April 20, 1943. W. I. TAYLOR 2,316,900

APPARATUS FOR THE TREATMENT OF YARN PACKAGES

Filed June 10, 1941

FIG. 1

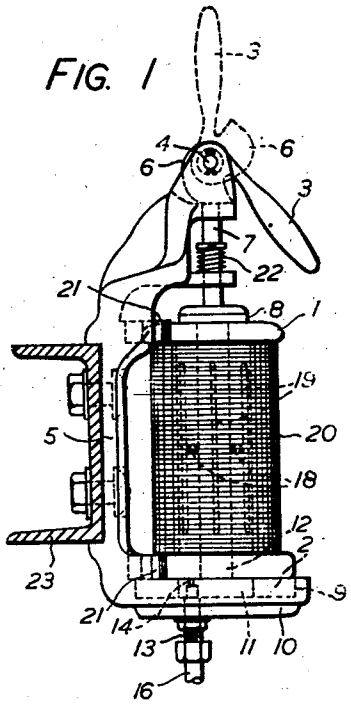


FIG. 2

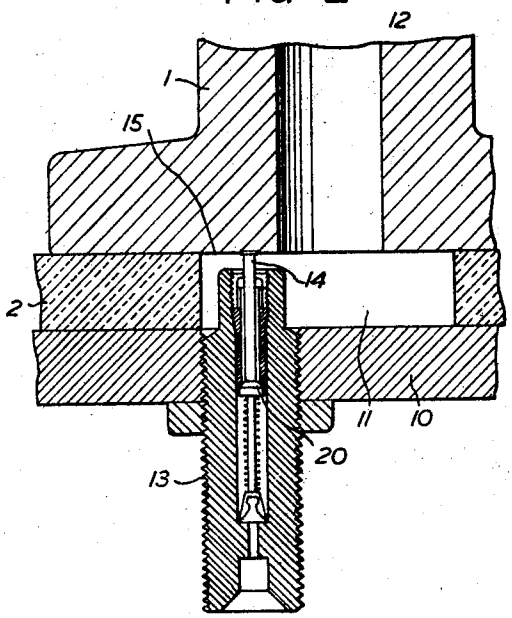


FIG. 3

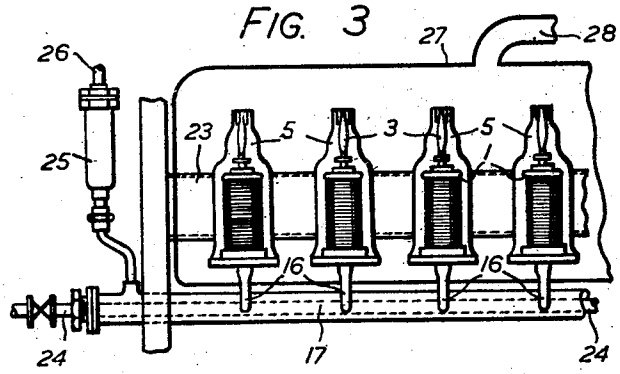


FIG. 4

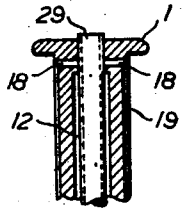


FIG. 5

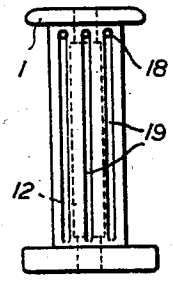
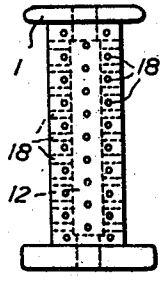


FIG. 6



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APPARATUS FOR THE TREATMENT OF YARN PACKAGES

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Application June 10, 1941, Serial No. 397,407
In Great Britain July 10, 1940

3 Claims. (Cl. 34—104)

This invention relates to apparatus for the treatment of yarn packages, and in particular for the treatment of packages of yarn of artificial materials spun from solutions of material in volatile solvents by the dry spinning process. Organic derivatives of cellulose are capable of being formed into filamentous yarns in the manner just indicated, cellulose acetate being commonly spun from a solution of which the solvent largely consists of acetone, the dry spinning operation effecting setting of the cellulose acetate filaments by evaporation of the acetone.

One of the objects of the present invention is to facilitate the production of yarns of the character mentioned in a suitable condition for subsequent use. A further object of the invention is to improve the recovery of the volatile solvent in the production of yarns of this character.

According to the invention, apparatus is provided for subjecting a bobbin of yarn to a gaseous flow through the body of the yarn and the bobbin, the apparatus comprising a clamp adapted to receive a bobbin with a perforated barrel and adapted to close the bore of the bobbin barrel, means associated with the clamp for supplying compressed gas to the bore of the barrel, and a valve in said supply means, said valve being normally closed but adapted to be opened by the act of clamping the bobbin in position. Conveniently, the valve may be engaged by the bobbin placed in the clamp, so that the clamping pressure on the bobbin opens the valve. Resilient packing rings may be used to assist in closing the bore of the barrel, and the valve may protrude within one of the rings, so as to be engaged by the bobbin when pressure on the latter compresses the ring.

Thus, artificial yarns as they are spun may be collected on bobbins having perforated barrels and each completed bobbin may then be placed in one of the clamps to which the compressed gas is supplied and left until a substantial quantity of the volatile solvent remaining in the yarn at the conclusion of the spinning operation proper has been removed by the flow of gas. The gas is most conveniently air, and the operation of removing the solvent is advantageously carried out in the spinning room, so that the solvent-laden air issuing from the bobbins may pass via the atmosphere of the room into the spinning cells, which provides for the ultimate recovery of the solvent along with the solvent released in the spinning operation. Provision may, however, be made for separately conducting away the solvent removed in the post-spinning operation, e. g., by a suction duct connected to a hood substantially surrounding a bobbin or a series of bobbins. By having the compressed air supply and the clamps in the spinning room, there is the added advantage that no additional handling of the bobbins is called for, because the placing of the bobbins in the clamps resembles the placing of bobbins on pegs at the spinning machine for storage prior to collection and removal. The operation of the clamp need take very little time, and, as indicated above, the supply of compressed air is automatically applied to each bobbin.

The gas may be heated to accelerate the removal of the solvent; and provision may be made for replacing at least in part the solvent removed by the gaseous flow by moisture so that not only does the yarn receive a quantity of moisture corresponding to the moisture regain that would result from subsequent exposure of the yarn to the atmosphere in the interval before the yarn was used, but the harmful effect of shrinkage resultant on the elimination of the volatile solvent is counteracted. Provision may therefore be made for the use of moisture-laden gas. Preferably the quantity of moisture in the gaseous flow is such that by the time the desired elimination of volatile solvent has been completed, the yarn has acquired the desired proportion of moisture.

The invention will now be described in greater detail with reference to the accompanying drawing, in which:

Fig. 1 is a side elevation of a clamping device for securing a flanged bobbin on an air pipe;

Fig. 2 is a section of part of Fig. 1 to an enlarged scale showing details of the valve;

Fig. 3 is a front elevation of an arrangement for the simultaneous treatment of a number of bobbins; and

Figs. 4, 5 and 6 show details of different types of bobbins that may be used.

Referring to Fig. 1, a flanged bobbin 1 is clamped on to a rubber pad 2 by means of a lever 3 pivoted at 4 in a clamping frame 5 and provided with a cam 6 that serves to depress a spindle 7 carrying at its lower end a second rubber pad 8. The rubber pad 2 is placed within a recess 9 in the base 10 of the frame 5 and contains a central hole 11 substantially larger in diameter than the bore 12 of the bobbin 1. Through the base 10 of the frame 5 passes the body of a valve 13 of the type used in motor tires. The valve is located out of line with the axis of the bobbin so that the valve 14 may be contacted by the face 15 of the bottom flange of the bobbin when the bobbin is pressed on to the pad 2. The valve is connected

by a branch pipe 16 to a header 17 to which compressed air is supplied.

The bore 12 of the bobbin is connected by radial holes 18 with longitudinal grooves 19 in the barrel of the bobbin so that when compressed air is admitted to the bore it can pass over the surface of the bobbin barrel and through the whole body of yarn 20 wound on the bobbin. Therefore, when a wound bobbin is placed in the frame 5 and the handle 3 is depressed to clamp the bobbin between the pads 2 and 8, thus closing the bobbin bore 12 and compressing the bottom pad 2 in the recess, the contact of the face 15 of the bottom flange of the bobbin with the valve stem 14 lowers the valve proper 20 from its seat and permits compressed air to pass from the branch pipe 16 into the bore 12 and by the holes 18 into the body of yarn 20. Opening of the valve thus takes place simultaneously with the clamping of the bobbin in position.

Buffers 21 in the frame 5 enable the bobbin 1 to be quickly positioned in relation to the pads 2 and 8 and the valve stem 14. The bobbin can be quickly released by raising the lever 3, a spring 22 serving to raise the pad 8 clear of the bobbin. The cam 6 is self-locking when the lever 3 is depressed.

As shown in Fig. 3, the compressed air header 17 supplies a number of branch pipes 16 for the simultaneous treatment of a number of bobbins, a suitable number of clamping frames 5 being carried by a longitudinal rail 23. A steam pipe 24 runs through the header 17 to enable heated air to be supplied to the bobbins. A filter 25 in the feed pipe 26 for the header 17 ensures that only clean air is permitted to contact with the yarn on the bobbins. The air supplied to the header 17 may be moist, so as to leave the yarn conditioned after the removal of solvent is completed.

The type of valve described is particularly useful when a large number of bobbins have to be treated; the operative has merely to attend to the clamping of the bobbins and their release after a suitable time, and the escape of air is automatically prevented during the interval that elapses between the removal of a treated bobbin and its replacement by an untreated bobbin. Solvent-laden air escaping from the bobbins may pass into the atmosphere, or, as shown in Fig. 3, a casing 27 may surround the bobbins under treatment, solvent-laden air being led by a duct 28 to a solvent recovery plant.

In the sectional view of the bobbin given in Fig. 4 it is shown how during winding of the bobbin the wharl-tube 29 closes radial holes 18 disposed near the top of the bobbin against the entry of spindle lubricant which might be propelled into the yarn by centrifugal force. Where this difficulty does not arise during winding, the radial holes 18 may be otherwise disposed, e. g. midway along the grooves 19, as shown in Fig. 1, or, again, the holes may be distributed over the length of the bobbin as shown in Fig. 6, and in this case a sufficiently large number of holes may be provided to render unnecessary the use of the surface grooves 19 shown in Figs. 4 and 5.

The perforations and/or channels may be drilled, milled, or otherwise machined from the material of the bobbins or, in the case of moulded bobbins they may be cast during the production of the bobbins. The material of the bobbins should be capable of withstanding the gaseous flow without cracking or distorting; it should likewise remain unaffeceted by the moisture content of the gas.

The invention is advantageous in dry spinning operations in general, since the yarn as spun generally contains a material proportion of volatile solvent, and by making provision for recovery of this solvent from the gaseous flow, material economy results which is reflected in the price of the yarn. Moreover, by means of the invention it becomes less important to secure the utmost removal of solvent in the spinning operation proper, since economic recovery of residual solvent is provided for in the manner above indicated, the moisture conditioning of the yarn during removal of the residual solvent preventing any harmful shrinkage of the yarn on the bobbin and enabling the yarn to be readily unwound in good condition.

Any suitable pressure may be employed for the compressed gas, provided a sufficient rate of flow is obtained to remove the solvent in a reasonably short time. High pressures may be employed, for example compressed air at 100 pounds per square inch, but a wide range of pressures of lesser amount proves effective, for example pressures of 5–25 or 50 pounds per square inch may be employed. Air at 50 pounds pressure has been found suitable for reducing the acetone content of freshly-spun cellulose acetate yarn to about 1% within the time that a bobbin must be removed from the clamp to make room for the next bobbin.

The treatment according to the invention may be applied to bobbins of various sizes, e. g., 4, 6, 8, 12 ozs., 1 lb., 2 lbs., 3 lbs., or more in weight, and is applicable to yarns of all deniers and filament deniers, being, however, particularly suitable for heavy yarns and/or yarns with heavy filaments. The treatment may be continued for any desired period, from a few minutes to half an hour, one hour or more, but protracted treatment is not necessary, since the volatile solvent may be virtually eliminated in a short time and at the same time the desired moisture regain, e. g., 5–6% may be effected.

Having described my invention, what I desire to secure by Letters Patent is:

1. Apparatus for drying bobbins of yarn, comprising a clamping frame for receiving a bobbin having a perforated barrel, a clamp mounted on said clamping frame and having means thereon for closing the bore of the bobbin barrel and means for urging said closing means against the bore of the barrel so as to press the barrel against another part of said clamping frame, means associated with said clamping frame for supplying compressed gas to the bore of the barrel, and a normally closed valve in said supply means said valve being adapted to be opened by engagement of said bobbin therewith, the construction and arrangement being such that the valve is opened by the action of the clamp in clamping the bobbin in position.

2. Apparatus for drying bobbins of yarn, comprising a clamping frame for receiving a bobbin having a perforated barrel, a clamp mounted on said clamping frame and having a rubber pad thereon for closing the bore of the bobbin barrel and means for urging said pad against the bore of the barrel so as to press the barrel against another part of said clamping frame, means associated with said clamping frame for supplying compressed gas to the bore of the barrel, and a normally closed valve in said supply means said valve being adapted to be opened by engagement

of said bobbin therewith, the construction and arrangement being such that the valve is opened by the action of the clamp in clamping the bobbin in position.

3. Apparatus for drying bobbins of yarn, comprising a clamping frame having a rubber seat for receiving a bobbin having a perforated barrel, a clamp mounted on said clamping frame and having a rubber pad thereon for closing the bore of the bobbin barrel and means for urging said pad against the bore of the barrel so as to press the barrel against another part of said clamping frame, means associated with said clamping frame for supplying compressed gas to the bore of the barrel, and a normally closed valve in said supply means said valve being adapted to be opened by engagement of said bobbin therewith, the construction and arrangement being such that the valve is opened by the action of the clamp in clamping the bobbin in position.

WILLIAM IVAN TAYLOR.