

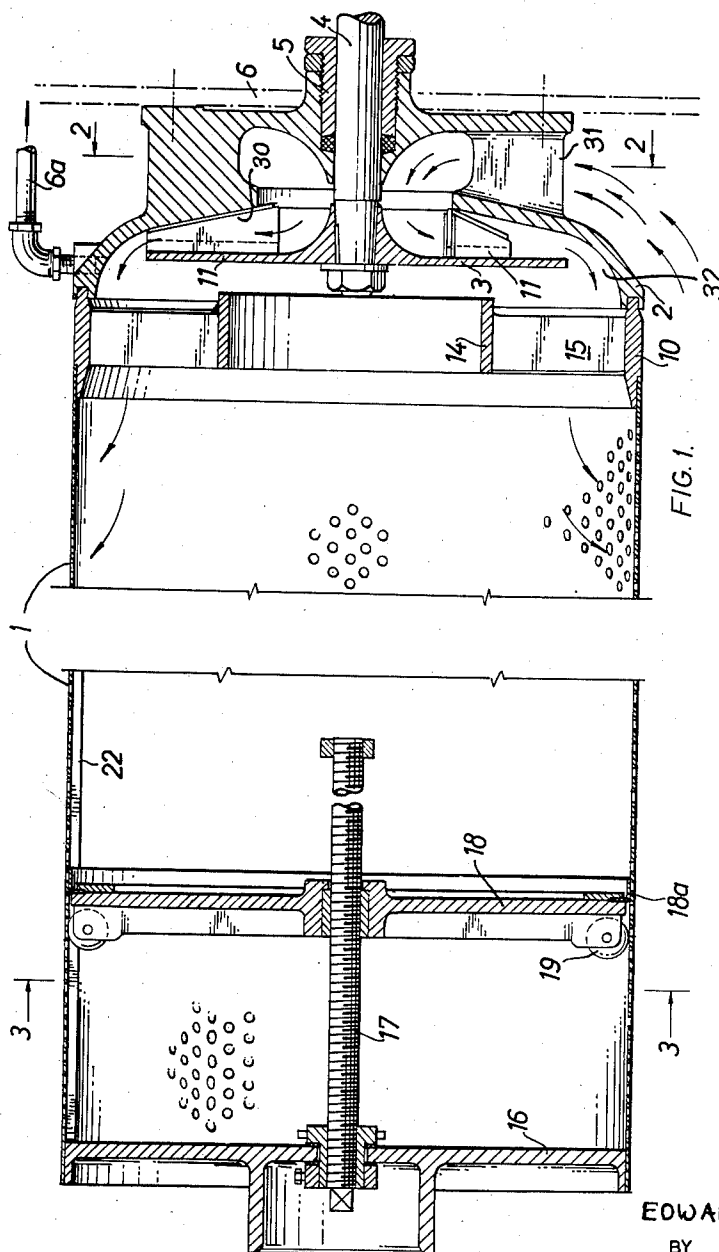
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E. STANWAY
BEAM DYEING MACHINES

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4 Sheets-Sheet 1



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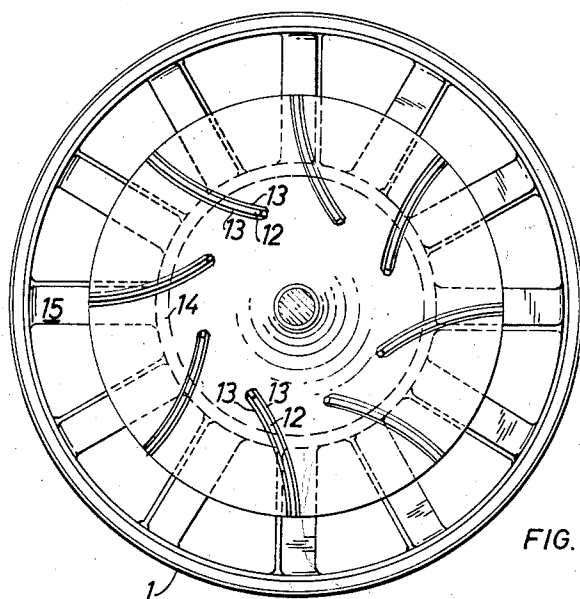


FIG. 2.

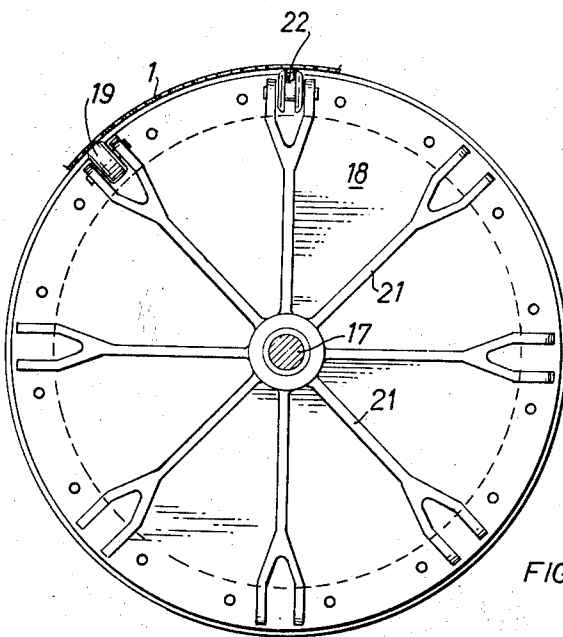


FIG. 3.

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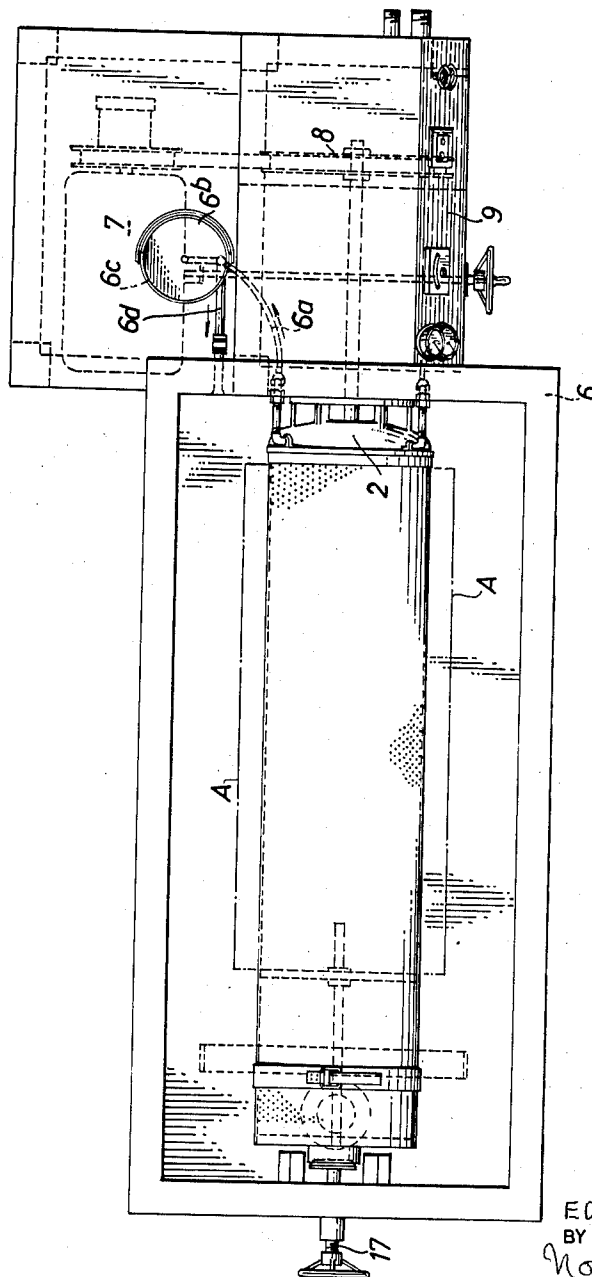


FIG. 4.

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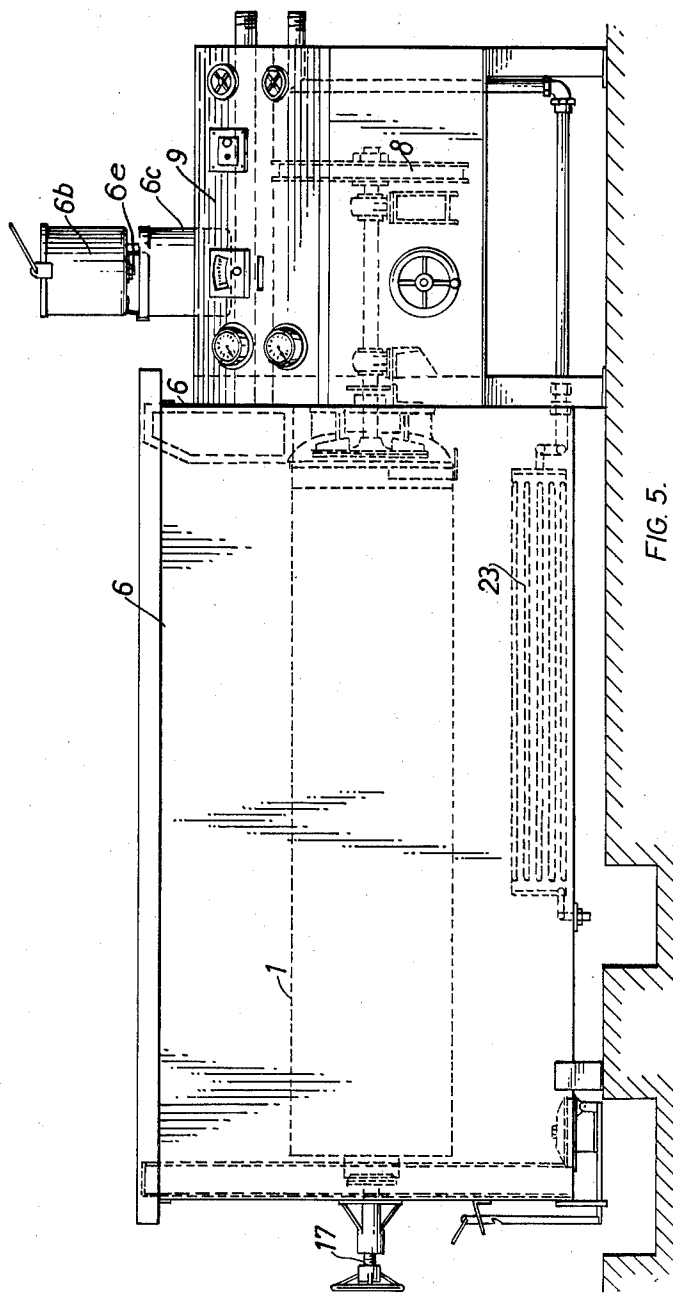


FIG. 5.

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BEAM DYEING MACHINES

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14 Claims. (Cl. 68—150)

This invention relates to improvements in beam dyeing machines.

Beam dyeing machines for woven or knitted fabrics have been proposed in which the cloth is rolled onto a perforated stainless steel beam or cylinder which is then lowered into a tank or vat, dye liquor being pumped into the interior of the beam or cylinder to pass out through the perforations therein and the cloth into the tank or vat from which the liquor is returned through a pipe connected to the base of the tank or vat or the pump for recirculation into the beam or cylinder. It has also been proposed to provide a reversing valve in the pipe line to enable the dye to be sucked through the cloth into the beam and to be exhausted through the cylinder back to the pump.

The object of the invention is to obtain a more even distribution of the liquor through the cloth and to eliminate piping carrying the dye liquor outside the tank or vat.

According to the invention a perforated beam or cylinder is mounted in a vat or tank, an impellor or rotor being mounted in an end cover forming a housing therefor to circulate liquor from the vat or tank into the interior of the beam or cylinder and out through the perforations and the fabric thereon.

The invention will be described with reference to the accompanying drawings:

FIG. 1 is a longitudinal section through a beam or cylinder constructed according to a preferred embodiment of the invention.

FIG. 2 is a transverse section on line 2—2 of FIG. 1 with the end cover removed.

FIG. 3 is a transverse section on line 3—3 of FIG. 1.

FIG. 4 is a plan of the machine incorporating the beam of FIGURE 1.

FIG. 5 is a side elevation of the machine of FIGURE 4.

A perforated dye beam or cylinder 1 is constructed to fit at one end with an outwardly dished end cover 2 forming a housing for an impellor or rotor 3. Cover 2 may be fixed to tank wall 6. The impellor or rotor 3 is mounted on a spindle 4 to rotate within the end cover 2. The spindle 4 is rotatably mounted in a gland 5 extending through the end cover and through the wall of a vat or tank 6 and is driven by a motor 7 through belt or other gearing 8 mounted below a control panel 9.

The impellor or rotor 3 is constructed with radial vanes 11 which extend axially from the rotor toward the annular housing surface 30. Each vane is a laminated structure comprising a blade 12 of polytetrafluoroethylene or equivalent hard smooth plastic material mounted between metal plates 13 (FIGURE 2). As shown in FIGURE 1 blade 12 projects beyond metal plates 13 to slidingly engage the housing surface 30 during rotor movement, the engaging surfaces of blade 11 and at 30 being correspondingly shaped.

Rotor housing 2 has an inlet opening 31 through which dye liquor may enter annular rotor chamber 32, and the dye liquor exits from chamber 32 through the impellor rotor 3 into the interior of beam 1.

Concentric rings 10 and 14 have radial ribs 15 extending between them. These ribs 15 are inclined relative to radial planes containing the axis of beam 1 and the rings and ribs define an annular deflector zone adjacent the annular discharge zone at the outer periphery of rotor 3. Ring 10 welded or otherwise affixed to one end of the

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beam or cylinder inwardly of the impellor 3 to form a beam end deflector to receive and controllably deflect liquor thrown out by the impellor on its passage to the beam or cylinder.

The opposite end of the beam or cylinder is closed by an end wall 16 through which passes a screwed rod 17 on which is mounted an axially adjustable liquid tight partition disc 18 mounted on runners 19 carried in ribs 21 and engaging the inner periphery of the beam or cylinder, one of the runners engaging an internal rib 22 to prevent the disc from rotating with respect to said cylinder. The disc 18 is positioned according to the width of the cloth A on the beam or cylinder.

A rubber diaphragm or wiper 18a is sealingly arranged around the periphery of the disc 18 to prevent leakage of liquor past the disc.

The cloth A is wound on to the cylinder or beam 1 in the normal manner, the beam 1 being then lowered into the tank or vat 6 which contains a heat exchanger panel 23.

The beam or cylinder 1 may be mounted in V supports in the vat or tank 6 or it may be mounted in bearings to allow the beam or cylinder to creep or rotate slowly (for example up to 10 or 12 r.p.m.) to vary the position of the beam in the vat. The liquor entering the beam or cylinder after passing from the vanes 3 of the impellor or rotor and through the inclined ribs 15 of the deflector zone and which impinges on the inner periphery of said cylinder tends to give a rotational motion to the beam or cylinder. The beam or cylinder 1 is rotatably mounted in the vat by suitable bearings (not shown). At its right end, as shown in FIGURE 1, beam ring 10 extends within an annular groove in stationary impellor housing 2 which effectively extends over the adjacent open end of the beam.

The ribs 15 on the disc 14 counteract any swirl effect produced on the liquor on leaving the vanes 11 of the impellor 3 and produce a flow substantially along the inner periphery of the beam or cylinder.

The liquor is circulated in closed circuit within the vat or tank 6 by the impellor, the liquor passing from the interior of the beam or cylinder through the perforations therein, through the cloth and back into the vat or tank.

The liquor being slung outwards by the vanes of the impellor around the periphery of the end cover builds up a pressure inside the beam or cylinder. The end cover is open to the beam or cylinder thereby effecting a saving in material and construction.

A supply of dye is contained in a reservoir 6b having a small valve 6e in the bottom which allows the colour to gradually drain out into a chamber 6e arranged therebelow.

Pressure built up in the impellor housing 2 permits a predetermined amount of the dye liquor to be discharged from chamber 32 and forced through a pipe 6a into the chamber 6c on which the reservoir 6b is mounted. This vessel 6c underneath the reservoir 6b is a sample beam chamber. Inside this chamber is a small perforated cylinder on which a sample piece of fabric is wound. The pipe 6a is arranged to enter inside this small perforated cylinder so that a small sample beam dyeing machine is produced which duplicates the conditions inside the main machine. In this way test pieces of the dyed fabric can be taken from the small sample beam without interfering with the main bulk which is wound onto the beam dyeing machine itself. After the dye liquor has come through the small sample beam inside the chamber 6c, this liquor then overflows into a pipe 6d through which it re-enters the vat or tank 1.

The bearing gland 5 through which the impellor drive spindle 4 passes is not subjected to the impellor pressure, and in fact there is a small suction on the gland since it is on the inlet side of the impellor.

It has been found that the pressure drop due to cavitation at higher temperatures is minimized, which is partly due to the inlet 31 to the impeller being completely flooded with dye liquor.

I claim:

1. A beam dyeing machine for woven and knitted fabrics comprising a vat adapted to contain dye liquor, a perforated hollow beam rotatably mounted in said vat and adapted to have fabric to be dyed wound thereupon, means closing one end of said beam, a housing rigid with the vat having an impellor chamber extending over the other end of said beam, a motor driven impellor rotatably mounted in said housing chamber and having radial vanes, means providing an inlet passage through said housing for conducting dye liquor from the vat to said chamber, means providing an outlet from said chamber into said other end of said beam whereby dye liquor under pressure induced by said rotor is circulated from the vat into said beam interior and out through the perforations therein and said fabric.

2. In a beam dyeing machine characterized by a tank adapted to contain dye liquor and a hollow perforated beam adapted to have cloth to be dyed wound on its periphery and rotatably mounted in said tank, said beam having one end closed by an end wall and its other end closed by a housing having an inlet open to receive liquor directly from said tank and an outlet adapted to direct dye liquor longitudinally into said beam, and a motor driven rotor within said housing adapted when rotated to draw dye liquor from the tank through the housing inlet and discharge said liquor into said beam whereby to develop sufficient liquid pressure within the beam that said dye liquor is forced through said beam perforations and the cloth back into the tank for recirculation by the rotor without leaving the tank.

3. In the beam dyeing machine defined in claim 2, means mounting said end wall of said beam opposite said housing for adjustment axially of the beam to vary the perforated beam area to suit the size of the cloth thereon.

4. In a beam dyeing machine characterized by a tank adapted to contain dye liquor and a hollow perforated beam cylinder rotatably mounted within said tank adapted to have cloth to be dyed wound on its periphery, said cylinder having opposite end closure members, one of said members having an opening directly into said tank and housing a motor driven rotor for drawing dye liquor from the tank through said opening to discharge said liquor through another opening directly into the interior of said cylinder, and means for controlling the direction of discharge of said liquor into said cylinder.

5. In a beam dyeing machine characterized by a tank adapted to contain dye liquor and a perforated cylinder in the tank adapted to have cloth to be dyed wound on its periphery, means defining a stationary rotor housing mounted to extend over one end of the cylinder for closing said one end of said cylinder, a wall closing the other end of said cylinder, said housing having an annular chamber directly connected into the tank by an inlet opening through the housing, and a motor driven rotor within the housing for drawing dye liquor through said inlet opening and annular chamber to discharge into the interior of said cylinder under sufficient pressure to pass through the cylinder perforations and wound cloth back into the tank.

6. In a beam dyeing machine defined in claim 5, said rotor having a set of vane means so cooperatively associated with said housing that dye liquor from said chamber is withdrawn between said vane means to the rotor periphery and discharged as an essentially annular stream at the inner periphery of said cylinder.

7. In the beam dyeing machine defined in claim 6, said housing and rotor vane means having correspondingly

shaped radial portions in slidable engagement during rotation of the rotor.

8. In the beam dyeing machine defined in claim 7, said vane means having edges of smooth hard plastic in sliding engagement with a continuous annular housing surface extending around said chamber.

9. In a beam dyeing machine characterized by a tank adapted to contain dye liquor and a perforated cylinder rotatably mounted in the tank adapted to have cloth to be dyed wound thereon, a stationary rotor housing mounted to extend over one end of said cylinder and having an inlet directly opening into said tank, a motor driven rotor within said housing for drawing dye liquor through said opening and discharging it in a stream into the interior of said cylinder, and means on said cylinder providing a plurality of direction controlling ribs in the path of said stream.

10. In the beam dyeing machine defined in claim 9, said stream being annular and directed toward the inner periphery of said cylinder, and said ribs being mounted in an annulus fixed upon the end of the cylinder adjacent said rotor.

11. In a beam dyeing machine characterized by a tank adapted to contain dye liquor and a perforated cylinder in the tank adapted to have cloth to be dyed wound thereon, end members closing opposite ends of said cylinder, a pump in one of said end members for circulating dye liquor from the tank into the interior of said cylinder and through the cylinder perforations and said cloth back into the tank, and means adjustably mounting the other end member for movement toward and away from said one end member to adapt the cylinder to the width of said cloth.

12. In a beam dyeing machine defined in claim 11, said adjustable mounting means comprising roller means supporting said other end member on the internal wall of said cylinder, and means providing a peripheral seal between said other end member and the cylinder.

13. In the beam dyeing machine defined in claim 5, means mounting a sample treating chamber outside the tank, an intake conduit connecting said chamber to said annular rotor chamber and an outlet conduit connecting said treating chamber with said tank, whereby sufficient dye liquor for said treating chamber is continuously bypassed through said sample treating chamber.

14. In a beam dyeing machine characterized by a tank adapted to contain dye liquor and a hollow perforated beam adapted to have cloth to be dyed wound on its periphery and mounted in said tank for rotation about its axis, a relatively stationary housing extending over and closing one end of said beam, said housing having an inlet open to receive liquor from said tank, and a motor driven rotor within said housing opposite said open end of the beam, radial ribs in the beam adjacent said open end, said rotor when rotated being adapted to draw dye liquor from the tank through the housing inlet and force said liquor against said ribs to impart a rotative creep to said beam and through the interior of said tank and said beam perforations and the cloth back into the tank for recirculation by the rotor without leaving the tank.

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