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(54) **Apparatus to dry textile materials after dyeing.**

(57) Apparatus (21) to dry textile materials and, in particular, wound bodies such as yarn packages (11) and the like after the dyeing step, the drying being carried out preferably in fast-drying equipment (10) comprising essentially a fan (13) for the forced circulation of air, an automatic device (14) to reverse the direction of circulation of air, an autoclave (12) to contain the textile materials to be dried, a means (17) to separate the water removed and a cooling battery (16), a firing device (22) to heat directly the drying air during its delivery to the autoclave (12) being incorporated between the fan (13) and the autoclave (12).

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APPARATUS TO DRY TEXTILE MATERIALS AFTER DYEING

This invention concerns an apparatus to dry textile materials after dyeing; to be more exact, the invention concerns an apparatus suitable to dry textile materials especially when such materials are packaged on wound bodies, the apparatus comprising independent means borne on the apparatus itself so as to heat directly the drying fluid.

As we said above, the invention is applied advantageously to the drying of wound bodies such as yarn packages, hanks or the like, but can be employed equally well for other types of textile materials differently packaged.

The problems linked to the processes of drying of textile materials after the dyeing operation are known in the state of the art.

Such textile materials have to undergo firstly a water removal step and then the drying step so as to have at the end the same weight as they had before being dyed.

The state of the art includes essentially two drying methods. A first method is carried out in one single stage and provides fast drying of the material, whereas the second method takes place in two different stages, namely a first preliminary mechanical drying stage with centrifuging of the material and a second actual drying stage with hot air driers or high frequency ovens.

The fast drying method offers the advantage of less handling of the product but is hardly competitive owing to its high consumption of energy.

For this reason the second method is used more often nowadays and entails longer working times than the first method, giving a preference to the final drying treatment in high frequency dielectric fields.

This final treatment enables large volumes of material to be processed in relatively short times, as required in modern dyehouses.

This invention has the purpose of overcoming the energy problem linked to the fast drying method and generally to all the like methods which involve hardly bearable energy consumptions.

In this way the fast drying method becomes satisfactory as being highly competitive as compared to the drying systems now generally most often used.

The purpose is attained with an apparatus to dry textile materials after dyeing according to the features of Claim 1, while the dependent claims describe various features of the invention.

The apparatus of the invention is an apparatus to dry textile materials which incorporates a firing device suitable to heat directly the air used in the drying process.

As is known, the fast drying apparatus carries

out a first water removal action with air under pressure and thereafter a drying step with hot air.

In this latter step the air, before coming into contact with the textile material in the drying chamber, is circulated in a firing device fitted in the delivery conduit leading to the drying chamber.

The firing device, advantageously operating with gas, is wholly within the apparatus and heats directly the air required for the drying process.

In this way a very high energy efficiency is achieved in a very simple plant structure.

These and other special features of the invention will be made clearer in the description that follows.

The attached figures, which are given as a non-restrictive example, show the following:-

Figs.1a and 1b

give diagrams of a plant for the fast drying of textile materials in the two working steps according to the state of the art;

Fig.2

is a diagram of a drying plant of the type shown in Fig.1 according to the invention.

Figs.1a and 1b give diagrams of an equipment 10 for the fast drying of textile materials, yarn packages 11 in this instance, the equipment 10 being of a type substantially already known.

This equipment 10 includes essentially an autoclave 12 suitable to accept the carriers of yarn packaged on conical bobbins 11, a high-pressure centrifugal fan 13, an automatic device 14 to reverse the direction of circulation of air, a battery 15 for indirect heating of air, a battery 16 for indirect cooling of air and condensation of evaporated water and a means 17 to separate the water removed.

Other auxiliary devices are also included such as, for instance, a centrifugal separator of condensed water, and control and drive devices, which have not been shown in the figures as they are not important for explanatory purposes.

The whole drying cycle is performed in the equipment 10 according to automatic programmed sequences.

Fig. 1a shows the step of dynamic removal of water from yarn packages 11 by means of high-pressure air delivered in the direction of the arrows 18 by the centrifugal fan 13 into the autoclave 12.

The air is forced through the material wound in yarn packages 11 in the direction of the arrows 19 inwards from outside.

The water removed dynamically from the yarn packages 11 is eliminated by a suitable separator 17.

At the beginning of the water removal step the static pressure in the circuit increases automatically

until it reaches a pre-set value so as to increase the relative density of the air in circulation and therefore to transmit great quantities of heat for evaporation of the water in the yarn.

Fig. 1b shows the actual drying step, which begins automatically at the end of the water removal cycle.

The batteries to heat 15 and to cool 16 the air are now actuated. The circulating air is thrust by the fan 13 through the heating battery 15, is heated to a pre-set temperature and delivered into the autoclave 12.

The heating battery 15 is normally a heat exchanger connected to a remote generator of carrier fluid.

The heated air is forced through the yarn packages 11 outwards from within in the direction of the arrows 20 and in this way transfers heat to the yarn and becomes saturated with evaporated water.

The saturated hot air then passes into the water separator 17 and thence to the cooling battery 16, where it loses its absolute moisture, and the condensate is gathered and removed from the circuit.

Thereafter the heating battery 15 is disactuated and the air is caused to circulate still as in Fig.1a so as to equalise the residual humidity and to reduce the temperature of the material in the yarn packages 11 progressively.

Fig.2 shows a fast drying apparatus 21 according to the invention, the apparatus 21 being of the type shown in Figs.1 and in the working step of Fig.1a in this case.

A firing device 22 to heat directly the air circulated by the fan 13 is installed in the circuit of delivery of air to the autoclave 12 instead of the heating battery 15 of Figs.1. This firing device 22 may be one of the many known types available on the market.

In this case the firing device 22 is a generator provided with a combustion chamber 23 equipped with its own gas burner (the inlet is shown in Fig.2) and with tubes 25 for fumes.

The air passes through the firing device 22 in the direction of the arrows 18, and the device 22 heats the air independently and directly before sending it to the autoclave 12. The gas used in the burner is advantageously methane.

The firing device 22 may be connected advantageously to an assembly that cools the fumes of combustion discharged by the firing device 22 itself.

The heat recovered may be employed in many various ways.

Obviously, the firing device 22 can be fitted at any other position between the fan 13 and autoclave 12.

The introduction of the firing device 22 into the

complex of the drying apparatus 21 obviously entails the inclusion of additional control, safety and protective devices in the apparatus 21, but all of this forms part of the state of the art and can be readily understood by a person skilled in this field, besides many other possible variants, without thereby departing from the scope of the invention as claimed.

Claims

1. Apparatus (21) to dry textile materials and, in particular, wound bodies such as yarn packages (11) and the like after the dyeing step, the drying being carried out preferably in fast-drying equipment (10) comprising essentially a fan (13) for the forced circulation of air, an automatic device (14) to reverse the direction of circulation of air, an autoclave (12) to contain the textile materials to be dried, a means (17) to separate the water removed and a cooling battery (16), the apparatus (21) being characterized in that a firing device (22) to heat directly the drying air during its delivery to the autoclave (12) is incorporated between the fan (13) and the autoclave (12).
2. Apparatus (21) as claimed in Claim 1, in which the firing device (22) is operated with gas, advantageously methane.
3. Apparatus (21) as claimed in Claim 1 or 2, in which the discharge of the products of combustion is connected to an assembly that cools these products of combustion.

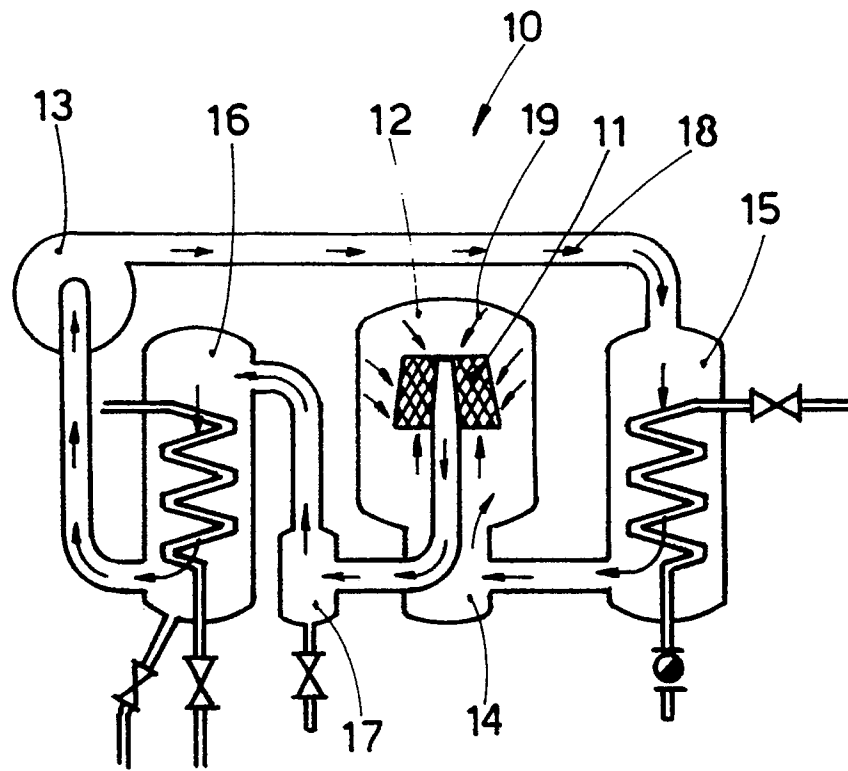


fig.1a

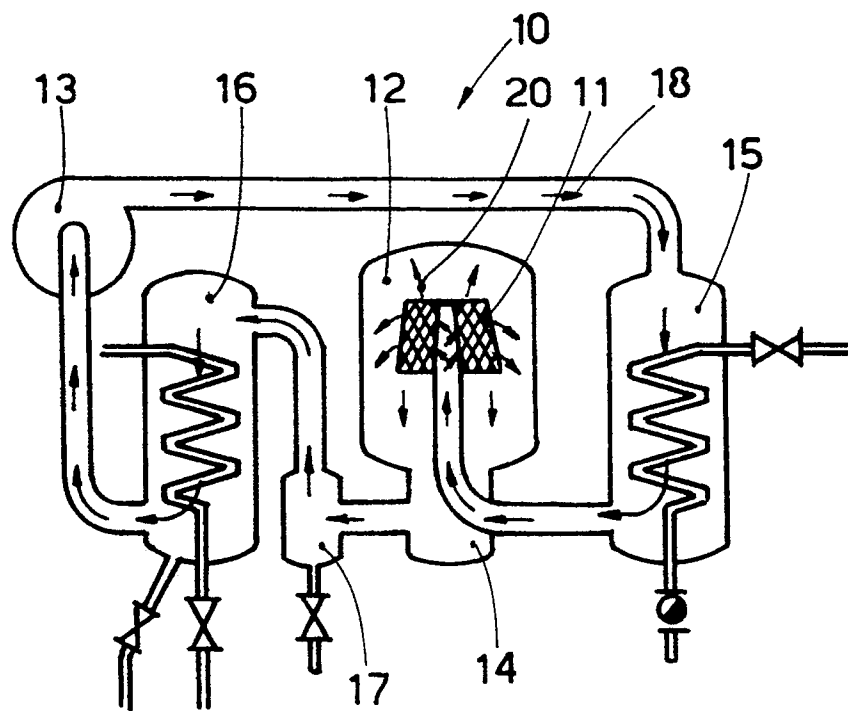


fig. 1b

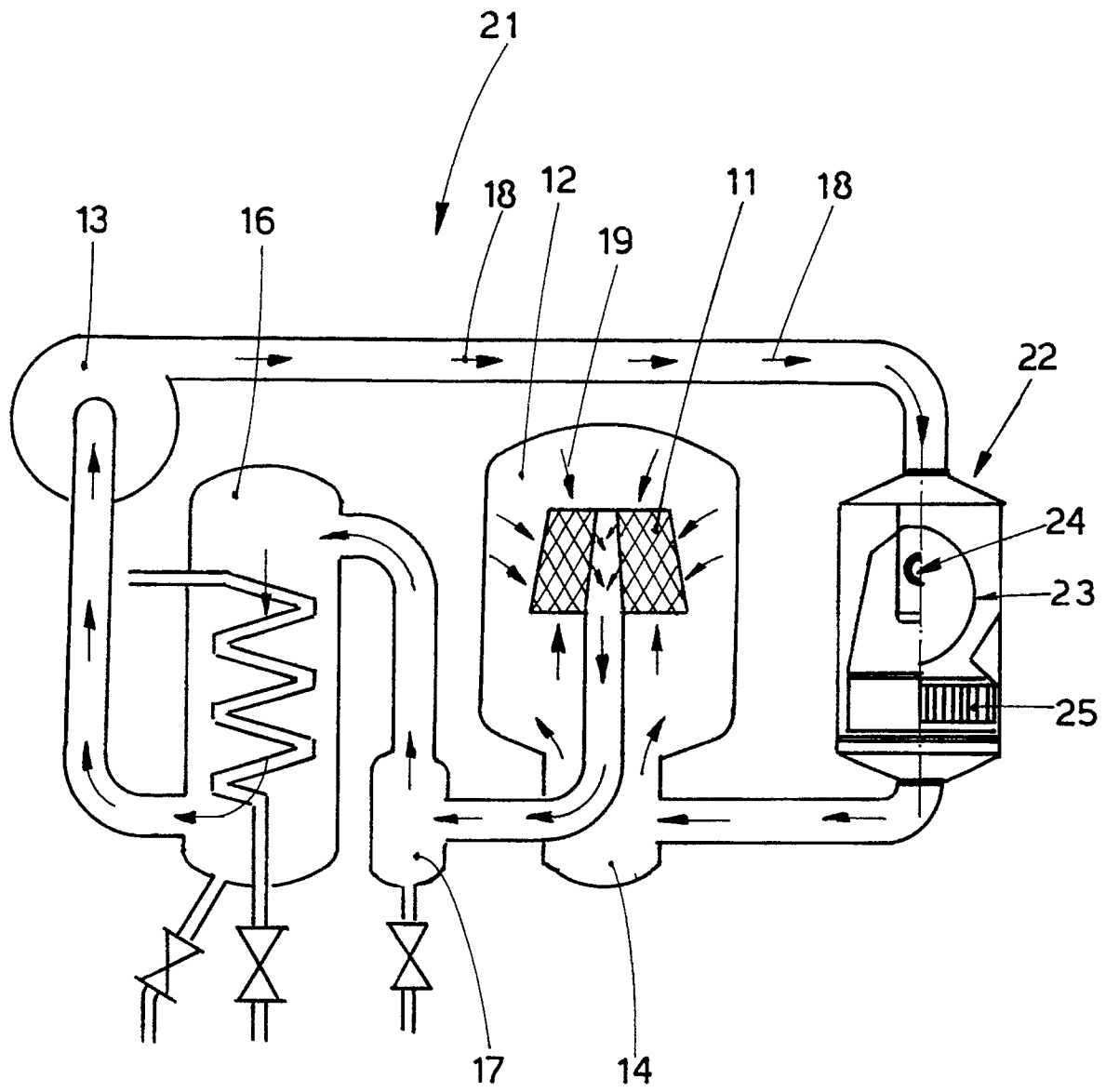


fig. 2



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EUROPEAN SEARCH REPORT

Application Number

EP 90 12 4357

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	FR-A-1 003 780 (VAUVILLIER) * the whole document * - - -	1-3	D 06 B 5/16
X	FR-A-9 759 02 (BONCOMPAIN) * the whole document * - - -	1-3	
X	FR-A-1 050 034 (BERTSCHINGER) * the whole document * - - -	1	
X	US-A-3 584 846 (LYLE MC COY) * the whole document * - - - - -	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D 06 B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of search 28 February 91	Examiner PETIT J.P.
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