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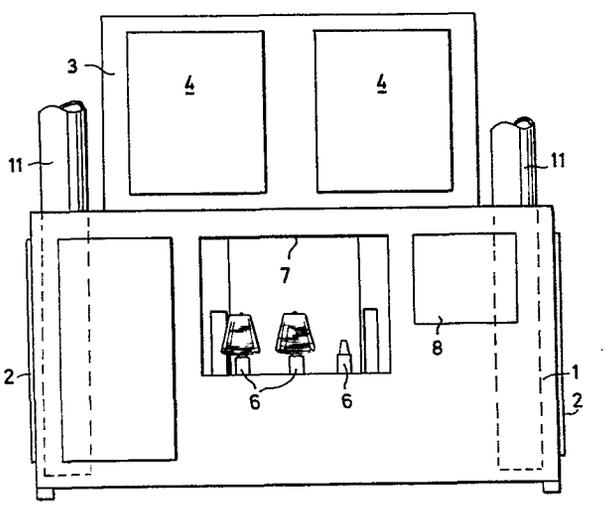
(54) Radio-frequency textile drying method and apparatus.

(57) A method of drying textile material which comprises revolving or otherwise circulating the material in a substantially closed container whilst simultaneously exposing the material to radio frequency energy and evacuating moisture from the container by suction.

Apparatus for performing this method comprises (Figure 1) a container (1), a turntable (5) means for applying radio frequency energy to the material while it is circulating or revolving and a vacuum pump for evacuating water or water vapour from the container.



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This invention relates to a method and apparatus for drying textile material by exposure to radio-frequency energy and which can also be used for causing dye fixation simultaneously with drying.

In accordance with the invention a method of drying textile material comprises revolving or otherwise circulating the material in a substantially closed container whilst simultaneously exposing the material to radio frequency energy and evacuating moisture from the container by suction.

Further in accordance with the invention, apparatus for the performance of such method comprises a substantially closed container, means for circulating or revolving the material in the container, means for applying radio frequency energy to the material while thus circulating or revolving and a vacuum pump for evacuating water or water vapour from the container. Preferably a such revolving means is a turntable on which the material is peripherally carried and the radio frequency energy applying means comprises cylindrical concentric electrodes between which the material is passed whilst thus carried.

A preferred embodiment of the apparatus according to the invention, and which is designated a radio frequency drying, relaxation and setting unit, is illustrated in the accompanying drawings to which

reference is hereafter made. In these drawings:-

Fig. 1 is a front elevation of the unit;

Fig. 2 is a side elevation of the unit;

Fig. 3 is a plan view of the unit; and

Fig. 4 is a perspective view of the unit.

Referring now to the drawings, the unit comprises a casing 1 of rectangular shape formed on four sides with access openings covered by removable panels 2. The casing 1 has a superstructure 3, also of rectangular shape, with access openings on two opposite sides covered by removable panels 4. The superstructure 3 contains for example a 45 KW. 27.12 MHz dielectric generator (not shown).

The casing 1 mainly contains a rotary motor-driven turntable 5 which carries, around its periphery, a plurality of vertical electrically insulated locating spindles 6 for receiving packages - e.g. cones, cheeses or muffs - of yarn. The casing has a rectangular opening 7 in its front side through which an operator can place and withdraw packages on and from the spindles 6. A rotary turntable with 24 spindles 6 is shown and this can be driven by its motor at an infinitely variable speed to enable the unit to handle between 50 and 500 packages per hour as may be required for a particular treatment and type of textile material or fibre. To one side of the opening 7 is a control panel 8 which incorporates all the Radiofrequency generator and turntable operating controls (not shown). Two exhaust pipes 11 emerge from the top of the casing 1 and are

connected to a vacuum pump (not shown).

As shown in Figs. 2 and 3 there is disposed concentrically within the turntable 5 a stationary 'live' cylindrical electrode 9 coupled to the radio frequency generator, whilst concentrically outside the turntable 5 there is disposed a stationary 'earth' cylindrical electrode 10.

The size and spacing of the electrodes 9 and 10 and the size of the turntable 5 may need to be changed depending upon the textile material which is to be treated and whether drying is or is not required to cause dyesetting and the apparatus is adapted to enable this to be done. In Fig. 2 there are shown alternative positions 9' and 10' for the inner and outer concentric cylindrical electrodes respectively when the unit is to be used for dye-setting and drying, a larger diameter turntable 5' being then also necessary.

The packages placed on the spindles 6 may contain for example up to 5 kilograms of yarn sliver or tow and may carry at least their own weight of water (5 kgs).

The method of treatment after the packages have been placed and the turntable starts to rotate is for the vacuum pump and the radio frequency generator to be simultaneously operated. This first removes liquid water mechanically and then removes water vapour which is driven from the yarn by the radio frequency field within a period of 5 to 15 minutes depending upon the size of the packages. Yarn may be dried to ambient Regain consistent with normal conditioning i.e. 15% for wool, 4% for nylon

and acrylic and 1% for polyester. Without the radio frequency energy the vacuum pump will remove very little water.

The method is effective because as the water in the textile material is heated by the radio frequency energy, a positive pressure is produced within the fibre and this expels mechanically retained liquid water as a first step, followed by water vapour as the temperature within each package rises towards 100°C. The liquid water temperature is between 15°C and 30°C and the vacuum pump only ensures that the water which is driven off is removed to a suitable container or drain.

This method can equally well be applied to fibres in most forms provided they are restrained from moving with the air or vapour flow. As examples may be quoted beams (rolls) cloth or beams of yarn as well as packages and loose stock.

CLAIMS

1. A method of drying textile material which comprises revolving or otherwise circulating the material in a substantially closed container whilst simultaneously exposing the material to radio frequency energy and evacuating moisture from the container by suction.

2. Apparatus for performing the method of Claim 1, comprising a substantially closed container, means for circulating or revolving textile material in the container, means for applying radio frequency energy to the material while thus circulating or revolving and a vacuum pump for evacuating water or water vapour from the container.

3. Apparatus as set forth in Claim 2 comprising a turntable for revolving the material in the container and wherein the radio frequency energy applying means comprises cylindrical concentric electrodes between which the material is passed whilst revolving with the turntable.

4. Apparatus as set forth in Claim 3 wherein the turntable is equipped around its periphery with spindles for supporting yarn packages.

5. Apparatus as set forth in Claim 3 or Claim 4 which is adapted to accommodate a

turntable and/or electrodes of different sizes at different positions.

6. A method of drying textile material substantially as hereinbefore described.

7. Apparatus for drying packaged textile fibre substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

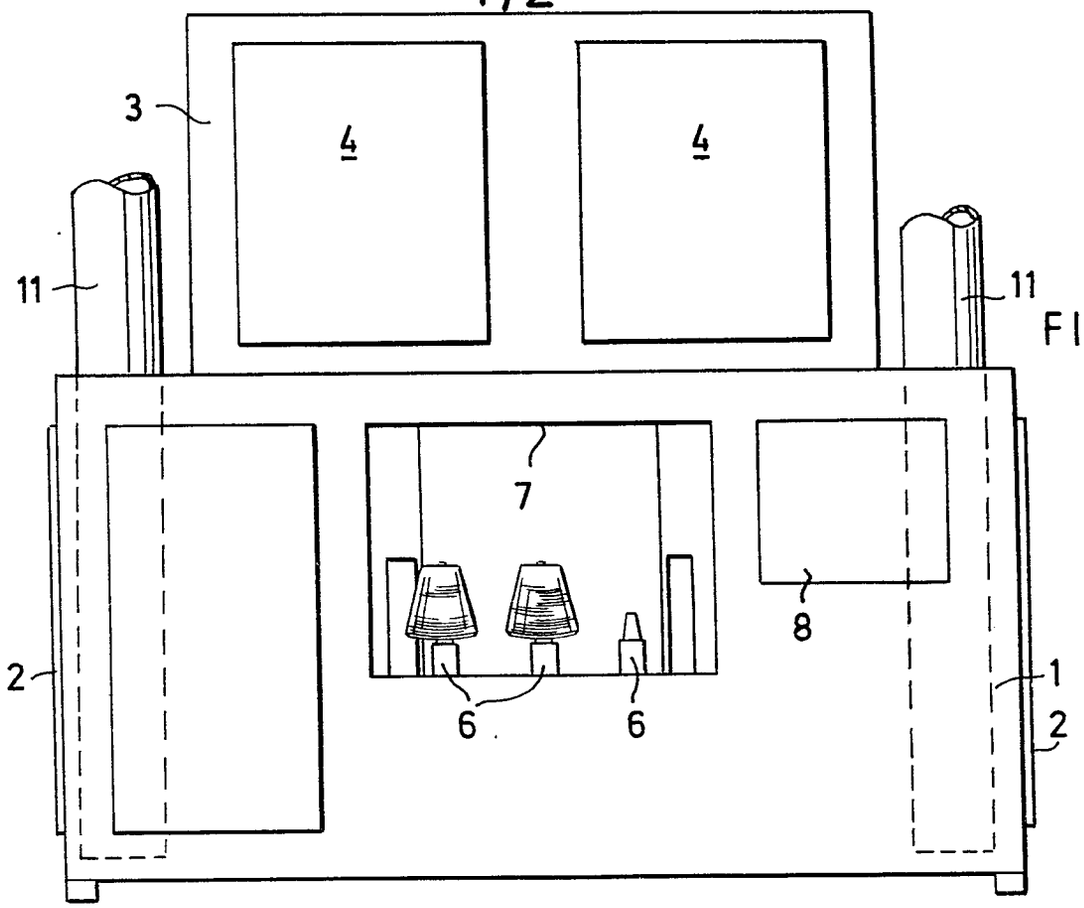

FIG.1.

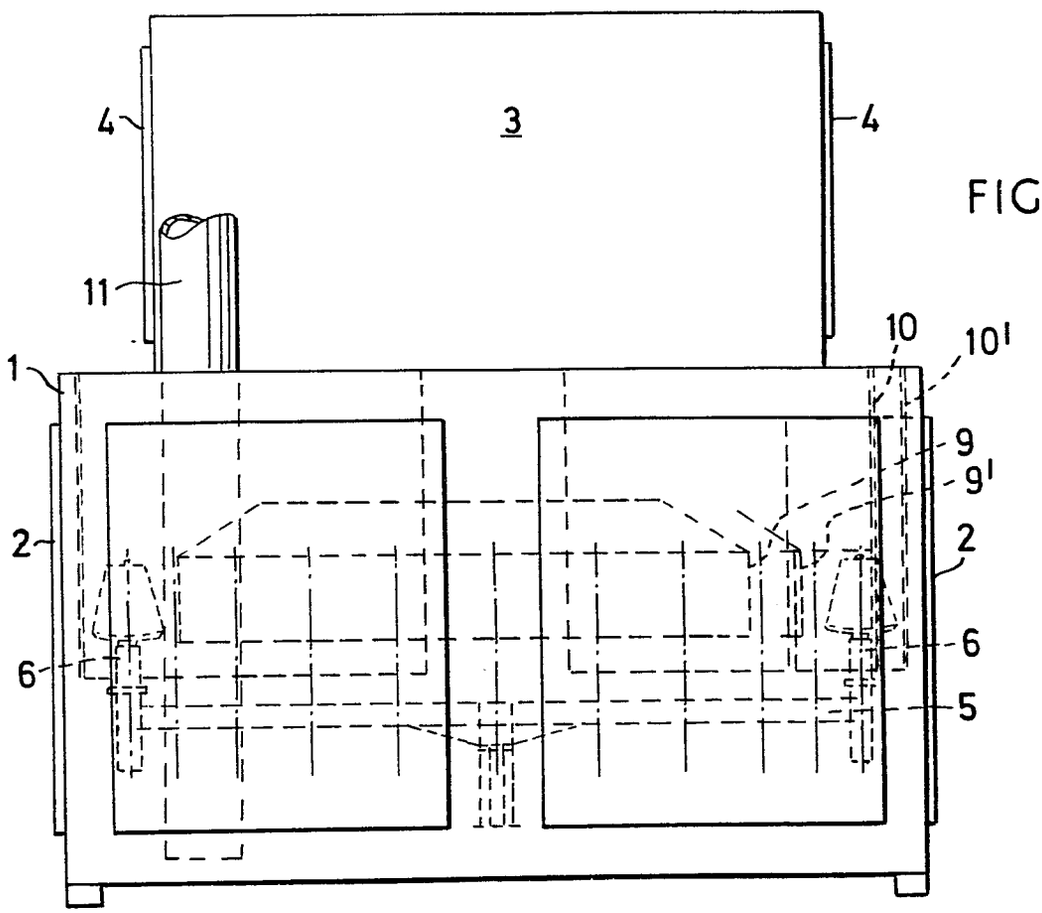

FIG.2.

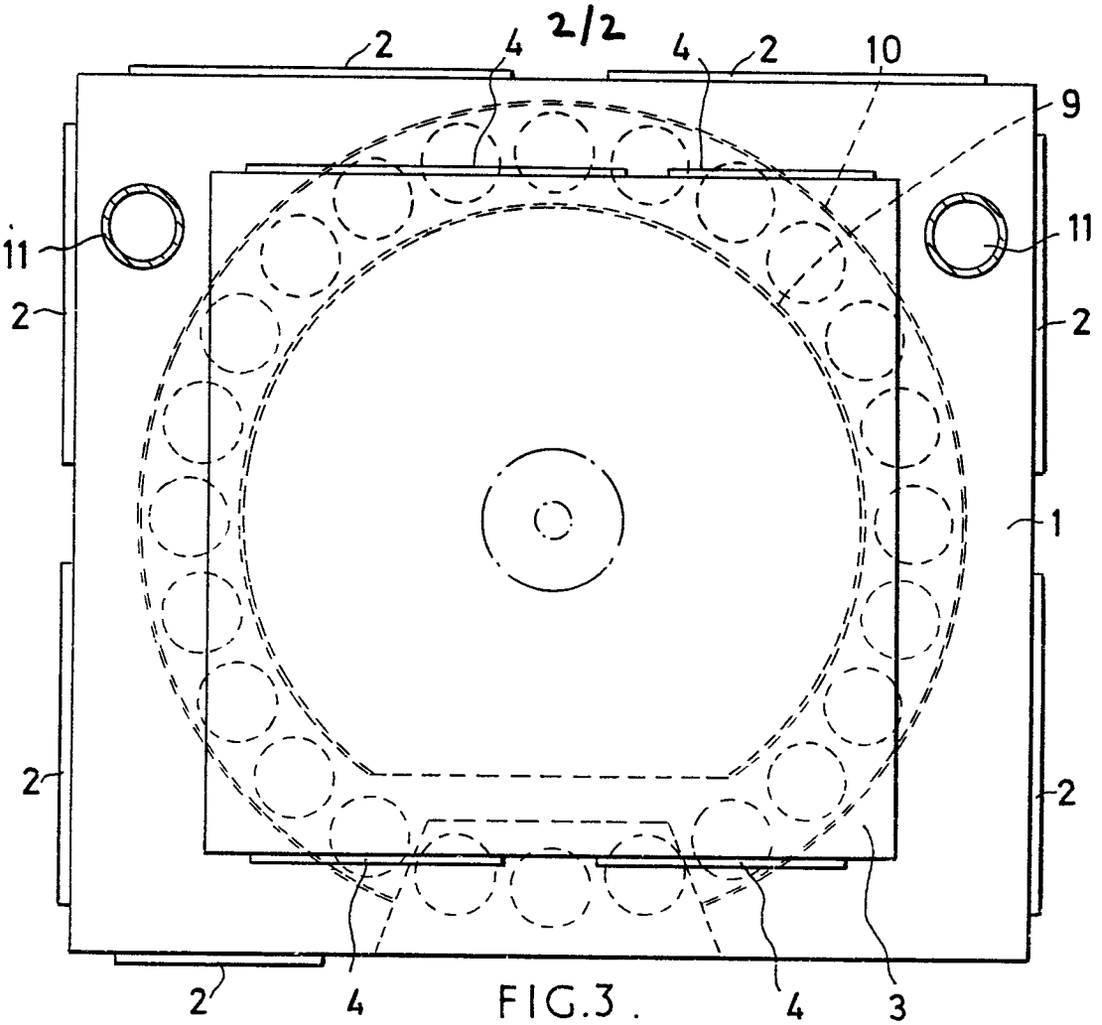

FIG.3.

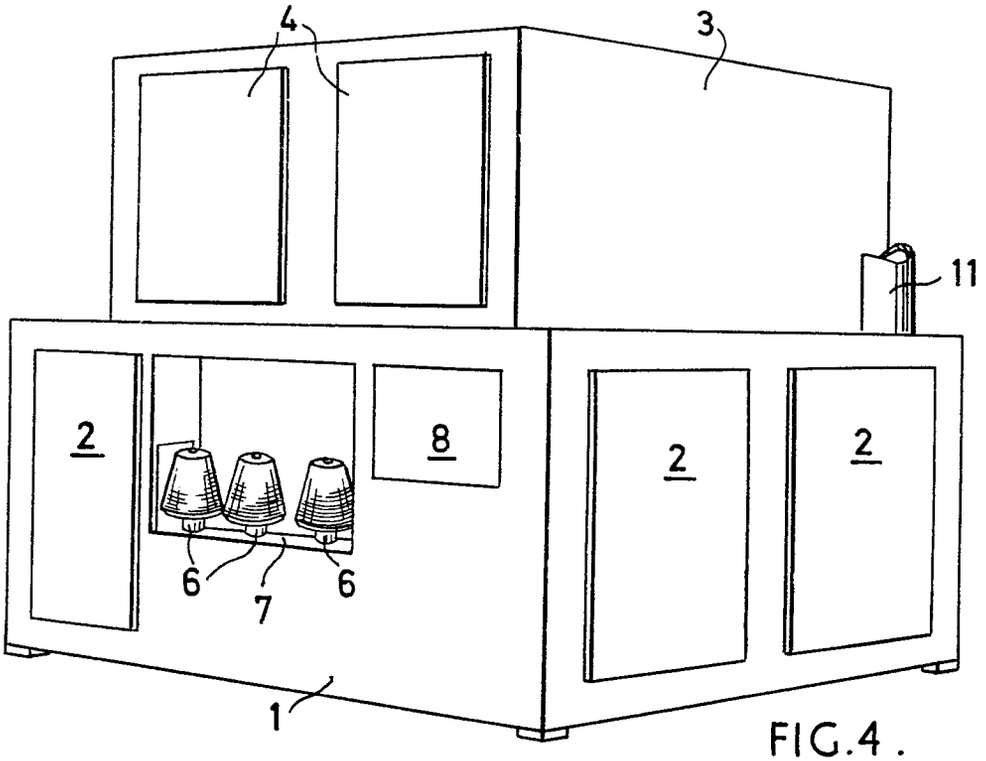

FIG.4.

European Patent Office

EUROPEAN SEARCH REPORT

0003684
Application number
EP 79 30 0204

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	FR - A - 2 299 443 (M.H.M.ELECTRONIC) * Entirety * --	1-5
	US - A - 3 986 268 (KOPPELMAN) * Abstract * --	1
	US - A - 4 045 639 (MEISEL) * Abstract * ----	1

CLASSIFICATION OF THE APPLICATION (Int. Cl.²)

F 26 B 3/34

TECHNICAL FIELDS SEARCHED (Int.Cl.²)

F 26 B

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	11-05-1979	BAETENS

EPO Form 1503.1 06.78