Dec. 9, 1969 HANS-HEINRICH FICKLER 3,482,510

ARRANGEMENTS IN HOT PRESSES

Filed Dec. 12, 1967

Fig. 1

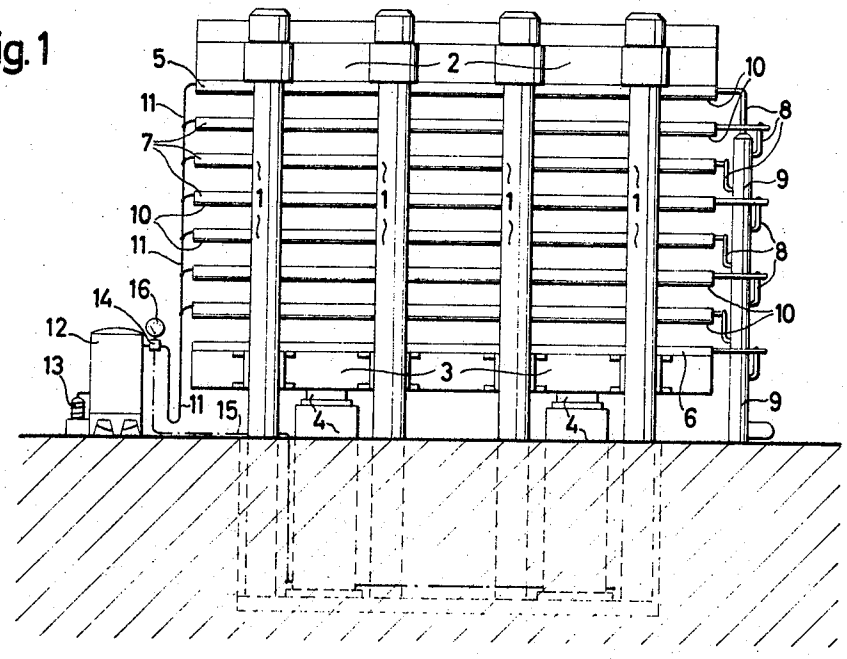


Fig. 2

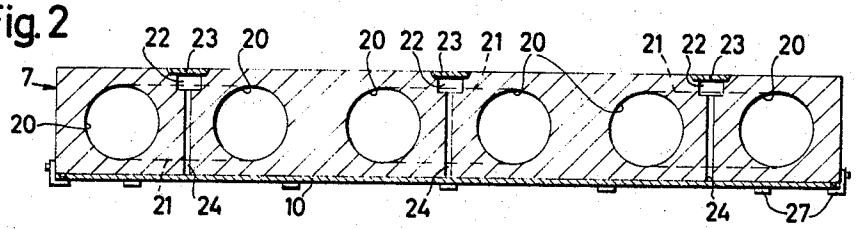


Fig. 3

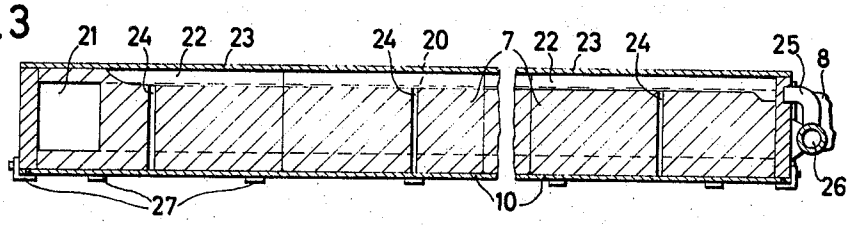
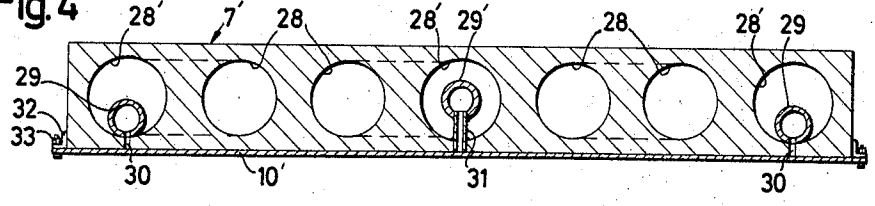


Fig. 4



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ARRANGEMENTS IN HOT PRESSES

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ABSTRACT OF THE DISCLOSURE

A multiple opening hot press having a plurality of vertically spaced heated press plates and a thin, flexible protective plate removably attached to the bottom side of each upper one of each cooperating pair of press plates is provided with passages and holes in each such relatively upper press plate connected to a source of pressurized clean air through flexible conduits and a timing valve supplying said air to the interspace between each protective plate and its related press plate only during short time intervals of each press operation cycle for preventing soot accumulation in said interspaces.

This invention relates to hot presses of the multiple opening type, for use in the manufacture of fibre boards, particle boards, plywood panels and like products.

A multiple opening press of the type here in question is adapted to receive during each operating cycle thereof a plurality of vertically spaced products to be pressed and has, therefore, not only an upper and a lower press plate, at least one of which is movable towards and away from the other, but also a variable number of intermediate press plates arranged to be sandwiched between the products when the press is closed. Commonly, but not necessarily, the upper press plate is attached to the bottom side of a stationary superstructure of the press while the lower press plate is rested and retained on top of a vertically movable press table beneath the superstructure. The intermediate press plates on the other hand are separate and only adapted to cooperate with suitable guiding means and means for restricting their vertical movements in such a manner that all the plates of the press including the upper and lower one will become substantially evenly spaced in vertical direction when the press is open to thereby facilitate the removal of the products already pressed as well as the charging of the press with new products to be pressed.

It is well known to those skilled in the art of manufacturing fibre boards, particle boards, plywood panels and similar articles of organic fibre materials, with or without surface laminations of plastic films, paper and the like, that the rather high temperatures used during the so called molding operation carried out in the hot press and frequently of the order of 300–400° F. are liable to cause a sort of burning or carbonization of certain edge portions of the pressed products exposed between the press plates. The result thereof is the formation of soot and tar particles which will be puffed out when the molding pressure is released due to the fact that a steam pressure is created within the pressed products during the molding operation, this in turn deriving from the moisture contents of the raw material blanks being pressed.

The soot particles and tar mist thus puffed out between the press plates, when the press is being opened, will badly contaminate the air surrounding the press and be borne by the same until depositing mainly within areas where the air is no longer capable of keeping them suspended, such as where the natural currents of the contaminated air are more or less disturbed and caused to change direction. This formation of soot and tar is highly objectionable since it causes troubles from various points of view, but there is obviously no way to avoid it. Therefore, in order to at least limit the inconveniences, it is common practice to provide the hot presses with exhausting devices for the contaminated air, but this does not effectively solve all the problems.

In using hot presses of the kind in question the products or blanks to be pressed are commonly placed on relatively thin transport trays of sheet metal, with or without an intermediate wire cloth. These trays will thus separate each product from the press plate on which it is rested during the molding operation. It is also an established practice to cover the bottom face of each press plate adapted to be positioned on top of a product by means of a relatively thin and flexible protective sheet metal plate which is removably attached so that it can be easily replaced.

The reason for using the said protective sheet metal plates is mainly to provide a smooth and glazy top surface on the pressed product. The heated press plates themselves are usually welded together from a number of smaller cast iron pieces, and although considerable care is taken to plane the upper and lower faces of the assembled plates, they are liable to show some surface irregularities in the form of scratches, voids and similar imperfections. These irregularities would impair the surface of the product by embossing the same but are sufficiently small to be easily bridged over by a protective sheet metal plate of a very moderate thickness e.g. 1/16 to 1/8 of an inch. Such plates, preferably of steel, are available with perfect surfaces at a very reasonable cost.

For obvious reasons the releasable attachment of said protective sheet metal plates can only be effected within their marginal portions and, since the protective plates are relatively weak, they will thus show a tendency to hang down or buckle, when the press is open. On the other hand, when the press is closed, the protective sheet metal plates will be flattened against the bottom face of their related press plates under the molding pressure. These movements of the protective plates are not objectionable per se—they may in certain cases rather facilitate the releasing of the protective plate from the pressed product—but they cause a sort of pumping or breathing action which is very undesirable in the particular environment filled with contaminated air as described hereinbefore.

Thus, when the press is being opened and the soot et cetera, from the pressed products is puffed out, a partial vacuum is also created between the bottom face of each press plate and its related protective sheet metal plate, so that the soot-contaminated air will be sucked in therebetween. This will result in a highly objectionable deposition of soot in the small interspace between the press plate and the protective sheet metal plate, and the soot-layer thus formed will gradually increase in thickness for each press operating cycle. Hence, in view of the fact that the press is also functioning as a thickness sizing means, the thickness of the pressed products will successively decrease in an uncontrollable and unfavorable manner.

The most annoying fact is, however, that the soot layers will not be of even thickness all over the contact area between the press plates and the protective plates, whereby the thickness of the pressed product will not only be reduced but also vary within certain limits causing flamy surface effects on the pressed products. A further inconvenience of the said irregularly patterned soot layer is that it will form a sort of insulation between the heat transferring opposed faces of the hot plates and the protective plates respectively, so that the surface temperature, to which the product to be pressed is subjected, will vary in an unfavorable manner. Also this may cause defects in the product which are almost irreparable so that a considerable percentage of rejection will result.

Therefore it has been necessary to very frequently clean the protective plates as well as the hot plates of the press, which is not only a rather difficult and time-consuming task but also involves the problem of a temporary interruption of the service of the entire press. This is, of course, a considerable economical drawback.

It is an object of this invention to avoid or at least considerably reduce such deposition of soot between each press plate and its related protective sheet metal plate in a hot press of the kind defined, so that the said cleaning work can be substantially neglected.

According to the invention this is basically achieved by supplying under pressure to the space between each press plate and its related protective sheet metal plate a gaseous medium, which may then be any suitable gas or gas mixture, e.g., air, which is purified or otherwise substantially free from soot, dust and other impurities, but which, if desirable, may be enriched by suitable additives in vapourized or atomized form, such as releasing agents, anticorrosives and the like.

It is also an object of the invention to provide means for supplying said gaseous medium to the press only during such intervals of the press operation cycle, when the entrance of contaminated air between each press plate and its related protective sheet metal plate can reasonably be expected, whereby considerable savings can be achieved, particularly when using a rather high gas pressure, which in turn is desirable for efficiency and for simplification of the medium distribution system, particularly within each separate press plate. In fact, the period during each operation cycle of the press at which the supply of gaseous medium is advantageous and desirable is a rather short one starting when the molding pressure is reduced for opening the press but still exceeds about 25–30 pounds per square inch on the products and ending when the press is sufficiently open to leave all the molded products free for removal.

Furthermore the invention is concerned with the provision of improved distributing systems for the said pressurized gaseous medium within each separate press from at least one of the permanently accessible edge portions thereof, as will more clearly appear from the following.

For a more complete understanding of the objects and features of the invention reference will now be had to the accompanying drawing wherein

FIG. 1 is a slightly diagrammatic side elevation of a hot press of the multiple opening type equipped with a system for supplying a gaseous medium under pressure to and through the heated press plates thereof,

FIG. 2 is a cross section of a first form of heatable press plate suitable for use in a hot press as shown in FIG. 1,

FIG. 3 is a shortened longitudinal section of the press plate of FIG. 2, and

FIG. 4 is a cross section of a modified form of heatable press plate capable of replacing the one shown in FIGS. 2 and 3.

A multiple opening hot press embodying the invention may, as far as its general structure and its mode of operation is concerned, by of any suitable known type. Therefore, the press shown in FIG. 1 must only be considered as an example and the detailed construction thereof is, as shall be understood, rather unimportant for the invention. In view of this fact FIG. 1 has been simplified and does not show all the details and equipment needed for operating the press.

The press of FIG. 1 comprises two parallel rows of posts or columns **1** supporting a stationary superstructure **2** between them and serving as guides for a vertically movable lower press table **3** which as illustrated is carried by a number of cooperating jacks **4** of the pressure operated, hydraulic or pneumatic type. Between the two rows of columns **1**, of which the rear one is not visible in FIG. 1, there are also arranged a number of press plates, the uppermost one **5** of which is attached to the bottom of

the superstructure **2**, the lowermost one **6** is attached to and rested on top of the press table **3**, while the intermediate ones **7** are not only laterally guided by the columns **1** but also, in a manner well know per se, arranged to be retained at different, vertically spaced levels when the press is opened, as illustrated, to thereby permit removal of the pressed products and the convenient insertion of new products to be pressed.

The jacks **4** for operating the press table **3** are in a well known manner, not shown, connected to a suitable source of pressure fluidum through a control valve device permitting the press operator to close and open the press at desired intervals. The pressure of this press operating fluidum must, of course, be sufficiently high to produce the necessary molding pressure on the products, which ordinarily exceeds 100 p.s.i.

The press plates **5**, **6**, **7** are heated to a rather high temperature, say 300–400° F., such as by overheated water or steam supplied to them through a system of flexible conduits **8** extending from a vertical distributing duct **9** which in turn is connected to a suitable boiler, not shown. All the heated press plates are preferably substantially similar in size and thickness and are, in fact, relatively thick and rigid. They are further provided with suitable, also well known and preferably adjustable means (not shown) for accurately defining their mutual distance, when the press is closed, so that the products pressed between them obtain a predetermined thickness. Each one of the heated press plates **5** and **7**, respectively, further has a relatively thin and flexible protective sheet metal plate **10** replaceably retained on its botom side, such as by screws or similar fastening means distributed along the edges of the plates, e.g. as has been illustrated in FIGS. 2 to 4.

So far the multiple opening hot press is generally of a conventional type but in accordance with this invention it has been improved by the provision of not only certain distributing passages and holes in most of the heated press plates themselves, as will be more fully described in the following, but also of external additional means for supplying under pressure a gaseous medium substantially free from soot and other objectionable contaminations to the press plates **5** and **7** and more particularly to at least one permanently accessible edge portion of each such plate. In FIG. 1 these latter means are illustrated as comprising flexible conduits or holes **11** connecting each and all of the press plates **5** and **7**, respectively, to a source of pressurized, purified air represented by the pressure air tank **12** and the related compressor **13** which, of course, is provided with a suitable inlet filter (not shown) positively preventing the passage of soot, dust and other objectionable impurities.

The delivery of the clean air under pressure from the tank **12** through the conduits **11** to the press plates **5** and **7** is controlled automatically by means of a valve device **14** operating in response to the fluidum pressure operating the press closing jacks **4**. This has been indicated by the dash-and-dot-line **15**. The valve device **14** is preferably of an adjustable type and may e.g. be set to open the tank outlet when sensing a decrease in the jack fluidum pressure from a higher pressure to that which corresponds to a molding pressure on the products of say 30 pounds per square inch and to then again close said outlet when sensing a zero-value of the jack operating pressure, it being understood that such zero-value is not reached before the press table **3** has returned to its lowermost position and the press is fully opened.

Other settings of the valve device are, however, also feasible, so that the period of time during which the pressurized air is supplied may be shortened or adjusted in the most favorable manner, i.e. so that a minimum quantity of air is required to obtain the desired result. Thus, the main task of the valve device **14** is to time and thereby limit the outflow of air from the tank **12** and this mainly during that period of each press operation cycle when the

press is being opened. Additionally, the valve device **14** may include means for reducing the pressure of the outflowing, purified air e.g. to between 50 and 100 p.s.i. and a manometer **16** may suitably be mounted on the valve device for checking said outflow pressure.

Of course, it is highly important that the purified gaseous medium from the tank **12** can be distributed in the most efficient manner when reaching each press plate **5** and **7**, respectively, to thereby prevent the contaminated surrounding air from entering the space between the bottom face thereof and the related protective sheet metal plate **10**, when the press is being opened. Such distribution is effected by a system of internal passages and holes in each press plate as will now be more closely described with reference to FIGS. 2 to 4 illustrating some preferred forms of such systems. Although in connection with these latter figures only an intermediate press plate will be described, it should be understood that the upper press plate **5** in the press of FIG. 1 may suitably be of identical design.

The press plate **7** shown in FIGS. 2 and 3 has formed therein a plurality of longitudinally extending parallel bores **20** communicating at their respective ends through cross cavities **21** to form a zigzag-path for the overheated water or steam utilized for heating the plate. Between some adjacent pairs of bores **20** and parallel thereto there are cut a number of grooves **22** in the upper face of the press plate and each such groove is covered and sealed by a sheet metal strip **23** welded or brazed in place. The strips **23** are countersunk so that their upper surfaces are flush with the top face of the press plate. From the bottom of each groove **22** a series of spaced, relatively narrow holes **24** extend straight through the thickness of the press plate **7** and open in the bottom face thereof. At the one end of each groove **22** there is provided an inlet connection **25** for the gaseous medium which in FIG. 3 is supposed to be delivered through a transverse piece of tube **26** mounted outside the one end of the press plate, this tube being, of course, connected to the conduit **11** and the tank **12** as shown in FIG. 1.

The closed grooves **22** and the holes **24** can easily be provided also in old press plates and their arrangement is such that the bottom face of the press plate remains substantially unchanged as far as its capability of evenly distributing the heat from the heating medium in the bores **20** to the protective sheet metal plate **10** in contact with its bottom face is concerned. The protective plate **10** is in this case held in place by a plurality of mutually spaced hook-like brackets **27** removably attached to the edge portion of the plate **7**.

Another arrangement, which may advantageously be used in new press plates, is shown in FIG. 4, where the press plate **7'** is provided with longitudinally extending bores **28** and **28'** respectively, for the heating medium, the bores **28'** having a somewhat larger diameter than the bores **28**. In the two outermost bores **28'** separate tubes **29** of a relatively small diameter are inserted in such a manner that they follow the bottom portion of the respective bore. The tubes **29** are brazed in place and holes **30** are bored from the bottom face of the press plate directly into the tubes at suitable intervals.

In the middlemost bore **28'** in FIG. 4 a similar tube **29'** is instead inserted to extend substantially centrally therethrough carried by a series of spaced tubular studs **31** brazed to the tube **29'** and extending through corresponding holes in the bottom portion of the bore. These studs open in the bottom face of the plate **7'** and communicate with the interior of the tube **29'** to let out the gaseous medium therefrom when required. This latter arrangment is a little more complicated than brazing the tube directly to the bottom of the bore but improves the transfer and even distribution of the heat from the heating medium to the bottom face of the plate.

The tubes **29** and **29'**, respectively, communicate at the one end of the press plate with the source of gaseous medium through suitable conduits as before in order to distribute said medium to the interspace between the bottom face of the press plate and the top face of the related protective sheet metal plate **10'**. For holding the latter in place the press plate **7'** has along its edges small brackets **32** to which the protective plate **10'** is detachably secured by bolts or screws **33**.

Although FIG. 4 shows two different ways of mounting the gas distributing tubes within the bores of the press plate, it should be understood that this is for illustrative purposes only and that the one or the other way will ordinarily be resorted to in practice. It should also be pointed out that the number of gas distributing grooves or tubes in each press plate may be varied mainly in dependence on the width of the plate. Thus, in press plates having a width of only 4 to 5 feet a single groove or tube extending substantially in the middle of the plate is mostly quite sufficient.

I claim:

1. In a multiple opening hot press for board and panel products, the combination of: a plurality of relatively thick and rigid, heated press plates adapted to receive between them a plurality of products to be simultaneously pressed; pressure operated means for forcing said press plates together in a manner to reduce their mutual distance to a predetermined minimum for effecting compressing and heating of the products received between them; a relatively thin and flexible protective sheet metal plate cooperating with each upper one of each cooperating pair of said heated press plates for separating the bottom face thereof from the product immediately beneath it; and means for supplying under pressure a gaseous medium substantially free from dust and soot to the interspace between each such protective sheet metal plate and the bottom face of its related press plate, said latter means including a source of said gaseous medium under pressure, a plurality of spaced openings in the bottom face of each press plate cooperating with one of said protective plates, at least one closed passage extending from an edge portion of each such press plate and communicating with said openings therein, flexible conduit means connecting said passage with said source, and automatic valve means for controlling the supply of said gaseous medium from said source to said openings in the respective press plates in a manner to effect such supply only during a short period of each press operation cycle.

2. In a multiple opening hot press for board and panel products, the combination as claimed in claim **1**, wherein said automatic valve means is arranged to operate in response to variations in the pressure forcing said press plates together.

3. In a multiple opening hot press for board and panel products, the combination as claimed in claim **1**, wherein said closed passage within the heated press plate is formed by a groove in the top portion thereof covered by a sheet metal strip and communicating with a series of spaced bores extending from said groove to the bottom face of the press plate for forming said openings.

4. In a multiple opening hot press for board and panel products, the combination as claimed in claim **1**, wherein said closed passage within the heated press plate is formed by a relatively narrow tube extending inside a related, relatively wide bore provided in the press plate for the distribution of heating medium therein, the interior of said tube communicating with a series of holes extending thereinto from the bottom face of the press plate for forming said openings.

5. In a multiple opening hot press for board and panel products, the combination as claimed in claim **4**, wherein said relatively narrow tube is supported substantially in the centre of said related bore by tubular studs communicating with the interior of said tube and extending into said holes forming the outlet openings for the gaseous medium.

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