July 6, 1965 H. R. STRUBE 3,192,647

DRYING ROLLS

Filed May 22, 1962

FIG. 1.

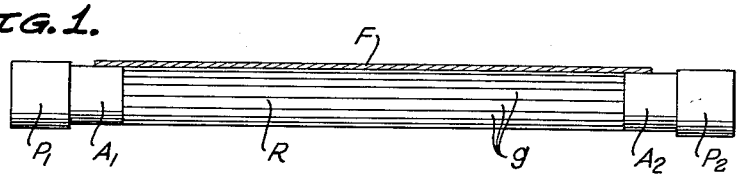


FIG. 2.

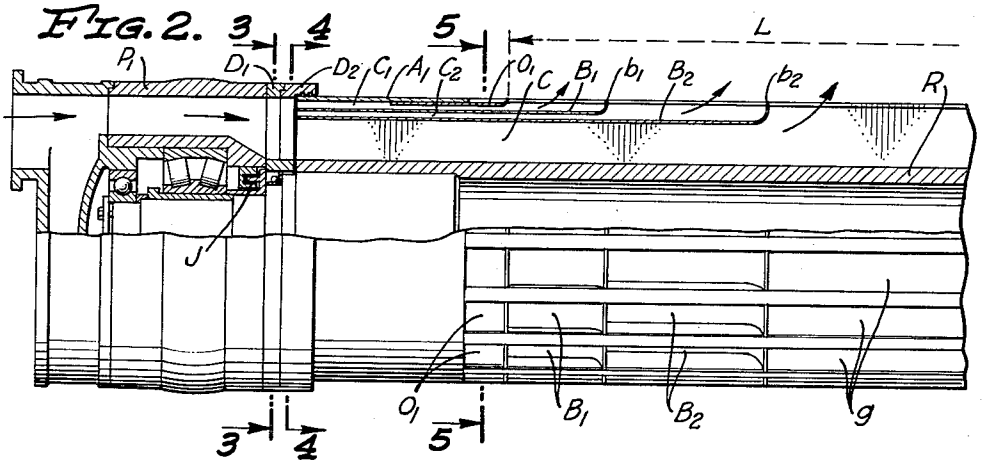


FIG. 3.

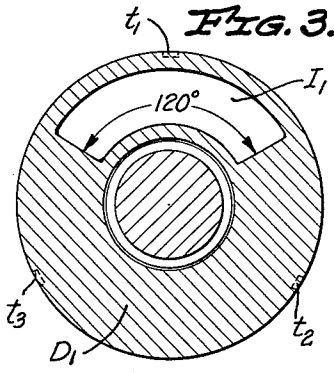


FIG. 4.

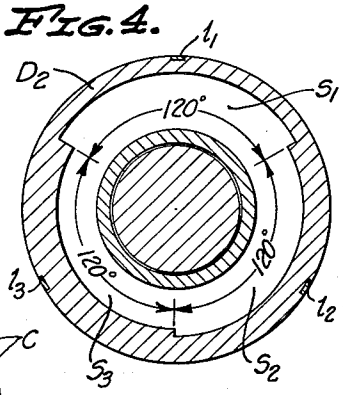


FIG. 5.

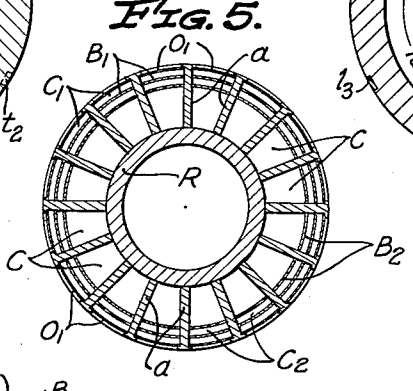
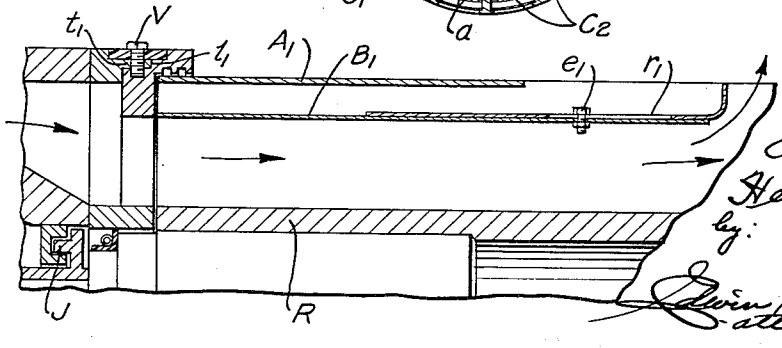


FIG. 6.



Inventor:
Henry R. Strube
by:
Edwin E. Greigg
attorney.

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DRYING ROLLS

Henri Robert Strube, Paris, France, assignor to Albert Madeleine, Nord, France and S.R.R.I. Societe de Recherches et de Realisations Industrielles, Paris, France, a French joint-stock company

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5 Claims. (Cl. 34—122)

The present invention relates to drying rolls which are intended to serve in a general manner for the purpose of drying material in the form of a band which is permeable either to a gas, to a mixture of gas or to steam and, more especially, for the purpose of drying the bands of felt employed in the drying sections of paper machines, board machines, textile machines and the like. The invention is more especially directed to rolls which comprise on the one hand a central body or core which is rotatably mounted in two bearings and is integral with a plurality of radial fins which are preferably equidistant and form channels covered at each end of the roll by an annular wall forming closed passages which are parallel to the axis of the roll and which open into the said channels and, on the other hand, at least one distributor which is placed in contact with one of the ends of said roll and is connected to a chamber inside which there prevails an internal pressure which is different from the pressure prevailing in the interior of the channels, in such manner as to produce inside those channels only which follow that peripheral portion of said roll which is in contact with the band to be dried a circulation of fluid which flows through said band and, lastly, means for providing at least relative fluid-tightness in the passage provided for the flow of fluid between the rotary roll and the stationarily fixed distributor.

It can frequently be observed in paper machines that the dryness of the sheet is not uniform over the whole width thereof and in particular that the degree of dryness of the marginal areas differs from that of the central area.

This irregularity can especially arise from the following causes:

(1) A badly air-conditioned machine room;

(2) An inadequately ventilated machine in which the circulation of air does not take place in a normal fashion in the center of the drying section;

(3) A machine in which the width of the drying rolls is employed to the maximum extent and in which the thermal exchanges are different at the center and in the marginal areas;

(4) A sheet which reaches the drying section with a degree of dryness which is variable in the direction of the width as a result either of faulty operation of the pulp-supplying unit, or of variation of pressure, or due to any other cause.

These differences in drying treatment frequently make it necessary either to reduce the speed of the machine in order to reduce the extent of such differences, or to reduce the effective width of the paper manufactured.

The improvement which forms the subject of the present invention tends to eliminate the aforementioned disadvantages in the drying rolls of the type contemplated and consists in arranging at the periphery of the channels at least one obturating partition which is adapted to slide axially and which is intended to cause the width of the blowing zone to vary and, in the interior of the said channels, stationary directing partitions which are employed in conjunction with an auxiliary distributor for the purpose of producing blowing jets which are distributed according to the requirements of each particular case.

One form of execution of the invention will now be described below, reference being made to the accompanying

drawings which are given solely by way of example without implied limitation, and in which:

FIG. 1 is a view in elevation of a drying roll, the felt being shown in cross-section;

FIG. 2 is a view in half-elevation and in partial axial half-section on a larger scale, of a drying roll comprising at each end one set of obturating partitions and two sets of directing partitions;

FIGS. 3, 4 and 5 are views in transverse cross-section taken respectively along the line III—III, IV—IV and V—V of FIG. 2; and

FIG. 6 is a view in partial axial cross-section showing a telescopic directing partition.

FIG. 1 is a diagrammatic drawing on a small scale which recalls the structural make-up of a drying roll R of the type referred to above, that is to say which is provided with radial fins a (as shown in FIG. 5), the said radial fins forming channels g which are closed-off at each end by means of sleeves A_1, A_2 in such manner as to form passages for the supply of drying fluid which are parallel to the axis of the roll. The said rolls are rotatably mounted with interposition of a labyrinth joint J (as shown in FIG. 2) in distributor bearings P_1, P_2 so designed that the blowing aperture I_1 (FIG. 3) of the distributor D_1 is in most cases provided with an angular opening of 120° which corresponds to the arc of winding of the felt band on the drying roll.

In accordance with a preferred form of embodiment of the invention, obturating partitions O_1 (as shown in FIGS. 2 and 5) in the form of segments of a cylinder which are fitted inside the sleeve A_1 are mounted to slide parallel to the axis of the roll inside grooves provided in the fins a which form the channels; the said partitions O_1 are designed to permit the width L of the blowing zone to be varied in dependence on the width of the felt band to be dried. This arrangement makes it possible to employ a single set of rolls for one installation, irrespective of the width of the felt and of the sheet of paper to be dried.

In accordance with another form of embodiment which has not been illustrated in the drawings, each obturating partition is formed by a sleeve which is adapted to slide over the periphery of the corresponding annular wall, this latter being preferably arranged in such manner as to ensure that said obturating partition is located in the line of extension of the periphery of the roll.

Directing partitions B_1, B_2 in the shape of a segment of a cylinder are fitted at each end into the fins of each channel and comprise end portions b_1, b_2 which are bent back transversely with respect to the axis of the roll. The directing partitions B_1 form inside each channel, in combination with the obturating partitions O_1, a small passage c_1 in the shape of an annular sector and, in combination with the directing partition B_2, a small passage c_2 also in the shape of an annular sector, whilst the partitions B_2 form with the walls of each channel a passage c of substantially triangular section. Accordingly, at the outlet of the distributor, the drying fluid is thus subdivided in each channel into three streams c, c_2, c_1 which are arranged in concentric tiers from the centre of the periphery; the stream c follows the central portion of the roll which is limited by the end of each marginal directing partition B_2, whilst the stream c_2 is limited by the two terminal edges b_1, b_2 and the stream c_1 is limited by the edge b_1 and the extremity of the obturating partition O_1.

It will be understood that by obturating or closing-off certain passages c, c_2 and c_1, it is possible to compensate any irregularities in the degree of dryness produced. This is carried into effect by virtue of the invention, by interposing between the main distributor plate D_1 which forms the opening of the blowing arc and the drying roll an auxiliary distributor plate D_2 (as shown

in FIGS. 2 and 4) having a central opening which is subdivided, in the example which is illustrated in the drawings, into three circle sectors S_1, S_2 and S_3 each making an angle of 120° and having respectively a radius equal to that of the obturating partition O_1, the directing partition B_1 and the directing partition B_2. It will be understood that when the sector S_1 is located opposite the blowing aperture I_1 of the distributor D_1, the drying fluid will be distributed through the passages c, c_1, c_2; when the sector S_2 comes into position opposite the aperture I_1, the passages c_1 will accordingly be closed off and, when the sector S_3 comes into a similar position, the passages c_1 and c_2 will be closed off and the drying fluid will be distributed solely through the passages c which are located at the bottom of the channels. The keying in position of the auxiliary distributor D_2 with respect to the main distributor D_1 will be effected by the penetration of lugs t_1, t_2 and t_3 of the said distributor D_1 in housings l_1, l_2, l_3 of the distributor D_2 and by the tightening of a screw V (shown in FIG. 6). It will naturally be understood that the said lugs could be formed on the distributor D_2 and the housings in the distributor D_1.

If the felt and the roll are brought into contact over an angle greater than 180°, it will not be possible to form the three sectors S_1, S_2, S_3 on a same auxiliary distributor and it will be necessary to make use of a second auxiliary distributor; the same would apply if more than two sets of directing partitions were employed.

In accordance with an alternative form which is illustrated diagrammatically in FIG. 6, each directing partition B_1 comprises an extension r_1 in which is formed a longitudinal elongated slot designed to permit the possibility of securing the said extension in a suitable position by means of a bolt e_1. This arrangement provides an additional possibility of adjustment.

What I claim is:

1. A drying roll assembly for treating sheet material with gas which is introduced into the roll and is in contact with the sheet material arranged thereover comprising:

(A) an elongated hollow roll having peripheral opening means for the passage of gas,

(B) plural partition means extending from at least one end of said roll and terminating within said roll for defining a plurality of coaxial annular channels about the longitudinal axis of said roll for the passage of gas parallel to said axis,

(C) terminal means secured to the terminating portion of said partition means, said terminal means extending substantially radially of said axis for directing gases radially through said peripheral opening means and terminating substantially at the outer periphery of said roll,

(D) a plurality of elongated fins disposed in a circular array about said axis extending radially therefrom and passing radially across each of said channels,

(E) means for introducing gas into said roll and in communication with said coaxial annular channels, and

(F) adjustable distributor plate valve means disposed coaxially and in close juxtaposed relation with at least one end of said roll, said distributor plate valve means comprising adjustable aperture means each being of different radial dimension to control the flow of gas through selected ones of said channels.

2. A roll assembly as defined in claim 1, wherein said roll includes an axial core defining the length of said roll and wherein said fins are fixedly attached to said core in a circular array and are adapted to fixedly hold a plurality of elongated strips constituting said partition means.

3. A roll assembly as defined in claim 1, wherein said terminal means are axially slidably secured to said partition means to vary the width of said peripheral openings.

4. A roll assembly as defined in claim 1, wherein said distributor means comprises:

(A) a main plate disposed coaxially and in close juxtaposed relation with said roll at least at one end thereof, said plate having an aperture for limiting the flow of fluid in said channels to a path having a cross-section substantially of an annular sector, and

(B) an auxiliary plate disposed coaxially and in close juxtaposed relation with said main plate and having an aperture composed of a plurality of concentric sectors each having an angle substantially equal to the angle of said annular sector and each having a different radius, each of said concentric sectors adapted to be selectively aligned with the aperture of said main plate for allowing the flow of fluid in selected ones of said channels.

5. A roll assembly as defined in claim 4, wherein said roll is mounted for axial rotation and wherein said plates are held stationary with respect to said roll.

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WILLIAM F. O'DEA, *Acting Primary Examiner.*

NORMAN YUDKOFF, *Examiner.*