

# United States Patent

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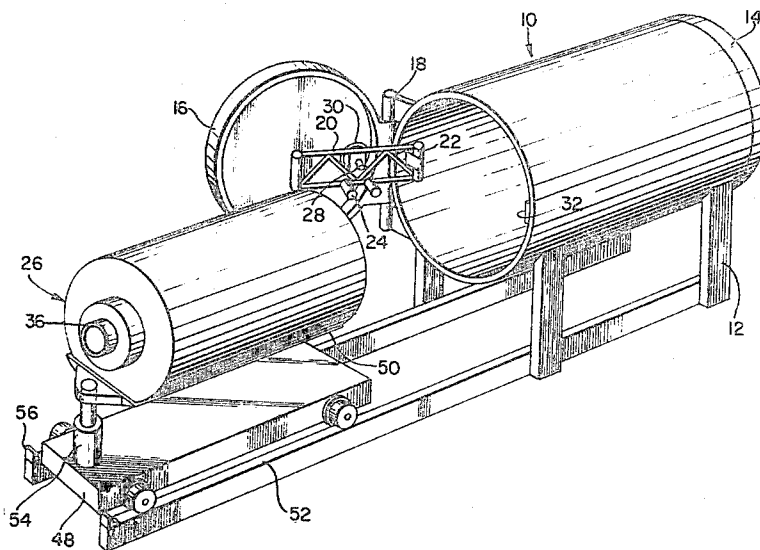
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[54] **BEAM DYEING APPARATUS**  
 9 Claims, 5 Drawing Figs.

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 [51] Int. Cl. .... B05c 8/02  
 [50] Field of Search ..... 68/8, 150,  
 198, 210

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**ABSTRACT:** A pressure chamber rotatably supports internally a removable perforated tubular beam about which fabric to be treated is wrapped. The hollow beam is provided with a propeller rigidly mounted coaxially within the beam and is adapted to rotate the beam under the pressure of a dyeing liquid pumped therethrough. The dye beam is supported at one end by a rotary seal communicating with a conduit connected to a pump and at its other end by a hinged gate mounted to swing in proximity with a hinged hatch. A dolly having a cantilevered and hydraulically operated cradle is mounted on tracks for movement in and out of the vessel when the hatch is open to replace dye beams.



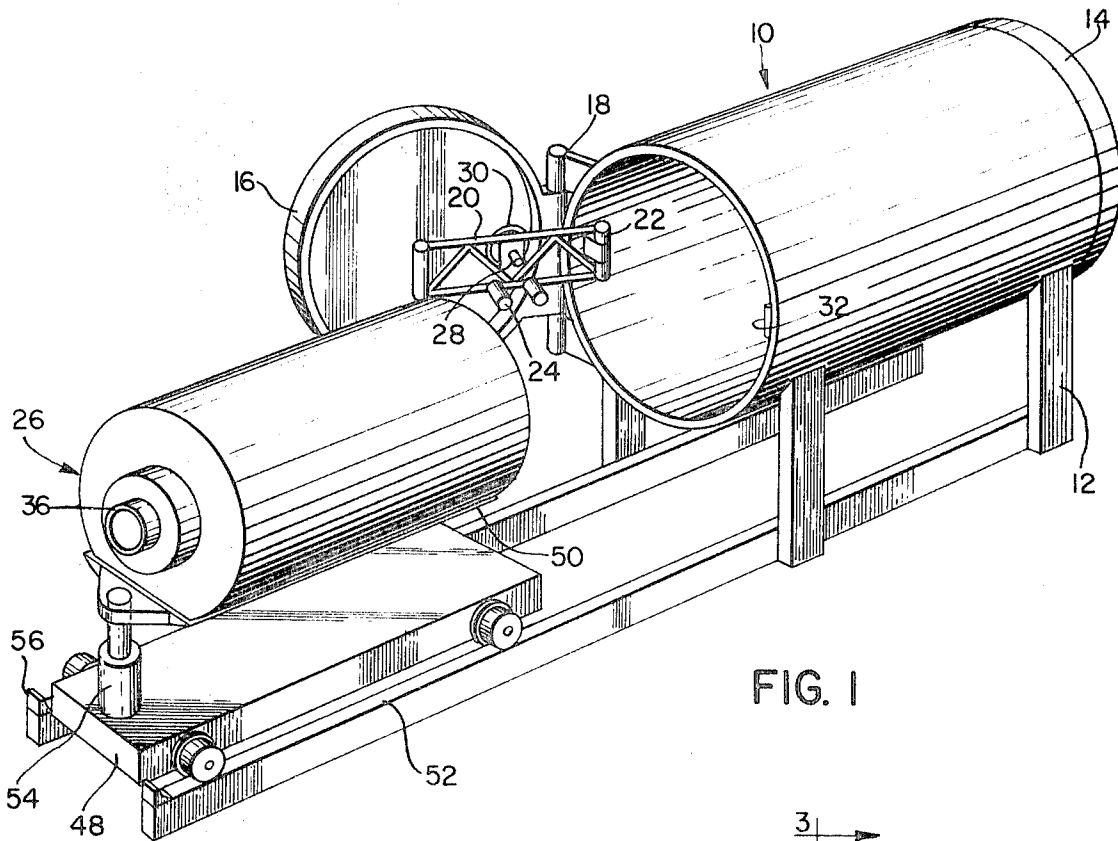


FIG. 1

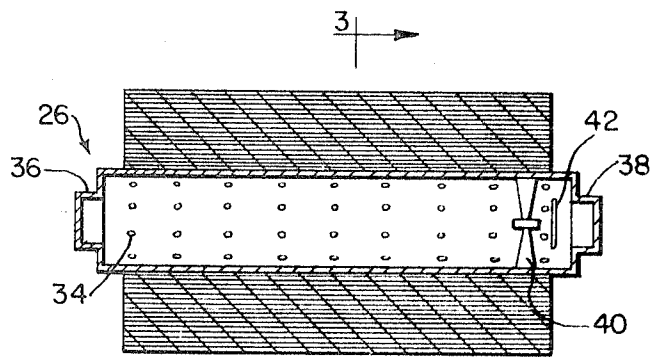


FIG. 2

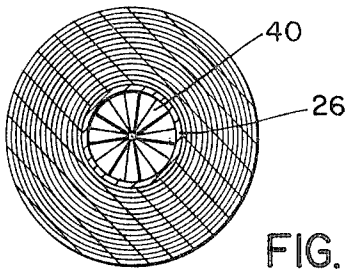


FIG. 3

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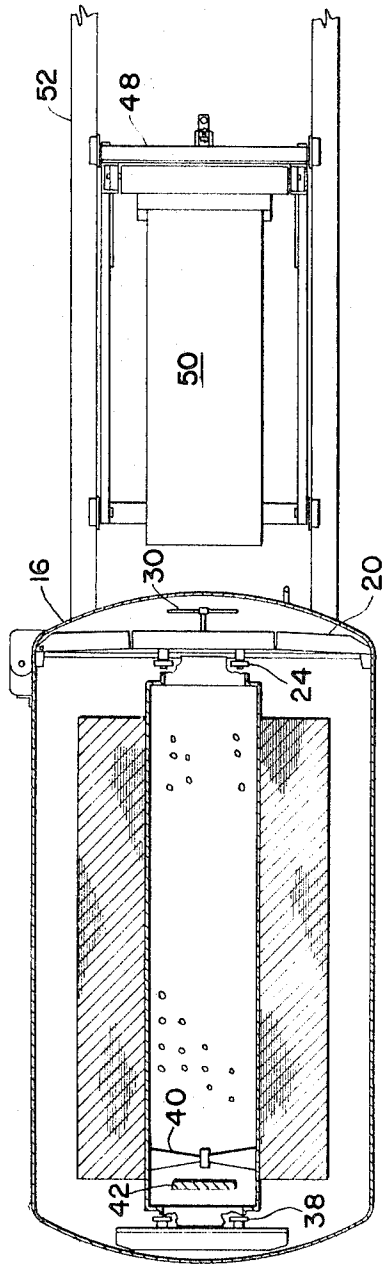


FIG. 5

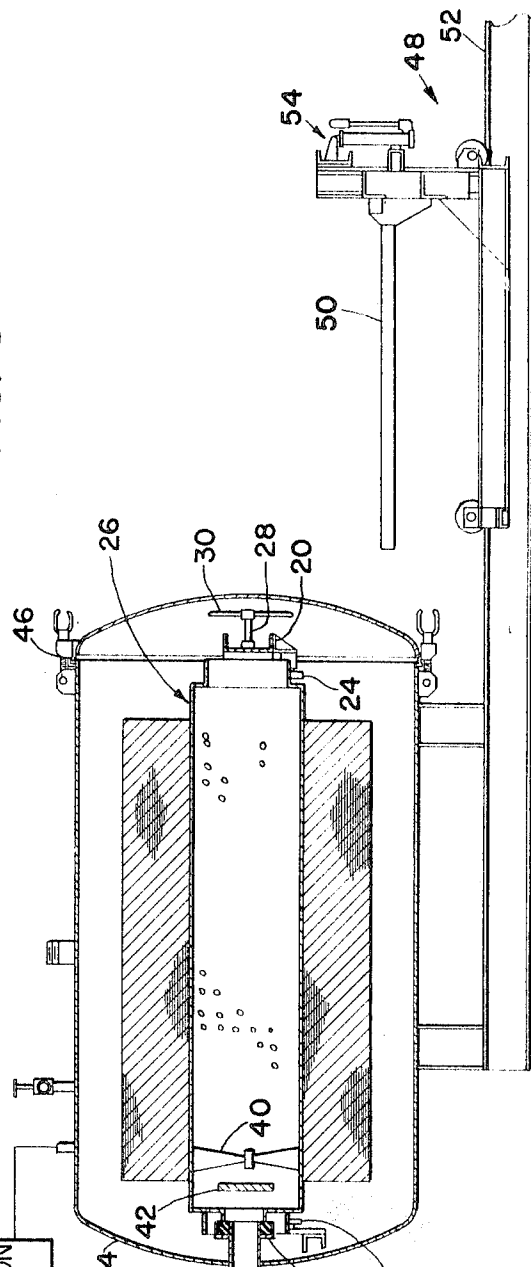
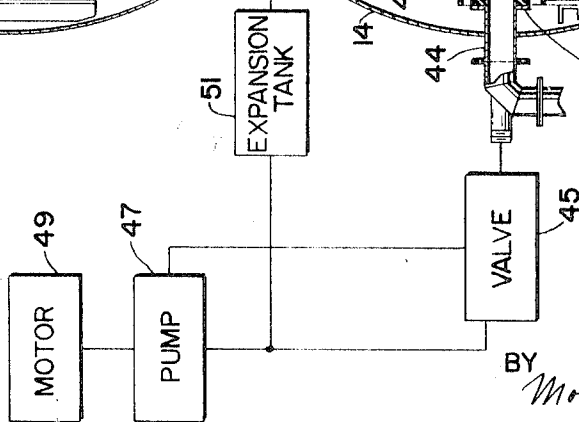


FIG. 4



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## BEAM DYEING APPARATUS

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

This invention relates generally to equipment for dyeing textiles and more particularly is directed towards a new and improved high-temperature beam dyeing apparatus.

#### 2. History of the Prior Art

In the production of textile materials the fabric, in many instances, is subjected to dyeing processes. The dyeing equipment employed may be of the open vat type in which dyeing is done at atmospheric pressure or, more desirably, it is carried out at elevated temperatures under pressure. For this purpose a pressure vessel is commonly used in which a perforated roll, known as a dye beam, is mounted for rotation within a chamber and the dyeing liquor pumped into the dye beam for passage out through the fabric wrapped about the beam. The beam is rotated commonly by means of a motor. Customarily, the chamber is provided with internal rails for sliding the beam into and out of the chamber. Certain problems are present in existing dyeing equipment of this type in that the use of a motor to drive the beam requires the installation of rotary pressure seals in the wall of the pressure vessel and the presence of the internal rails overcrowds the interior of the vessel and reduces the capacity of the dye beam.

Accordingly, it is an object of the present invention to provide improvements in fabric dyeing equipment and it is a more particular object of this invention to provide improvements in high-temperature, high-pressure beam dyeing equipment. It is a further object of this invention to provide means for facilitating the loading and unloading of a beam dyeing apparatus.

### SUMMARY OF THE INVENTION

This invention features beam dyeing apparatus comprising a pressure vessel having an opening with a door for access to the interior of the vessel. A hinged gate is mounted normally across the opening to support one end of a perforated dye beam mounted within the vessel. The other end of the dye beam is mounted at the opposite end of the vessel against a rotary seal and in communication with a conduit through which the dyeing liquor is pumped. The beam is provided with fixed internal propellers which cause rotation of the beam under the force of the liquor flowing into the beam. External rails are provided parallel to the beam axis to support a dolly having a cantilevered hydraulically operated cradle adapted to move into and out of the vessel when open to provide ease of loading and unloading and to eliminate internal obstructions.

### DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in perspective, partly broken away, showing a beam dyeing apparatus made according to the invention,

FIG. 2 is a sectional view in side elevation of a dye beam made according to the invention,

FIG. 3 is a cross-sectional view taken along the line 3-3 of FIG. 2,

FIG. 4 is a sectional view in side elevation of the apparatus, and,

FIG. 5 is a sectional top view thereof.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and to FIG. 1 in particular, the dyeing apparatus of the invention is generally organized about a pressure vessel 10, typically in the form of a horizontally mounted cylinder supported in a raised position by means of frame members 12. The vessel 10 is closed at the right-hand end by end wall 14 and the open left-hand end thereof is provided with a hatch or door 16 mounted by a hinge 18 and adapted to swing from a closed position to a fully open position in order to provide maximum access into the interior of the vessel. Mounted directly within the opening in proximity

to the hatch 16 is a gate 20 supported by an interior hinge 22. The gate 20 is provided with roller bearings 24 to support the end of a dye beam 26 when mounted in position. It also is furnished with a clamping screw 28 operated by means of a handwheel 30 for tightening the beam 26 into position against a rotary seal 31 (FIGS. 4 and 5) at the opposite end of the vessel. The free end of the gate 20 is locked against the opposite wall of the vessel by means of a pin 33, dropped through a bracket 32 mounted opposite the hinge 22.

The beam is in the form of a hollow cylinder the walls of which are formed with perforations 34 and the ends of which are reduced at 36 and 38 for rotatably engaging roller bearings 24 on the gate and roller bearings 38 (FIG. 4) at the opposite end of the vessel. As viewed in FIG. 2 the right-hand end of the dye beam is open to permit the dyeing liquid to be pumped axially into the dye beam. Mounted inside the beam near the inlet end thereof are fixed propellers 40 coaxial with the beam axis. To direct the flow of the incoming fluid into a radially outward path a baffle 42 is provided in spaced opposition to the inlet end of the dye beam. The fixed propellers 40, being located directly behind the baffle and in close proximity to the inlet, will react against the flow to cause rotation of the beam about its axis under the force of the pumped liquor without the need of separate driving means such as a motor, for example, which would require a pressure rotary seal through the end wall in addition to other accessories.

The inner or inlet end of the dye beam, when in operating position, bears up against the rotary seal 31 provided at the end of an inlet pipe 44 passing through the end wall 14 of the chamber 10. The neck of the dye beam at the inlet end is supported by the rollers 38 which permit rotation of the dye beam. The pipe 44 is connected to accessory equipment such as a valve 45 connected to the discharge and suction side of a pump 47 to permit a dye liquor to flow through the pipe in either direction as desired although the more common practice is to use the pipe 44 primarily as an inlet for the liquor. The pump typically is driven by a suitable electric motor 49 and an expansion tank 51 normally is connected to the system as are drain lines, return lines, safety valves and the like.

The dye beam is forced into a snug engagement with the seal 31 by means of the screw 28 operated by hand wheel 30 which bears against the opposite end of the dye beam. The tightening mechanism, as previously described, is mounted to the hinged gate which is independent of the hatch 16 to permit the dye beam to be independently supported and positioned prior to closing the hatch. The hatch 16 is provided with a suitable gasket and clamped tight by means of dogs 46.

Interior slide supports for the dye beam are not required in the pressure chamber and the available space within the chamber is increased by the use of a dolly 48 having a cantilevered cradle 50 and movably mounted on rails 52 exterior to the chamber 10 and running parallel to the axis of the dye beam. As shown in FIG. 1, the loaded dye beam 26 may be placed on the cradle 50 initially by an overhead crane or other lifting mechanism and is then transferred into the chamber 10 by moving the dolly 48 along the rails 52 until the inlet end of the dye beam is in position against the seal 31. The cradle 50 extend forwardly from hydraulic lifting mechanism 54 forming part of the dolly unit to permit the cradle, with its load to be raised or lowered not only to deliver the dye beam correctly in position but also to lower the cradle and to move the dolly clear once the dye beam has been properly mounted.

In practice, the chamber first is fully opened with both the hatch and gate swung back out of the way as suggested in FIG. 1. The dolly together with the dye beam is moved forwardly to push the dye beam end against the seal at which point the gate is swung shut and locked. The cradle is then lowered and withdrawn so that the weight of the dye beam shifts to the rollers 24 and 38. The screw clamp 28 is then tightened by means of the wheel 30 until the dye beam is fully positioned. Thereupon the hatch 16 is closed and secured by the dogs. The dyeing process is then initiated and the liquor pumped through the dye beam which will be rotated by means of the fixed

propellers 40. When the process is complete, the tank is drained, the hatch opened and the dolly with its cradle inserted so as to lift the dye beam from its supporting rollers. The gate is then swung back out of the way, the cradle withdrawn with the dye beam then transferred to other processes.

The rails 52 may be provided with stops 56 to limit the travel of the dolly rails. While the rails are shown mounted below the tank similar advantages may be obtained by mounting the rails above the tank and suspending the dolly with its cradle from the overhead rails.

Having thus described the invention what I claim and desire to obtain by Letters Patent of the United States is:

- 1. Textile-dyeing apparatus, comprising
  - a. a pressure chamber having an access opening formed therein,
  - b. a door for closing said opening,
  - c. a dye beam mountable in said chamber,
  - d. first bearing means at one end of said chamber for rotatably supporting one end of said beam,
  - e. second bearing means movably mounted at said opening for rotatably supporting the opposite end of said beam, and,
  - f. loading means external of said chamber for transferring said beam into and out of said chamber.

2. Textile-dyeing apparatus according to claim 1 wherein said loading means includes a dolly movable to and away from said chamber and a cantilevered tray mounted to said dolly for supporting said beam.

3. Textile dyeing apparatus according to claim 1 wherein said beam is hollow and the walls thereof are perforated and piping means for delivering fluid into one end of said beam.

4. Textile-dyeing apparatus according to claim 3 including propellers coaxially mounted in fixed position within said beam for causing rotation of said beam in reaction to the flow of said fluid.

5. Textile dyeing apparatus according to claim 1 wherein said second bearing means includes rollers, a hinged support for said rollers mounted to said chamber in proximity to said opening.

6. Textile-dyeing apparatus according to claim 5 including a screw clamp mounted to said support and coaxial with said beam for tightening said beam in position.

7. Textile-dyeing apparatus according to claim 2 including lifting means mounting said tray to said dolly for raising and lowering said tray.

- 8. A dye beam, comprising
  - a. a tubular cylinder open at one end and closed at the other,
  - b. the cylindrical walls of said beam being perforated,
  - c. propeller blades mounted in fixed position within said cylinder adjacent the open end of said cylinder and coaxial with said cylinder.

9. A dye beam according to claim 8 including baffle means disposed between said blades and the open end of said beam for directing fluid outwardly of said beam.

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