

2,587,534

4 Sheets-Sheet 1



Feb. 26, 1952

S. B. SCHWARTZ ET AL

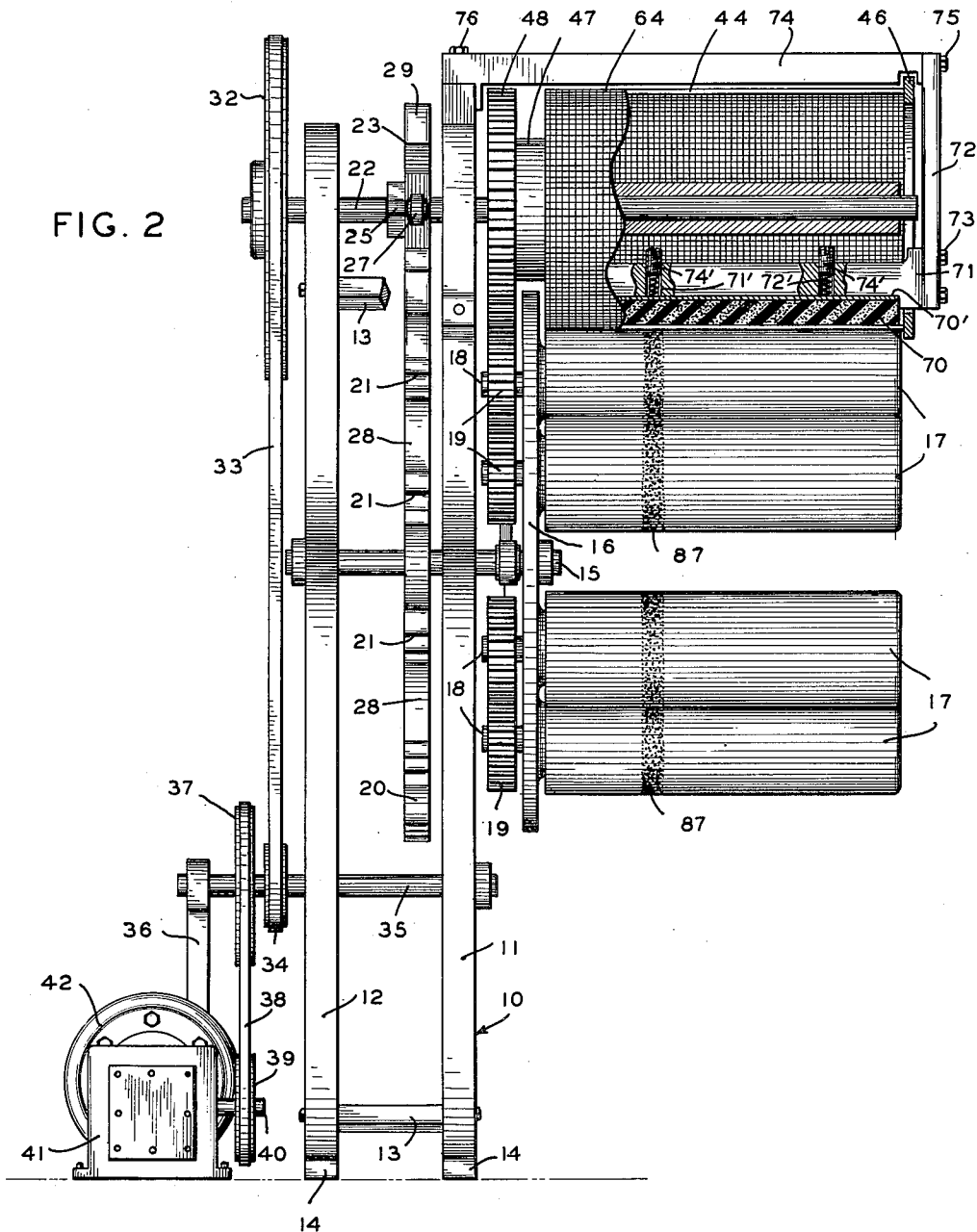
2,587,534

DESIGN DYEING APPARATUS

Filed Nov. 26, 1947

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FIG. 2



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DESIGN DYEING APPARATUS

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FIG. 3

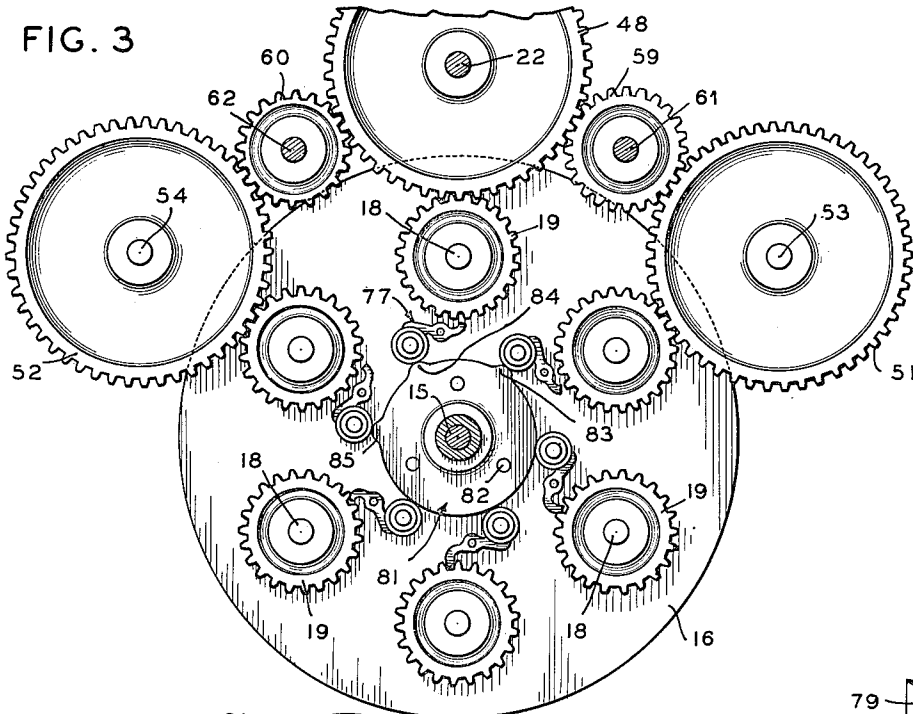


FIG. 4

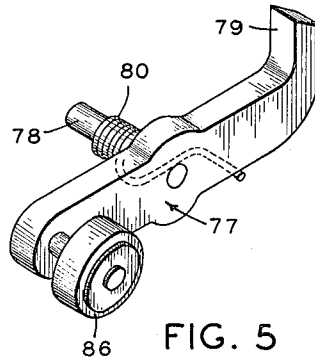
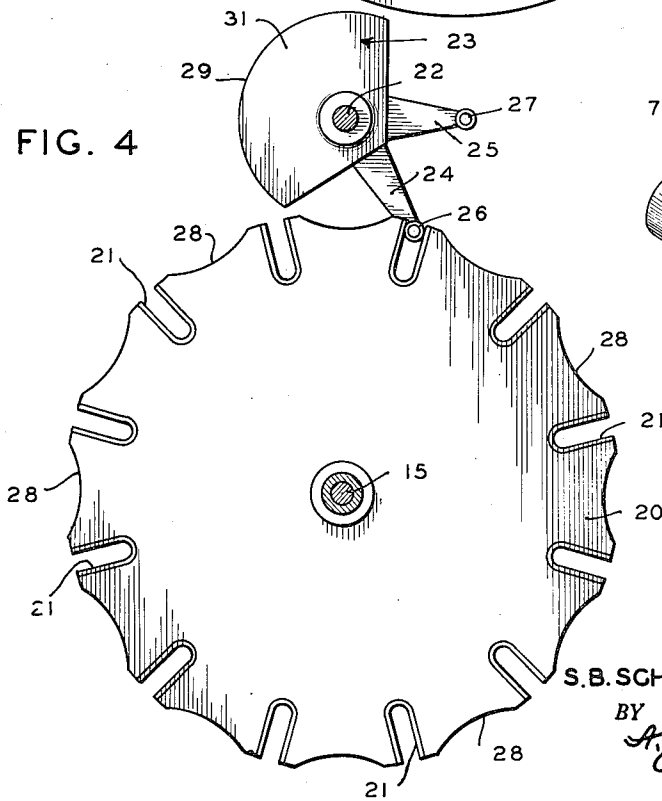


FIG. 5

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FIG. 6

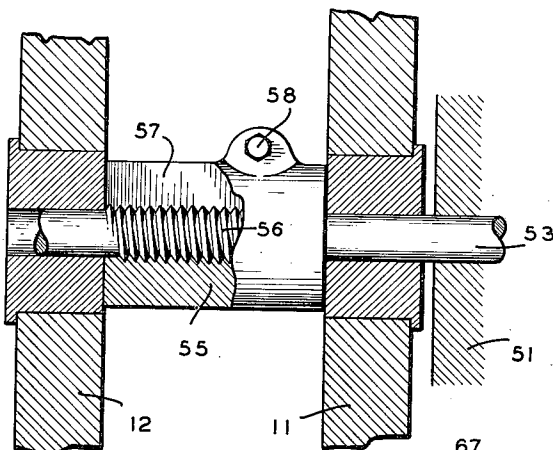
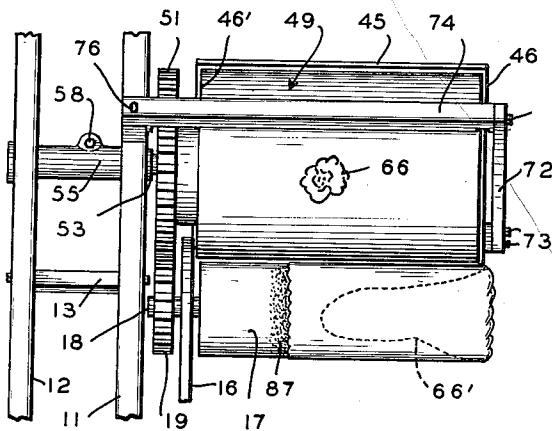


FIG. 7

FIG. 11

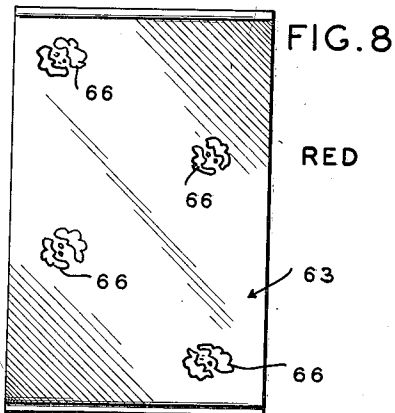
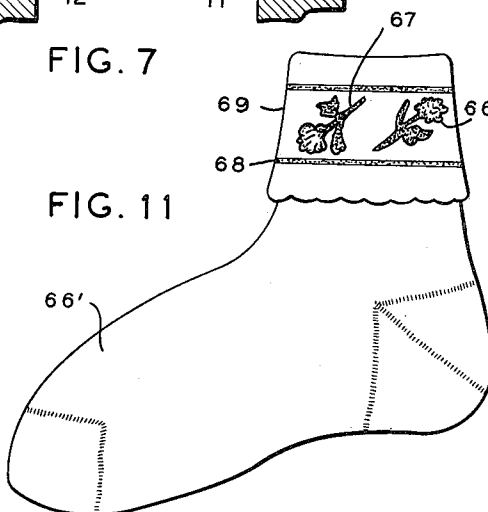


FIG. 8

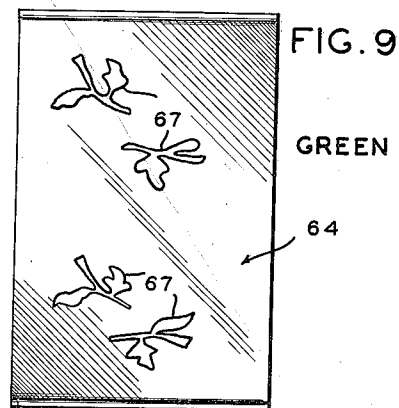


FIG. 9

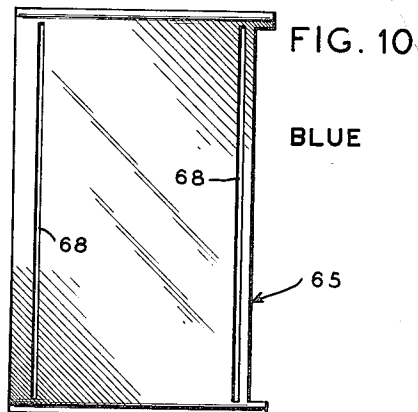


FIG. 10

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UNITED STATES PATENT OFFICE

2,587,534

DESIGN DYEING APPARATUS

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Application November 26, 1947, Serial No. 788,186

8 Claims. (Cl. 101—115)

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This invention relates to ornamentation, and more particularly to design dyeing and apparatus for and process of accomplishing the same.

One specific use of the invention is the application of a single or multi-color design for purposes of ornamentation to finished or fabricated textiles such as, for example, to hosiery or the like. The method does not pertain to woven piece goods which are printed continuously by such means as roller printing with intaglio cylinders.

Ornamentation has been accomplished in many ways, including the printing of designs on piece goods and on some finished articles such as blouses, T-shirts, overalls, and the like. However, this type of ornamentation has either been very limited as to color and durability, or has required the use of much skilled labor in the production thereof.

Hosiery has also been heretofore produced with designs which have been knitted into the hosiery. This is a very costly process, requiring the use of special colored yarns in knitting, and requiring special machinery. The designs possible by this method are extremely limited due to the inherent limitations of knitting machines. Intricate and sharp designs are not possible by this method.

Further, the design has not been permanent when applied by a thermoplastic or thermosetting transfer which is inexpensive. Also, the application of a design to finished or fabricated articles of textile apparel has not been adapted to low cost quantity production, being accomplished by manual operations using the screen process or the like. The roller printing process, utilizing the same types of dyes or printing pastes as applicants' process is not adaptable to finished or fabricated articles of textile apparel, such as hosiery. Initial cost of machinery and engraving of intaglio cylinders precludes practicability of utilizing this process for fabricated textiles such as hosiery where yardage is small compared to that normally run on one design on piece goods. Also the roller process has not been adapted mechanically for the printing of fabricated articles such as hosiery but is utilized exclusively for the printing of piece goods in continuous flat form.

Applicants' apparatus and process has been specifically created for application of a single or multicolored design to hosiery. It is desirable that the application of designs to articles such as socks be accomplished rapidly and inexpensively in order that these articles may be sold

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at a comparatively low price in the present day highly competitive market where competition is keen, thereby precluding the manual application of such designs.

Applicants' process of applying designs is a true dyeing process in that the dye is applied to the fabric and allowed to penetrate and completely color the fibers therein. An aqueous solution of a textile coloring component such as a vat dye, may be incorporated in the printing paste or a pigmented oil-in-water or water-in-oil two phase emulsion, with resin binder, may be utilized. These printing pastes are well known to those skilled in the art of textile printing. Consequently, the resulting product is completely wash-fast and the design will retain substantially its original brilliance and character throughout the life of the fabric.

It is an object of the invention to provide a simple and inexpensive apparatus and process for design dyeing, and employing a multiplicity of colors which may be easily varied and in which the articles are partially dried prior to removal from the apparatus.

Another object of the invention is to provide apparatus for design dyeing which is substantially automatic in its operation, except for the supplying to and removal from the same, and with means for properly initially positioning the article relative to the apparatus.

A further object of the invention is to provide automatic apparatus for design dyeing, particularly hosiery, and utilizing flexible fine mesh screening, the design portion of which is open and the remaining covered with a material impervious to the printing paste and through which design portion the dye or color paste is applied to the product.

Another object of the invention resides in a process of providing a multi-colored design on knitted or woven fabrics such as hosiery, or the like, which design is sharp and pleasing to the eye, is wash-fast, or permanent in character, and will substantially retain its original brilliance throughout the life of the fabric, as well as to provide a process easily adaptable for use on an automatic machine.

A further object of the invention resides in a process of dyeing designs in fabrics in which dye or color paste is applied thereto through one or more screens carrying the design and in which flow of the dye beyond the edges of the design is prevented by treatment of the fabric prior to dyeing.

A further object of the invention resides in the

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process of dyeing designs in fabrics such as hosiery in which the hose or sock is treated with an oil-in-water emulsion, such as for example, an emulsion of paraffin wax in water prior to application of the dye.

Further objects and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a front elevation of an apparatus illustrative of the invention and showing the apparatus in condition to apply a three color design;

Fig. 2, a side elevation of the apparatus of Fig. 1 partially in section and with parts omitted for greater clarity;

Fig. 3, a rear elevation of the plate carrying the sock receiving cylinders and showing the drive mechanism for these cylinders and the dyeing screens as well as the means for retaining the sock carrying cylinders in proper position to obtain registry of the various portions of the design;

Fig. 4, a detailed elevational view showing the Geneva gear mechanism for obtaining step by step rotation of the cylinder carrying plate;

Fig. 5, a detailed perspective view of the dog used for maintaining the sock carrying cylinders in position prior to rotation thereof;

Fig. 6, a partial side elevation showing a sock in position on the cylinder with a portion of the design about to be applied thereto;

Fig. 7, a sectional elevational view showing details of the adjusting means for obtaining proper preliminary adjustment of the dyeing screens;

Figs. 8, 9, and 10, plan views of three screens prior to mounting on the screen cylinders and adapted to be used for applying a three color design and,

Fig. 11, a side elevation of a sock having applied thereto a three color design by use of the screens in Figs. 8, 9 and 10.

With continued reference to the drawings, particularly Figs. 1 and 2, there is shown an apparatus for dyeing designs in fabrics such as hosiery and having a frame 10, comprising front and rear upright frame members 11 and 12 held in parallel spaced apart relationship by spacers 13. The lower portions of the frame members 11 and 12 may be provided with feet or the like 14 for securing to a base or table.

Substantially centrally of the plates 11 and 12 a shaft 15 is journaled having a plate 16 fixed to one end. The plate 16 serves to rotatably carry a plurality of cylinders 17 equally spaced around the plate and in the illustrated embodiment, since six such cylinders are shown, this spacing will be 60 degrees. Each of the cylinders 17 are mounted on a shaft 18 journaled in the plate 16 and on the inner end of each shaft 18 is fixed a gear 19. In order to obtain step by step rotation of the plate 16 and cylinders 17 carried thereby, there is provided on the shaft 15 between the plates 11 and 12 a Geneva gear 20, the details of which are shown in Fig. 4. The Geneva gear 20 is provided in this particular embodiment with twelve notches 21 in order that plate 16 will make twelve steps in completing one revolution thereof.

In order to drive the Geneva gear 20, there is provided adjacent the upper portion of frame 10 a main drive shaft 22 journaled in plates 11 and 12 and having mounted thereon for engagement with Geneva gear 20 a Geneva drive member 23, the details of which are shown in Fig. 4. This

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drive member 23 is provided with two arms 24 and 25 each of which arms is provided adjacent the end thereof with rollers 26 and 27 respectively. As shaft 22 rotates, rollers 26 and 27 successively engage slots 21 in the Geneva gear 20 to rotate the shaft 15 and plate 16 carried thereby through two 30 degree arcs.

In order to lock shaft 15 and plate 16 carried thereby in position while rollers 26 and 27 are out of engagement with slots 21, there is provided on the peripheral surface of the Geneva gear 20 between each pair of slots 21 an arcuate surface 28 which is adapted to be engaged by arcuate surface 29 on plate 31 fixed to shaft 22 and arms 24 and 25 for rotation therewith. It will be noted that arcuate surface 29 is so disposed with relation to the arms 24 and 25 as to only engage the arcuate surface 28 on Geneva gear 20 during periods in which the rollers 26 and 27 are out of engagement with the slots 21. It will thus be seen that immediately after each two 30 degree steps of rotation by the gear 20 that arcuate surface 29 will engage arcuate surface 28 and thus lock gear 20 and plate 16 in position until the roller 26 engages the next slot 21.

To the outer end of shaft 22 is fixed a pulley 32 having trained thereover a belt 33 engaging a pulley 34 on shaft 35 journaled for rotation in plates 11 and 12 and a bracket 36. Also mounted on shaft 35 is a pulley 37 engaged by a belt 38 which in turn engages a pulley 39 mounted on a shaft 40 extending from a reduction gear box 41 mounted adjacent the lower portion of the frame 10. The gearing within box 41 may conveniently be driven by a motor 42 connected thereto through shaft 43.

Fixed to the opposite end of shaft 22 from pulley 32 is a dye applying cylinder indicated generally at 44, the construction of which is best shown in Fig. 2. The dye applying cylinder 44 comprises a cylindrical shell portion 64 which may be formed of a fine mesh silk or metallic screen sufficiently rigid to maintain the shape of the cylinder but which at the same time possesses sufficient flexibility to conform to irregularities in the surface of the fabric material to be dyed. The screen 64 is supported at the outer end thereof by an annular ring 46 and at the inner end by a circular disc 46' having a hub portion 47 to which is secured a gear 48. Gear 48, hub 47 and screen 64 are all mounted on shaft 22 for continuous rotation therewith. In order to further strengthen the cylinder 44, there is provided a bar 45 rigidly secured at its ends to the ring 46 and disc 46'.

If a single color design is to be applied it is only necessary to use a single dye applying cylinder but since it is contemplated by this invention that a multi-color design will be applied, there are shown herein for purposes of illustration three cylinders, indicated generally at 49, 44 and 50, resulting in an apparatus which will apply a three color design. Cylinders 49 and 50 are similar in construction to cylinder 44 and are provided adjacent the rear ends thereof with gears 51 and 52 respectively of the same size as gear 48 mounted on screen 44. Cylinders 49 and 50 are mounted on shafts 53 and 54 journaled in plate members 11 and 12 as best shown in Fig. 6.

In order that cylinders 49 and 50 may be adjusted longitudinally to initially position the design with respect to the design on cylinder 44 in order to obtain proper registration, shafts 53 and 54 are mounted to permit slidable movement in their journal bearings in the plates 11 and 12

and there is provided means for adjusting and locking cylinders 49 and 50 in the desired position. This means is best shown in Figs. 6 and 7 and comprises a sleeve 55 threadedly received on threads 56 formed in shafts 53 and 54, the sleeve 55 being rotatably received between the plates 11 and 12 and being of such length as to have substantially no end play. By rotating sleeve 55 with relation to shafts 53 and 54, these shafts may be moved longitudinally in either direction to adjust the cylinders mounted thereon and this adjustment may be maintained by providing a slot 57 in the sleeve 55 and a locking bolt 58 for clamping the slotted sleeve 55 about the thread 56, thus preventing undesired relative rotation between sleeve 55 and shafts 53 and 54. It is only necessary to provide this adjustment on two of the cylinders, since these cylinders may be adjusted in accordance with the position of the design on central cylinder 44.

Cylinders 49 and 50 are driven from gear 43 on shaft 22 by idler gears 59 and 60 respectively journaled on stub shafts 61 and 62 respectively mounted in the plate 11. In will thus be seen that upon rotation of shaft 22 and cylinder 44 that cylinders 49 and 50 will be rotated at the same speed and in the same direction.

Cylinders 44, 49 and 50 provide a plurality of screens indicated generally at 63, 64 and 65 in Figs. 8, 9 and 10. These screens are formed of a fine silk or metallic mesh and serve to carry the design to be applied to the fabric, such as a sock 66. Screens 63, 64 and 65 must be of relatively fine mesh in order to prevent the pattern of the screen from being reproduced on the fabric but at the same time must have sufficient tensile strength and resistance to wear to impart relatively long life thereto. Consequently, it has been found that these screens are best formed of silk or of fine steel wires but obviously these screens may be formed of any other suitable material.

The screens are prepared for use in the apparatus of this invention by applying to the surface thereof a coating of material impervious to the dye being used to impregnate the fabric and form the design therein. The entire surface of the screen is covered with this material with the exception of a portion forming the outline of the design. Screen 63, as shown in Fig. 8, is intended to apply the petal portion 66 of a flower design to each side of the cuff of a sock as shown in Fig. 11. The color of this petal design could, for instance, be red, as indicated in Fig. 8. Screen 64 is intended to apply the leaf and stem design 67 to the petal design applied by screen 63 and the color of the leaves and stem may well be green as indicated in Fig. 9. Screen 65 is designed to apply lines 68 completely around the cuff 69 of sock 66 and these lines may well be blue as indicated in Fig. 10. It is understood, however, that any design or color combination may be utilized by properly forming the screens to apply such a design.

In order to force the dye through the screens 63, 64 and 65 there is provided within each cylinder 49, 44, and 50, a squeegee 70 which may be formed of rubber or other relatively soft material. The squeegee 70 may be slidably mounted in a recess 70' in bar 71, which bar in turn is adjustably mounted on a bar 72 by screw threaded members 73. Bar 72 in turn may be adjustably mounted on bracket 74 by screw threaded members 75, bracket 74 being fixed on plate 11 by a screw threaded member 76. In order to properly adjust the pressure of the squeegee against the

inner surface of the screen 64 there is provided in the bar 71 two apertures 71' in each of which may be placed a compression spring 72' serving to urge squeegee 70 into engagement with the inner surface of screen 64. The pressure on the spring 72' and the squeegee 70 may conveniently be regulated by screw threaded members 74' threadedly received in the apertures 71'. It will thus be seen that in this arrangement squeegees 70 may be easily removed for cleaning purposes and may also be adjusted in order to give the desired pressure on the inner surface of screen 64.

In operation, it is only necessary to apply a dye in the form of paste or the like to the inner surface of the screens and upon rotation thereof the dye will be forced through the treated portions of the screen by the rubbing action of squeegee 70. One squeegee is provided for each of the cylinders 49, 44 and 50 and each of these may be of similar construction.

In the dyeing of a design in articles such as socks carried on the cylinder 17, it is necessary to bring the external surface of the socks into engagement with the external surface of the screens carried by cylinders 49, 44 and 50 and to rotate the sock and cylinder while in contact at the same surface speed during which rotation the design will be imparted to the sock by action of the squeegee in forcing the dye through the screen. In order to rotate sock carrying cylinders 17 at the same surface speed as the cylinders 49, 44 and 50 there is provided on the shaft 18 of each cylinder 17 a gear 19 which is adapted to engage gear 51 on cylinder 49, gear 48 on cylinder 44 and gear 52 on cylinder 50 when the respective sock carrying cylinders 17 are in position to receive dye from these cylinders. It will be obvious that once in engagement, cylinder 17 will be rotated at a speed in accordance with the gear ratio between gears 41, 48 and 52 and the gears 19.

In order that cylinder 17 and gears 19 will not be accidentally rotated while out of engagement with the gears associated with cylinders 49, 44 and 50 and that the cylinders 17 will be stopped immediately after one revolution, there is provided on the rear surface of the plate 16 a plurality of dogs indicated generally at 77, shown in operative position in Fig. 3 and in detail in Fig. 5. One dog 77 is provided for each of the gears 19 and each dog is pivotally mounted on the plate 16 by a pintle 78, a portion 79 of the dog being normally urged into engagement with its associated gear by a spring 80.

In order to move each dog out of engagement with its associated gear when that gear engages the gear associated with the cylinders 49, 44 or 50, there is provided a cam indicated generally at 81, which cam may be conveniently secured in fixed relation to the outer surface of plate 11 by screw threaded members 82. The peripheral surface of cam 81 is provided with three raised portions 83, 84 and 85 respectively, corresponding to the positions occupied by the sock carrying cylinder 17 when in engagement with the cylinders 49, 44 and 50 respectively. The raised portions 83, 84 and 85 are adapted to engage a roller 86 carried at the opposite end of each dog 77 from the gear engaging portion 79 which will raise the gear engaging portions 79 away from the gear and permit the same to turn. Dog 77 will remain out of engagement with gear 19 until one revolution thereof is completed at which time plate 16 will move 30 degrees thus allowing roller 86 to move off of raised portions 83, 84 and 85 and permit gear

engaging portion 79 to again engage gear 19 and lock the same against rotation.

It will thus be seen that there has been provided a mechanism by which socks or the like carried on cylinder 17 may be moved into engagement with dyeing cylinders 49, 44 and 50 whereupon the engaged cylinders will make one complete revolution at the same surface speed, thus imparting the portion of the design carried by the associated screen to the sock and that upon the completion of one revolution cylinders 17 will be locked against rotation until engagement with the respective succeeding dyeing cylinder whereupon the cylinders will be unlocked for further rotation, thus assuring proper registration of the various portions of the design and preventing the overlapping of the different colors.

In order to facilitate positioning of the socks on the cylinders 17 there is provided a ring 87 of contrasting color about each cylinder 17, it being only necessary for the operator to apply the cuff of the sock over the cylinder and up to the ring 87 as shown in Fig. 6. Also, if desired the foot portion of the sock extending from the outer end of cylinder 17 may be pushed inside of the cylinder in order to prevent engagement thereof with other parts of the machine or to impede the operator in the application and removal of socks from the apparatus and to permit dyeing the design on the outer part of a turned down cuff without turning the sock inside out.

In operation screens provided with the desired design are mounted on the machine and secured in place while dye of the desired color is applied to the inner surface thereof. A sock is applied to the sock carrying cylinder 17 at loading station A whereupon the plate 16 will be stepped around until the sock on cylinder 17 engages the first dyeing cylinder 49, at which time the first color of the design will be applied thereto. While this operation is carried out the next sock is applied to the following cylinder 17 at station A. After completion of the first dyeing step at cylinder 49, plate 16 and cylinder 17 will be stepped through a 30 degree arc which is halfway between cylinder 49 and cylinder 44, thus allowing the design time in which to partially dry before the next dyeing operation at cylinder 44 takes place. This process is repeated at cylinders 44 and 50 after which the sock is allowed to dry until it reaches station B, at which time the sock may be removed and a new sock applied as cylinder 17 moves to station A. The above operation may be repeated until the desired number of socks carrying this design have been completed.

The process of dyeing designs in fabrics such as hosiery or the like as carried out by the apparatus above described is a true dyeing process as distinguished from a painting or heat applied transfer process in which the color or ink is merely applied to the surface of the material whereas in the instant process the material is substantially impregnated to color the fibers thereof.

The dye or printing paste used may well be a water-in-oil or an oil-in-water emulsion incorporating the following ingredients: color, water, common salt as a stabilizer, a petroleum naphtha solvent and a resin binder. The dye or printing paste may also be a color paste made up as a single phase system, utilizing water with no water immiscible substance or as an oil-in-water or water-in-oil emulsion in which an aqueous

solution of a textile coloring component, such as a vat dye may be incorporated in the thickening vehicle. The thickening vehicle may be a starch or starch derivative dispersion, or it may be a cellulose derivative solution, or simply an oil and water emulsion, with resin or other stabilizer, of the proper viscosity. This dye or color paste is prepared in the proper viscosity and applied to the inner surface of the screens as described above.

It has been found, however, that in applying a dye of the above type directly to the material it is extremely difficult to obtain a sharp design and one in which various colors do not run outside the lines of the design and also the character of the design is greatly effected by the squeeze pressure.

The above difficulty appears to be caused by the fact that it is practically impossible to prepare the dye in the form of a perfect emulsion, that is, an emulsion in which all of the particles of water are completely emulsified in the solvent and it is also practically impossible to obtain an emulsion which does not contain some free solvent as well as free water. If a perfectly emulsified colored printing paste could be obtained as a practical matter, a clear sharp design would be produced and in all probability the colors would not run beyond the lines of the design.

This problem has been overcome by treating the fabric or the article to be dyed prior to the application of dye thereto with a water repellent solution which may conveniently be a simple oil-in-water emulsion, such as, for example, an emulsion of a paraffin wax in water. Treatment with this water repellent solution appears to increase the surface tension in the fabric material outside of the design and that therefore the absorbency of the material inside the design is greater by comparison than that outside the design which results in the free solvent or free water in the dye having a greater attraction for the wet portion within the design and is thus not permitted to flow freely outside the lines of the design where it is not desired.

It has been found that this process results in a clear sharp design which retains its outline, brilliancy, and character throughout substantially the life of the fabric material.

It will be seen that applicants by their invention have provided a novel dyeing process for the application of designs to fabricated material such as hosiery and have further provided an automatic apparatus for carrying out this process in a relatively rapid and economical manner.

It will be obvious to those skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof and therefore the invention is not limited by that which is shown in the drawing and described in the specification but only as indicated in the appended claims.

What is claimed is:

1. Apparatus for design dyeing of fabric articles comprising in combination a frame, a plate and Geneva gear rotatably mounted on said frame, a main drive shaft rotatably mounted on said frame, a Geneva drive member mounted on said drive shaft for cooperation with said Geneva gear whereby upon rotation of said drive shaft said plate will be intermittently rotated step by step, means associated with said Geneva gear and said Geneva gear drive member whereby said plate will be locked against rotation between each

movement thereof, a plurality of article receiving cylinders rotatably mounted on said plate, means on said cylinders to facilitate proper positioning of the articles thereon, a drive gear operatively associated with each article receiving cylinder, a dye applying cylinder mounted on said main drive shaft for rotation therewith, additional dye applying cylinders journaled on said frame disposed on either side of said first mentioned dye applying cylinder and in spaced relation thereto, each of said dye applying cylinders comprising a screen carrying a design, a gear disposed on the inner end of each cylinder, a squeegee adjustably mounted within said screen and in contact with the inner surface thereof whereby upon rotation of said screen dye disposed on the inner surface thereof will be forced through the design thereon by the action of said squeegee, idler gears disposed between the gears on said cylinders whereby said cylinders will be simultaneously rotated at the same speed and in the same direction, said article receiving cylinders being disposed on said plate in a manner whereby the drive gear on each article receiving cylinder will successively engage the gear on each dye applying cylinder at intervals during the step by step rotation of said plate and whereby articles carried by said article receiving cylinders will engage said screens and be rotated while in engagement therewith at the same surface speed to apply a design to the article, and means to lock said article receiving cylinders against rotation while out of engagement with said dye applying cylinders.

2. Apparatus for design dyeing of fabric articles comprising in combination a frame, a plate and Geneva gear rotatably mounted on said frame, a main drive shaft rotatably mounted on said frame, a Geneva drive member mounted on said drive shaft for cooperation with said Geneva gear whereby upon rotation of said drive shaft said plate will be intermittently rotated step by step, means associated with said Geneva gear and said Geneva drive member whereby said plate will be locked against rotation between each movement thereof, a plurality of article receiving cylinders rotatably mounted on said plate, means on said cylinders to facilitate proper positioning of the articles thereon, a drive gear operatively associated with each article receiving cylinder, a dye applying cylinder mounted on said main drive shaft for rotation therewith, additional dye applying cylinders journaled on said frame disposed on either side of said first mentioned dye applying cylinder and in spaced relation thereto, a screen carrying a design disposed on each dye applying cylinder, a gear disposed on the inner end of each dye applying cylinder, idler gears disposed between the gears on said dye applying cylinders, said article receiving cylinders being disposed on said plate in a manner whereby the drive gear on each article receiving cylinder will successively engage the gear on each dye applying cylinder at intervals during the step by step rotation of said plate and whereby articles carried by said article receiving cylinders will engage said screens and be rotated while in engagement therewith at the same surface speed to apply a design to the article, and means to lock said article receiving cylinders against rotation while out of engagement with said dye applying cylinders.

3. Apparatus for design dyeing of fabric articles comprising in combination a frame, a plate rotatably mounted on said frame, a main drive shaft rotatably mounted on said frame, means

operatively associated with said plate and said main drive shaft to intermittently rotate said plate in step by step movements and to lock said plate against rotation between movements thereof, a plurality of article receiving cylinders rotatably mounted on said plate, a drive gear operatively associated with each article receiving cylinder, a dye applying cylinder mounted on said main drive shaft for rotation therewith, additional dye applying cylinders journaled on said frame disposed on either side of said first mentioned dye applying cylinder and in spaced relation thereto, a screen carrying a design disposed on each dye applying cylinder, a gear disposed on the inner end of each dye applying cylinder, idler gears disposed between the gears on said dye applying cylinders, said article receiving cylinders being disposed on said plate in a manner whereby the drive gear on each article receiving cylinder will successively engage the gear on each dye applying cylinder at intervals during the step by step rotation of said plate and whereby articles carried by said article receiving cylinders will engage said screens and be rotated while in engagement therewith at the same surface speed to apply a design to the article and means to lock said article receiving cylinders against rotation while out of engagement with said dye applying cylinders.

4. Apparatus for design dyeing of fabric articles comprising in combination a frame, a plate rotatably mounted on said frame, a main drive shaft rotatably mounted on said frame, means operatively associated with said plate and said main drive shaft to intermittently rotate said plate in step by step movements and to lock said plate against rotation between movements thereof, a plurality of article receiving cylinders rotatably mounted on said plate, a drive gear operatively associated with each article receiving cylinder, a dye applying cylinder mounted on said main drive shaft for rotation therewith, additional dye applying cylinders journaled on said frame disposed on either side of said first mentioned dye applying cylinder and in spaced relation thereto, a screen carrying a design disposed on each dye applying cylinder, a gear disposed on the inner end of each dye applying cylinder, idler gears disposed between the gears on said dye applying cylinders, said article receiving cylinders being disposed on said plate in a manner whereby the drive gear on each article receiving cylinder will successively engage the gear on each dye applying cylinder at intervals during the step by step rotation of said plate and whereby articles carried by said article receiving cylinders will engage said screens and be rotated while in engagement therewith at the same surface speed to apply a design to the article.

5. Apparatus for design dyeing of fabric articles comprising in combination a frame, means rotatably mounted on said frame and carrying a plurality of rotatably mounted article receiving members, a plurality of rotatably mounted dye applying members, means operatively associated with said article receiving members whereby articles carried thereby will successively engage said dye applying members, means to rotate said dye applying members and said article carrying members during engagement therebetween and at the same surface speed, means to apply a design to said articles during said engagement and means to lock said article receiving members against rotation while out of engagement with said dye applying members said last named means com-

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prising a pivotally mounted dog adjacent at least one article receiving member, resilient means normally urging said dog into engagement with a portion of an article receiving member, and cam means mounted on said frame to move said dogs out of engagement with said article receiving member during engagement between said article receiving members and said dye applying members whereby said article receiving members may rotate freely during such engagement.

6. Apparatus for design dyeing of fabric articles comprising in combination a frame, means rotatably mounted on said frame and carrying a plurality of rotatably mounted article receiving members, a plurality of rotatably mounted dye applying members, means operatively associated with said article receiving members whereby articles carried thereby will successively engage said dye applying members, means to rotate said dye applying members and said article carrying members during engagement therebetween and at the same surface speed, means to apply a design to said articles during said engagement, means to lock said article receiving members against rotation while out of engagement with said dye applying members and cam means for releasing said lock means during engagement of said article receiving members with said dye applying members.

7. Apparatus for design dyeing of fabric articles comprising in combination a frame, a plate rotatably mounted on said frame, means to intermittently rotate said plate in step by step movements, a plurality of rotatably mounted article holders on said plate, a drive gear operatively associated with each holder, a dye applying cylinder rotatably mounted on said frame, additional dye applying cylinders journaled on said frame and disposed on either side of said first mentioned dye applying cylinder and in spaced relation thereto, a screen carrying a design disposed on each dye applying cylinder, a gear disposed on each dye applying cylinder, idler gears disposed between the gears on said dye applying cylinders, means to drive one of said dye applying cylinders, said article receiving holders being disposed on said plate in a manner whereby the drive gear on each article holder will successively engage the gear on each dye applying cylinder at intervals during the step by step rotation of said plate and whereby articles

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carried by said article holders will engage said screens and be rotated while in engagement therewith at the same surface speed to apply a design to the article.

8. Apparatus for design dyeing of fabric articles comprising in combination a frame, a plate rotatably mounted on said frame, means to intermittently rotate said plate in step by step movements, a plurality of rotatably mounted article holders on said plate, drive means operatively associated with each holder, a dye applying cylinder rotatably mounted on said frame, additional dye applying cylinders journaled on said frame and disposed on either side of said first mentioned dye applying cylinder and in spaced relation thereto, a screen carrying a design disposed on each dye applying cylinder, means to drive each of said dye applying cylinders, said article receiving holders being disposed on said plate in a manner whereby the drive means on each article holder will successfully engage the means to drive each dye applying cylinder at intervals during the step by step rotation of said plate and whereby articles carried by said article holders will engage said screens and be rotated while in an engagement therewith at the same speed to apply a design to the article.

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