March 21, 1950 R. C. PARKES 2,501,537

DRYING MACHINE

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Fig. 1.

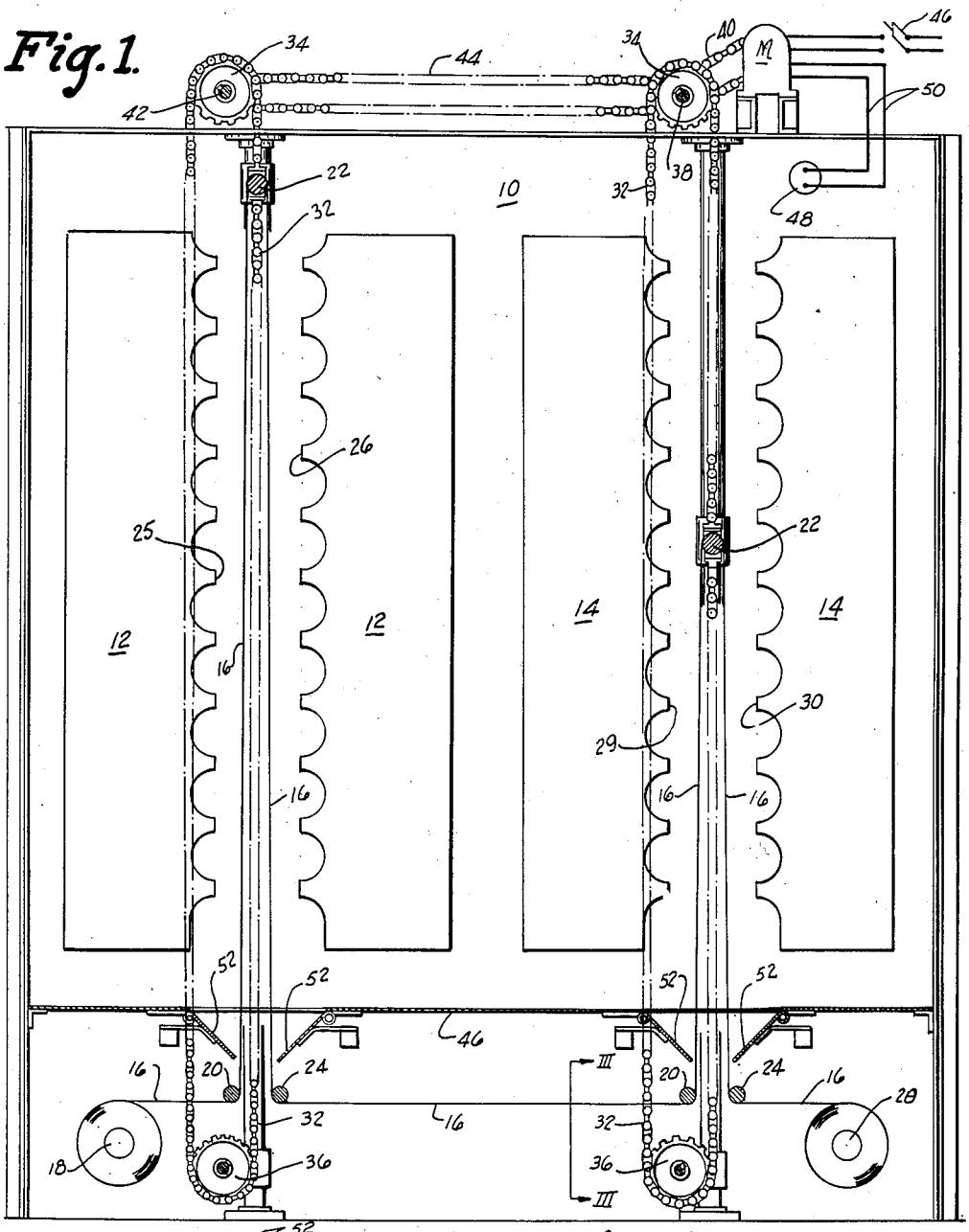


Fig. 2.

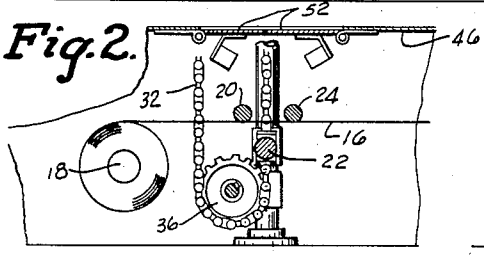
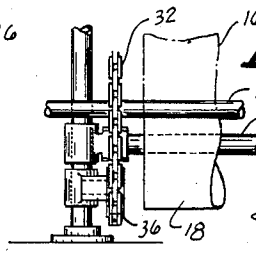


Fig. 3.



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DRYING MACHINE

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5 Claims. (Cl. 34—55)

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This invention relates to the art of drying textiles and other materials by causing the material to be dried to move through, or by placing the material in, a drying chamber to which heat is supplied.

One object of the invention is to produce an improved drying machine for drying materials of the type set forth.

For efficient drying it is desirable to subject the very moist material to relatively high temperatures so as to drive out the moisture content of the material relatively rapidly, and to subject the partly dried material to reduced temperatures, in the same or in another drying chamber, so as to evaporate the residual moisture.

In a machine of this type, if the material continues to be exposed to the relatively high temperatures, after the material has passed through the constant drying rate stage and has entered upon the falling drying rate stage, there is danger of the fabric being ignited or otherwise damaged. If the fabric is ignited or scorched, or if the fabric or other material has been heated to, or beyond, its critical point, again shutting off the heat will not help because the fabric or other material has already been damaged or the heat stored in the drying chamber will be enough to cause or to aggravate the damage. These are among the major difficulties encountered in making use of rapid, high, temperature drying when the material to be dried is combustible or when the material is such as to be damaged if its temperature is raised to relatively high value.

It is therefore a further object of the invention to produce an improved drying machine in which materials having a high moisture content may be dried, to a liimted extent, under relatively high temperatures, and to provide means for expelling the material from the drying chamber when the material is in danger of being ignited, over-dried, etc. whereby damage may be prevented or limited.

Merely expelling the material from the heated chamber is not enough. For example, because heat rises, the material, if expelled through the upper part of the machine will continue to be subjected to the heat and flame. Also, to open the top of the compartment is to allow the heat, flame and smoke etc. to belch out and spread or cause other damage. The same is true to a lesser extent, if the opening is on the side of the compartment. Furthermore, to raise the material, which may be bulky or heavy or both, such as a few hundred feet of wet cloth out of the top of the compartment will be slow and will require great power.

Furthermore, when the material is in the nature of a long piece of cloth, the bolt from which material is fed into the drying compartment should not be located near where the flame and

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smoke would escape in the event of an emergency.

In order to overcome these difficulties, I have devised an improved arrangement whereby the cloth is fed upwardly into the drying compartment and is removed from the compartment by being rapidly dropped to a point below the compartment. In this way the top of the compartment remains closed so as to confine the flame, heat or smoke, and the dropped material will immediately find itself in a relatively cool place.

A still further object is to produce an improved drying machine which may be used as a pre-drier, in tandem with another drying machine employing more moderate temperatures, or one which can be used as an independent unit for effecting complete drying of the material to be dried.

A still further object of the invention is to produce an improved drying machine in which the rate, or extent, of the drying of the material, or both, may be regulated without changing the rate of movement of the material and without changing the heat input.

A still further object is to produce an improved drying machine of the type described, which will be practical, durable, simple, compact and inexpensive to produce or operate.

These, and other, objects are attained by the invention as set forth in the following specification and as shown in the accompanying drawings in which:

Fig. 1 is a diagrammatic view, partly in section and partly in side elevation of a drying machine embodying my invention.

Fig. 2 is fragmentary view of the lower right hand portion of Fig. 1 showing the manner in which the material being dried is expelled from the drying chamber.

Fig. 3 is a fragmentary view looking in the direction of line 3—3 on Fig. 1.

In Fig. 1 there is diagrammatically shown a drying machine built of suitable insulated walls and supporting frame work which define a drying chamber 10 having the desired height and width. As shown, the drying chamber is adapted to house two or more heating units 12 and 14, disposed side by side, but it is within the scope of the invention to use a lesser or greater number of units which may or may not be partitioned off from each other. The units 12 and 14 emit highly heated air or other fluid drying medium which they receive from heating coils and blowers, not shown, or they may emit heat in the form of radiant energy or in the form of a flame.

The material to be dried, such as sheet material 16 may be passed independently, through either one of the units, or, as shown in Fig. 1, through both of the units in series.

The sheet material 16 is fed from a freely turning feed roll 18 over a freely rotating guide roll

20, over a driven or a freely rotating roll 22 and over another freely rotating guide roll 24, so as to move once past the nozzles 25 and once past the nozzles 26 of the heat emitting unit 12. After passing over the guide roll 24 the sheet material may be wound directly on a take-up roll 28 or it may be passed between the nozzles 29 and 30 of the heat emitting unit 14 as shown in Fig. 1, depending on conditions. Also, instead of being wound on the take-up roll 28, the sheet material 16 may be introduced into still another drying chamber, or other machine, not shown, for further drying or for other treatment.

The rolls 22 which carry the material to be dried are carried by endless sprocket chains 32 which travel over upper and lower sprocket wheels 34 and 36 disposed above and below the drying chamber, respectively, as shown in Fig. 1. Therefore, if the sprocket wheels are turned in clockwise direction, as viewed in Fig. 1, the rolls 22 and the cloth carried thereby, will move toward the bottom of the drying chamber, and vice versa.

For the purpose of moving the sprocket chains I provide a motor M which drives the shaft 38 of one of the sprocket wheels 34, by a chain or belt drive 40, engaging a sprocket wheel or a pulley (not shown) on the shaft 38. The rotation of the shaft 38 is transmitted to the shaft 42 of the other sprocket wheel 34, by means of a chain or belt drive 44 which engages sprocket wheels or pulley (not shown) on the shafts 38 and 42.

The motor M is of the reversing type and is therefor capable of rotating the sprocket wheels 34 in either direction.

The motor M is provided with a suitable, manually operable switch 46 by means of which the motor may be caused to actuate the drive 44 in either direction, to raise or lower the pole or rolls 22 to any desired point from the highest point, as shown at the left of Fig. 1, to a point below the bottom wall 48 of the drying chamber, as shown in Fig. 2. With reference to the position of the roll 22 as shown at the right of Fig. 1, it is pointed out that, because the shafts 38 and 42 are driven by the same drive 44, the two rolls 22 will always be at the same level. In other words the position of the pole at the right of Fig. 1 is merely to show an intermediate position to which both rolls 22 can be moved.

The structure thus far described operates as follows.

The motor is energized in a manner to bring the rolls 22 down to a position in which the material 16 can be looped on one or both of the rolls 22. The motor is then reversed so as to raise the rolls 22 to the desired height, depending on the requirement of each particular case. For example, if the material is heavy and has a high moisture content and, if the heat input is disregarded, the poles should be raised to the highest point so as to prolong the travel of the material past the nozzles 25, 26, 29 and 30. Conversely, if the material is light and, if its moisture content is low, and again disregarding the heat input, the rolls 22 should be raised to a relatively lower position, to about the position shown at the right in Fig. 1. If the heat input is taken into consideration, the position of the rolls 22 will be correspondingly affected. For example, the more intense the heat, disregarding the moisture content, the lower the position of the rolls 22 should be and, vice versa.

Also, by moderating the heat emanating from the nozzles 29 and 30, the apparatus shown can be used for complete drying. Thus, the initial drying can be carried out at a high temperature while the material passes between nozzles 25 and 26 and the drying can be completed at a moderate temperature while the material is passing between the nozzles 29 and 30. If desired either, or both of the units shown can be used in tandem with another drying machine so that the material will be subjected to intense heat and rapid drying in the apparatus shown and the drying can be completed, or the material can be otherwise treated in another chamber not shown.

In the event that the material is overdried, or is in danger of burning, etc. the operator can, by energizing the motor, cause the rolls 22 to drop down to the vicinity of the lower sprockets 36 which are outside the chamber 10 as shown in Fig. 2. Simultaneously, the take-up roll 20 is stopped so as to arrest movement of the material 16 from the feed roll 18.

In order to provide for automatically dropping the rolls 22 and the fabric carried thereby out of the chamber 10 I provide a bimetal or a wafer thermostat, or a thermocouple, or other protective heat-responsive device 48, which is electrically connected to the motor M by wires 50. The protective device is so arranged that, when the temperature in the chamber 10 reaches a predetermined high value, the protective device 48 causes the motor to turn in a direction to lower the rolls 22 out of the chamber 10. The motor M is of a high speed type and/or the gear train is such that the rolls 22 are dropped out of the chamber 10 rapidly.

The chamber 10 is provided with bottom doors 52 which are arranged to assume the open position shown in Fig. 1 as long as the material 16 is moving through the chamber 10, and to close, as shown in Fig. 2 when the rolls 22 drop out of the chamber.

The take-up roll 28 is a torque roll adapted to turn and withdraw the material from the drying chamber as long as the tension of the material does not exceed a predetermined value, and to stop when the tension reaches a predetermined value.

Therefore, when rolls 22 are dropped out of the drying chamber, the take-up roll 28 will turn long enough to pull the fabric out of the chamber and to take up the slack but will stop because the tension of the material, due to the locking of the feed roll 18 by the magnetic brake, will be in excess of the torque of the take-up roll.

The feed roll 18 is normally freely rotating but it is provided with a magnetic brake which is energized to lock the feed roll when the motor M is energized in a direction to drop the rolls 22 out of the chamber 10.

The doors 52 are provided with counter weights 53 which maintain the doors in any position to which they are moved, such for example, as the position of Fig. 1. When the rolls 22 drop, they actuate a lever, not shown, which will shut the doors to protect the fabric there below from the heat of the chamber, to confine the fire, if any, within the chamber.

A conventional relay mechanism, the movement of the rolls 22 to the position of Fig. 2, or the closing of the doors in the bottom of the chamber may be utilized to deenergize the motor M and keep it deenergized until the machine is again loaded or until whatever relay or tripping mechanism used shall have been reset.

What I claim is:

1. A drying machine including a drying chamber, supporting means in said chamber for supporting the material to be dried, there being an opening in the bottom of said chamber, means for feeding said material upwardly through said opening into said chamber and onto said support, means for supplying heat to said chamber, and means responsive to a predetermined condition within said chamber for rapidly expelling said support and all of said material from said chamber through said opening.

2. A drying machine including a drying chamber, a support movable to a selected, fixed position above the floor of said chamber, there being an opening in the bottom of said chamber, means for feeding a material to be dried upwardly through said opening and passing it over said support, means for supplying heat to said chamber, and means in said chamber responsive to predetermined heat conditions within said chamber for rapidly expelling said support and all of said material from said chamber through said opening.

3. A drying machine including a drying chamber, a first sprocket wheel near the upper portion of said chamber, a second sprocket wheel near the lower portion of said chamber, an endless sprocket chain travelling over said sprocket wheels, a support carried by said chain and adapted to support the material to be dried, said chamber having an opening in the bottom thereof, means for moving said chain in a direction to raise said support to a selected, fixed position above the bottom opening of said chamber, and high speed means for dropping said chain, said support, and all of said material through the opening in the bottom of said chamber to a point below the bottom of said chamber.

4. The structure recited in claim 3 together with heat responsive means in said chamber connected to and adapted to actuate the last mentioned means when the temperature in said chamber reaches a predetermined value.

5. The structure recited in claim 1 together with a closure adapted to obstruct said opening and means for maintaining said closure in non-obstructing position relative to said opening, during movement of said material into and out of said chamber.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
124,248	Brown	Mar. 5, 1872
1,773,709	Daniels	Aug. 19, 1930
1,984,063	Graham	Dec. 11, 1934
2,038,395	Wardle	Apr. 21, 1936
2,423,030	Johnson	June 24, 1947