United States Patent

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[72] Inventor **Nils G. H. Bjorklund**
Lapinniemi, Finland

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[73] Assignee **Oy Tampella Ab**
Tampere, Finland

[54] **DRYING CYLINDER**
4 Claims, 1 Drawing Fig.

[52] **U.S. Cl.** **219/470,** 219/471
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[50] **Field of Search** 219/469, 470, 471

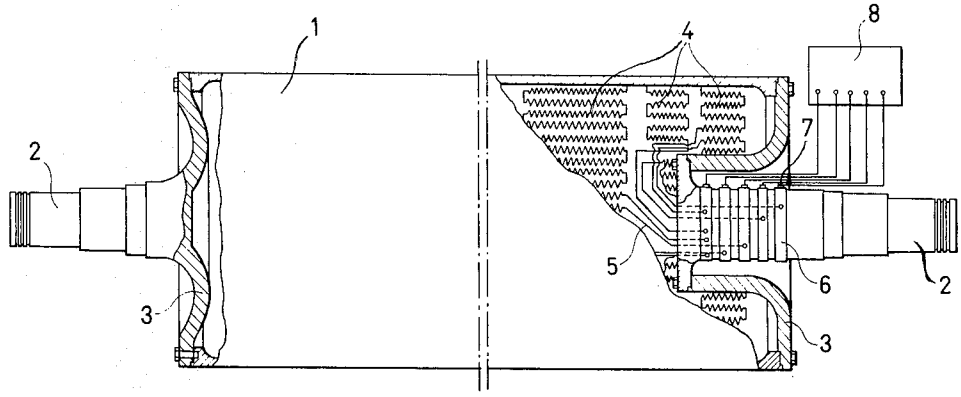
[56] **References Cited**

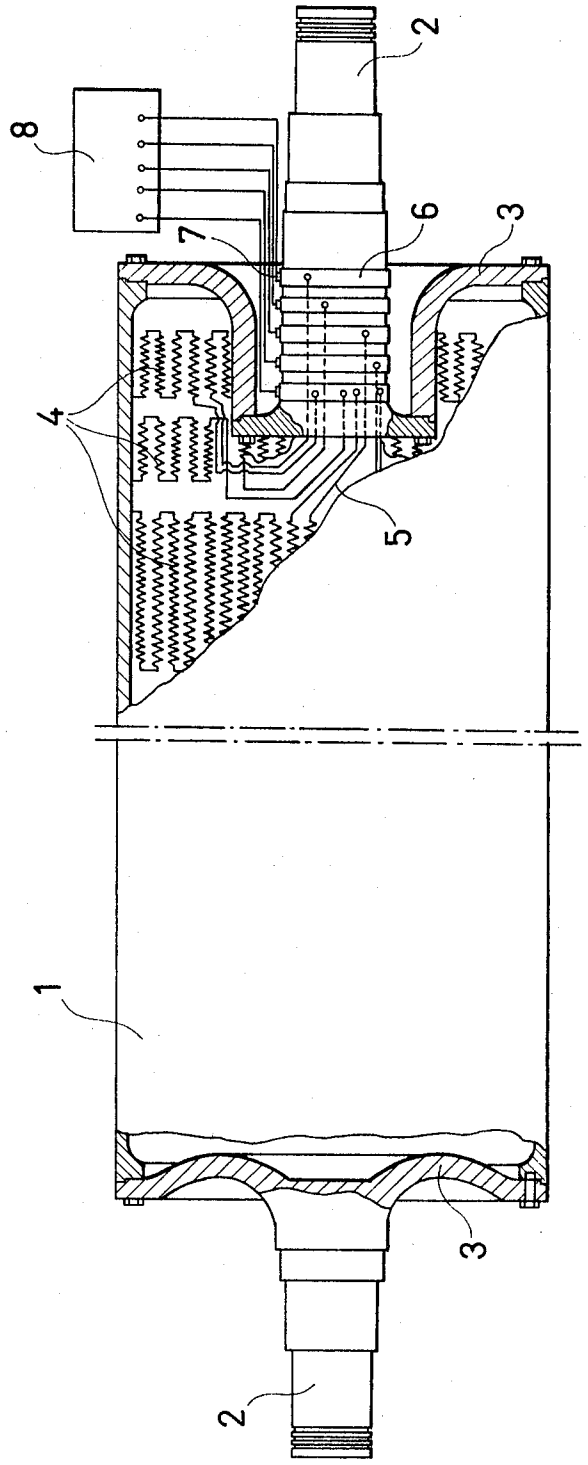
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Primary Examiner—Bernard A. Gilheany
Assistant Examiner—F. E. Bell
Attorney—Roylance, Abrams, Berdo & Kaul

ABSTRACT: Drying cylinder for paper webs and equivalent having a rotatable cylindrical mantle, to the inside of which there have been attached several coaxially arranged annular heating elements. The heating elements are electrical resistances which are separately adjustable for achievement of desired temperature profile across the mantle surface of the drying cylinder.




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DRYING CYLINDER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to drying cylinders for paper webs or the like which cylinders are heated by electricity.

2. Description of the Prior Art

Prior art includes a drying cylinder of the above-mentioned type in which there has been rotatably journaled on a fixed shaft a cylindrical part, closely adjacent to the inner surface of which there is a concentric induction coil rigidly mounted on the shaft and by means of which the rotating cylinder mantle is heated. If the cylindrical part is very long, subdivision of the induction coil into several parts following one after the other axially has been suggested, which are preferably displaceable in axial direction for achievement of uniform temperature across the mantle surface. However, this solution is expensive and constructionally unnecessarily complicated, and the effect of the device moreover remains rather unpretensious.

It is possible or likely, however, that webs treated with the aid of such cylinders belonging to prior art which are uniformly heated across the mantle surface will dry nonuniformly so that the margins of the web dry faster than its central part. But it is highly important that e.g. a paper web can be made to dry uniformly over its entire width.

Such drying cylinders heated with steam are also known in prior art in which the marginal parts of the cylinder have been heated less than its central part. In this way it has been possible to control the heat profile of the drying cylinder so that uniform drying of the paper over its entire width has been achieved. A device of this kind is inexpensive in operation if cheap steam is available, but the initial costs are high owing to its complex design.

SUMMARY OF THE INVENTION

According to the present invention there is provided a drying cylinder for paper webs and equivalent which is electrically heatable by means of separate annular resistances attached coaxially to the inside of the cylinder.

The electrical resistances are preferably so adjusted that the marginal portions of the cylinder mantle have a lower temperature than the central portion therebetween.

The object of the present invention is to accomplish a drying cylinder of the type mentioned for achieving a uniformly dried web and which is simple of its design and accordingly cheaply manufacturable.

BRIEF DESCRIPTION OF THE DRAWING

The invention is described in the following more closely with reference to the attached drawing, in which a drying cylinder according to the invention has been shown, seen from one side and partly in section.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The mantle surface of the drying cylinder has been indicated with reference numeral 1 in the drawing. To both ends of the mantle 1 end pieces 3 have been attached, to which journal pins 2 have been integrally fitted, which are coaxial with the mantle 1. Inside the mantle 1 a plurality of electrically heatable resistance elements 4 have been placed, which have been arranged axially one after the other in contact with the inner surface of the mantle 1 to constitute annular units which are concentric with the mantle 1. The resistance elements 4 have been connected to an external source of current 8 by means of leads 5, rings 6 and slide contacts 7.

As can be seen from the figure, each resistance element ring 4 has been connected to a different ring 6, into which rings electric current is supplied which has various intensities or the intensity of which may be regulated within wide limits. It is thus possible to adjust the resistance elements at the ends of the drying cylinder to have a lower temperature than the resistances in their center, whereby the marginal parts of the mantle surface 1 will be at lower temperature than its central part. In this manner compensation is accomplished for the tendency of the paper web to dry faster on the edges and this tendency is eliminated.

The resistance elements or rods are advantageously spaced 3–8 cm. from each other, similarly the spacing of the resistance element rings 3–8 cm. With this arrangement it is still possible to accomplish comparatively uniform temperature on the outer surface of the mantle if this has a thickness of about 30 cm.

The resistance elements have been insulated against the mantle 1 of the drying cylinder by insulators, such as ceramic insulators, which at the same time efficiently conduct heat from the resistances into the mantle. The drying cylinder is also advantageously grounded. The resistance elements may also be placed inside the mantle without insulators between the resistances and the mantle, in which instance the heat generated by the resistances is transferred to the mantle mainly by radiation. In this case, however, the resistance elements cannot be in positive contact with the mantle, which naturally reduces the heat transfer efficiency. It is also obvious that the resistance elements need not absolutely be placed axially one after the other.

With the aid of the invention a highly inexpensive device has been accomplished by means of which various kinds of moving webs may be dried uniformly over the entire width of the web.

What is claimed is:

1. A drying cylinder for paper webs comprising:

a rotatable cylinder having an axis of rotation and a cylindrical mantle wall with a plurality of separate, nonoverlapping axial, annular regions located along the inner surface of said mantle wall and encircling said axis of rotation, each of said annular regions having attached thereto a separate, coaxial, annular electrical resistance, each said resistance forming a substantially continuous ring around said axis of rotation; and control means providing a separate adjustable electrical current to each of said resistances for providing an axial temperature gradient along said mantle wall.

2. The drying cylinder in claim 1 wherein said control means additionally includes one axially extending electrical connection for each of said resistances.

3. The drying cylinder in claim 1 wherein each said electrical resistance comprises a plurality of series connected rods.

4. A drying cylinder for paper webs comprising:

a rotatable cylinder having an axis of rotation and a cylindrical mantle wall with a plurality of separate nonoverlapping axial annular regions located along the inner surface of said mantle wall and encircling said axis of rotation, each of said annular regions having attached thereto a separate, coaxial, annular electrical resistance, each said resistance forming a substantially continuous ring around said axis of rotation;

journal pins coaxial with said cylinder and integrally fitted to end pieces attached to both ends of said cylinder;

a plurality of contact rings upon at least one journal pin, said contact rings being electrically connected to separate resistances;

a slide contact mounted in sliding contact with each said contact ring; and

an external, adjustable source of current connected to each of said slide contacts for supplying a separate adjustable electrical current to each of said resistances for producing an axial temperature gradient along said mantle wall.

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