

March 24, 1959

W. W. SPOONER

2,878,583

DRUMS FOR THE TEMPERATURE TREATMENT OF MATERIALS

Filed March 27, 1956

3 Sheets-Sheet 1

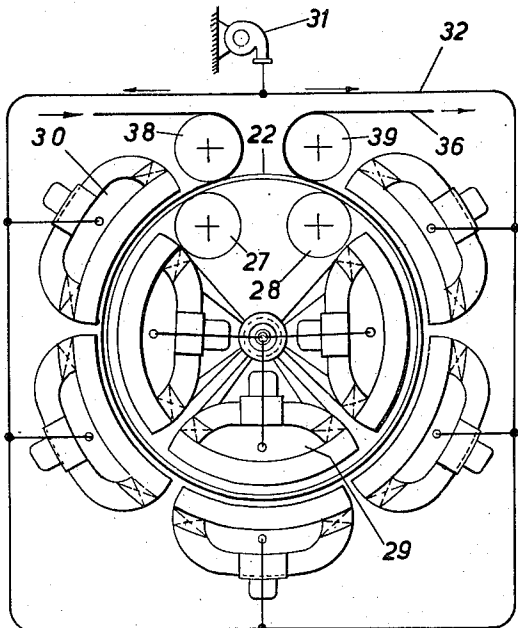
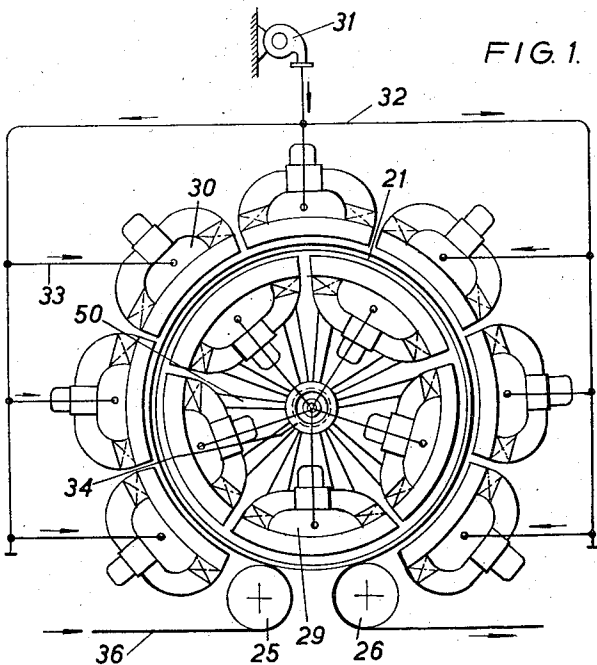


FIG. 3.

INVENTOR

WILLIAM WYCLIFFE SPOONER

mead, Browne, Scheyer & Beveridge

ATTORNEYS

March 24, 1959

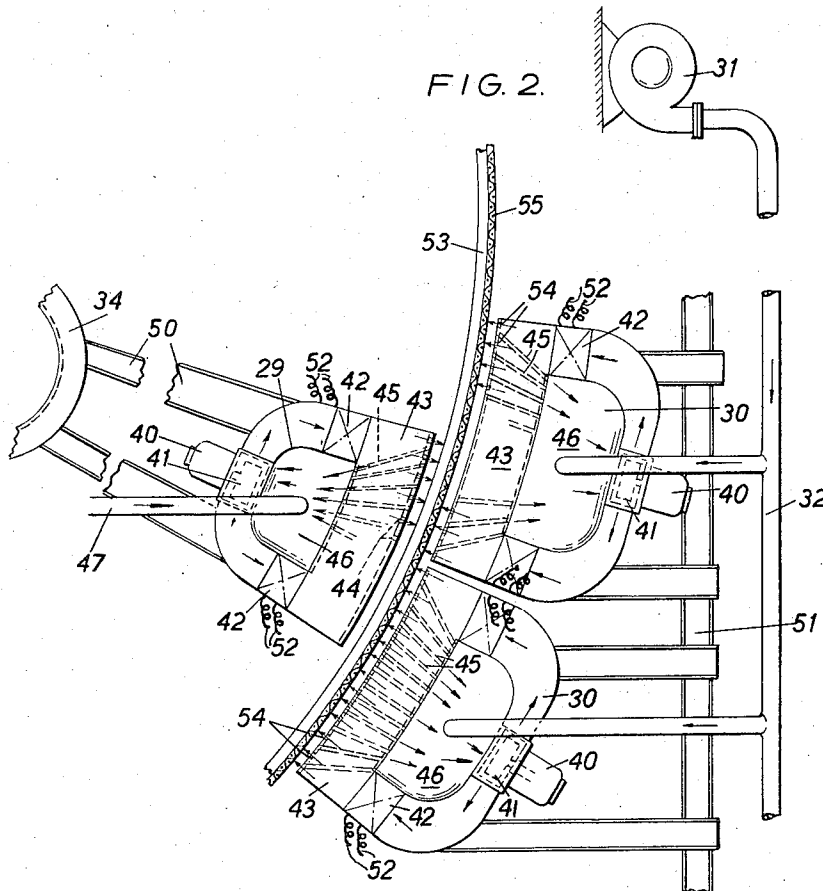
W. W. SPOONER

2,878,583

DRUMS FOR THE TEMPERATURE TREATMENT OF MATERIALS

Filed March 27, 1956

3 Sheets-Sheet 2



WILLIAM WYCLIFFE SPOONER
By ^{Inventor}

mead, Brown, Schuyler & Beveridge
Attorneys

March 24, 1959

W. W. SPOONER

2,878,583

DRUMS FOR THE TEMPERATURE TREATMENT OF MATERIALS

Filed March 27, 1956

3 Sheets-Sheet 3

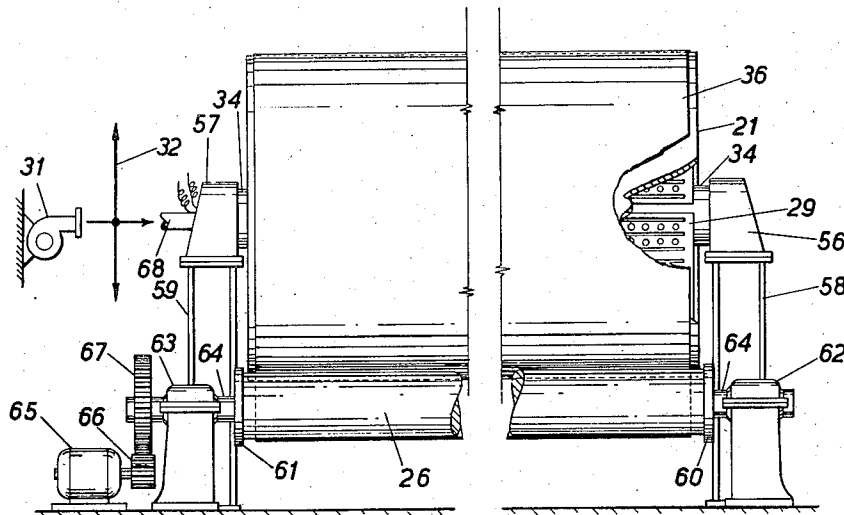


FIG. 4.

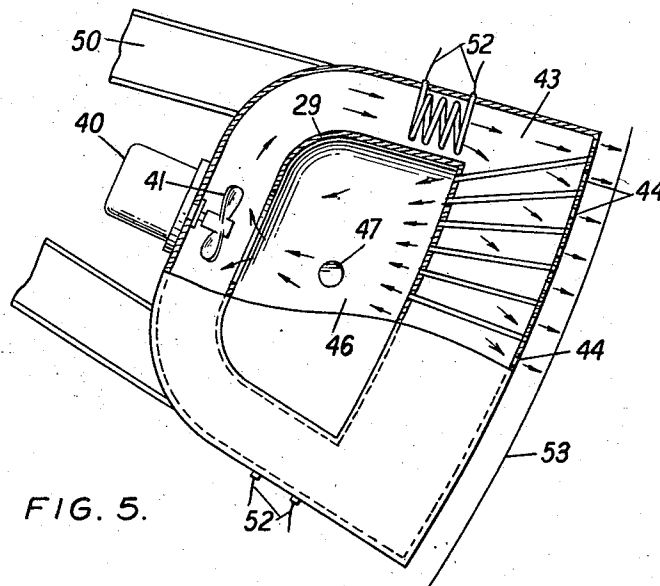


FIG. 5.

INVENTOR

WILLIAM WYCLIFFE SPOONER

BY

Mead, Browne, Schuyler & Bevelidge

ATTORNEYS

1

2,878,583

DRUMS FOR THE TEMPERATURE TREATMENT OF MATERIALS

William Wycliffe Spooner, Ikley, England, assignor to
The Spooner Dryer & Engineering Co. Limited, Ikley,
England

Application March 27, 1956, Serial No. 574,300

8 Claims. (Cl. 34—122)

The present invention relates to a drum for the temperature treatment of materials, suitable for use, for example, in paper-making and textile processing, in which at least one casing having a convex arcuate outer face provided with nozzle openings is located within the drum and means are provided for supplying a heating or cooling fluid to said casing for projection through said nozzle openings on to the internal surface of the drum to heat or cool the same. More particularly the invention relates to methods of mounting such drum.

It has already been proposed to mount the heating apparatus on and around a shaft coaxial with the drum so as to be contained within the drum. The drum is caused to rotate about the shaft by external means and suitable bearing journals are provided between the drum and the shaft. This arrangement has the disadvantage that in order to provide a rigid support for the heating apparatus the supporting shaft may have to be of considerable size, especially in the case of long drums with a substantial outer heated area. This results in large bearing journals between the shaft and the drum which besides being costly and difficult to fit also considerably increase the rotating weight of the drum. This increase in rotating weight necessitates a corresponding increase in the magnitude and cost of the power necessary to rotate the drum, especially in respect of the starting torque required.

According to the present invention the drum rests upon two substantially parallel and horizontal rollers and at least one end is partially or completely open to allow rigid support means for said casing and auxiliary equipment to pass therethrough.

The drum may be driven by one or both of said supporting rollers or by another roller or other rollers.

The drum may rest with its outer surface upon the supporting rollers in which case these rollers are preferably utilized as lead-on and lead-off rolls for web or strip material to be treated by contact with the heated surface of the drum. Alternatively the supporting rollers may extend axially within the drum in which case the drum rests with its inner surface upon the supporting rollers. This arrangement has the advantage that the whole of the heated outer surface of the drum is free from any supporting means and a greater length of material may be treated at any one time than is the case when the drum rests with its outer surface in contact with the supporting rollers. The lead-on and lead-off rolls may also, in this case, be conveniently situated in the upper region of the drum.

Heated drums according to the present invention are particularly suitable for use in the paper manufacturing trade as drying cylinders for M.G. machines in which a web of paper is pressed onto the polished outer periphery of the heated cylinder and a glaze is imparted to the surface of the web which is in contact with the cylinder. In this case a hood or cover, which contains heating means, preferably surrounds the drum over as large a portion of the periphery as possible. This hood assists

2

in drying the paper web during its time of contact with the heated drum surface.

In many cases it is desirable to dry the paper web on both sides in which case it is conveniently led around two drums in turn, being led onto and off one drum towards the bottom of the drum and subsequently led onto a second drum towards the top thereof. In this application drums according to the present invention are particularly suitable, the first drum being supported on its lead-on and lead-off rollers and the second drum supported on internal supporting rollers, the second drum being provided with separate lead-on and lead-off rollers. Two or more large drums used in this manner conveniently replace the larger number of small rolls which are commonly used in the Fourdrinier type of paper making machine. The heating means in the hoods preferably comprise a series of nozzles directing heated fluid streams onto the surface of the web.

Whilst the nozzles inside both the drum and the hood may be of any form they are preferably narrow in the circumferential direction and relatively long in the axial direction of the drum and they conveniently extend along the whole axial length of the drum.

The nozzles inside both the drum and the hood may be distributed amongst a number of individual heating units each of which heats an arc of the surface of the drum. Each heating unit may have its own circulating fan and heating means, the hot air projected from the nozzles onto the surface of the drum being collected and recirculated through the heating means. As with this system there will tend to be a small wastage of air it is desirable that make-up air should be supplied to each heating unit. Make-up air for all the units of each drum may be supplied from a single header fed by a blower.

The invention will be further described by way of example with reference to the accompanying drawings, in which:

Fig. 1 illustrates diagrammatically an end view showing the operation of a drum constructed according to one embodiment of the present invention,

Fig. 2 is a detail view of Fig. 1 to a larger scale,

Fig. 3 illustrates diagrammatically an end view showing the operation of a drum constructed according to another embodiment of the present invention, and Fig. 4 illustrates diagrammatically a detail view of the embodiment of Fig. 1 with certain parts removed for the sake of clarity,

Fig. 5 is an end view of one heating unit, partly in section.

Referring to Fig. 1 a drum 21 is supported on rollers 25 and 26.

Heating units such as 29 having a convex arcuate surface provided with nozzles, as shown more particularly in Fig. 2, are disposed around the available inner surface of the drum. Similar units such as 30 having a concave arcuate surface provided with nozzles are disposed around the available outer surface of the drum. Heating air is circulated through heaters and after projection from the nozzles onto the surface of the drum is collected and recirculated. To compensate for the wastage of air which occurs make-up air is supplied to all the heating units of the drum by a fan such as 31. This fan feeds a common header 32 from which supply lines such as 33 distribute the make-up air to the various outer heating units. A hollow shaft such as 34 is located centrally within the drum and includes a header for supplying make-up air to the inner heating units of that drum.

A strip or web of material 36 to be dried is led onto drum 21 around the supporting roller 25 and is led off around supporting roller 26.

The embodiment of Fig. 3 differs from the embodi-

ment of Fig. 1 in the method of support for the drum and in the position of lead-on and lead-off of the strip or web of material. The drum 22 is supported on rollers 27 and 28 placed inside the drum 22 and the material 36 is led on to the drum 22 over the roller 38 and is led off over the roller 39.

In Fig. 2 the construction of the heating units is shown in more detail. Considering the inner heating unit 29 there illustrated, a motor 40 drives a fan 41 which circulate air through heaters 42 to a manifold 43. The heaters 42 are shown heated by electrical means, the electricity being supplied through leads such as lead 52. The manifold 43 has a series of axially directed parallel nozzles such as 44 through which the heated air is projected onto the inner surface 53 of the drum. The nozzles alternate with rows of holes through which air projected onto the drum is collected and which communicate via internal tubes 45 with a central chamber 46. Make-up air is supplied to the chamber 45 through a feed pipe 47. The air in the chamber 46 is induced by the fan 41 and circulated as before.

The outer heating units such as 30 function in a similar manner. Parallel nozzles such as 54 project heated air onto the outer surface 55 of the material being treated.

The inner heating units are supported on spider arms 50 which radiate outwards from the shaft 34 which also acts as a header for the supply of make-up air to the inner heating units. The outer heating units, as shown in Fig. 2, are supported on a suitable external framework 51.

In Fig. 4 the heating units placed outside the drum are not illustrated so as to more clearly show the method of supporting the drum and the rollers. The roller 26, which together with roller 25 carries the drum 21, has flanges 60 and 61 to restrict lateral movement of the drum 21. The roller 26 is supported by the spindle 64 in bearings 62 and 63. An electric motor 65 drives the roller 26 through pinion 66 and wheel 67. The supports 58 and 59 carry the ends 56 and 57 of the fixed shaft 34. The fan 31 is shown supplying make-up air to the common header 32 and to the pipe 68 which in turn supplies make-up air view the shaft 34 and the feed pipes to the inner heating units such as 29.

Other forms of support members for the heating units may be chosen to suit the weight and disposition of the units, in particular the only limitation on the form of the support members for the inner heating units is that they must be able to pass through the open end or ends of the drum. Fig. 4 shows the inner heating units supported through both ends of the drum. They may however be cantilevered through one end of the drum only. The considerable flexibility which is thus allowed in the design of support member for the heating units removes the main disadvantage of the previous design of such heating drums.

In both embodiments illustrated the drum is driven by either or both of the rollers on which it is supported. However other means of driving the drum may be used, either friction drive for example from one or more additional rollers or if desired a more positive drive for example a gear drive to a gear ring attached to the drum.

Whilst the use of one drum alone is illustrated enabling only one side of a web to be brought into contact with a heated surface, such as will be the case when using a drum of this type as part of a M. G. paper making machine, it will readily be appreciated that both embodiments may be used in tandem so that both sides of the web may be treated.

I claim:

1. Apparatus for the temperature treatment of moving materials of web, sheet or strip form, comprising a rotatable drum for engaging said material and having an opening at one end, at least one casing located within the drum and having a convex arcuate outer face defining a

plurality of nozzle openings therein, means for supplying a heat transfer fluid to said casing and projecting said fluid through said nozzle openings onto the inner surface of the drum to alter the temperature thereof, a plurality of substantially parallel and horizontal rollers supporting the drum, means for rotating said drum, means for guiding material being treated along a path during a portion of the length of which the material is in contact with the outer surface of the drum, rigid supporting means passing through said openings and supporting the casing within the drum, and temperature treatment means disposed around and adjacent to the outer periphery of the drum to assist in altering the temperature of the material in contact with the drum.

2. Apparatus according to claim 1 in which said temperature treatment means includes a plurality of nozzle adapted to direct said heat transfer fluid towards the outer surface of the drum.

3. In Apparatus for the temperature treatment of moving materials of web, sheet or strip form, the combination of a rotatable drum for engaging said material and having a central opening at one end, a plurality of substantially parallel and horizontal rollers supporting the drum, means for rotating said drum, means for guiding said material along a path during a portion of the length of which the material is in contact with the outer surface of the drum, a plurality of temperature treatment units disposed within the drum and around the inner surface thereof, rigid supporting means passing through said opening and supporting said units within the drum, each of said units comprising a casing including means defining a chamber within said casing, said casing having an outer convex arcuate face and defining a plurality of parallel radially directed nozzles extending in the axial direction of the drum, said face including a plurality of fluid intake conduits disposed between said nozzles and communicating with said chamber, heat transfer means for varying the temperature of a heat transfer fluid passing therethrough, and a fan for circulating said heat transfer fluid through said heat transfer means to said nozzles for projection towards the drum and for recirculating fluid from adjacent said drum, through said fluid intake conduits, said chamber and said heat transfer means.

4. Apparatus for the temperature treatment of moving materials of web, sheet or strip form, comprising a rotatable drum for engaging said material and having an opening at one end, at least one casing located within the drum and having a convex arcuate outer face defining a plurality of nozzle openings therein, means for supplying a heat transfer fluid to said casing and projecting said fluid through said nozzle openings onto the inner surface of the drum to alter the temperature thereof, a plurality of substantially parallel and horizontal rollers supporting the drum, means for rotating said drum, means for guiding material being treated along a path during a portion of the length of which the material is in contact with the outer surface of the drum, said rollers being disposed below the axis of the drum, one of said rollers forming a lead-on roll and the other of said rollers forming a lead-off roll for respectively guiding material onto and off the drum, rigid supporting means passing through said openings and supporting the casing within the drum, and temperature treatment means disposed around the outer periphery of and adjacent to the drum to assist in altering the temperature of the material in contact with the drum.

5. Apparatus for the temperature treatment of moving materials of web, sheet or strip form, comprising a rotatable drum for engaging said material and having an opening at one end, at least one casing located within the drum and having a convex arcuate outer face defining a plurality of nozzle openings therein, means for supplying a heat transfer fluid to said casing and projecting said fluid through said nozzle openings onto the inner surface of the drum to alter the temperature thereof, a

plurality of substantially parallel and horizontal rollers supporting the drum, said rollers being disposed above the axis of the drum and said drum raised with its inner surface in contact therewith, means for rotating said drum, means for guiding material being treated along a path during a portion of the length of which the material is in contact with the outer surface of the drum, a lead-on roller and a lead-off roller disposed adjacent the outer surface of the drum in parallel axis therewith and adapted to guide said material on to and off said drum, rigid supporting means passing through said openings and supporting the casing within the drum, and temperature treatment means disposed around the outer periphery of and adjacent to the drum to assist in altering the temperature of the material in contact with the drum.

6. In apparatus for the temperature treatment of moving materials of web, sheet or strip form, the combination of a rotatable drum for engaging said material and having a central opening at one end, a plurality of substantially parallel and horizontal rollers supporting the drum, means for rotating said drum, means for guiding said material along a path during a portion of the length of which the material is in contact with the outer surface of the drum, said rollers being disposed below the axis of the drum, one of said rollers forming a lead-on roll and the other of said rollers forming a lead-off roll for respectively guiding material onto and off the drum, a plurality of temperature treatment units disposed within the drum and around the inner surface thereof, rigid supporting means passing through said opening and supporting said units within the drum, each of said units comprising a casing including means defining a chamber within said casing, said casing having an outer convex arcuate face, and defining a plurality of parallel radially directed nozzles extending in the axial direction of the drum, said face having disposed thereon a plurality of fluid intake conduits between said nozzles, and communicating with said chamber, heat transfer means for varying the temperature of a heat transfer fluid passing therethrough, and a fan for circulating said heat transfer fluid through said heat transfer means to said nozzles for projection towards the drum and for recirculating fluid from adjacent said drum through said fluid intake conduits, said chamber and said heat transfer means.

7. In apparatus for the temperature treatment of moving materials of web, sheet or strip form, the combination of a rotatable drum for engaging said material and having a central opening at one end, a plurality of substantially parallel and horizontal rollers supporting the drum, said rollers being disposed above the axis of the drum and

said drum raised with its inner surface in contact therewith, means for rotating said drum, means for guiding said material along a path during a portion of the length of which the material is in contact with the outer surface of the drum, a lead-on roll and a lead-off roll disposed adjacent the outer surface of the drum in parallel lines therewith and adapted to guide said material on to and off said drum, a plurality of temperature treatment units disposed within the drum and around the inner surface thereof, rigid supporting means passing through said opening and supporting said units within the drum, each of said units comprising a casing including means defining a chamber, said casing having an outer convex arcuate face and defining a plurality of parallel radially directed nozzles extending in the axial direction of the drum, said outer face having a plurality of fluid intake conduits disposed in said face between said nozzles and communicating with said chamber, heat transfer means for varying the temperature of a heat transfer fluid passing therethrough, and a fan for circulating said heat transfer fluid through said heat transfer means to said nozzles for projection towards the drum and for recirculating fluid from adjacent said drum through said fluid intake conduits, said chamber and said heat transfer means.

8. Apparatus according to claim 1, in which said temperature treatment means includes a plurality of individual temperature treatment units disposed around and adjacent to said drum, each of said units comprising a casing including means defining a chamber within said casing, said casing having a concave arcuate outer face and defining a plurality of parallel radially directed nozzles extending in the axial direction of said drum, said concave face including a plurality of fluid intake conduits disposed between said nozzles and communicating with said chamber, heat transfer means for varying the temperature of said fluid, and a fan for circulating fluid from adjacent said drum, through said intake conduits, said chamber and said heat transfer means to said nozzles for projection towards said drum.

References Cited in the file of this patent

UNITED STATES PATENTS

876,007	Moss	Jan. 7, 1908
1,669,774	O'Malley	May 15, 1928
1,933,960	Brabaek	Nov. 7, 1933
2,065,032	Spooner	Dec. 22, 1936
2,141,377	Chylinski	Dec. 27, 1938
2,545,917	Cowie	Mar. 20, 1951
2,576,036	Ostertag et al.	Nov. 20, 1951