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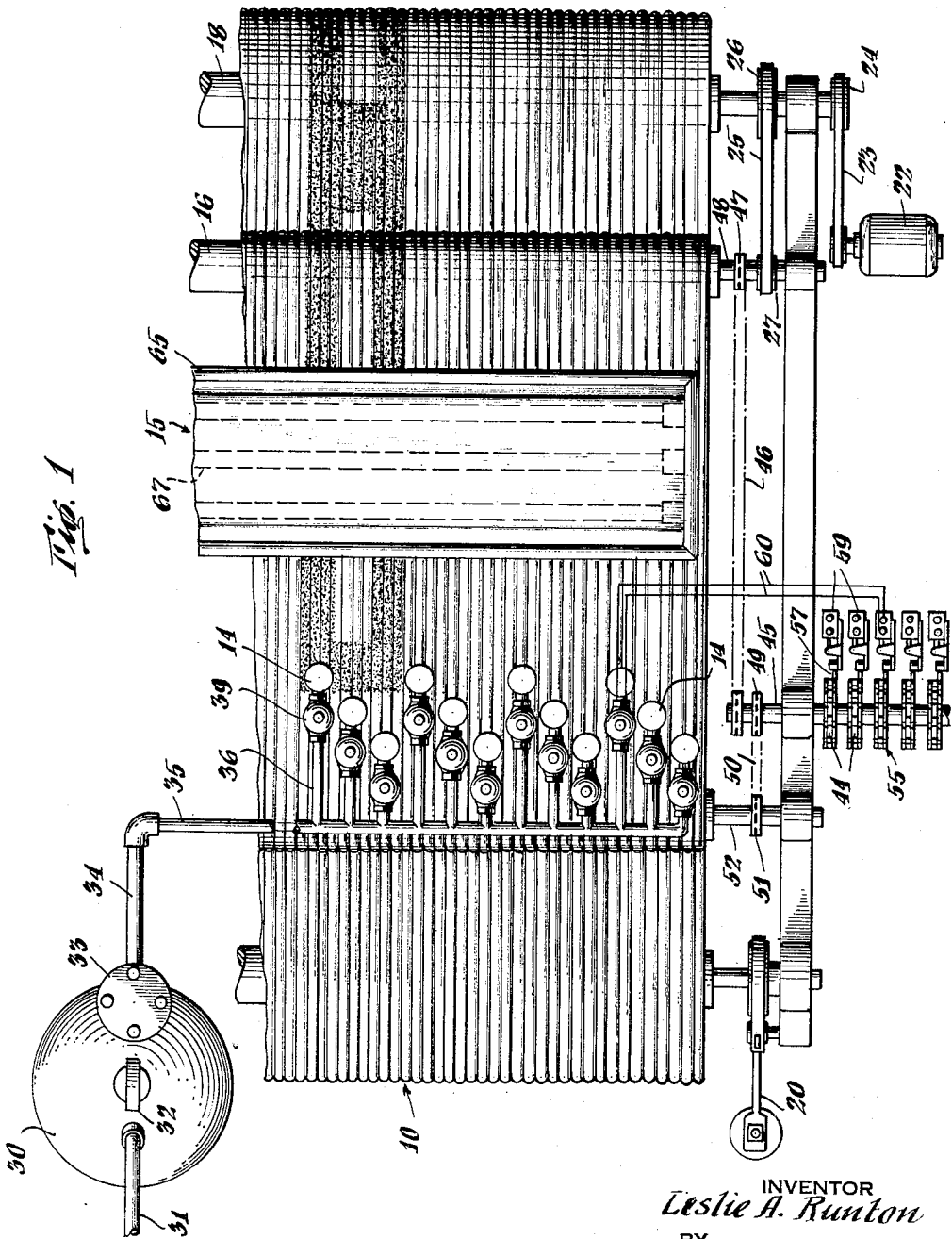
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APPARATUS FOR DYEING YARNS AND FABRICS

Filed Oct. 29, 1954

2 Sheets-Sheet 1



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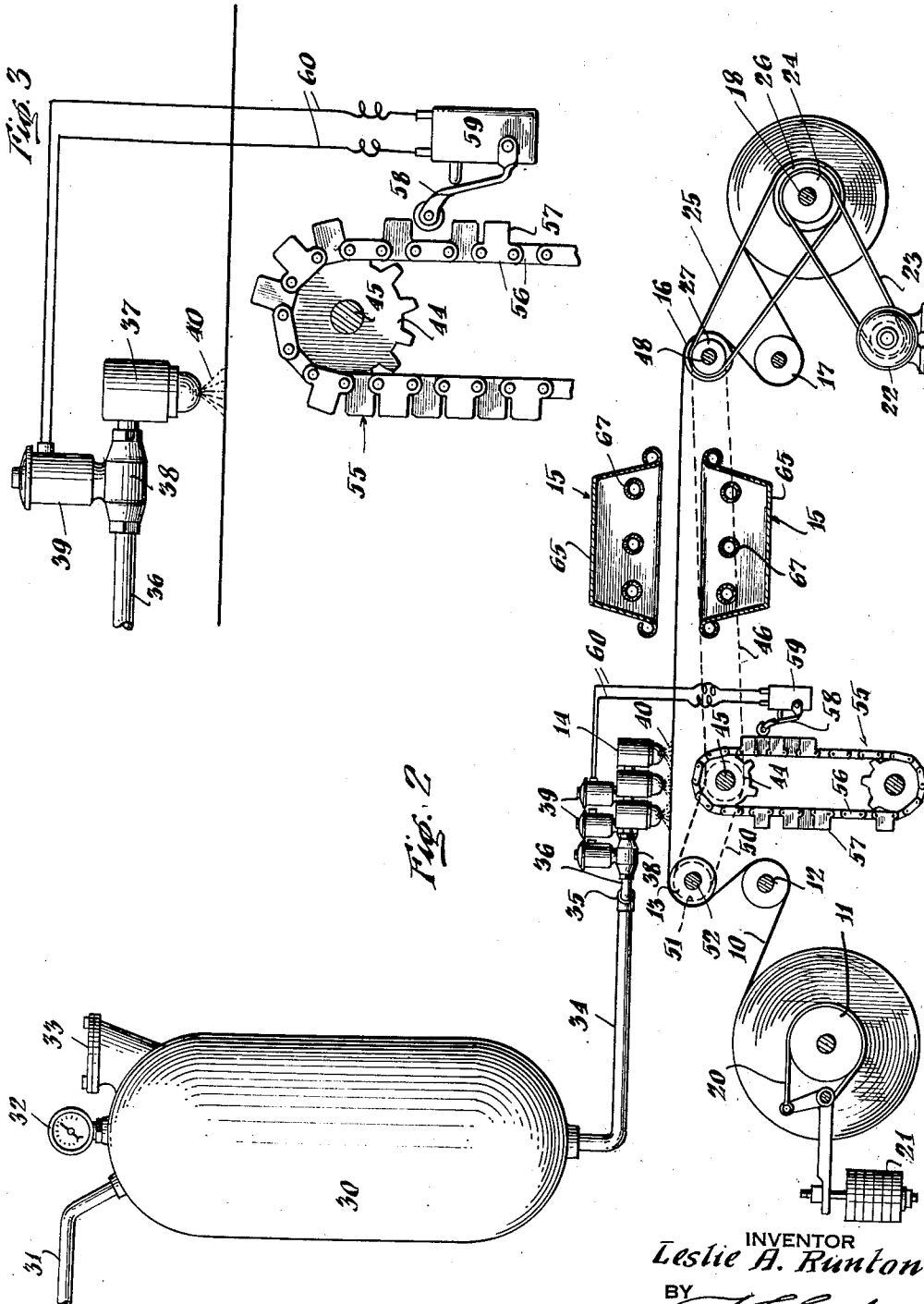
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APPARATUS FOR DYEING YARNS AND FABRICS

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3 Claims. (Cl. 68—13)

This invention relates to a method and apparatus for dyeing yarns and fabrics and more particularly to a method for dyeing yarn sheets to be wound on warp beams for use on velvet looms or the like.

An object is to provide a novel and improved method of the above type in which the pattern can be readily set up or changed and which does not require the use of printing on transfer rollers.

A more specific object is to provide a novel and improved method for dyeing warp sheets for making patterned velvets.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

This invention contemplates the use of the water soluble dyestuffs which are currently available and which dry at a rapid rate. Such dyestuffs exhaust on the textiles and are absorbed by the fibers at low temperatures.

In a specific embodiment of the invention the warp is enrolled from a warp beam and is passed as a sheet of parallel warp yarns under a series of spray nozzles which are spaced across the sheet and are individually controlled in a manner to form the selected pattern. The warp sheet is then passed under a dryer, such as a bank of infra red lamps, so as to dry and set the dye after which the warp sheet is rewound on a warp beam suited for use in weaving patterned velvets.

A series of such nozzles are disposed across the warp sheet in each color stage, the number depending upon the fineness of the design to be applied thereto. Each nozzle is controlled by an individual control mechanism which is settable according to the selected pattern. These controls are so arranged that the pattern is repeated as the warp sheet advances. The pattern may also be repeated in a transverse direction by employing a duplicate set of nozzles for each repeat of the pattern and controlling the corresponding nozzle of each set from the same pattern control.

The novel features which characterize this invention will be better understood by referring to the following description, taken in connection with the accompanying drawings forming a part thereof in which a specific embodiment has been set forth for purposes of illustration.

In the drawings:

Fig. 1 is a top plan view of an apparatus embodying the present invention;

Fig. 2 is a side elevation thereof; and

Fig. 3 is a detail view illustrating the control mechanism for a single nozzle.

Referring to the drawings more in detail, a sheet of warp yarn 10 is unwound from a warp beam 11, is passed around idler roll 12 and feed roll 13, is fed as a sheet under a bank of nozzles 14 to be described and between drying units 15, thence over a feed roll 16 and idler roll 17 and is rewound on a warp beam 18.

The warp beam 11 is provided with a suitable brake mechanism 20 including a weight 21 to apply the necessary drag for maintaining the warp sheet under tension as it is unwound. The warp beam 18 is shown as driven

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by a suitable means such as a motor 22 which is connected by a belt 23 to a pulley 24 on the warp beam. A chain 25 connects a sprocket 26 on the warp beam with a sprocket 27 connected to the feed roll 16 for driving the feed roll. The driving connection from the pulley 24 to the warp beam 18 may include the usual slip clutch mechanism for driving the beam at the proper speed to maintain the warp sheet under suitable tension as it is received from the feed roll 16.

The water soluble dyestuff is held in a tank 30 which is shown as a closed tank which may be maintained under pressure by air supplied through pipe 31, the pressure being indicated by a pressure gauge 32. A filler opening 33 is provided for charging the dyestuff into the tank 30. The dyestuff is fed through a feed pipe 34 to a manifold 35 having branches 36 leading to the individual spray heads or nozzles 14. Control valves 38 are actuated by individual solenoids 39 which are adapted to open and close the valves 38 and thereby control the spray 40 which is applied from the spray heads 14 onto the yarn. The spray heads 14 are shown as having narrow openings 37 which are elongated in the direction of travel of the yarn and are disposed in staggered relationship so as to permit the spray bands to be closely spaced to conform to the pattern requirements. A pitch of five or six nozzles to the inch may be used, depending upon the warp pitch and the fineness of the pattern. The width of the dye band from each nozzle may be made to conform to a single yarn or to a group of several yarns as desired. For controlling the various nozzles a series of sprockets 44 are mounted on a shaft 45 which is connected to be driven by a chain 46 from a sprocket 47 on shaft 48 of the feed roll 16. The shaft 45 also carries a sprocket 49 which is connected by a chain 50 to a sprocket 51 on shaft 52 of the feed roll 13 so that the feed rolls 13 and 16 are driven in unison and in synchronism with the shaft 45.

The shaft 45 carries a sprocket 44 for each of the spray heads 14 constituting a single transverse repeat of the pattern. These sprockets 44 carry chains 55 having links 56. The chains are driven in synchronism with the feed rolls 15 and 16 at a rate such that each link 56 corresponds to, for example, one inch of yarn passed beneath the spray heads 14. If the chain is driven at the same speed as the yarns, each link would be one inch in length. Raised blocks 57 are provided which may be inserted in selected links 56 of the respective chains. These blocks 57 are adapted to actuate spring arms 58 of microswitches 59 as the blocks 57 pass said spring arms. The microswitches 59 are connected by leads 60 to the respective solenoids 39 and are so arranged that a solenoid 39 is energized to hold the corresponding valve 38 open while its spring arm 58 is engaged by one of the high blocks 57. Hence the duration and timing of the opening of each of the valves 38 may be controlled by adjusting the position and arrangements of the various blocks 57 on the chains 55. In the example above given each block 57 controls the application of spray to one inch of yarn which would correspond to one pile loop in a woven fabric having half inch pile. Hence the pattern is controlled by inserting a block 57 in the position on the respective chains corresponding to each pile loop which is to be sprayed with that particular color.

The drying units 15 are shown as hoods 65 disposed above and below the yarn between the spray position and the feed roll 16. Each hood 65 contains a plurality of sources 67 of infra red rays which are adapted to heat the yarn passing the heating station to a temperature and for a time to dry and set the dye on the yarn before the yarn is re-rolled on the warp beam 18.

It is understood of course that the set of nozzles and dryers are repeated for each color which it is desired to

print on the fabric or yarn, only one station having been shown for convenience.

In the operation of this mechanism a series of chains 55 is set up on the corresponding sprockets 44 and the blocks 57 are disposed thereon in accordance with the selected pattern. In the embodiment shown the block is used for each of the pile loops which are to be colored. It is to be understood of course that the drive ratio may be varied so that each block may correspond to more or less length of yarn. A block corresponding to each pile loop has been selected for convenience as this arrangement facilitates the setting up of the apparatus. If, however, the coarseness of the design is such that the length of the shortest color bank encompasses several pile loops, then the feed ratio between the chains 55 and the feed sprockets 13 and 16 may be selected so that each block corresponds to a length of yarn for forming several pile loops. The particular length and drive ratio may be selected in accordance with the coarseness of the pattern.

A width of beam has been shown corresponding to a single pattern repeat. If the pattern is repeated two or more times across the beam the nozzles shown will be duplicated by the same microswitch 59. The chains, nozzles and dryers will be repeated for each color station and set up in accordance with the selected pattern.

As the warp is fed from the beam 10 to the beam 18 the nozzles are automatically actuated as above described to spray bands of color onto the yarn in accordance with the selected pattern. Obviously, if the yarns are to be woven from the beam 18 without re-winding, the pattern will be reversed since the direction of travel of the yarns during weaving will be the reverse of that of the yarns as they pass under the spray heads 14. This can be corrected by reversing the position of the control block 57 on the chains 55 so that the pattern is reversed on the yarns during printing.

Chain pattern controls have been shown for convenience. Other types of control such as Jacquard cards or the like may also be used. For changing a pattern a different set of chains or cards may be substituted for the previous set. The chains 55 may, for example, be set up on sprockets 44 on a shaft 45 and placed in control position as a unit, thereby minimizing the time required for a pattern change.

This system is particularly applicable to printing warp yarns for use on warp beams in velvet looms. It may however be used for printing any fabric or band which may be passed from one feed roll to another beneath the spray heads and it is to be understood that the invention is not to be restricted to the specific embodi-

ment shown as changes and modifications may be made therein as will be apparent to a person skilled in the art.

What is claimed is:

- 5 1. Apparatus for dyeing sheets of material, comprising means feeding said sheet through a spray zone having a series of spray nozzles spaced across said sheet to spray a dye in selected bands thereof, a solenoid actuated valve adapted to control the spray from each of said nozzles, circuit means including a switch connected to control the operation of each of said solenoids, a shaft carrying a plurality of sprockets and driven in synchronism with said sheet, chains driven by each of said sprockets, each of said chains having elements thereon adapted to actuate a selected one of said switches, said elements being settable in accordance with a predetermined pattern.
- 10 2. Apparatus for dyeing warp yarn to be woven as pile warp on a velvet loom, said apparatus comprising means arranging said yarn in the form of a sheet of spaced parallel yarns, a plurality of spray nozzles spaced across said sheet of warp yarn and adapted to spray a dye onto selected bands thereof, control means for each of said spray nozzles including actuating valves, feed means including a feed roll feeding said sheet of yarn past said spray nozzles, a plurality of pattern chains, means synchronized with said feed roll to advance said pattern chains, and means associated with each of said chains to control a selected nozzle in accordance with a predetermined pattern, said last means comprising raised elements carried by said chains and settable in accordance with a predetermined pattern, and valve actuating means connected to be actuated by said raised elements for controlling the respective valves.
- 15 3. Apparatus as set forth in claim 2 in which said valves are solenoid actuated and switch means is actuated by said raised elements to control the energization of said solenoids.

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