

June 20, 1944.

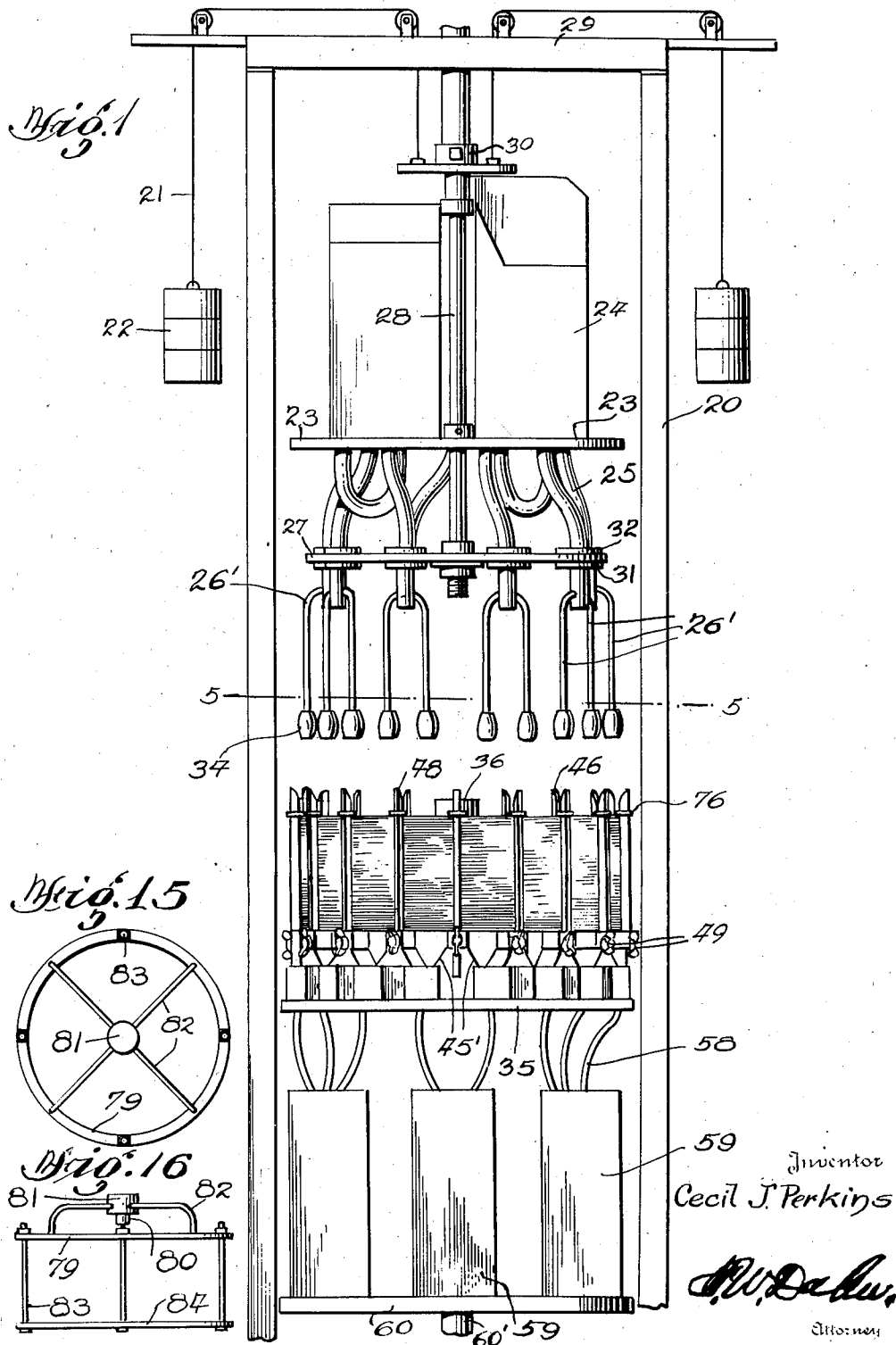
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2,351,701

PROCESS AND APPARATUS FOR SPOT-DYEING SKEINS

Filed Nov. 11, 1941

6 Sheets-Sheet 1



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PROCESS AND APPARATUS FOR SPOT-DYEING SKEINS

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6 Sheets-Sheet 2

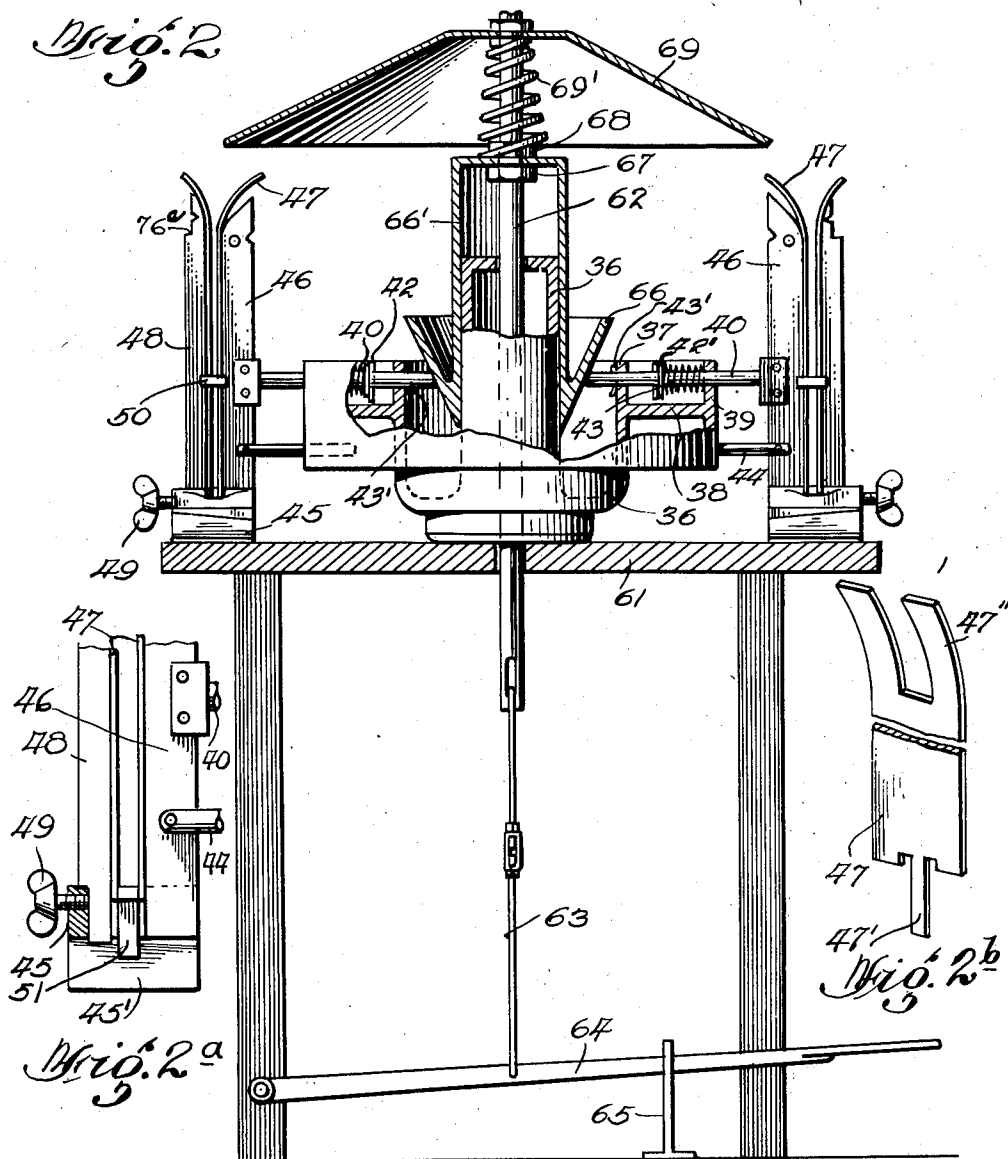


Fig. 3

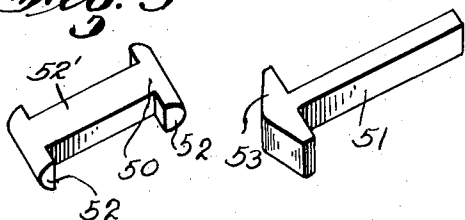


Fig. 4

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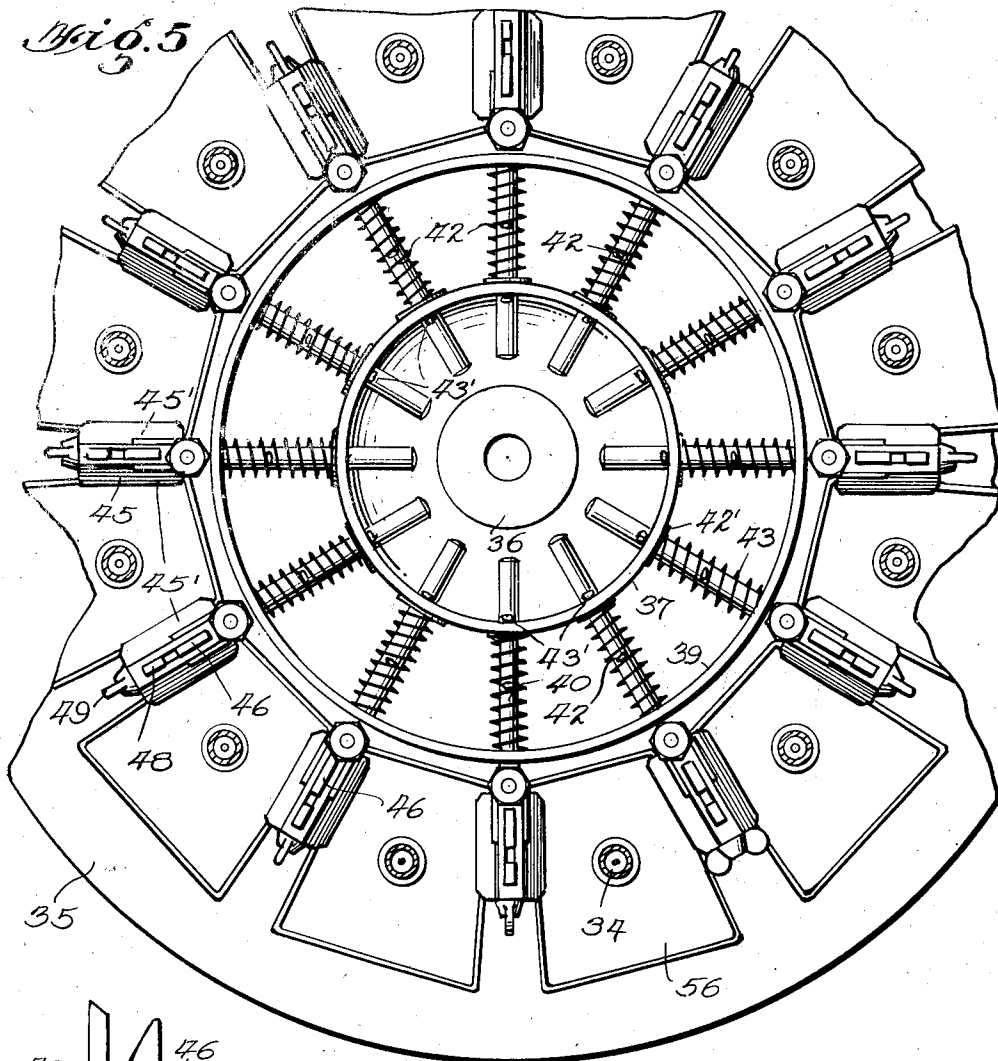
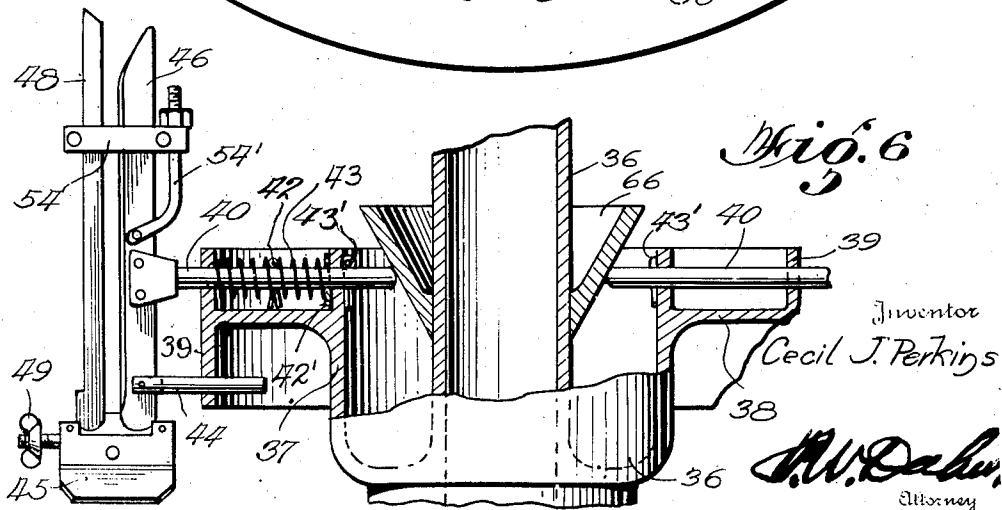
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PROCESS AND APPARATUS FOR SPOT-DYEING SKEINS

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6 Sheets-Sheet 3



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Fig. 7

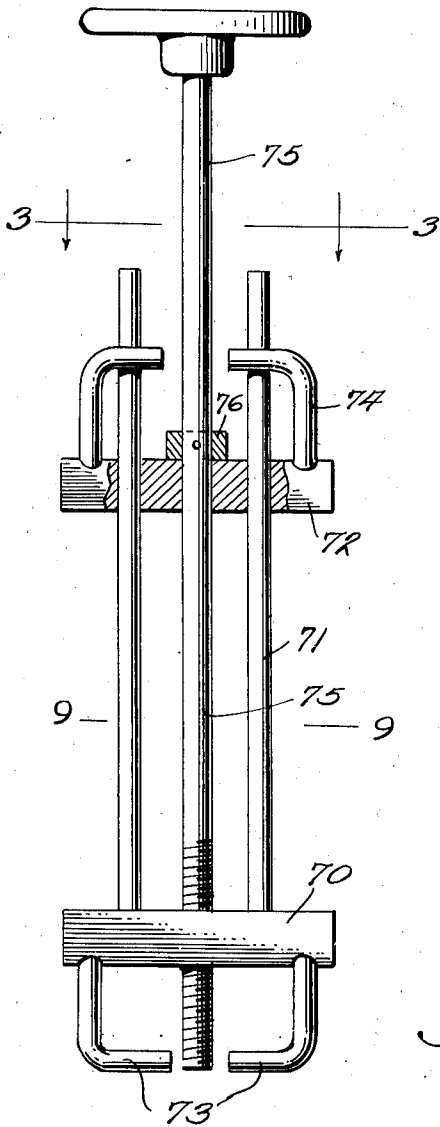


Fig. 8

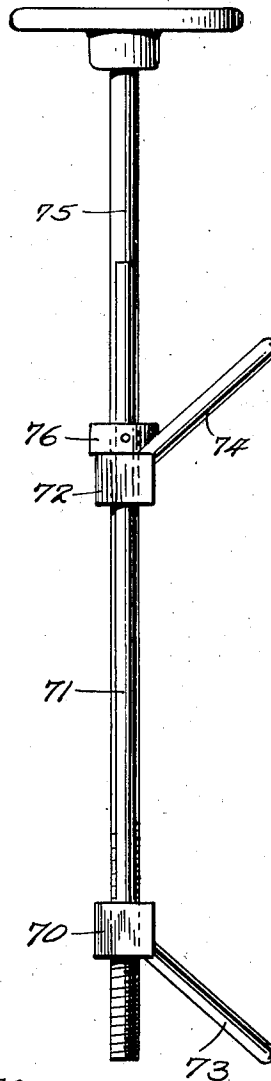
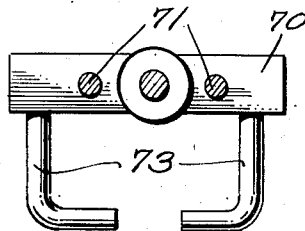


Fig. 9



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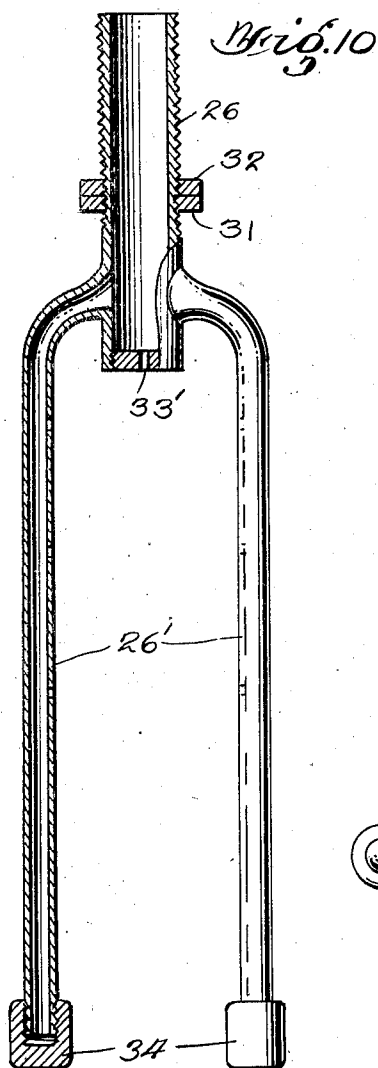
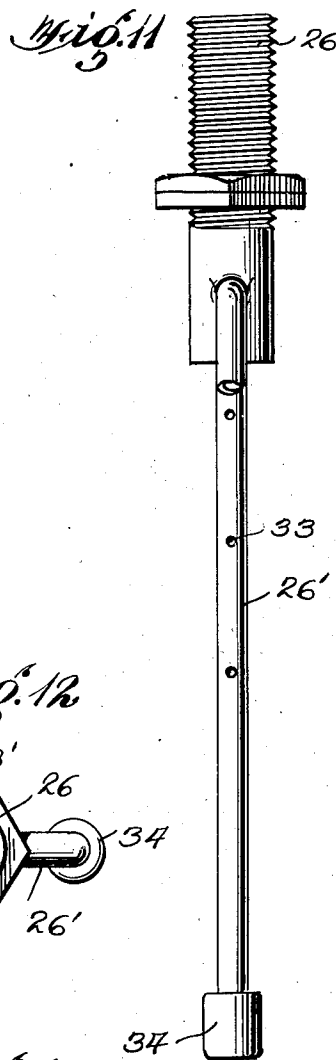
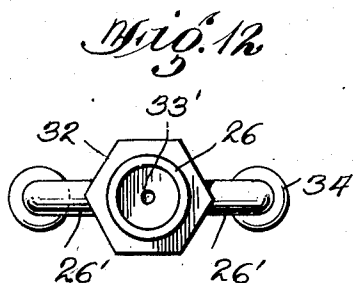
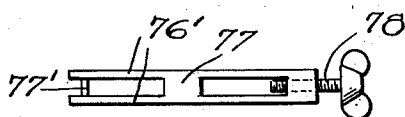
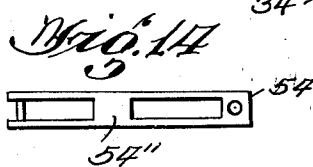
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PROCESS AND APPARATUS FOR SPOT-DYEING SKEINS

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6 Sheets-Sheet 5



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PROCESS AND APPARATUS FOR SPOT-DYEING SKEINS

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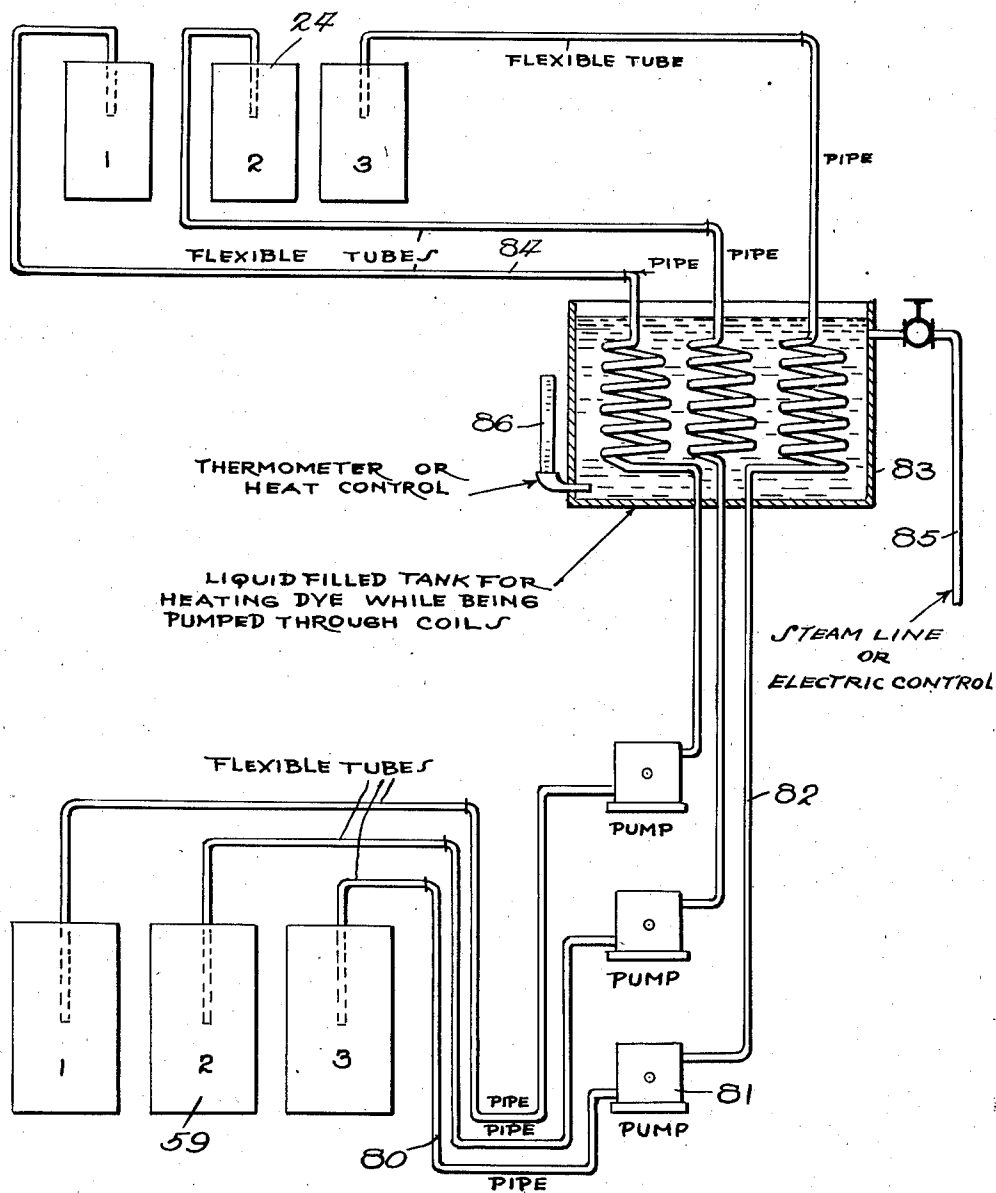


Fig. 17

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UNITED STATES PATENT OFFICE

2,351,701

PROCESS AND APPARATUS FOR SPOT-DYEING SKEINS

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Application November 11, 1941, Serial No. 418,632

26 Claims. (Cl. 8-148)

My invention relates to an improved process for spot dyeing skeins of yarn at portions only of the skein so as to produce yarn having certain portions only of its length dyed, which portions may vary in length within wide limits, and to apparatus for carrying out said process. Both apparatus and process may obviously be used for applying fluids for purposes other than dyeing.

Some of the objects of my invention are to provide a process and means for spot dyeing yarn in skeins expeditiously; to provide means and a process for insuring complete dyeing of all yarns at the desired points, while insuring that intermediate parts remain undyed; to provide means for assembling a set of skeins and holding them securely in desired position for treatment, while also providing for quick removal after treatment; to provide for application of dye or other fluid at opposite sides of skeins to insure adequate and complete penetration of the treating fluid; and to provide apparatus that shall be simple and inexpensive in manufacture.

Referring to the drawings, which are made a part of this application and in which similar reference characters indicate similar parts;

Fig. 1 is an elevation of the spot-dyeing apparatus;

Fig. 2, an elevation, partly in vertical section, of the means for assembling skeins;

Figs. 2a and 2b, details of parts shown in Fig. 2;

Figs. 3 and 4, details of parts used in the assembling operation;

Fig. 5, a horizontal section on line 5-5 of Fig. 1;

Fig. 6, a view of parts shown in Fig. 2, on an enlarged scale;

Figs. 7, 8, and 9, details of skein-compressing devices;

Figs. 10, 11, and 12, details of fluid-applying nozzles;

Figs. 13 and 14, plans of attachments used with the mechanisms shown in Figs. 2a and 6 respectively;

Figs. 15 and 16, a plan and an elevation of a device used in centrifuging skeins, and

Fig. 17, a diagrammatic view of a modification.

In the drawings, reference character 20 indicates a framework on which there is supported the vertically movable dye-applying mechanism in counterbalanced relation by means of cables 21 and counterweights 22. This mechanism comprises a platform 23 carrying a plurality of

dye containers 24 connected by a series of pipes 25 to forked nozzles 26', said nozzles passing through a collar 27 that supports them against lateral movement. The platform and the collar 27 are fixed to a shaft 28 slidable through an opening in the upper end portion 29 of the frame 20 and upward movement may be limited by a collar 30 fixed to shaft 28. The platforms, nozzles, and fluid containers may all be revolved with shaft 28 to which they are secured, all of the parts being rotatably supported by the collar 30.

The forked nozzles are shown in detail in Figs. 10 to 12, and they comprise upper end portions 26 which are threaded to receive nuts 31, 32, for securing the nozzles to collar 27 (see Fig. 1), and duplicate forks 26' each of which has a plurality of openings 33 at its inner face through which fluid is ejected upon material interposed between said forks. One or more ports at 33' serve to spray dye directly on the top of an exposed skein section. At their lower ends the hollow forks are closed by caps 34.

Below the fluid-applying mechanism there may be provided means, such as a rotatable table 35, for supporting a carrier for material to be treated. According to my invention such a carrier may consist of a drum for supporting a set of superposed skeins of yarn, this drum being shown in Figs. 1, 2, 5, and 6. The drum comprises a hub 36 having an outwardly and upwardly extending annular flange 37 which carries a radial flange 38 on which is a mantle 39.

The concentric portions of mantle 39 and flange 37 have aligned openings at intervals about their upper ends for receiving a series of radially slidable rods 40 forming supports for skein clamps. Cotter pins 42 may be inserted through said rods behind washers 42' (see right side of Fig. 2) to compress springs 43, so as to hold the skein clamps at the inner limit of their movement, and cotter pins 43' may also be inserted into other openings in said rods for limiting the extent of their radial outward movement. By inserting the cotters between convolutions of the springs, as in Fig. 6, the inward pressure may be varied. Stud 44 on the skein clamps serve to hold them in vertical position by engagement in holes in the lower part of mantle 39.

The skein clamps comprise bases 45 each having two oppositely inclined wings 45' and clamp members 46 fixed on said bases coact with removable clamp members 48 having narrowed lower ends extending into slots in bases 45 and held in place by set-screws 49, to clamp portions

of skeins on said drum. (Fig. 2a.) Guards 47 (Figs. 2 and 2b) of any desired width may be used to widen the undyed sections of the skeins, said guards having extensions 47' extending into the central slots of bases 45 and being provided with spaced extensions 47'' at their upper ends. Such guards may be integral with clamp members 46 and 48, if desired, but are preferably separate so that guards of different widths may be interchanged at will.

T-shaped fillers such as shown at 51 (Fig. 4) may be inserted between the clamp members 46, 48 to hold the clamp members in open position to receive the yarn and to prevent contact of the lowermost skeins with the bases 45, the heads 53 resting on the tops of the bases to limit downward movement of the fillers and the screws 49 coacting with fillers 51 and other movable parts to hold them rigidly in place. The head 53 must extend outward far enough to support the filler on the base 45, but may be extended farther outward. Fillers 50 may be placed on top of the yarn between the clamps, as hereinafter described, these fillers having projections 52 at each end and extending oppositely from the body of a filler.

Yokes 54 (Figs. 6 and 14) loosely carried by bent bolts 54' pivoted on clamp members 46, may be used to hold pairs of clamp members against separation and may be forced down on the skeins by turning the nuts on said bolts, so as to compress the skeins to prevent penetration of dye or other treating fluid into the clamped portion. Both fillers 50 and yokes 54 serve also to protect the upper surface of the yarn in a clamp against accidental splashing or running of dye to the clamped portion or to another section which is receiving a different dye or is being differently processed. For this purpose the filler 50 has a solid neck portion 52' and the yoke 54 has a solid middle portion 54'' filling the space between clamps 46 and 48.

On the table 35 there is a series of fixed pans 56 each located under a free portion of the skeins on the drum, so as to receive the processing fluid from such portions. The flaring wings of the base cover the spaces between the pans to divert the processing liquid into the pans. Apertures in the pans lead to pipes 58 by which the dye that runs off the skeins is led to receptacles 59, on a platform 60 fixed to the table 35, there being as many receptacles as there are pans, if desired. Or, in case different colors are applied to different sections of a skein, there may be only as many receptacles as there are colors, the pipes 58 being flexible and long enough so that they can be arranged so as to lead to the same receptacle from all pans receiving dye of the same color, or all pipes may lead to one receptacle if only one color of dye is being applied to sections of a skein while the other sections are undyed. The drum is supported on the table by providing an annular flange on the table inside the ring of pans, upon which flange the hub 36 rests, or in any other suitable manner. The platform 60 is supported on a shaft 60' or by any other suitable means and is rotatable.

For assembling the skeins I provide means comprising a platform 61 with a vertically movable central rod 62 connected to treadle 64 by a link 63 having a hook at its upper end. A suitable detent 65 serves to hold the treadle in depressed position. At a point above the table the rod carries an inverted conical wedge 66 fixed to the rod as by nuts 67, 68 on a threaded

part of the rod, and so located as to be adapted when depressed to force the skein clamps outward against the tension of springs to a distance limited, if desired, by pins 43' on the rods 40. The wedge has a hollow hub 66' adapted to fit and slide on hub 36. At the upper end of rod 62 there is a frustoconical guide 69, shaped to open a skein fully as the skein passes down around it, the outer edge of the guide being so positioned as to direct a skein placed thereon so as to cause spaced parts of the skein to fall between the clamping members of the circular series of clamps on the drum and to extend about the series in substantially taut condition, i. e., lightly stretched or tensioned. The upper ends of the clamps are flared respectively inward and outward, said guide being forced upward by a spring 69' resting on the top of hub 66'.

In Figs. 7 to 9 I have shown compressing means such as may be used to force the skeins close together on the drum. This consists of a block 70 carrying a pair of guide rods 71 on which another block 72 is slidable. Block 70 has a pair of laterally inclined arms 73 and block 72 has a pair of oppositely inclined arms 74 at the same side of the compressing means. A screw 75 carries a fixed collar 76 above block 72 and has threaded engagement with block 70. The tool being positioned with its forks 73 straddling the base 45 and the forks 74 straddling the clamp 48, and the side arms of fillers such as 50 to 51 extending outward far enough to be engaged by the intumed ends of said arms, the screw 75 is rotated to force the fillers toward one another and compress the assembled skeins as much as may be desirable.

The attachment shown in Fig. 13 comprises a U-shaped member with arms 76', 76' connected at the middle by a solid skein-covering portion 77 and at one end by a rivet 77' the other ends being united by a solid portion carrying a screw 78. This separate attachment may be placed over the upper ends of the clamps 46, 48 and the screw turned to draw said ends together and to hold them as adjusted, thus compressing the skeins.

Figs. 15 and 16 show an attachment used in the final step of my process, wherein excess dye is removed from the skeins by use of a centrifugal machine. The drum with its dyed skeins is removed bodily from the dyeing apparatus and the guard device of Figs. 15 and 16 is placed on it, and a stud 80 on the hub 81 of this guard entering the central aperture at the top of hub 36 of the drum to support said guard. The hub 81 is connected to upper ring 79 by crossbars 82 and ring 79 is connected to a bottom ring 84 by bolts 83. The cage or guard is an important feature at this stage, since the tender yarn is liable to be damaged by the outward push of the clamps under centrifugal action if that weight were not taken off the yarn by the cage.

In the use of my apparatus the drum is placed on table 61 (Fig. 2) and a filler 51 is placed between parts 46 and 48 of each clamp. Then set screws 49 are tightened to hold clamp members 46 and 48 in place. The treadle 64 is depressed, pulling down cone 66 to spread the clamps and also pulling down the guide 69, preferably to a point where the outer margin of said guide rests on the fixed clamp members 46 or on the inner members 47, if these are used, and the parts are held down against the tension of spring 69' by means of detent 65, which preferably has several teeth so that various positions of wedge 66 and

guide 69 are provided for. Then a skein is opened and placed on the conical guide 69 and slid off into the clamps of the circular series, the guide 69 being depressed against the tension of its spring, so as to insure proper positioning of the skein, and this operation is repeated until all the skeins have been placed on the drum, or until it is sufficiently full, as the case may be. Now, if the fillers 50 are used, they are placed one in each clamp and, if desired, the compressor shown in Figs. 7 to 9 is used at some or all of the clamps by engaging one pair of arms (73 or 74) under one filler and the other pair over the other filler, the lower fillers being loosened, if desired, at this time, and the screw 75 is rotated for further compressing the skeins, yokes 54 or 76' being placed on the clamps to prevent them from spreading. If wider undyed sections are desired, guards 47 of appropriate width are placed in the clamps before putting on the skeins, these guards being slotted at their upper ends to permit the yokes to pass down over the upper ends of clamps 46 and 48. Yokes 76' may be used either when only clamps 46, 48 are employed, but their use is particularly desirable when wider guards 47 are used, so as to exert additional compressing action to prevent penetration of the yarn at those parts which are to remain untreated. When the adjustable yoke of Fig. 13 is used it is desirable to back off the set screw 49 to permit some rocking movement of clamp 48. The yoke is located between forks 47' of parts 47, and rests on shoulders 76a of the clamps 46, 48.

Now the link 63 is unhooked from the rod 62 and the rod is lifted, carrying with it the cone 69 and wedge 66, so that the drum can be removed from table 61 and placed on table 35. Table 35 is alined under the raised dye-applying devices shown in Fig. 1, so as to position the exposed parts of the skeins correctly with reference to the nozzles and the dyeing mechanism is lowered into operative position. Dye is now run into receptacles 24 (or valves in tubes 25 are opened, if valves are used) and the dye passes down through the tubes 25 and through the nozzles, and jets out against the top and both sides of the exposed parts of the skeins on the drum. It should be noted that when the drum is removed from table 61 the skein clamps are moved inward due to the action of springs 40, thus removing tension from the skeins and permitting the free portions thereof to fluff out so that the dye can penetrate readily into said parts.

After the skeins have been treated sufficiently the drum is removed and placed in a suitable centrifuge, the hub of the drum fitting or resting on a suitable vertical drive shaft and any suitable container or collecting wall surrounding the drum to catch the thrown-off dye. At this time the guard of Figs. 15 and 16 may be placed about the skein clamps to hold them against outward movement under the action of centrifugal force, said guard being supported by hub 36. This is especially necessary in the case of rayon yarns, which are made tender by wetting. Thereafter the drum is removed from the centrifuge, the upper ends of the clamps are freed and the spot-dyed skeins taken off the drum, for which purpose the screws 49 can first be backed off and the clamps 48 removed, if desired.

In Fig. 17 there is illustrated a modified form of the invention in diagrammatic form, wherein provision is made for continuous operation, and for heating the dye or other treating liquid, as is desirable for example with some kinds of dye.

The receptacles 59 here have pipes 80 leading to pumps 81 of any suitable character, from which pipes 82 lead off through a tank 83 to flexible tubes 84 which carry the liquid to upper dye containers 24. The pipes 82 may have portions bent into coil form and located in the tank 83, and this tank is shown as being filled with a liquid such as water, this being heated by steam supplied through a pipe 85. (Or the part 84 may serve as a conduit for a conductor carrying electricity to suitable heating means in the tank, as is obvious.) The tank is supplied with a part 86, which may be either a thermometer for indicating the temperatures in the tank, or a thermostat such as may serve for regulating the temperature therein. Other suitable or desirable means may of course be employed for heating the treating fluid, which passes down from supply tanks 24 to the receptacles below the skeins in the order indicated by the respective sets of numerals 1, 2, 3 and is then returned to the supply tanks after being suitably raised in temperature.

It will be obvious to those skilled in the art that many changes may be made in the process and in the devices herein shown and described, all without departing from the spirit of my invention; therefore I do not limit myself to what is shown in the drawings and description in the specification, but only as indicated in the appended claims. For example, the endless series of clamps may be arranged in an ellipse instead of a circle; one or more treating fluids may be applied to one or more portions of the skeins; the device may be used for saponifying portions of skeins that are to take different dye from other portions; for simultaneously dyeing certain parts and saponifying or otherwise treating other portions, etc.

Having thus fully described my invention, what I claim is:

1. In a spot-dyeing apparatus for yarn in skeins, means for supporting a set of superposed skeins, means for covering sections of said skeins, a support above said first-named means, dye containers on said support, forked nozzles on said support connected to said containers and adapted to straddle exposed portions of said skeins, ports in said nozzles facing toward said skeins and means for moving said support vertically to bring said nozzles either into operative position or into an inoperative position above the skein supporting means.

2. Apparatus for spot-dyeing skeins, comprising a drum having a series of clamps arranged about its periphery, said clamps each extending axially of the drum, said clamps being mounted for movement radially of the drum, means for operating the clamps to cause them to compress sections of the skeins and so to prevent penetration thereof by the dye, means for placing skeins in said clamps in stretched condition, means for slackening the skeins, and means for applying dye to the slackened skein sections between said clamps.

3. Apparatus for treating yarn in skeins, comprising a drum having a vertical axis, a series of upwardly opening clamps on the drum for supporting opened skeins, means arranged to spray liquid on said skeins between said clamps, a series of pans positioned to receive the drip from said skeins, and means for covering the spaces between said pans and leading the drip into said pans.

4. A device as in claim 3, including a table supporting said drum and said pans, containers for

liquid beneath said table, and tubes connected to said pans and selectively connectible to said containers for leading off the liquid in said pans to desired containers, said spraying means being arranged to spray liquids of different character on different exposed portions of said skeins.

5. Spot dyeing means comprising a framework, a platform thereon, a circular series of nozzles depending from the platform, means on said platform for supplying dye to said nozzles, a rotatable table below said platform, means on said table for supporting opened yarn skeins in operative relation to said nozzles, means for covering portions of said skeins, and means carried by said table for collecting the drip from the exposed portions of said skeins.

6. A device as in claim 5, said nozzles being arranged to spray the inner side, the outer side, and the upper surface of exposed skein portions simultaneously.

7. Means for spot-treating skeins of yarn, comprising a drum having an upper and a lower series of perforations in its periphery, clamps arranged about the drum and each extending axially of the drum, a pair of pins on each clamp adapted to be positioned respectively in holes of said two series, said clamps being adapted to hold an opened skein of yarn, means adapted to act on the inner ends of said pins for forcing said clamps outward to keep the skeins stretched, and means tending to return said clamps to an inner position to slacken the skein sections between said clamps.

8. A clamp for spot-dyeing apparatus and the like comprising a base, an upwardly extending clamp thereon, a coacting removable clamp having a reduced portion extending downward into a slot in said base and a shoulder resting on said base, a T-shaped filler having a leg for insertion into said slot, and means to force said removable clamp and said filler toward said fixed clamp member.

9. A device as in claim 8, including removable means extending across the space between said clamps when in use and adapted to force the upper end of said removable clamp toward said fixed clamp.

10. A device as in claim 8, including laterally flaring wings at opposite sides of said base.

11. A device as in claim 8, including a pair of relatively wide guards adapted to be located between said clamps and respectively contacting therewith.

12. A device as in claim 8, including a pair of relatively wide guards adapted to be located between said clamps and respectively contacting therewith, said guards each having projections adapted to enter the slot in said base, and to be clamped between said filler and the respective clamp members.

13. Apparatus for spot-treating skeins of yarn, comprising a drum, an endless series of radially movable clamps on the drum, said clamps extending axially of the drum and being normally open at their upper ends, spring means tending to hold said clamps at the inner limit of their movement, means for forcing said clamps outward into position to receive and hold said skeins in stretched condition, and means for guiding an opened skein into the clamps of said series.

14. A device as in claim 13, including a conical guide supported above said drums with its lower margin close to the open upper ends of said clamps so as to guide an opened skein into said clamps.

15. A device as in claim 13, including a conical guide supported above said drums with its lower margin close to the open upper ends of said clamps so as to guide an opened skein into said clamps, and means to support said conical guide yieldably for axial movement toward and from said drum.

16. Apparatus as in claim 13, wherein said forcing means consists of an inverted conical wedge and said clamps have radial pins whose inner ends are located so as to be engaged and moved outward by said wedge.

17. Apparatus as in claim 13, including a radial pin on each clamp extending to the interior of the drum, an inverted conical wedge adapted to engage said pins for forcing the clamps outward and a conical shield movable with said wedge into a position where the lower margin of the shield is located between the inner and outer members of each clamp to guide an opened skein into the series of clamps.

18. Apparatus as in claim 13, including a radial pin on each clamp extending to the interior of the drum, an inverted conical wedge adapted to engage said pins for forcing the clamps outward and a conical shield movable with said wedge into a position where the lower margin of the shield is located between the inner and outer members of each clamp to guide an opened skein into the series of clamps, and spring means for elevating said wedge and shield into inoperative position.

19. Spot-dyeing apparatus for yarn skeins, comprising a support, an endless series of clamps on said support, said clamps being open at their upper ends for receiving and holding opened skeins, fillers above and below the yarn between the parts of a plurality of said clamps, and means for acting on said fillers to compress the sections of yarn which are held between the opposed members of said clamps.

20. Apparatus as in claim 19, including means for compressing said sections by forcing the clamp members together.

21. Apparatus for liquid treatment of yarn, comprising an endless series of clamps adapted to support yarns in skein form, said clamps covering certain portions of the yarn while leaving intermediate portions exposed, nozzles positioned to spray liquid on said exposed portions, receptacles below said clamps to collect surplus liquid, and pumps connected to said receptacles and to said nozzles for maintaining a continuous circulation of fluid during a treating operation.

22. Spot-treating apparatus for yarn skeins comprising an endless series of upright supports adapted to have a skein trained about them, means for covering parts of the skein while leaving intermediate portions exposed to atmosphere, and spray nozzles adjacent opposite sides of the exposed portions of a skein on the supports.

23. A device as in claim 22, said nozzles having means for directing a spray upon the upper face of a skein on said supports.

24. Spot-treating apparatus for yarn skeins comprising a circular series of supports arranged about an upright axis and adapted to have a skein trained about them, a circular series of spray nozzles coaxial with the first-named series, means for covering portions of a skein on said supports, and means for supplying different treating fluids to the nozzles that coat with different uncovered skein portions.

25. A method of liquid treatment of yarns, comprising the steps of assembling skeins of yarn

about a vertical support in superposed stretched relation, applying pressure axially of the skeins to such skein portions as are to remain untreated, compressing and clamping said portions laterally, slackening the uncompressed portions of the skeins, and spraying liquids of different character simultaneously on the inner and outer faces of different exposed portions of said skeins to

produce different effects on different exposed portions.

26. A method as in claim 25, including as a step spraying on the upper face of each exposed section under treatment fluid of the same character as that being applied to the inner and outer faces of such portion.

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