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⑤④ **METHOD AND PLANT FOR DRYING WOOD PRODUCTS.**

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Description

Background of the invention

For conventional drying of timber, such as boards, planks and the like, in the type of drying houses which are available at saw mills, hot air and/or vapour from a suitable source of energy, for example an oil or solid fuel furnace, is supplied to the interior of the house and, after circulating around the wood products, is evacuated via outlets provided with suction fans and positioned in the roof of the drying house. To make the throughflow of air as intensive as possible, both the outlets and the fans have a large capacity, implying that comparatively large amounts of heated air per unit of time pass through the room. This results in an exceedingly high drying cost per unit of timber volume.

Brief description of the inventive idea

The present invention aims at drastically reducing the cost for drying timber and to this end relates to a method which is characterised in that the wood products are stored in a space which is outwardly substantially sealed by a house or enclosure and in which at least one internal combustion engine, such as a diesel engine, is positioned, to which the required combustion air is supplied in the form of humid air directly from the storage space, and that the exhaust gases from said engine, while being evacuated to the open air outside said enclosure via an exhaust pipe, heat the supply or replacement air which enters said space from the outside via a supply pipe, an amount of replacement air being supplied to the interior of said enclosure via said supply pipe while an equal amount of engine exhaust gases is being evacuated via said exhaust pipe.

In addition to the method, the invention also relates to a plant for drying wood products. The characteristic features of this plant are stated in the appended claims.

CH-A-383,267 discloses a hot blast furnace or drier comprising an oil burner arranged in a combustion chamber from which exhaust gases are discharged to a chimney via pipes and via openings in a circular chamber or channel arranged between inner and outer circular chambers through which the air intended to be heated passes. The air to be heated is supplied to these circular chambers at the drier end where the oil burner is positioned, and is caused to pass through the chambers to the opposite end, while being heated by the exhaust gases both in the actual combustion chamber and the intermediate circular chamber. The outer circular chamber is further connected to and communicates with a slit defined between the chimney and a surrounding pipe jacket. The required supply air is supplied to the combustion

chamber through a special damper. During normal operation, air is supplied to the circular chambers from the space in which the drier is located, via the inlet openings and is conducted through the circular chambers to the outlet, while being successively heated by the hot exhaust gases in the combustion chamber and the intermediate circular chamber, which means that the air which is being heated is kept entirely separated from the exhaust gases with no risk of mixing therewith. The thus heated air which is assumed to be supplied through the drier in considerably larger amounts than the supply air supplied to the combustion chamber via the damper, will however not be dehumidified, but merely be heated. If it is assumed that the drier according to the CH-A-383,267 were located in an outwardly closed space in the same manner as the internal combustion engine according to the present invention, the same well-known effect as in a non-ventilated room in which one tries to dry e.g. clothes would arise; as long as the humid air is not evacuated, the clothes will remain moist, no matter how much the heat in the room is increased.

In contrast to the mode of operation of the drier according to CH-A-383,267, the method according to the present invention is characterised in that, during evacuation of the engine exhaust gases via the exhaust pipe, an equally large amount of air is supplied to the interior of the enclosure via the supply pipe, i.e. all humid outlet air passes the engine in the form of combustion air, and the enclosure in which the internal combustion engine is located, is outwardly closed. In other words, all ventilation takes place via the engine, and the moderate amounts of heat which the engine develops are enough to maintain a sufficient temperature within the enclosure. A crucial fact is that the engine consumes large amounts of air, which in turn means that the air in the enclosure is effectively dehumidified. An additional advantage which in actual practice is most important and which is obtained by using an internal combustion engine, e.g. of the diesel engine type, is that the engine at the same time can drive the necessary fans, which is quite impossible with the oil burner according to CH-A-383,267.

Detailed description of an embodiment of the invention

The enclosed drawing illustrates a schematic perspective view of a plant according to the invention. The plant comprises in per se known manner a house designated 1 in its entirety and having one or more gates 2 through which a suitable amount of stacks 3 of wood products arranged like battens can be moved into and taken out from the interior of the house. When the gates 2 are closed, the walls 4 and the roof 5 of the house form an outwardly substantially sealed

enclosure, to the interior of which air can pass only via a single inlet as described below.

The interior of the house 1, which serves as a drying space, accommodates according to the invention an internal combustion engine which, in practice, suitably is a diesel engine 6. The engine comprises an air inlet 7 which opens directly in the drying space proper. Preferably, the engine is of the type comprising a turbo-compressor which in known manner supplies exceedingly large amounts of combustion air per unit of time to the combustion chamber of the engine. From the engine 6, there extends an exhaust pipe 8 whose outlet opening 9 is located in the open air outside the house 1, conveniently at a great distance from a neighbouring wall 4 of the house. As is evident from the drawing, the engine 6 is considerably spaced apart from the exhaust outlet, which implies a considerable length of the exhaust pipe 8. The exhaust pipe will be particularly long if designed with three parallel loops, as in the drawing. In practice, the pipe can thus have a length of 10-50, preferably 20-30 m.

The supply or replacement air is supplied to the drying space via a supply pipe 10 which is significantly larger than the exhaust pipe 8 and which is, at least partially, concentrically mounted on the outside of the exhaust pipe or parts thereof. In the embodiment illustrated, the supply pipe 10 extends from an inlet opening 11 conveniently flush with the wall through which the exhaust pipe 8 extends to the open air, to an outlet opening 12 which preferably, but not necessarily, is located high up in the drying space.

To circulate in the drying space the air supplied through the pipe 10, there are arranged a plurality of fans 13 which via a transmission, such as a belt transmission 14, are connected to a power take-off in the form of an output shaft 15 of the engine 6.

Function and advantages of the invention

After the stacks 3 of wood products have been moved into the interior of the house and the gates 2 have been closed so as to substantially hermetically seal the associated opening in the wall, the engine 6 is started. Quite soon after the engine has started, the pipe 8 is heated to a high temperature by the hot flue gases or exhaust gases passing through the same from the engine 6 to the outlet opening 9 in the open air. At the same time as the engine exhaust gases are evacuated via the exhaust pipe 8, an equally large amount of air is supplied to the interior of the house via the supply pipe 10, viz. in the form of cold fresh air from the outside. While passing through the slit-shaped circumferential space between the exhaust pipe 8 and the surrounding larger supply pipe 10, the sucked-in supply air is heated so as to have, while passing through the outlet opening 12 into the drying space, a temperature which is considerably higher than room temperature, in practice about 40-50°C. The fans 13

cause the sucked-in air thus heated by the exhaust pipe to circulate in the interior of the house. In the embodiment shown, the circulation is initiated in the area immediately below the roof of the house. During this circulation, the hot air passes between the individual wood products of the stacks 3 and absorbs moisture released by the wood products, simultaneously as the air is being cooled and sinks towards the lower portion of the drying space. The humidified, slightly cooled air is received through the air intake 7 and is used in conventional manner as combustion air to operate the engine 6. In other words, the internal combustion engine 6 will "eat" the humid air which is to be evacuated from the drying space.

Experiments in a test plant have shown that the cost for extensive drying, i.e. drying to moisture contents below 8%, can be reduced to 30-50% of the cost for the corresponding drying by conventional drying methods. Furthermore, these experiments have unexpectedly shown that no cracks occur in the wood products which are dried according to the inventive method.

The method according to the invention may advantageously be used not only for drying sawn wood products, such as boards, planks and the like, but also for drying non-sawn wood products, such as posts, pole, etc.

Claims

1. A method for drying wood products, **characterised** in that said products (3) are stored in a space which is outwardly substantially sealed by a house or enclosure (1) and in which at least one internal combustion engine (6), such as a diesel engine, is positioned, to which the required combustion air is supplied in the form of humid air directly from the storage space, and that the exhaust gases from the said engine, while being evacuated to the open air outside said house via an exhaust pipe (8), heat the supply or replacement air entering said space from the outside via a supply pipe (10), an amount of replacement air being supplied to the interior of said house via said supply pipe 10, while an equal amount of engine exhaust gases is being evacuated via said exhaust pipe (8).

2. A plant for drying wood products, **characterised** in that a wood product storage space which is outwardly substantially sealed or sealable by a house or enclosure (1) accommodates at least one internal combustion engine (6), such as a diesel engine, adapted to receive the required combustion air in the form of humid air directly from the storage space, and that a pipe (8) for evacuating the engine exhaust gases to the open air outside said house is included in a heat exchanger (8, 10) for heating supply or replacement air entering said space from the outside via a supply

pipe (10) which is adapted to supply, during evacuation of the engine exhaust gases via said exhaust pipe (8), an equal amount of replacement air from the outside to the interior of said house.

3. A plant as claimed in claim 2, **characterised** in that said pipe (10) is, at least partially, comparatively large-sized and preferably concentrically mounted on the outside of pipe (8) of a smaller diameter which, during transportation of exhaust gases from said engine (6) to an outlet opening (9) outside said house (1), preheats supply air sucked in through the slit-shaped circumferential space between said pipes (8, 10).

4. A plant as claimed in claim 3, **characterised** in that the outlet opening (12) of said supply pipe (10), which is located inside said drying space, is positioned high up in said space, preferably closely below the roof (5) of said house (1).

5. A plant as claimed in any one of claims 2-4, **characterised** in that a power take-off (15) for said internal combustion engine (6) is connected to a transmission (14) for driving one or more fans (13) for circulating the supply air in said space.

Patentansprüche

1. Verfahren zum Trocknen von Holzprodukten, dadurch **gekennzeichnet**, dass die Produkte (3) in einem Raum gelagert werden, welcher von einem Haus oder einer Umhüllung (1) nach aussen im wesentlichen abgeschlossen ist und in welchem zumindest ein Verbrennungsmotor (6), z.B. ein Dieselmotor, untergebracht ist, dem die erforderliche Verbrennungsluft in Form von feuchter Luft direkt vom Lageraum zugeführt wird, und dass die Abgase vom Motor während der über eine Auspuffleitung (8) erfolgenden Absaugung ins Freie ausserhalb des Hauses die über eine Zuleitung (10) in den genannten Raum von aussen eintretende Zuluft oder Ersatzluft erhitzen, wobei eine Menge Ersatzluft über die Zuleitung (10) dem Inneren des Hauses zugeführt wird, während eine gleich grosse Menge Motorabgase über die Auspuffleitung (8) abgesogen wird.

2. Anlage zum Trocknen von Holzprodukten, dadurch **gekennzeichnet**, dass ein Holzproduktlageraum, der von einem Haus oder einer Umhüllung (1) im wesentlichen abgeschlossen oder abschliessbar ist, zumindest einen Verbrennungsmotor (6), z.B. einen Dieselmotor, enthält, der die erforderliche Verbrennungsluft in Form von feuchter Luft direkt vom Lageraum empfängt, und dass eine Leitung (8) zum Absaugen der Motorabgase ins Freie ausserhalb des Hauses in einem Wärmetauscher (8, 10) enthalten ist, welcher die über eine Zuleitung (10) in den genannten Raum von aussen eintretende Zuluft oder Ersatzluft erhitzt, wobei die Zuleitung während der Absaugung der Motorabgase über die Auspuffleitung (8) eine gleich grosse Menge Ersatzluft von aussen dem Inne-

ren des Hauses zuführt.

3. Anlage nach Anspruch 2, dadurch **gekennzeichnet**, dass die Leitung (10) zumindest teilweise einen verhältnismässig grossen Durchmesser hat und vorzugsweise konzentrisch auf der Leitung (8) mit kleinerem Durchmesser angebracht ist, die, während die Abgase vom Motor einem Auslass (9) ausserhalb des Hauses (1) zugeführt werden, die durch den spaltförmigen, rundumverlaufenden Raum zwischen den Leitungen (8, 10) eingesogene Luft anheizt.

4. Anlage nach Anspruch 3, dadurch **gekennzeichnet**, dass der im Trockenraum untergebrachte Auslass (12) der Zuleitung (10) hoch oben in diesem Raum angebracht ist, vorzugsweise dicht unter dem Dach (5) des Hauses (1).

5. Anlage nach einem der Ansprüche 2-4, dadurch **gekennzeichnet**, dass ein Abtrieb (15) des Verbrennungsmotors (6) an eine Transmission (14) angeschlossen ist, die ein oder mehrere Gebläse (13) zum Umwälzen der Zuluft im genannten Raum treibt.

Revendications

1. Procédé de séchage de produits de bois, caractérisé en ce que les produits de bois (3) sont stockés dans un espace qui est sensiblement isolé de l'extérieur par un bâtiment ou une enceinte (1), et dans lequel est placé au moins un moteur à combustion interne (6), par exemple un moteur diesel, auquel l'air comburant nécessaire est fourni directement en provenance de l'espace de stockage sous la forme d'air humide, et en ce que, pendant qu'ils sont rejetés dans l'air libre à l'extérieur de ladite enceinte par un tuyau d'échappement (8), les gaz d'échappement dudit moteur chauffent l'air d'alimentation ou de remplacement qui entre dans ledit espace, en provenant de l'extérieur, en passant par un tuyau d'alimentation (10), une quantité d'air de remplacement étant envoyée à l'intérieur de ladite enceinte par ledit tuyau d'alimentation (10) pendant qu'une quantité égale de gaz d'échappement du moteur est évacuée par ledit tuyau d'échappement (8).

2. Installation de séchage de produits de bois, caractérisée en ce qu'un espace de stockage de produits de bois qui est sensiblement isolé ou peut être sensiblement isolé de l'extérieur par un bâtiment ou une enceinte (1) renferme au moins un moteur à combustion interne (6), tel qu'un moteur diesel, adapté pour recevoir directement en provenance de l'espace de stockage l'air comburant nécessaire sous la forme d'air humide, et en ce qu'un tuyau (8) servant à évacuer les gaz d'échappement du moteur dans l'air libre situé à l'extérieur dudit bâtiment, est inclus dans un échangeur de chaleur (8, 10) pour chauffer de l'air d'alimentation ou de remplacement qui pénètre dans ledit espace en provenant de l'extérieur à travers un

tuyau d'alimentation (10) qui est adapté pour introduire, pendant l'évacuation des gaz d'échappement du moteur à travers ledit tuyau d'échappement (8), une quantité égale d'air de remplacement de l'extérieur dans le volume intérieur dudit bâtiment. 5

3. Installation selon la revendication 2, caractérisée en ce que ledit tuyau (10) est au moins partiellement de dimension relativement grande et de préférence monté concentriquement sur la surface le tuyau (8) de plus petit diamètre qui, pendant que les gaz d'échappement dudit moteur (6) sont envoyés à une ouverture de sortie (9) située à l'extérieur dudit bâtiment (1), préchauffe l'air d'alimentation qui est aspiré à l'intérieur en passant par l'espace circonférentiel en forme de fente compris entre lesdits tuyaux (8, 10). 10 15

4. Installation selon la revendication 3, caractérisée en ce que l'ouverture de sortie (12) dudit tuyau d'alimentation (10) qui est située à l'intérieur de l'espace de séchage, est placée dans une position haute à l'intérieur dudit espace, de préférence à une petite distance au-dessous du toit (5) dudit bâtiment (1). 20

5. Installation selon une quelconque des revendications 2-4, caractérisée en ce qu'une prise de force motrice (15) dudit moteur à combustion interne (6) est accouplée à une transmission (14) servant à entraîner un ou plusieurs ventilateurs (13) qui servent à faire circuler l'air d'alimentation dans ledit espace. 25 30

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