating movements and then releasing the web and the

grid with the cushion during the other of said reciprocating movements, stationary nozzles arranged in a number of rows equal to the number of stencils, each row of nozzles spraying a liquid colored differently from that sprayed from the nozzles of the other rows, the spray from each row being directed through a stencil on the web during the movement of the pressure table and the stencil casing with the web clamped between them.

70 casing, means for reciprocating the pressure table with the stencil casing and for driving the web during one of these reciprocating movements, stationary nozzles arranged in a number of rows equal to the number of stencils, each row of nozzles being adapted to spray a liquid colored differently from that sprayed from the nozzles of the other rows, and means for controlling the spraying of colors from the nozzles in accordance with said reciprocating movements of the stencil casing. 75

10 7. A machine of the character described, comprising in combination, a pressure table, a stencil casing movable up and down on the pressure table, stencils contained in the stencil casing in a number equal to that of the colors to be sprayed, a double rack pivotally connected to the pressure table, a motor driven pinion adapted to engage alternately both portions of the double rack, means for causing the pinion to be disengaged at the ends of the double rack from the one of its portions and to engage its other portion thereby causing the pressure table and the stencil casing to be reciprocated, means for alternately clamping the web between the pressure table and the stencil casing during one of said reciprocating movements and then releasing the web at the other of said reciprocating movements, stationary nozzles spraying differently colored liquids, each nozzle directing its spray through a stencil on the web during the movement of the pressure table and the stencil casing with the web clamped between them.

35 8. A machine of the character described, comprising in combination, a pressure table, a stencil casing movably mounted on the pressure table, stencils contained in the stencil casing in a number equal to that of the colors to be sprayed, toggle levers adapted to move the stencil casing up and down, a double rack pivotally connected to the pressure table, a motor driven pinion to engage the portions of the double rack for reciprocating the pressure table with the stencil casing, a crank lever pivotally connected to the pressure table, a link connecting the crank lever to the double rack, a second link and a thrust rod connecting the crank lever to said toggle levers, the raising and lowering of the double rack causing the pinion to engage the one or the other portion of the double rack and the toggle levers to be collapsed or extended, causing the web to be alternately clamped between the pressure table and the stencil casing and to be driven or released, stationary nozzles spraying differently colored liquids, each nozzle spraying its liquid through a stencil on the web during the movement of the pressure table and the stencil with the web clamped between them.

65 9. A machine of the character described comprising in combination, a pressure table, a stencil casing movably mounted on the pressure table, stencils contained in the stencil

10. A machine of the character described, comprising in combination, a pressure table, a stencil casing movably mounted on the pressure table, stencils contained in the stencil casing, means for reciprocating the pressure table with the stencil casing and for driving the web during one of these reciprocating movements, stationary nozzles arranged in a number of rows equal to the number of stencils, each row of nozzles being adapted for spraying a liquid colored differently from that sprayed from the nozzles of the other rows, a vessel containing the colored liquid and compressed air, tubes connecting the vessel with the nozzles to lead compressed air from the vessel to the nozzles and causing the colors to be dispersed and to be sprayed through the stencils on the web. 80 85 90

11. A machine of the character described, comprising in combination, a pressure table, a stencil casing movably mounted on the pressure table, stencils contained in the stencil casing, means for reciprocating the pressure table with the stencil casing and for driving the web during one of these reciprocating movements, stationary nozzles adapted to eject differently coloured liquids arranged in a number of rows equal to the number of stencils, a dye container arranged at each nozzle and provided with compressed air, and tubes adapted to lead compressed air to the nozzles from the space in the dye containers over the dye liquid, causing hereby the dye liquids to be driven from the dye containers to the nozzles, to be dispersed therein and to be sprayed through the stencils on the web. 110 115

12. A machine of the character described, comprising in combination, a pressure table, a stencil casing movably mounted on the pressure table, stencils contained in the stencil casing, means for reciprocating the pressure table with the stencil casing and for driving the web during one of these reciprocating movements, stationary nozzles spraying differently colored liquids arranged in a number of rows equal to the number of stencils, a dye container arranged at each nozzle and provided with compressed air, tubes adapted to lead compressed air from said container to the nozzles, a stop valve in each of said tubes, coupling rods connecting the valves of the nozzles arranged in the same 120 125 130

row to each other, a coupling rod connecting said first coupling rods to each other, a projection on the stencil casing, and stationary means actuated by said projection reciprocated by the stencil casing to control the coupling rods and said stop valves.

13. A machine of the character described, comprising in combination, a pressure table, a stencil casing movably mounted on the pressure table, stencils contained in the stencil casing, means for reciprocating the pressure table with the stencil casing and for driving the web during one of these reciprocating movements, stationary nozzles spraying differently colored liquids arranged in a number of rows equal to the number of stencils, a dye container arranged at each nozzle and provided with compressed air, tubes adapted to lead compressed air to the nozzles and to the space in the dye containers over the dye liquid causing hereby the dye liquids to be driven from the dye containers to the nozzles, a stop valve in each of said tubes, coupling rods connecting the valves of the nozzles arranged in the same row to each other, a coupling rod connecting said first coupling rods to each other, a projection on the stencil casing, and stationary means actuated by said projection reciprocated by the stencil casing to control the coupling rods and said stop valves.

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

JULIUS GROETSCHER.

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