

Jan. 18, 1955

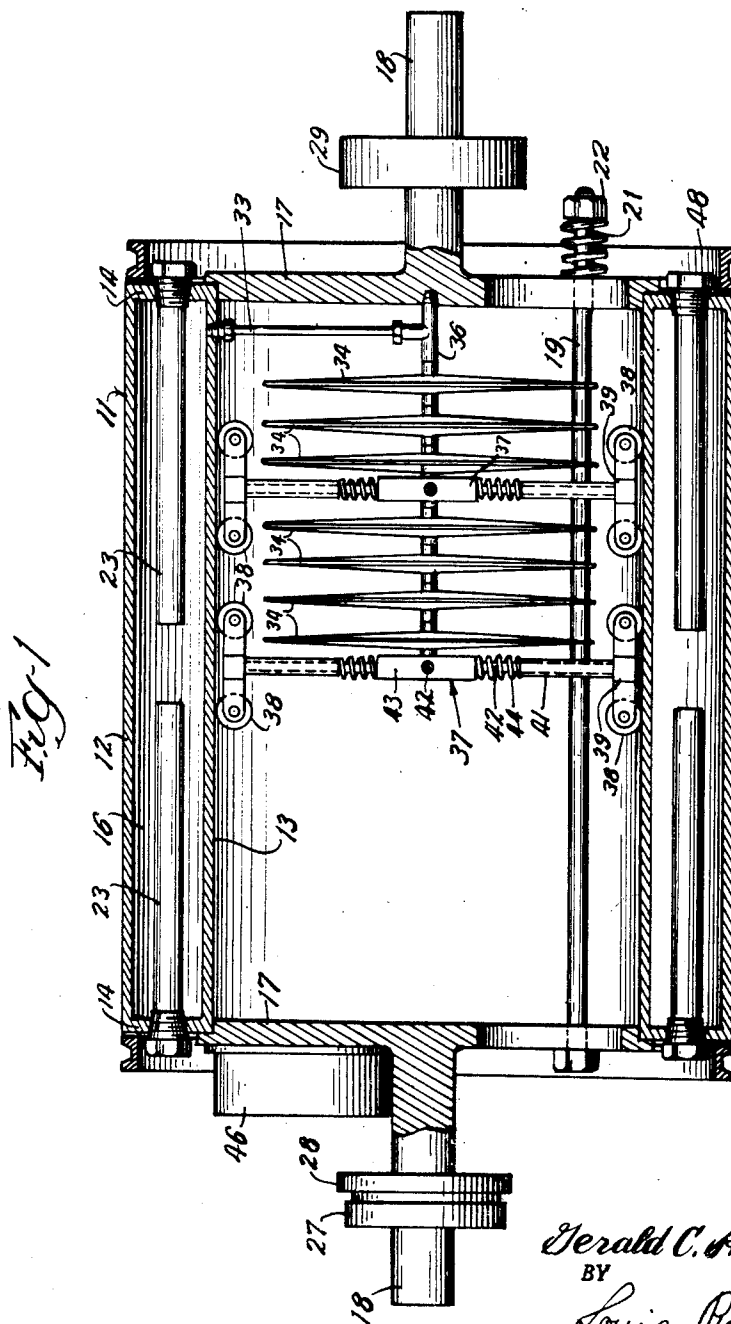
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2,700,094

HEATING DRUM

Filed Feb. 6, 1951

2 Sheets-Sheet 1



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2,700,094

HEATING DRUM

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Application February 6, 1951, Serial No. 209,692

6 Claims. (Cl. 219—19)

For various purposes, it is desirable to have drums which are very uniformly and accurately heated and in which the temperature can be changed quickly. For example, in stretch-wrapping with Pliofilm, the Pliofilm should be heated to a optimum temperature. The optimum degree of heating is best reached by adjusting the heating means during operation until it gives the best results.

The use of oil-filled drums has been recognized as advantageous because of its simplicity and uniform heating action. During operation the oil is agitated enough so that the oil temperature is uniform and hence keeps the drum temperature uniform at all points on the surface of the drum. Oil-filled drums have been subject, however, to the disadvantage that the temperature cannot be changed very quickly when desired.

According to the present invention, a heating drum with the advantages of the oil fill is provided in which the temperature can be changed more quickly than with conventional oil-filled drums. Furthermore, the temperature is more dependably regulated.

Additional objects and advantages of the invention will be apparent from the following description and from the drawings.

Designation of figures

Figure 1 is an axial cross-section of the drum chosen for illustration of this invention.

Figure 2 is an end view of the drum partially broken away and with the circuits shown thereon, the view being from the left of Fig. 1.

Figure 3 is a similar view of the other end of the drum.

Although the law requires a full and exact description of at least one form of the invention, such as that which follows, it is, of course, the purpose of a patent to cover each new inventive concept therein no matter how it may later be disguised by variations in form or additions of further improvements; and the appended claims are intended to accomplish this purpose by particularly pointing out the parts, improvements, or combinations in which the inventive concepts are found.

General description

According to the present invention, the drum is made up of an annular casting 11 having an outer wall 12, an inner wall 13 and end walls 14. It is thus apparent that the annular casting 11 forms an annular chamber 16.

The annular casting 11 may be supported by end plates 17, each of which may have a stub shaft 18 extending therefrom for rotatably mounting the drum. The end plates 17 may be notched annularly to fit the inner corners of casting 11, and may be held in the inter-fitting position by two or more tie rods 19. To allow for differential expansion with changing temperatures, a spring 21 may be provided on each tie rod 19, a suitable tension being applied by nut 22. The casting 11 is desirably formed of aluminum, while the tie rods 19 are more likely to be formed of steel.

The chamber 16 is filled with oil which is heated with a plurality of heaters 23. These heaters extend into the chamber 16 through the opposite end walls 14 to which they are threaded by pipe threads or in some other leak-proof manner. As seen in Figs. 2 and 3, the heaters 23 may be distributed uniformly around the drum periph-

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erally, being illustrated as inserted through each end wall 14.

The heaters are controlled by thermostats 26, of which there are preferably several, as seen in Fig. 2, spaced equally around the drum. As shown by the circuit diagram, these thermostats 26 are preferably connected in series, so that if any one of them reaches the desired cut-off temperature, it will interrupt the circuit and de-energize heaters 23. It will be understood that the thermostats will usually operate indirectly, interrupting a circuit for the solenoid coil of a switch, the contacts of which will interrupt the circuit for the heaters 23. To this end, slip rings 27, 28 and 29 may be provided. So that these may be separately indicated in the circuit diagram of Fig. 2, they have been shown in three different diameters, although in practice they would be of the same diameter, if of the cylindrical type shown. One or more brushes will of course be provided for each slip ring. The slip ring 28 may engage a brush which is connected to a service wire representing a source of supply of electric current. As will be seen in Fig. 2, slip ring 28 is connected to one end of the circuit through the thermostats 26, the other end of the circuit being connected to slip ring 27 which engages a brush leading to the solenoid coil of the heater switch. Slip ring 28 is also connected to one side of the heater circuit, in which the heaters are connected in parallel. The other side of the heater circuit is connected to the slip ring 29. It may be noted that wires extend through the drum to connect the heaters at both ends of the drum in parallel.

A lamp 31 is preferably connected in parallel with each of the thermostats 26 so that the condition of each thermostat can be detected. When the thermostat operates its contacts, the adjacent lamp 31 will be illuminated. The lamp will not permit enough current to pass to maintain actuation of the solenoid of the heater switch, these lamps being mere pilot lights. Observation of the lamps permits determination of any inequality of the thermostats so that they may be equalized or synchronized by replacement or adjustment.

The use of at least three, preferably four, thermostats is desirable so that when the drum is at rest, one of the thermostats will always be near the top. Although rotation of the drum agitates the oil enough to maintain a uniform temperature throughout the chamber 16, convection currents, when the drum is stationary, tend to make the top hotter than the bottom. Excessive temperature may cause the film heated by the drum to divide or become too tacky. If the film divides, rethreading the machine is necessary. If the film becomes too tacky, it may stick to surfaces of the machine and require cleaning. With four or more thermostats, one is always near the top of the drum and hence near the hottest part of the drum if the drum is stationary. Hence when the desired temperature is reached at one point, the heaters will be shut off, although a further warming up may be required after the drum starts rotating with consequent equalization of the temperatures by consequent agitation of the oil.

Expansion of oil

To provide for unequal expansion of the chamber 16 and the oil within it upon changes of temperature, something in the nature of an expansion tank is desired. According to the form of the invention (illustrated in my co-pending application, Serial No. 203,050 entitled "Turret-Type Stretch-Wrapping") the chamber 16 may be connected through one of the shafts 18 with a stationary expansion tank. According to a preferred form of the invention, expansion means within the drum is provided instead. This may be a cylinder and piston, or a sealed, incompletely filled tank with an axial connection always below the liquid level therein. A form is preferred, however, more certain not to develop excessive pressures. To this end, a pipe 33 connects the chamber 16 with a series of diaphragm-type expansion wafers or expansion chamber units 34. Each of the expansion chamber units 34 may expand or contract axially of the drum to receive or discharge oil. It will be understood that each face of each unit 34 is a flexible diaphragm, preferably metal, the units thus comprising bellows.

The expansion chamber units 34 may be movably supported within the drum in any desired manner. One or two of them may be adequately supported by a T-shaped fitting 36 threaded into one of the end plates 17. One or two might not provide adequate expansion space, however, and so the remainder are supported with the help of movable spiders 37. Although these spiders may take various forms, they are preferably provided with rollers 38 for ease of movement. The rollers 38 may be carried by blocks or feet 39, to which tubes 41 may be secured. Tubes 41 have a sliding fit with rods 42 which may be rigid with a central hub 43. The spring 44 around each rod 42 tends to center the hub 43, thus approximately centering the expansion chambers 34 within the drum. The curvature of the inside wall 13 of casting 12 keeps the blocks 39 reasonably aligned in parallelism with the axis of the drum. If desired, rod 42 and tube 41 may be square in cross section in order to maintain the alignment of blocks 39. Preferably each spider 37 includes 3 or 4 arms carrying the rollers 38.

A thermometer 46 is preferably provided for indicating the temperature of the drum. It may be of the bulb type, having a bulb in the chamber 16.

Because some film has a tendency to shrink when it is heated, it may be desirable to provide some means for restraining the film from shrinkage as it moves around the drum. For example, grooved rims 48 may be secured to the drum at its ends and the film held along its edges by belts pressing the film into the grooves, preferably pinching the film against the sides of the grooves. This pinching action will naturally follow, if V-belts and grooves are used, if they fit as usual.

To assist in filling or draining the chamber 16 and to assist in changing a heater 23, one or more plugs 51 may be provided. These plugs are not necessary, however, because the combination of the diaphragm and the heaters 23 makes filling or replacing a heater 23 without the use of a plug 51 quite simple. The defective heater is turned to the top of the drum. As it is loosened, the oil pressure will tend to spread the expansion chamber units 34 so that the oil will fall below the level of the top heaters. If necessary to this end, the expansion chambers may be stretched out manually. The heater may then be removed and replaced. Before inserting the new heater, any oil spilled may also be replaced. The expansion chambers may then be pressed together manually until the air has been expelled from around the loosened heater, after which the heater may be tightened. The air will be expelled more completely if the drum is up-ended or if the plug 51 is loosened, while positioned at the top of the drum, to let air escape from the very top of the drum.

I claim:

1. A heating drum including inner and outer walls and end walls forming a peripheral chamber of substantially the axial length of the drum and narrow in a radial direction, a body of liquid substantially filling said chamber, an expansion chamber communicating with the peripheral chamber and carried by the drum, said expansion chamber including a plurality of flexible diaphragm-type expansion chamber units and means for movably supporting some of said units within the drum, comprising a hub to which a unit is secured, telescoping tube and rod means secured at one end to the hub, roller means secured to the other end of the tube and rod means, and spring means tending to center the hub with respect to the inner wall of the drum, and means for controllably heating the liquid in said peripheral chamber.

2. A heating drum including inner and outer walls and end walls forming a peripheral chamber of substantially the axial length of the drum and narrow in a radial direc-

tion, a body of liquid substantially filling said chamber, an expansion chamber communicating with the peripheral chamber and carried within the drum, said expansion chamber including a plurality of flexible diaphragm-type expansion chamber units, means for movably supporting some of said units within the drum, and means for controllably heating the body of liquid.

3. A heating drum including inner and outer walls and end walls forming a peripheral chamber of substantially the axial length of the drum and narrow in a radial direction, a body of liquid substantially filling said chamber, an expansion chamber communicating with the peripheral chamber, and means for controllably heating the liquid in said chamber, including heaters in heating relationship with the liquid in the chamber and at least three thermostats equally spaced peripherally around the chamber responsive to the temperature of the liquid in the chamber and connected together to interrupt the heating if any one of the thermostats reaches the cut-off temperature.

4. A heating drum including inner and outer walls and end walls forming a peripheral chamber of substantially the axial length of the drum and narrow in a radial direction, a body of liquid substantially filling said chamber, an expansion chamber communicating with the peripheral chamber and carried by the drum, said expansion chamber including a plurality of flexible diaphragm-type expansion chamber units, means for movably supporting some of said units within the drum, and means for heating the liquid in the peripheral chamber, comprising a heating unit threaded in sealed relationship to an end wall and extending therethrough into direct contact with the liquid within the chamber.

5. A heating drum for heating plastic film and the like, including a peripheral wall and additional wall means forming a chamber for liquid in contact with the peripheral wall, heaters in heating relationship with the liquid in said chamber and at least three thermostats equally spaced peripherally around the drum in proximity to the peripheral wall and connected together to cause reduction of the heating if any one of the thermostats reaches the cut-off temperature.

6. A heating drum including a peripheral wall, additional walls forming with the peripheral wall a peripheral chamber for holding liquid in contact with the peripheral wall, an expansion chamber communicating with said chamber and jointly sealed therewith, with liquid substantially completely filling all of the space in said chambers, and a heater extending through a wall of the peripheral chamber into direct contact with the liquid therein and removable therefrom, said expansion chamber being adapted, upon loosening the heater, to receive sufficient liquid to lower the liquid level below the heater when positioned at the top of the drum.

References Cited in the file of this patent

UNITED STATES PATENTS

429,559	Carpenter	June 3, 1890
695,041	Fues	Mar. 11, 1902
751,527	Marr	Feb. 9, 1904
963,942	Richardson	July 12, 1910
1,151,203	Lofquist	Aug. 24, 1915
1,672,036	Oltman	June 5, 1928
1,754,826	Hitchcock	Apr. 15, 1930
1,812,802	Price	June 30, 1931
2,322,957	Sullivan	Jan. 29, 1943
2,474,759	Schmitz	June 28, 1949
2,483,275	Gregor	Sept. 27, 1949
2,552,360	Zichis	May 8, 1951