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(54) **Hot-air cell artificial drying plant for wood equipped with mobile lamellar deflector for intercepting internal air flows.**

(57) This invention concerns the improvement of artificial wood drying plants; said improvement involves the use of a deflector screen (9) in the hot air chamber — fitted between the two sets of flues (6,7) for the entry and discharging of air — which can be controlled to provide the best external-internal air circulation.

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ARTIFICIAL WOOD DRYING PLANT WITH HOT AIR CHAMBER FITTED WITH A MOBILE LAMELLAR DEFLECTOR FOR INTERCEPTING INTERNAL AIR FLOWS

This invention concerns the improvement of the so called "hot air chamber" artificial wood drying plants.

The plant is designed to improve the quality of conventional drying plants and to reduce drying times.

Plants of this kind are widely used in the wood industry for drying stacks of wood ; the results achieved with conventional plants are not however satisfactory in terms of quality and drying times are too long.

The purpose of these drying plants is to dry the wood correctly, while maintaining the proper humidity gradient between the ambient conditions and the wood, above all, one which is not too high since this is the only way to prevent hardening, tensions due to excessive humidity differences at various depths from the surface of the wood and, consequently the risk of whole boards collapsing.

A brief description and explanation of the structure and the operating principle of the current drying plants is given ; these are in fact characterized by a wide chamber, which is generally rectangular, having a false ceiling ; along the two opposite sides of this false ceiling there are two radiating batteries that heat the air which is then forced to circulate by a number of axial fans positioned at the center of the space between the roof of the plant and the false ceiling of the hot air chamber.

Generally, two separate sets of flues are installed before and after the above fans, through which hot and very humid air is expelled intermittently, and fresh dry air drawn from outside the plant.

The operating principle of the plant, briefly, is as follows : the wood is dried by forcing air to circulate through the wood stacked in the chamber ; the closed circuit circulation of the air in the plant lasts until the circulating air reaches a specific degree of humidity, corresponding to the humidity equilibrium with respect to the wood (according to the relative humidity and to the air temperature).

Once this degree of humidity has been reached, special reading and guide sensors, with which the plant is fitted, open the gates which close the above flues so that the depression before the fans draws fresh air from the surrounding atmosphere.

As this current of fresh air enters the drying plant, it mixes with the humid air which is still circulating in the plant thereby reducing the humidity of the same proportionally to the capacity of the fresh and dry air which is introduced in the plant when the flues are opened. At the same time, below the fans, a part of this air flow which has already been mixed can escape from the flues pushed by the above axial fans, while the remaining air continues circulating towards the chamber and mixes again with additional fresh air beyond the fans, thereby further reducing the humidity of the air mass which gradually crosses the drying chamber.

These conventional drying plants have not given satisfactory results, above all because it is almost impossible to regulate the humidity of the air mass circulating in the chamber, accurately.

This negative effect, on one hand creates serious problems for obtaining a good quality dried wood, and on the other, requires rather long drying times.

These conventional plants have proved to be especially unsatisfactory and lengthy for drying stacks of wood which are extremely humid.

In this case, the mass of hot air circulating in the chamber absorbs the water which escapes from the wood, reaching very high levels of humidity, to the point that the quantity of fresh air introduced in the dryer when the flues are opened is not sufficient to bring the humidity of the air circulating in the chamber to the ideal level.

The practical reason for which the dry air does not reduce the humidity of the air in the drying chamber, is that when the two sets of flues are open, even though a good part of the fresh air drawn from the outside through the flues before the axial fans does in fact mix with the more humid air inside, it is immediately returned into the atmosphere through the flues immediately beyond the fans.

Since a large part of the dry air is immediately expelled again into the atmosphere, the flow circulating in the chamber, when the flues are open, retains too much humidity.

This is because the flow consists of a mixture of a large amount of humid air in the chamber and a much lower percentage of fresh air from outside the plant.

In other words, with the use of conventional drying plants, the humidity of the internal air is reduced only to a very limited extent, while the exchange of the internal humid air is not sufficient.

The device according to the invention was designed in order to overcome the above problems, and above all in order to construct a plant which provides the degree of humidity actually required for the internal air ; said device, for the first time, permits a complete exchange of the internal humid air with an equivalent mass of dry air from the outside.

The technical feature which has made it possible to obtain this very important achievement is a large deflector screen inside the space between the roof of the plant and the false ceiling of the hot air chamber, at a point between the two series of flues, with the set of axial fans positioned before or after both the above

sets of flues, and no longer at the middle.

Moreover, this deflector screen operates in synchronization with two sets of flues in that, when the flue gates are closed, the screen is open and when the flue gates are open, the screen is closed thereby immediately interrupting the air circulation in the space above the drying chamber.

In other words, when the above screen is closed, it acts as a by-pass between the two sets of flues, thereby forcing the entire mass of incoming air to cross the drying chamber before escaping through the other set of flues.

In fact, thanks to the positioning of the above, when the screen is open and the flues are closed, there is perfect conventional type internal air circulation.

When the flues are open and the screen is closed, the humid air is expelled completely by the mass of dry incoming air which cleans the drying chamber.

As mentioned previously, this effect is due to the fact that when the screen is closed, there is an external-external air circulation in that all the air which enters the plant through the output flues, enters the chamber with no dispersion, pushing the mass of humid air before it, which, because of the deflector screen, can not enter the chamber, but must escape through the exhaust flues, pushed continuously by the mass of fresh air.

The decisive idea in the design of the model according to the invention is the separation of the two sets of flues, when they are both open at the same time.

This feature in fact makes it possible to prevent the mass of dry air which has entered the exhaust flue plant, from escaping into the atmosphere — even if this is mixed with the internal humid air — through the second set of flues. It is easy to appreciate that by leaving the flues open for a sufficient length of time and the screen closed, the cleaning of the drying chamber by the incoming dry air will be complete and efficient, and will also reach those inaccessible areas in which there is no circulation of air.

For major clarity, the description of the invention continues with reference to the enclosed drawing which is intended for illustrative purposes and not in a limiting sense in which figures 1 and 2 show the drying plant according to the invention, cross-sectioned with a transverse vertical plant parallel to the axis of rotation of the internal fans of the plant, during circulation of the internal air and during circulation of the external air respectively, during the exchange.

With reference to the enclosed figure, the plant according to the invention consists of a drying chamber (1) — in which the wood to be dried is stacked — having side walls and a false ceiling (2) along whose two opposite sides there are two radiators (3), used to heat the air which circulates continuously inside a similar plant, in a circular flow created by the action of a set of axial fans having a horizontal axis (4), generally positioned in a space (5) between the false ceiling (2) and the actual roof of the plant.

On the roof of the plant, there are two separate sets of flues (6) and (7) which open into the plant, generally into the above space (5) and which are opened and closed, according to the operating requirements of the drying plant, by two gates (8).

The fans (4) which force the circulation of the air inside the plant, must be positioned either before or after both sets of the flues (6) and (7), while between these, at the middle, inside the above space (5), there is a large mobile screen generally having a lamellar, shutter type structure (9), with directional strips.

When this screen, (9) is open (see Fig. 1), it does not compromise the circulation of the air inside the plant, but when it is closed (see Fig. 2), it blocks the whole transverse section of the space (5) in which it is installed, thereby interrupting the circulation of the air mass inside the plant.

It should be reiterated in this regard, that the operation of the screen (9) is synchronized with that of the flues (6) and (7), in that, when the flues are closed, the screen (9) is open — and consequently does not stop the continuous flow of air in the drying plant — and when the flues are open, it closes, thereby stopping the air flow through the space (5) of the plant.

When this screen (9) closes, it stops the shortest passage of communication between the two sets of flues and forces the air which has entered the plant from the exhaust flues, to follow the long passageway inside the drying chamber, before being expelled through the escape flues.

As previously mentioned, the dry air from the flues which is forced along this long passageway, performs what was previously described as a perfect cleaning action of the drying chamber, thereby removing all the water steam previously formed in the chamber.

Thanks to this action, it is possible to establish the required degree of humidity in the drying plant chamber thereby ensuring a top quality result while reducing the times required for drying, very considerably.

The design according to the invention also includes the possibility of producing a number of special construction structures, which are basically similar; in other words, while respecting the basic structure of the plant, the position of the flues could be modified, in that one set of flues could be on the roof, while the other set of flues could be positioned next to the plant; in the same way, another position could be found for the fans or the deflector screen inside the space, or even the best layout for all these components.

Finally, in order to ensure perfect extraction of the humid air from every part of the chamber, the system according to the invention offers the possibility of reversing the direction of rotation of the air flow.

This is possible in that the rotation direction of the fans (4) can be reversed ; for this purpose, during the cleaning phase, the heating unit (3) just before the exhaust flue, is switched off.

The reason for switching off this radiating component is to avoid unnecessary wasting of energy in heating an air flow which is to be expelled immediately after by the plant.

The radiating unit before the drying chamber, during this cleaning phase, must be kept ON in order to heat the fresh air flow entering the plant.

In this regard, it should be noted that the plant in question, features automatic devices which can reverse the rotation direction of the fans at preset times, and consequently select which of the two radiating units must be switched OFF during the above cleaning phase.

Claims

1. An improved plant for the artificial drying of wood, of the "hot air chamber" type, including a drying chamber (1) consisting of side walls and a false ceiling (2) — along whose two opposite sides there are two radiator units (3) — having a space (5) housing a set of axial fans with horizontal axis (4) ; said space communicates with the outside atmosphere through two separate sets of flues (6) and (7) — which can be opened and closed by gates (8) — installed on the roof of the plant **characterized in that** the fans (4) which are used to force the circulation of the air inside the plant, must be positioned either before or after both sets of the above flues (6) and (7), while in between these flues (6) and (7), inside the space (5), there is a large mobile screen (9) generally consisting of a lamellar structure and which can, when necessary, block the entire transverse section of the space (5) ; the operation of this screen (9) is in fact synchronized with that of the flues (6) and (7) in that, when the flues are closed, the screen (9) is open, and when the flues are open, the screen is closed.

2. An improved plant for the artificial drying of wood, of the "hot air chamber" type, according to the previous claim, characterized in that the fans (4) in the space (5) can reverse their rotation direction ; when these fans (4) are activated during the expulsion phase of the hot and humid air, the heating unit (3) just before the exhaust flue, is automatically switched OFF.

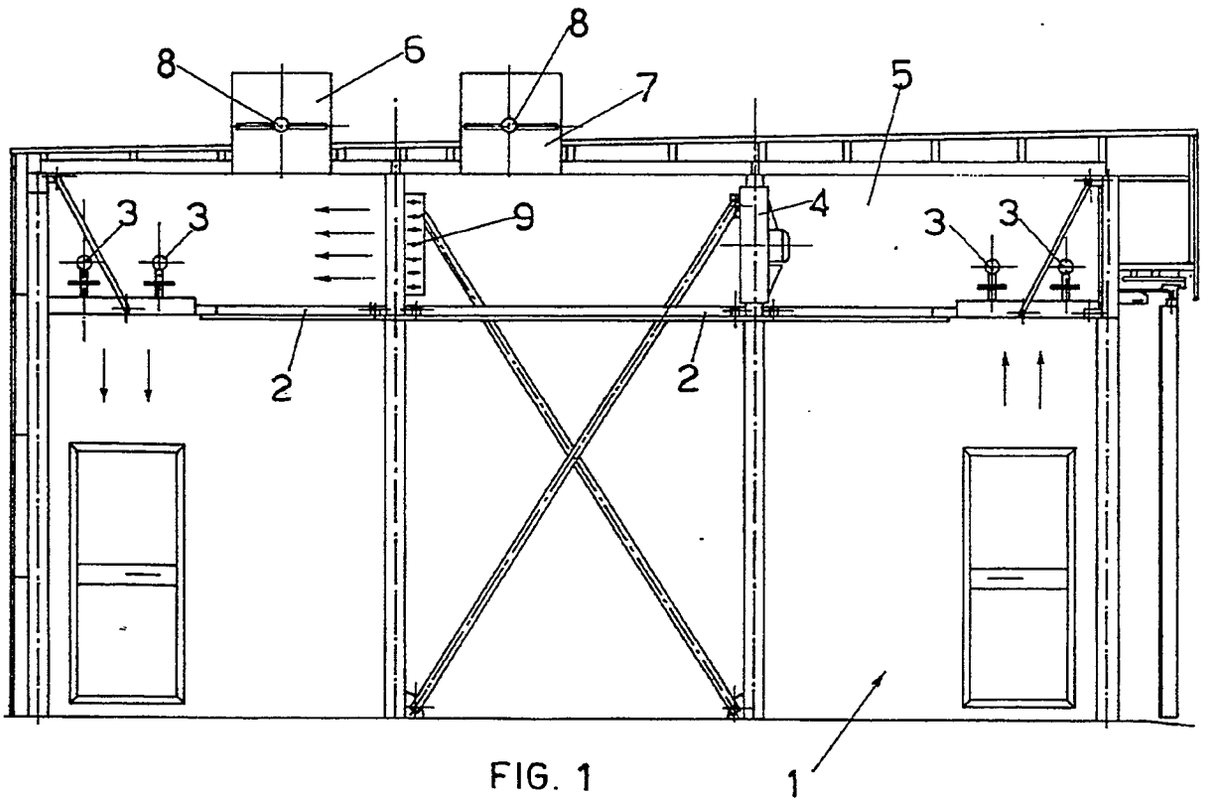

FIG. 1

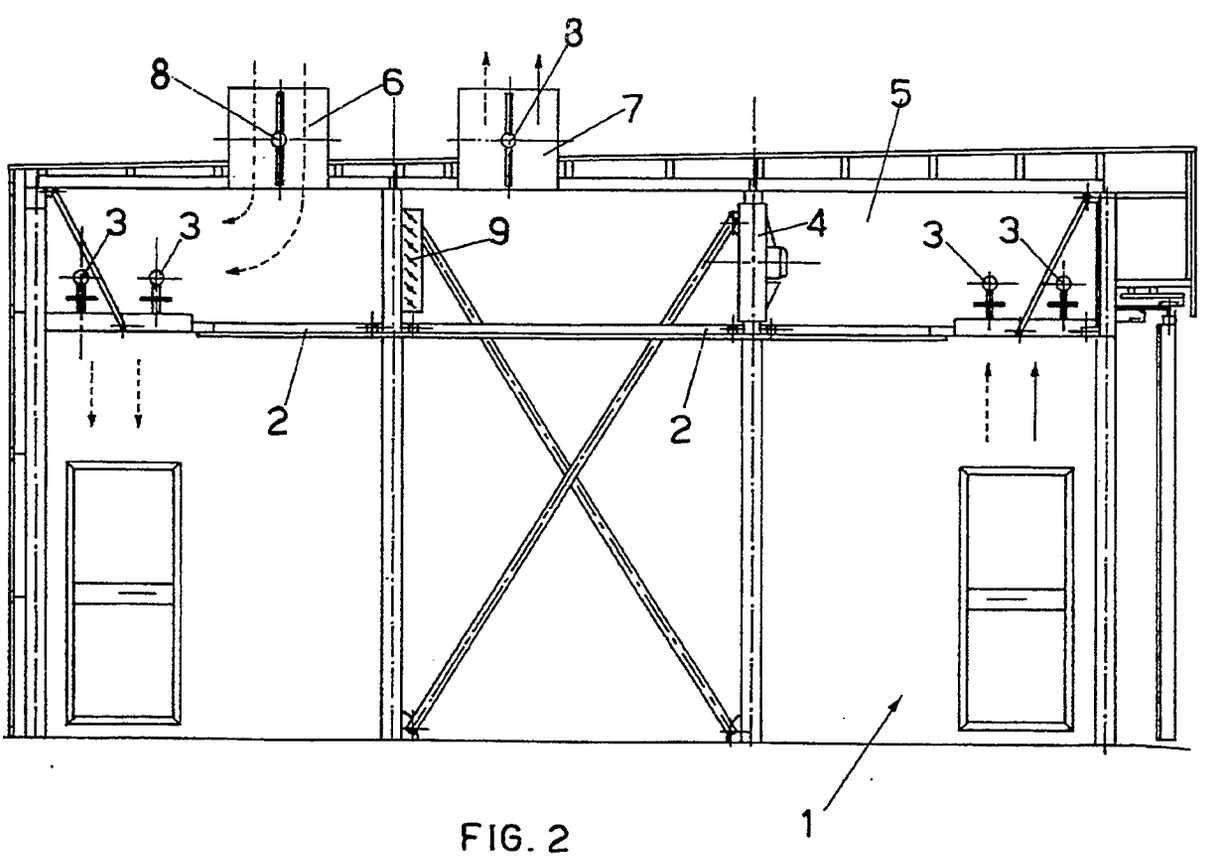

FIG. 2

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EUROPEAN SEARCH REPORT

Application Number

EP 90 83 0559

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	FR-A-1315881 (SALOMON) * the whole document *	1, 2	F26B21/02
Y	FR-A-2408802 (PROFROID S.A.) * the whole document *	1, 2	
A	EP-A-266516 (HERMANN WALDNER GMBH & CO.) * the whole document *	1	
A	EP-A-47353 (COPPA) * the whole document *	1	
A	EP-A-17665 (KELLER OFENBAU GMBH)		
A	US-A-3149932 (BACHRICH)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			F26B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 FEBRUARY 1991	SILVIS H.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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