May 22, 1928. 1,670,991

R. SCHILDE

APPARATUS FOR DRYING FABRICS AND THE LIKE

Filed April 5, 1926

Fig.1.

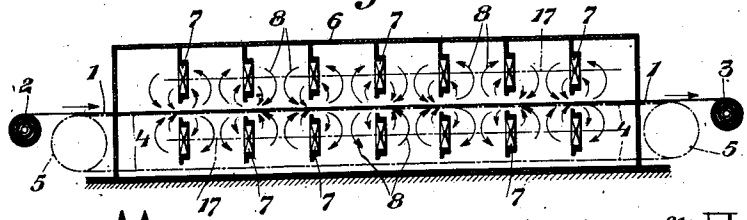


Fig.2.

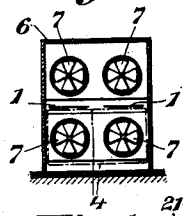


Fig.3.

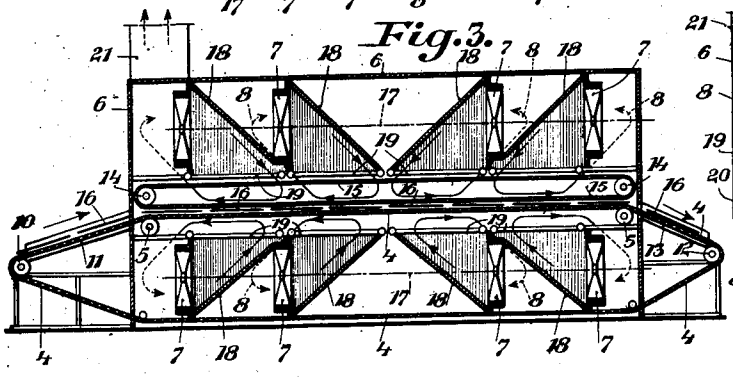


Fig.4.

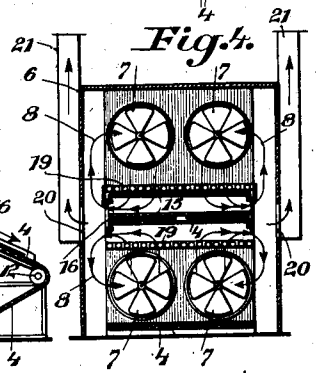


Fig.5.

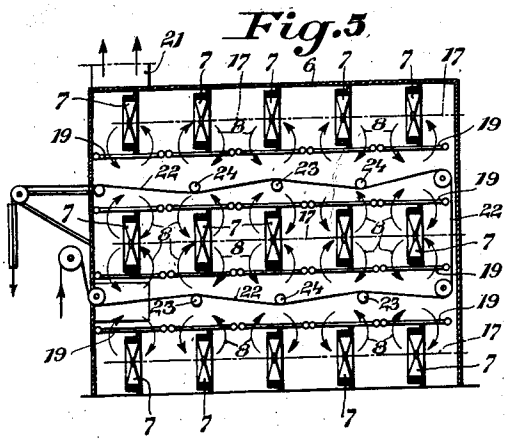
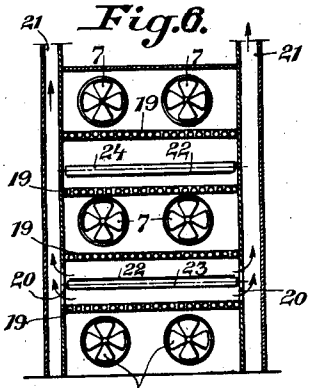


Fig.6.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR DRYING FABRICS AND THE LIKE.

Application filed April 5, 1926, Serial No. 99,908, and in Germany April 25, 1925.

This invention relates to a drying apparatus for drying stretched and unstretched material, and comprises devices or blowers which produce circulating currents of air above and beneath the path of movement of the material to be dried, the driving axles of each row of fans or blowers being parallel to the plane in which the material to be dried travels.

By arranging the fans in rows parallel to the plane in which the material to be dried travels and in opposed relation to one another, it is possible to so direct circulating air currents that they impinge against the surface being treated and are caused to ricochet for further action, so that the time required to effect the drying operation is reduced and it is possible to reduce the dimensions of the drying apparatus or plant, it being preferable that helical fans be used.

The fans preferably are arranged in rows with the fans of each row on a common driving shaft, since economy results in the utilization of single drives, and while helical fans are shown and preferred, it is obvious that other fan structures may be used. Furthermore, the driving axles of the blowers or fans may be disposed transversely to the direction in which the material to be dried travels, with a corresponding change in the driving shafts. However, the general principle of the invention, viz: the disposition of the drying fans or blowers above and below the path traversed by the material to be dried, will be at all times preserved, with the advantage that an intensive surface application of the circulating air currents to the material to be dried ensues and which cannot be obtained with efficiency or adequacy in drying apparatus heretofore commonly used.

Care must be taken in practicing the present invention that the total quantity of air which is circulated or whirled around relatively to the material to be dried comes in contact with the surface of the latter in a perpendicular direction in order that the air may be able to give up its drying heat as rapidly as possible. Care must also be taken that, in proportion to unit of time and surface of the material to be dried, the greatest possible quantity of the circulated air is caused to come in contact with the surface of the said material. This maximum must obviously be maintained within economical limits as regards power consumption and cost of installation.

The invention will be described with reference to the accompanying drawings, in which:

Fig. 1 is a longitudinal section of a drying apparatus embodying the features of the invention;

Fig. 2 is a cross section of the same;

Figs. 3 and 4 are views similar to Figs. 1 and 2, showing a drying apparatus embodying the features of the invention adapted for plate shaped material wherein the fans or blowers and their shafts are arranged in a similar manner but comprising a series of a different form of blowers;

Figs. 5 and 6 show, respectively, in longitudinal and cross sections a surface drier without a conveyor band for the material to be dried and wherein the material is conducted above and below guide rollers and wherein the traveling sheets of material are reversed and in which the air is blown onto said material from both sides by means of the fans or blowers therein illustrated.

In the drying apparatus shown by Figs. 1 and 2 the fans or blowers 7 are arranged above and below the path along which the material to be dried travels. The continuous strip 1 of the material to be dried is wound off a cylinder 2 and rewound on a cylinder 3, which cylinders are located, respectively, at opposite extremities of the apparatus and in contact with or bearing upon an endless conveyor band 4 guided over cylinders 5 and shown in dotted lines. The drying chamber 6 is tunnel shaped and is closed at its opposite ends except for an opening in each end for the passage of the conveyor band and the material to be dried. The fans 7 are secured to driving shafts 17 which preferably extend longitudinally of the chamber 6 and produce the circulating air currents indicated by the arrows 8 in the zones adjacent the fans.

In the drying apparatus shown in Figs. 3 and 4 and which is adapted for drying stiff or plate-shaped material such as cardboard, veneer, sheet metal plates, paper sheets and similar material, the conveyor band 4, which is perforated, in addition to

travelling over the cylinders 5, also passes over rollers 10 and 12 mounted outside of the chamber at opposite ends of the latter in order that the portion of the band 4 between the roller 10 and the cylinder 5 at one end of the apparatus may serve as a laying-on table for the material to be dried, and the portion of said band between the cylinder 5 at the opposite end of the apparatus and the roller 12 may serve as a delivery table. Above the conveyor band 4 a perforated covering band 15 is guided over rollers 14 mounted above the cylinders 5. The material 16 to be dried is carried through the chamber between the bands 14 and 15. Suitable fans or blowers 7, preferably of the helical type, are mounted on shafts 17 both above and below the said bands 4 and 15 on axes parallel to the paths of said bands, the fans or blowers each having a deflecting plate 18 arranged at an inclination to its axis so that, when the fans revolve, they produce circulating air currents indicated by the arrows 8 within the zones between the fans and said plates, the said air currents being first driven between heating devices, such as pipes 19 (Figure 4), so that the air is heated before it comes in contact with the material to be dried. The fans or blowers, therefore, form with the plates 18 a series of cells on opposite sides of the material to be dried, and, since the deflecting plates 18 at one end of the apparatus are inclined toward those at the opposite end of the apparatus, the circulating air currents drive the drying air from the entrance end and exit end of the drying channel towards the center of said channel. The drying channel is in this manner subdivided into several compartments or cells, so that the air currents produced by the blowers or fans are forced from both ends of the drying channel towards the center of the same, as just noted, and the air in each cell, after it has acted upon one side of the material, is driven in again by the same fan or blower, the suction thus created taking place in the same cell. Consequently the air currents are always reversed in the cell or compartment in which they have been produced. The air that is saturated with moisture can escape through lateral openings 20 in the walls of the chamber and ventilating shafts 21. In this form of the drying apparatus the material 16 to be dried is operated upon both on the upper surface as well as on the lower surface, which is necessary in the case of cardboard, paper strips, veneer, metal plates and similar plate-shaped material. Material which has to be dried on one side only, for instance, wall paper, oil cloth, artificial leather and the like, requires only one series of fans or blowers 7 above the conveyor band 4. The same operation will ensue in drying material permeable to air which must not be strained too much by the circulating air currents 8 and accordingly must be supported by a conveyor band while passing through the drying channel.

In Figs. 5 and 6 drying apparatus without a conveyor band is illustrated, and in this instance a continuous band 22 of the material to be dried is guided over and under rollers 23 and 24, and the sheet of material 22 is reversed by being again passed through the chamber in the opposite direction, the air flowing from both sides onto said material, the air currents being produced by several tiers of helical fans or blowers, the fans in each tier being mounted on a common drive shaft 17. The circulating air currents produced pass along the heating means 19 prior to coming into contact with the material to be dried.

I claim—

1. In a drying apparatus the combination of a casing, means for moving flat material in a horizontal plane through said casing whereby said material forms a partition between the upper and lower portions of the casing and divides the casing into two chambers, two longitudinally disposed shafts mounted one above and the other below said means, and a plurality of fans mounted on each shaft, certain of said fans being disposed to oppose air currents caused by adjacent fans whereby the currents are deflected to impinge and ricochet from the exposed surface of the material upon opposite faces thereof.

2. In a drying apparatus the combination of a casing, means for moving flat material in a horizontal plane through said casing whereby said material forms a partition between the upper and lower portions of the casing and divides the casing into two chambers, two longitudinally disposed shafts mounted one above and the other below said means, and a plurality of fans mounted on each shaft, certain of said fans being disposed to oppose air currents caused by adjacent fans whereby the currents are deflected to impinge and ricochet from the exposed surface of the material at right angles to its path of travel.

3. In a drying apparatus the combination of a casing closed at both ends, material conveying means disposed in a horizontal plane and for movement through the casing, the flat material carried by said conveyer forming a partition longitudinally of the casing and dividing the casing into an upper and a lower compartment, a plurality of longitudinal shafts mounted in each compartment, a plurality of pairs of fans mounted on each of said shafts, said fans alternating in their direction of suction whereby certain fans drive air in opposition to the current from its opposing fan and whereby the currents of air are directed to a point at sub-

stantially right angles to and upon the material being treated and are there caused to be ricochetted.

4. In a drying apparatus the combination of a casing closed at both ends, material conveying means disposed in a horizontal plane and for movement through the casing, the flat material carried by said conveyer forming a partition longitudinally of the casing and dividing the casing into an upper and a lower compartment, a plurality of longitudinal shafts mounted in each compartment, a plurality of pairs of fans mounted on each of said shafts, said fans alternating in their direction of suction whereby certain fans drive air in opposition to the current from its opposing fan and whereby the currents of air are directed to a point at substantially right angles to the material being treated, and a plurality of transverse partitions, one for each fan, said partitions serving to confine the air currents produced by their associated fans and also serving to direct the air on to the surface of the material and to ricochet therefrom.

5. In a drying apparatus the combination of a casing having a centrally and horizontally disposed opening in each end thereof, an endless conveyer passing through said openings and movable longitudinally within the casing and whereby material conveyed thereby divides the casing into an upper and a lower compartment, a plurality of transverse partitions in each compartment, each partition being provided with an opening therethrough, a fan disposed adjacent each opening and two longitudinal shafts one to each chamber and extending substantially the full length of the casing, the fans in the upper compartment being fast to one shaft and those in the lower compartment being fast to the remaining shaft and the fan in one partition being opposed to the one in the next partition, said fans cooperating with the partitions and the material to be dried to direct air upon opposite faces of the material in transit.

6. In a drying apparatus the combination of a casing having a centrally and horizontally disposed opening in each end thereof, an endless conveyer passing through said openings and movable longitudinally within the casing and whereby material conveyed thereby divides the casing into an upper and a lower compartment, a plurality of transverse partitions mounted in each compartment, each partition having an opening therethrough, a fan disposed adjacent each opening and two longitudinal shafts one to each compartment and extending substantially the full length of the casing, the fans in the upper compartment being fast to one shaft and those in the lower compartment being fast to the other shaft, said fans serving to create air currents and cooperating with the partitions to direct air upon opposite faces of the material in transit, some of said fans being arranged to direct air currents in opposite directions to other fans, said partitions and the material cooperating to cause the air currents to be directed to opposite faces of the material in transit.

7. An apparatus for drying material in a flat and moving state, including a casing, a conveying member located in said casing and dividing the same into an upper and a lower chamber, fans arranged in rows above and below the conveyer, and a common driving axle for each row of fans, said fans producing circulating air currents that oppose each other and are directed against the material being dried so as to be ricochetted therefrom to be caught again by the fans and returned to the material.

In testimony whereof I have hereunto set my hand.

RICHARD SCHILDE.