Feb. 6, 1962 TSUNEO ONISHI ETAL 3,020,383

HEATED ROLL

Filed Dec. 3, 1959

FIG. 1

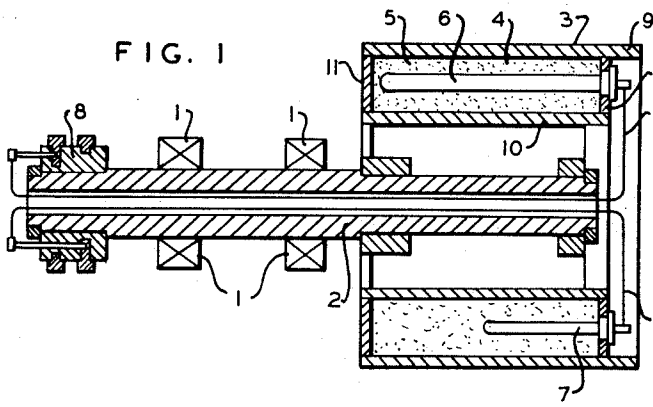


FIG. 2

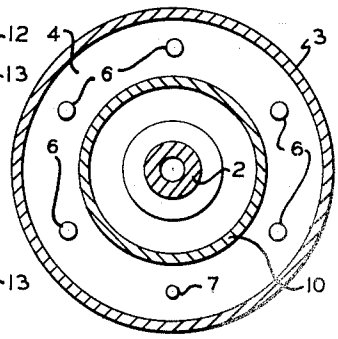


FIG. 3

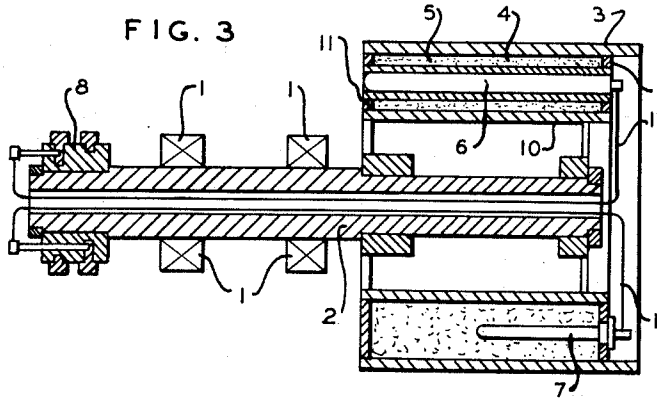


FIG. 4

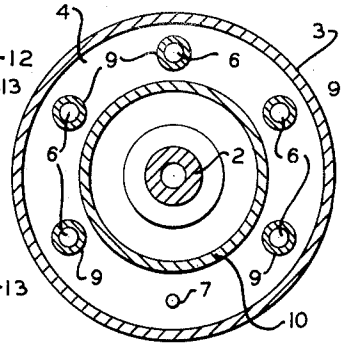


FIG. 5

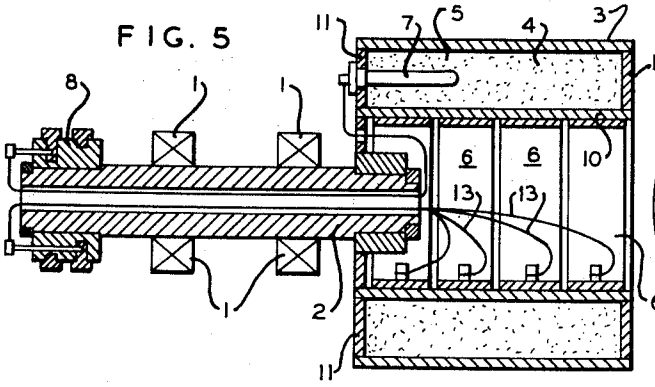
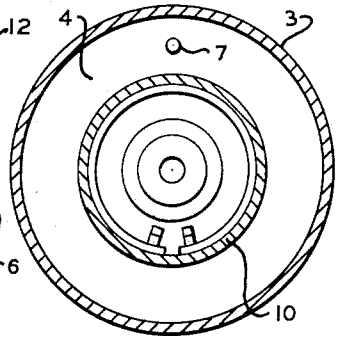


FIG. 6



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3,020,383
HEATED ROLL

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2 Claims. (Cl. 219—37)

This invention relates to an improved heated roll suitable for drying and heat treating synthetic fibers.

Heating devices of the rotary roller type have been previously used in drying and heat treating artificial fibers. Generally, such prior rollers involved the positioning of a fixed heating device within the roller. With such device, uniform temperature distribution on the surface of the roller generally was not obtainable. Additionally, rollers were devised whereby the heat was provided by injecting steam into the roller through a hollow shaft. Where high roller temperatures were desired, it was necessary to employ high pressure steam. With such heated rollers, the steam, especially high pressure steam, tended to escape from the apparatus at various joints and connecting elements.

It is an object of the present invention to provide an improved heated roller which is especially adapted for the drying and/or heat treatment of fibers.

Other objects will be apparent from the following description of the invention.

In the accompanying drawing, FIGS. 1 and 2 illustrate an embodiment of the present invention. FIGS. 3 and 4 illustrate a second embodiment of the invention.

FIGS. 5 and 6 illustrate still another embodiment of the invention.

The heated roll of the present invention broadly comprises a cylindrical roller attached to a hollow shaft. The said roller has a concentric inner cylinder adapted to define a confined ring shaped space between the inner and outer cylinder walls. The said ring shaped space contains a suitable heat transfer fluid, for example, diphenyl tetrachloride, a eutectic mixture of phenyl ether and diphenyl, and the like. Electric heating means are positioned within the said roll in heat exchange relationship with the said heat transfer medium which is confined in the said ring shaped space. Electric current is supplied to the electric heating means by wires passing through the said hollow shaft. The heated roll of the present invention provides uniform temperatures over substantially the entire exterior roll surface. The said temperature may be adjusted with a high degree of exactness as desired. When used in the drying or heat treatment of fibers, the rolls of the present invention insure even fiber drying and heat treatment.

Referring now to FIGS. 1 and 2 of the accompanying drawing, wherein FIG. 1 shows a sectional side view of an apparatus of the invention and FIG. 2 represents a sectional end view of the same apparatus, bearings **1** rotatably support hollow shaft **2** which shaft is attached to roll **3**. Ring shaped space **4** is defined by outer cylinder **9** and concentric inner cylinder **10**. Space **4** is further defined by cylinder wall **11** and by partition **12** located within the roll. Space **4** contains a suitable heat

transfer medium such as a eutectic mixture of phenyl ether and diphenyl. A plurality of electric heating elements **6** extend into the said space **4** through partition **12**. Said heating elements are suitably resistance heating elements. A temperature measuring device **7** can also be inserted in space **4** through the said partition **12**. Electric current is supplied to the said heating elements **6** through wires **13** which wires pass through the hollow center of shaft **2**. Slip rings **8** are provided to which electric current is supplied from a suitable power source (not shown) through brushes (not shown).

FIGS. 3 and 4 represent respectively a sectional side view and a sectional end view of a second embodiment of the heated roll of the present invention. As shown in these figures, fixed tubes **9** may be provided within the confined space **4** containing the heat transfer fluid. The electric heating elements **6** can be positioned within said fixed tubes **9**. Removal of the heating elements **6** without disturbing confined space **4** containing the heat transfer fluid as during apparatus shut downs is considerably facilitated by this construction.

FIGS. 5 and 6 represent respectively a sectional side view and a sectional end view of still another embodiment of the instant heating roll. In the embodiment of the invention shown in FIGS. 5 and 6 the electric heating means are positioned entirely within the inner concentric cylinder **10**. The said electric heating elements are in contact with the inner surface of cylinder **10**. Heat is transmitted through the surface of cylinder **10** to the heat transfer medium contained in confined ring shape space **4**. This embodiment of the present invention is especially advantageous since the electric heating elements **6** can readily be removed during shut down of the apparatus.

The novel heated rollers of the present invention preferably are made of a suitable metal such as iron or stainless steel although other material may be used. The driving means for rotating the shaft and attached cylindrical roller may be any of the conventional driving means used in the art.

We claim:

1. A roll adapted to be heated for the drying and heat treatment of fibers which comprises, in combination, a rotatably-supported hollow shaft, cylindrical roller means secured to said hollow shaft for simultaneous rotation therewith, said roll means including an inner cylindrical wall spaced radially from said shaft and a concentric outer cylindrical wall spaced radially from said inner wall to define an annular outer chamber therebetween concentric with but radially spaced from said shaft and separated therefrom by said inner wall and an inner annular chamber defined between said inner wall and said shaft, said outer chamber being closed and fluid-tight and containing a heat-transfer fluid, electric heating means disposed exteriorly of said shaft but in heat conduction relationship with said heat-transfer fluid, and conductors for supplying energizing current to said electric heating means, said conductors extending interiorly of said hollow shaft.

2. A roll adapted to be heated for the drying and heat treatment of fibers which comprises, in combination, a rotatably-supported hollow shaft, cylindrical roll means secured to said hollow shaft for simultaneous rotation therewith, said roll means including an inner cylindrical

wall spaced radially from said shaft and a concentric outer cylindrical wall spaced radially from said inner wall to define an annular outer chamber therebetween concentric with but radially spaced from said shaft and separated therefrom by said inner wall and an inner annular chamber defined between said inner wall and said shaft, said outer chamber being closed and fluid-tight and containing a heat-transfer fluid, electric heating means disposed exteriorly of said shaft but in heat conduction relationship with said heat-transfer fluid, conductors for supplying energizing current to said electric heating means, said conductors extending interiorly of said hollow shaft, and a temperature measuring device disposed in said outer chamber in direct contact with said heat-transfer fluid.

References Cited in the file of this patent

UNITED STATES PATENTS

2,474,759	Schmitz	June 28, 1949
2,700,094	Hosack	Jan. 18, 1955
2,739,218	Wennerlund	Mar. 20, 1956
2,831,097	Malewski	Apr. 15, 1958