Nov. 11, 1969 R. HILDEBRAND 3,477,139

DRYING CHAMBER FOR DRYING LUMBER

Filed Dec. 7, 1967

FIG. 1.

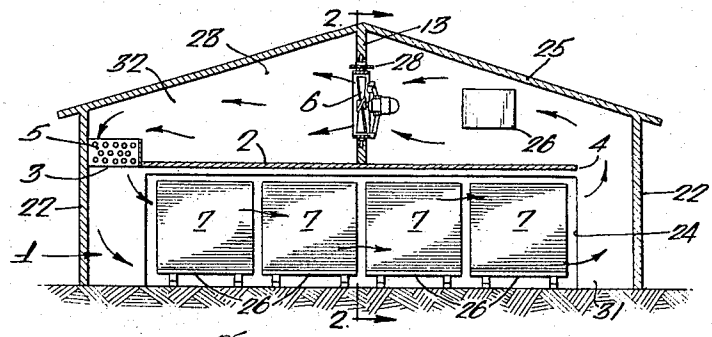


FIG. 2.

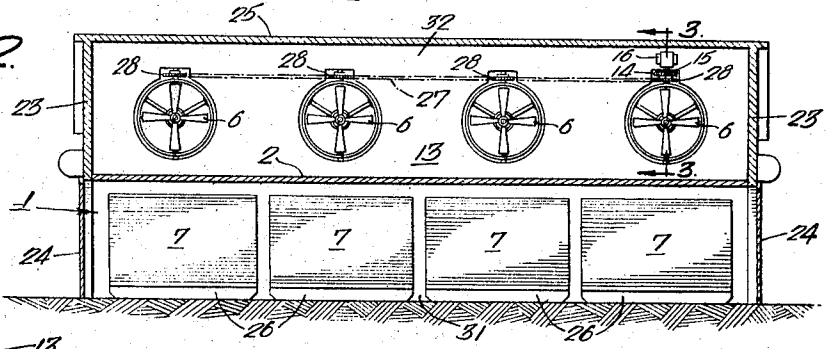


FIG. 3.

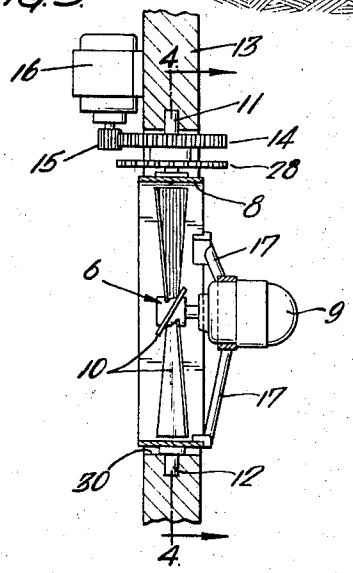


FIG. 4.

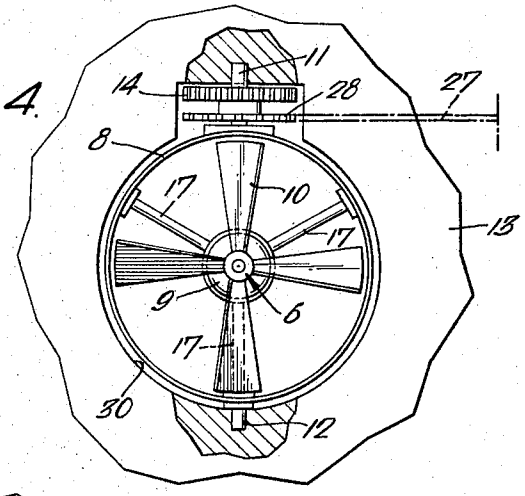
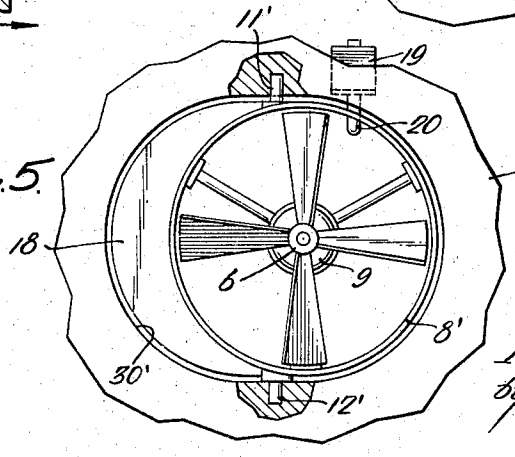


FIG. 5.



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DRYING CHAMBER FOR DRYING LUMBER

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ABSTRACT OF THE DISCLOSURE

A drying chamber, particularly for lumber, having a drying room in which the lumber is placed and a loft through which the drying medium is recirculated. Fan means is mounted in the loft to effect circulation of the drying medium and temperature and moisture controlling means are provided to regulate the condition of the drying medium. The fan is mounted in the loft so that it may be reversed in position to face in either one direction or a direction 180° opposed thereto so that by pivoting the fan between is two positions, the direction of circulation through the drying room may be reversed.

The present invention relates to drying chambers, and has particular application to a chamber for drying lumber wherein fan means is provided for circulating the drying medium, preferably air, in a given direction through the lumber.

For drying lumber and other materials, it is advantageous to reverse the direction of air flow from time to time in order to obtain uniform drying throughout the drying chamber. Prior to the present invention, this has been accomplished by the use of a stationary fan whose direction of rotation may be reversed when it is desired to reverse the direction of the flow. Such reversible fans have small efficiency because they must be designed to forward the drying medium in one direction when rotated in a first direction, and in the opposite direction when rotated in the opposite direction.

The present invention enables the use of a high-efficiency fan or blower which is designed to forward air in only one direction and a reversal of flow is obtained pivoting the entire fan about an axis, preferably about an axis disposed substantially at right angles to the axis of rotation of the fan. The fan is held in one position for predetermined period, for example several hours, and then is rotated 180° and held in the opposite position for a similar period so that the two periods, the direction of flow is reversed without reversing the direction of rotation of the blades. The present invention therefore makes it possible to use fans of simple design having a high efficiency.

In accordance with another feature of the invention, the fan is an axial fan mounted in a ring which surrounds the fan blades and is provided with oppositely disposed trunnions or pivot pins mounted in bearings to support the fan, one of the pivot pins having a drive wheel secured thereto. The bearings for the fan support may be of simple design to permit pivoting of the fan, or retention of the fan in its adjusted position, by means of the drive wheel, which is connected, at least indirectly, with a positioning motor.

To avoid the necessity for a positioning motor, the pivotal axis for the fan may be offset from the rotary axis of the fan blades so that the reaction force produced by the rotation of the fan provides a pivoting force for pivoting the fan on its trunnions. A stop is provided to halt the pivotal movement of the fan in the desired position so that by operation of the stop, the position of the fan may be changed as desired.

All of the objects of the invention are more fully set forth hereinafter with reference to the attached drawing wherein:

FIG. 1 is a transverse sectional view of a drying chamber embodying the present invention;

FIG. 2 is a longitudinal section taken along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged sectional view taken on the line 3—3 of FIG. 2;

FIG. 4 is a sectional view taken on the line 4—4 of FIG. 3; and

FIG. 5 is a view similar to FIG. 4 showing a modified embodiment of the present invention.

In the embodiment of the invention illustrated in FIGS. 1–4 inclusive, the drying chamber **1**, includes side walls **22**, end walls **23** having doors **24** therein through which the lumber **7** is transported, and a roof **25**. The lumber **7** is stacked on the floor of the drying chamber, for example on pallets **26** by means of conventional vehicles.

In accordance with the invention, the drying chamber is provided with means for circulating drying medium through the lumber from one side thereof to the other for a predetermined period and thereafter for circulating the dying medium in the reverse direction through the lumber. To this end, the drying chamber is provided with a ceiling **2** spaced downwardly from the roof to divide the chamber into a drying room **31** and a loft **32** through which the drying medium is circulated. Along the opposite sides, the ceiling is spaced from the side walls **22** to provide flow-through openings **3** and **4**, the opening **3** of which is covered by a heat register **5**, in the present instance a heat exchanger of conventional design. The air is circulated from one wall to the opposite wall within the drying room **31** and is returned through the loft **32**. In order to reduce the moisture content of the drying medium, means is provided at **26** to control the moisture content of the circulating drying medium. In its simplest form, the moisture-controlling means may consist of dampers operable to exhaust moisture-laden air to the atmosphere and to introduce fresh dry air.

In the loft, the drying medium, in the present instance air, is circulated by a series of fans **6**, each of which is mounted in an upright partition **13** extending longitudinally of the loft **32** of the drying chamber **1**. Each fan is mounted so it can pivot about an axis transverse to the axis of rotation of its blades so that it may face in opposite directions. When facing as shown in FIG. 2, the air circulation is as indicated by the arrows therein. When the fan reverses to face the opposite direction, the air circulation is opposite to that indicated by the arrows.

In accordance with the invention, to permit ready reversal of the flow, each fan **6** is mounted in a fan support ring **8** surrounding the fan blades **10** and having spider struts **17** for mounting the drive motor **9** for the fan. At diametrically opposite sides, the ring **8** is journalled in the partition **13** by means of trunnions or pivot pins **11** and **12**. The ring is mounted in an opening **30** in the partition **13** which corresponds in outline to the fan support ring **8**.

The upper trunnion **11** has a drive wheel **14** mounted within the opening **30** and projecting therefrom, as shown in FIG. 3 to mesh with a drive pinion **15** carried by the drive shaft of a positioning motor **16** mounted on the partition **13**. When the motor is energized, it drives the wheel **14** to rotate the ring **8** in the opening **30** to thereby control the direction in which the fan faces. When the motor **16** is de-energized, it serves to retain the fan in its adjusted position.

As shown in FIG. 2, a plurality of fans are provided in the partition **13**. Although each fan may be provided with a separate positioning motor, it is more advan-

tageous to gang the fans together, for example by means of a drive chain **27** and sprockets **28** on the individual fan support rings as shown in FIGS. 2–4. In this way, only a single position motor is required. In the embodiment of the invention illustrated in FIGS. 1–4 inclusive, the positioning motor is shown as a conventional rotary motor, but it should be understood that the positioning motor may consist instead of a hydraulic or pneumatic operating cylinder connected to the fan ring **8** in any convenient manner. Alternatively, the motor may be omitted and a simple mechanical manual control may be provided for pivoting the fans and locking them in position.

It may be desired to use the reaction force of the fan to supply the turning force for pivoting the fan between its oppositely facing positions. For example, as shown in FIG. 5, the fan **6** is mounted in a fan support ring **8'** having upper and lower trunnions **11'** and **12'** respectively, whose common axis is disposed offset from the rotary axis of the fan blades **10**. The trunnions **11'** and **12'** mount the fan **6** in an elliptical opening **30'** in a partition **13'** corresponding to the partition **13** of the previously described embodiment. In order to fill the opening **30'**, the fan support ring includes a crescent-shaped appendage **18** so that it presents a symmetrical outline relative to the axis of the trunnions **11'** and **12'**. Thus, the fan support ring fills the opening **30'** in both of its positions which are 180° apart.

Because of the offset relationship of the trunnion axis to the rotary axis of the fan **6**, the reaction force of the fan tends to rotate the fan assembly on the trunnions **11'** and **12'**. To secure the fan in either of its oppositely-facing positions, a stop element **20** projects into the path of the fan ring **8** to form a stop, arresting pivotal movement of the assembly on the trunnions. In the present instance, the stop element **20** is made as the armature of a solenoid **19** such that when the solenoid **19** is energized, the stop is withdrawn out of the path of the fan ring **8'** permitting the reaction force of the fan to pivot the assembly on the trunnions **11'** and **12'**. Upon de-energization of the solenoid **19**, the stop element **20** projects into the path of the fan ring **8** to prevent further rotation beyond the 180° pivotal movement afforded by the withdrawal of the stop element from the opening **30'**. In this manner, the separate positioning motor is not required, enabling the use of the reaction force of the fan to provide the pivotal movement, under the control of the stop element **20**.

In the drying of lumber in a drying chamber in accordance with the present invention, the direction of circulation of the drying medium is reversed only at great intervals of time, for example after several hours. The actuation of the positioning motors, or the solenoid may be performed automatically by a suitable timer, or may be performed manually by the operator.

While particular embodiments of the present invention have been herein illustrated and described, it is not intended to limit the invention to such disclosure, but changes and modifications may be made therein and thereto within the scope of the following claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a drying chamber having walls, a roof, a ceiling spaced from said roof to separate said drying chamber into a drying room and a loft, and a fan to circulate drying medium through said drying room in a given direction, and means to control the condition of said drying medium in said loft; the improvement wherein said means to circulate the drying medium comprises at least one axial fan mounted in said loft, said fan having blades mounted for rotation about an axis of revolution, a support ring surrounding the blades of said fan and supporting the fan motor, trunnions transverse to and offset from the axis of revolution of said fan and disposed on a common vertical axis to support said ring for pivotal movement between opposite positions facing respectively in opposite directions whereby in one position said fan effects circulation through said drying chamber in a given direction, and in the opposite position said fan effects circulation of the drying medium through said drying room in the opposite direction, whereby, upon rotation of said fan, the reaction forces of said fan tend to pivot said fan ring on said trunnions, and means to retain the fan in position comprising a stop element operable between operative and inoperative positions, in the inoperative position permitting pivotal movement of said fan ring by said reaction forces, and in the operative position projecting into the path of the fan ring to prevent pivotal movement thereof by said reaction forces and to hold said fan in one of said opposite positions.

2. A drying chamber according to claim **1** wherein said stop constitutes the armature of a solenoid operable when energized to dispose said stop in its inoperative position and operable when de-energized to dispose said stop in its operative position.

3. A drying chamber according to claim **1** wherein said loft is provided with an upstanding partition spanning between said roof and said ceiling, said partition having an opening for said fan ring, said trunnions pivotally mounting said fan ring for pivotal movement in said opening, said fan ring having an outline symmetrical to the vertical axis of said trunnions, and said opening conforming in outline to the outline of said fan support ring.

4. A drying chamber according to claim **3** wherein said opening is elliptical and said fan support ring comprises a circular portion surrounding the fan blades and a crescent-shaped appendage to conform said ring to the elliptical outline of said opening.

5. A drying chamber according to claim **4** wherein the center of said circular portion is offset from the vertical axis of said trunnions.

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