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 ROTARY CYLINDER FOR HEAT TREATMENT OF FABRICS
 OR THE LIKE CONTINUOUS MATERIALS
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3,452,967

FIG. 1

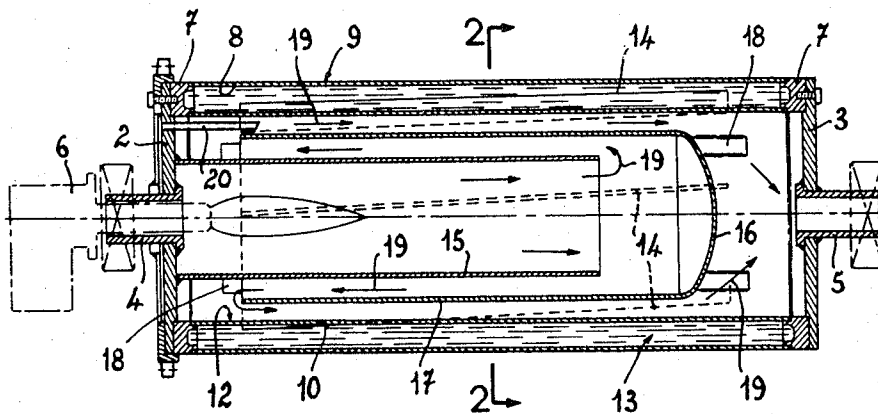
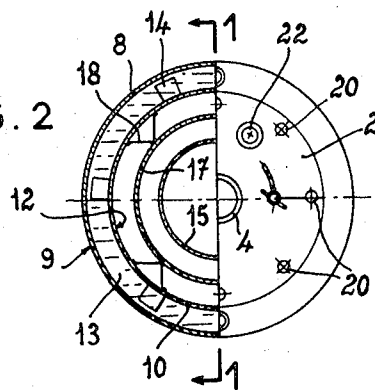


FIG. 2



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ROTARY CYLINDER FOR HEAT TREATMENT OF FABRICS OR THE LIKE CONTINUOUS MATERIALS

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7 Claims

ABSTRACT OF THE DISCLOSURE

A rotary cylinder for thermal treatment comprises outer and inner annular shells secured to a pair of spaced discs and defining an annular chamber adapted for filling with a thermally conductive fluid, there being helical blades in the chamber for stirring the fluid. One end of a tubular fire chamber with a burner thereat is secured to one of the discs and the opposite end of the fire chamber is open and disposed with a tubular member within the inner shell to define an S-shaped flow path for the combustion gases from the interior of the fire chamber to a discharge outlet in the other disc.

The present invention relates to an improved rotary cylinder for heat treatment of fabrics or the like continuous materials.

Rotary heating cylinders are commonly used for heat treating said materials, for instance, for fixing, drying, or polymerizing the liquids soaking a fabric after the latter is impregnated.

Such cylinders may be heated either by means of electric resistors, or by fluids circulated in a coil by a pump, or else by one or more oil or gas burners or the like.

Differences in temperature of the order of 10° C. are to be noted on the outer surfaces of the rotary cylinders directly heated by an inner burner which are presently used, which differences disturb to a certain extent the treatment performed by said cylinders.

The object of the present invention is to obviate said drawback. To this end, the invention relates to an internally heated rotary cylinder for heat treatment of fabrics or the like continuous materials, of the type heated by a burner and constituted by two discs to which two cylindrical shells are secured, which shells are coaxial and different in diameter and form an annular chamber filled with a thermally conductive fluid, said cylinder including a tubular fire-chamber which is heated to redness by the above-mentioned burner and opens into a diffusing shell near the bottom of the latter, said diffusing shell being arranged in said cylinder in a way such that the gases produced by the combustion follow an S-like path during which they become still hotter as they contact said diffusing shell before flowing along the inner surface of the annular chamber, the latter being provided internally with helical blades which stir the thermal fluid contained in said chamber, upon rotation of the cylinder, whereby the heat is distributed on the outer cylindrical shell and a constant temperature is obtained at the outer surface of the latter, throughout the length thereof.

According to a preferred embodiment of the invention, the discs of said cylinder are integral each with a hollow shaft, the burner passing through one of said shafts, while the other shaft is connected with a smoke exhauster, the disc through which the burner passes being integral with the tubular fire-chamber.

Furthermore, the helical blades have a winding direction which is a function of the direction in which the

cylinder rotates, and they are disposed on the smaller cylindrical shell of the annular chamber of the cylinder.

Said helical blades are advantageously perforated, to ensure a better stirring of the thermal fluid during the rotation of the cylinder.

The invention will now be described in further detail, with reference to the appended diagrammatic drawing, which illustrates, by way of non-limiting example, an embodiment of the rotary cylinder of the invention. In said drawing:

FIGURE 1 shows a longitudinal section of said cylinder, along line 1—1 of FIGURE 2; and

FIGURE 2 is an elevational end view of same, in partial cross-section along line 2—2 of FIGURE 1.

The cylinder of the invention includes two discs, 2, 3, each of which is integral with a hollow shaft, 4, 5, respectively.

A burner 6 passes through the hollow shaft 4, while the hollow shaft 5 is connected with a smoke exhauster (not shown).

A ring 7 is bolted on each disc 2, 3. The two rings 7 are integral with two concentric cylindrical shells, to wit, a larger shell 8, the outer surface 9 of which constitutes the working part of the cylinder, and a smaller shell 10, the inner surface of which constitutes one of the surfaces of the path of the gases.

Said two cylindrical shells 8, 10, the ends of which are welded to the rings 7, form a fluid-tight annular chamber 13 containing a thermally conductive fluid, the boiling point of which is considerably higher than the temperature obtained when heating the cylinder.

In a known way, the chamber 13 is not completely filled with fluid, so as to allow the latter to expand freely when the temperature rises.

According to the invention, helical blades 14 are welded to the cylindrical shell 10, inside the annular chamber 13, so as to produce a stirring of the fluid when the cylinder is rotated, which stirring up ensures the distribution of said fluid inside said chamber 13 and, consequently, a uniform heat distribution over the cylindrical shell 8, in order that the temperature of the surface 9 of said shell may be the same throughout the length thereof.

Of course, the winding direction of the blades 14 is determined as a function of the direction in which the cylinder rotates. Furthermore, as shown in FIGURE 1, the flame from the burner 6 is sent forth into a tubular fire-chamber 15, which is made of refractory steel and welded to the inner surface of the disc 2. Said tubular fire-chamber 15 opens in turn near the dished bottom of a second tube 17 welded to angle members 18, the latter being in turn welded to the inner wall 12 of the smaller cylindrical shell 10. Said tube 17 constitutes a diffusing shell.

The fire-chamber 15, the tube or shell 17, and the wall 12, which are disposed on the same axis and equidistant, form thus an S-shaped path for gases, which path as shown by the arrows 19 in FIGURE 1, ensures that said gases are heated to a maximum.

As a matter of fact, said gases flow out of the tubular fire-chamber 15, which is heated to redness by the flame of the burner 6, and, after being turned back by the bottom 16, they are guided by the outer surface of said fire-chamber, which heats them further, and by the inner surface of the diffusing shell 17, until they reach the vicinity of the disc 2, where they are guided by the outer surface of the tube 17 and the inner surface 12 of the smaller cylindrical shell 10, to which they transfer a portion of their heating energy. Said shell 10, heated thus along its inner surface 12, transmits its heat to the fluid which is in contact with the outer surface of said shell 10.

Owing to said arrangement, the heating energy gener-

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ated by the flame of the burner is utilized to the utmost, so that, for any given working temperature, the working costs of the cylinder of the invention are lower than those of a conventional cylinder.

Furthermore, the temperature of the cylinder of the invention is the same at all points of the length of its working surface 9, and this is true whatever the diameter of said cylinder may be, owing to the arrangement of the helical blades 14.

Furthermore, said blades may be perforated, in order to stir the gases even more efficiently.

The cylinder of the invention may include pipes 20 welded to the disc 2 and passing through the latter to open into the starting chamber for the gases, which chamber is located below the surface 12 of the cylindrical shell 10, which pipes provide for the inlet of additional air to the cylinder.

Furthermore, a sight-hole in the disc 2 enables the combustion of the flame of the burner 6 to be supervised.

What I claim is:

1. A rotary cylinder for thermal treatment comprising a pair of spaced discs, outer and inner annular shells secured to said discs and defining an annular chamber adapted for being filled with a thermally conductive fluid, helical blades supported in said chamber for stirring said fluid, a tubular fire chamber having one end secured to one of said discs and an opposite end which is open and disposed within the inner shell, burner means in said fire chamber in the region of said one disc, means at the other disc for discharge of combustion gases produced by said burner, a tubular member mounted within the inner shell and having a closed end facing said open end of the fire chamber, said tubular member encircling said fire chamber and having an open end spaced from the disc to which the fire chamber is secured, whereby to define an S-shaped flow path for the combustion gases

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from the interior of said fire-chamber, then around the exterior thereof and finally around the exterior of the tubular member and to the discharge means.

2. A rotary cylinder as claimed in claim 1 comprising a hollow rotatable shaft secured to each disc and projecting therethrough, said burner means extending in one shaft and said means for the discharge of the combustion gases being coupled to the other shaft.

3. A rotary cylinder as claimed in claim 1, wherein said helical blades are secured to the inner shell.

4. A rotary cylinder as claimed in claim 3, wherein said helical blades are perforated.

5. A rotary cylinder as claimed in claim 1, wherein said helical blades have a height which is less than the radial height of said annular chamber.

6. A rotary cylinder as claimed in claim 1, wherein said shells are cylindrical and coaxial, and said fire chamber and tubular member are coaxially mounted within said shells.

7. A rotary cylinder as claimed in claim 1 comprising means for supplying air through said one disc to the space between the tubular member and the inner shell.

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34—119, 124; 165—90