United States Patent [19]

Pfeiffer

[11] **3,775,033**

[45] **Nov. 27, 1973**

[54] **HEATING PLATEN PRESS**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **425/109,** 425/339, 425/143, 144/281, 425/407

[51] **Int. Cl.** **B30b 7/02,** B29j 5/00

[58] **Field of Search** 425/109, 182, 143, 425/73, 470, 407

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[57] **ABSTRACT**

Heatable single or multilevel platen press for manufacturing wood and fiber composition panels or the like includes a stationary base structure and a displaceable structure, each of the structures being composed of a plurality of individual bridge members and rib members interconnecting the bridge members and forming conjointly therewith a grid extending over the entire width of the press, press platens loosely mounted on the grid at the workpiece-side therof, the rib members having fluid circulation passages therein for equalizing longitudinal thermal stresses, and the bridge members having fluid circulation passages therein for equalizing transverse thermal tensions, the passages of both the rib and the bridge members being connected into at least one close circulatory loop, and at least one pump connected in the circulatory loop for circulating fluid medium therethrough.

8 Claims, 6 Drawing Figures

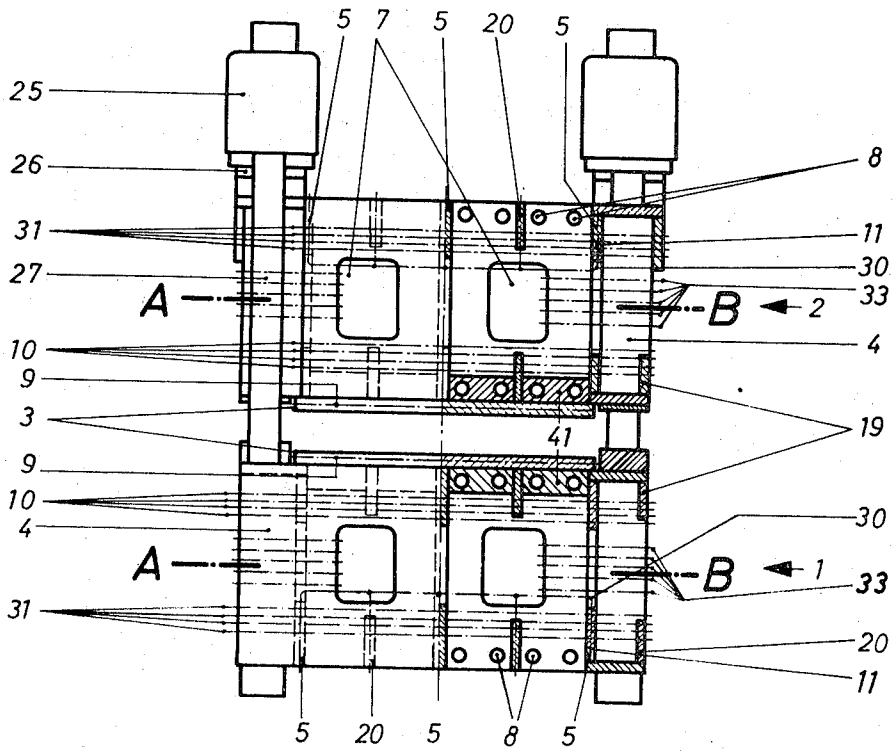


Fig. 1

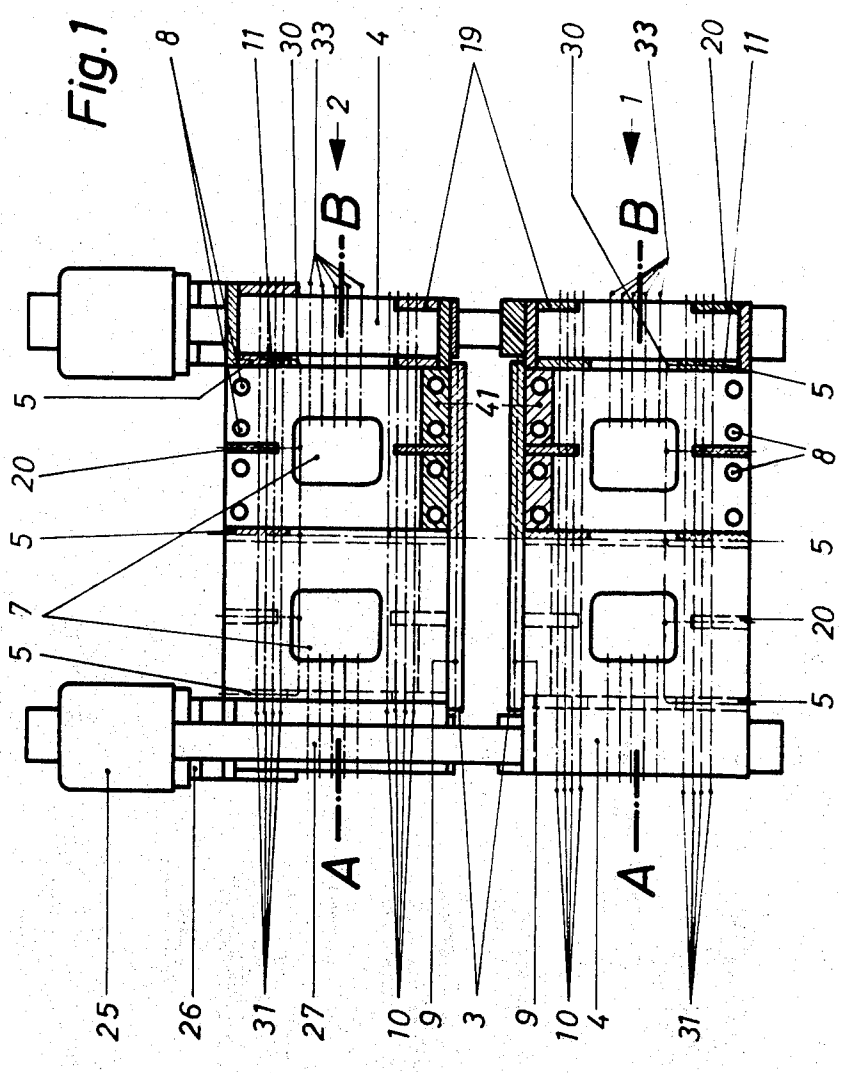

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Fig. 2

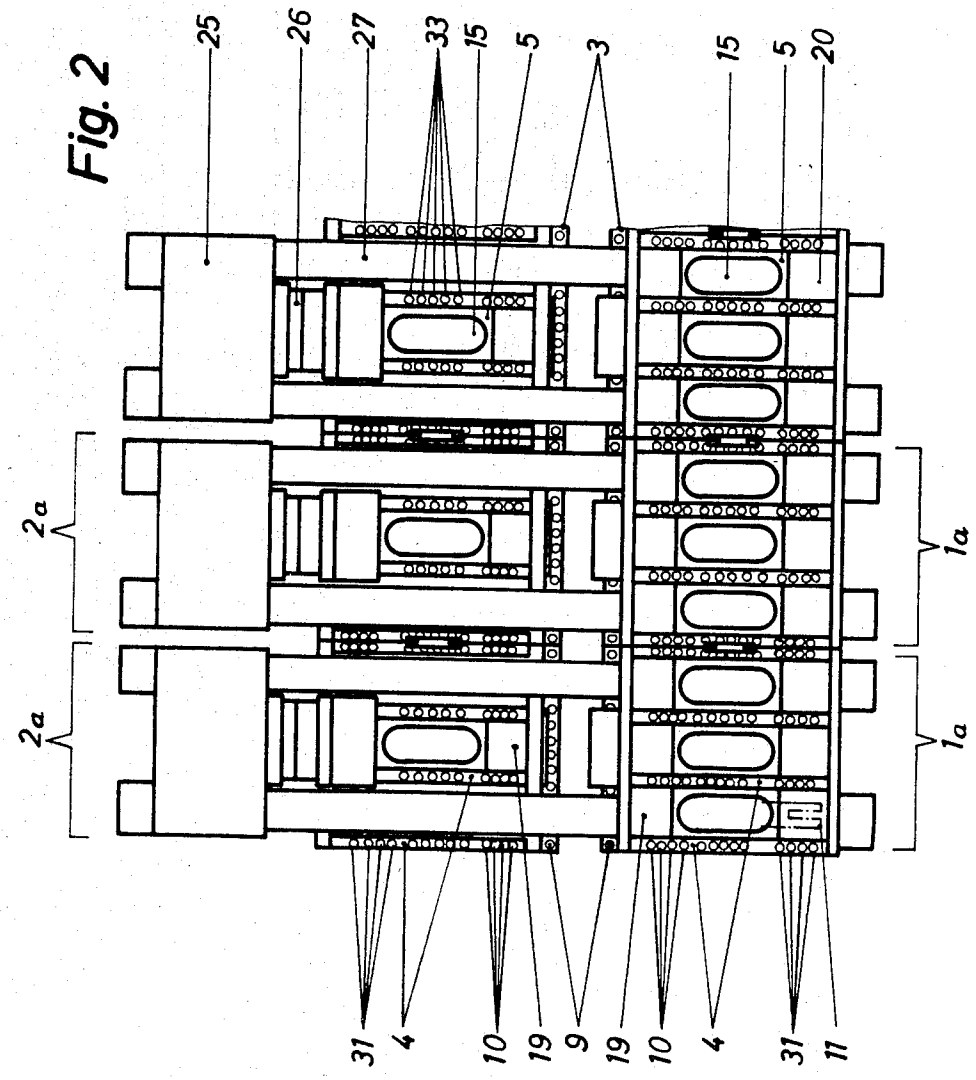


Fig. 3

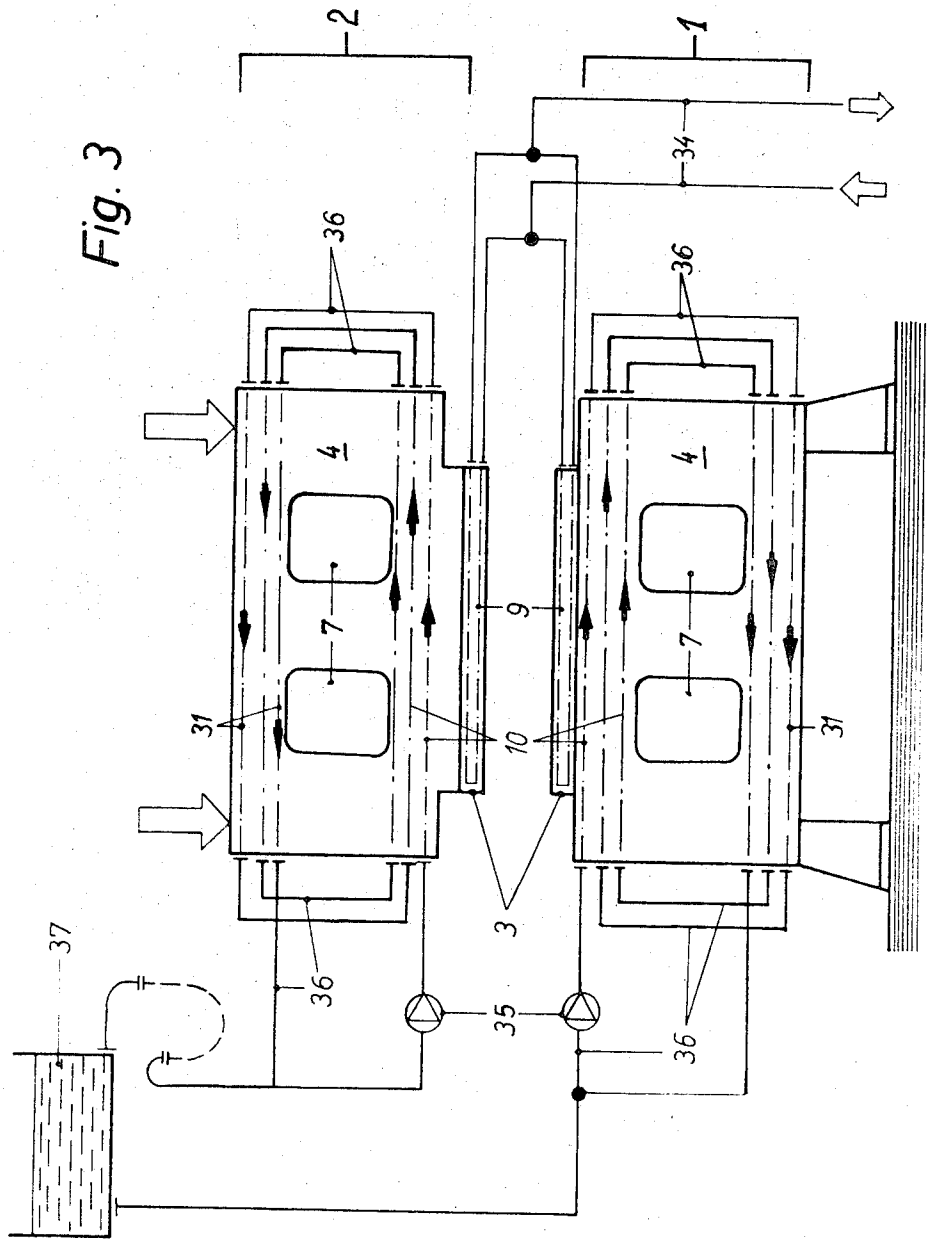


Fig. 4

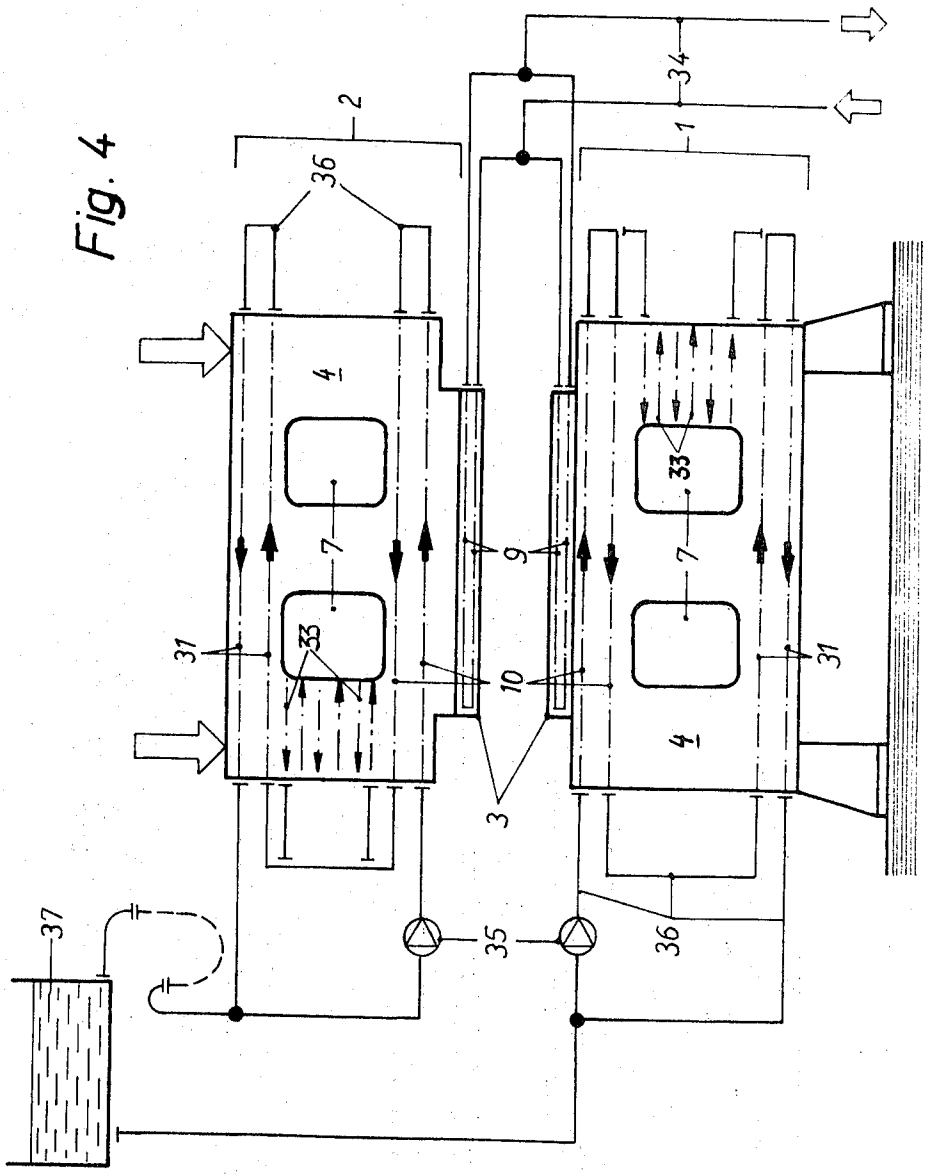


Fig. 5

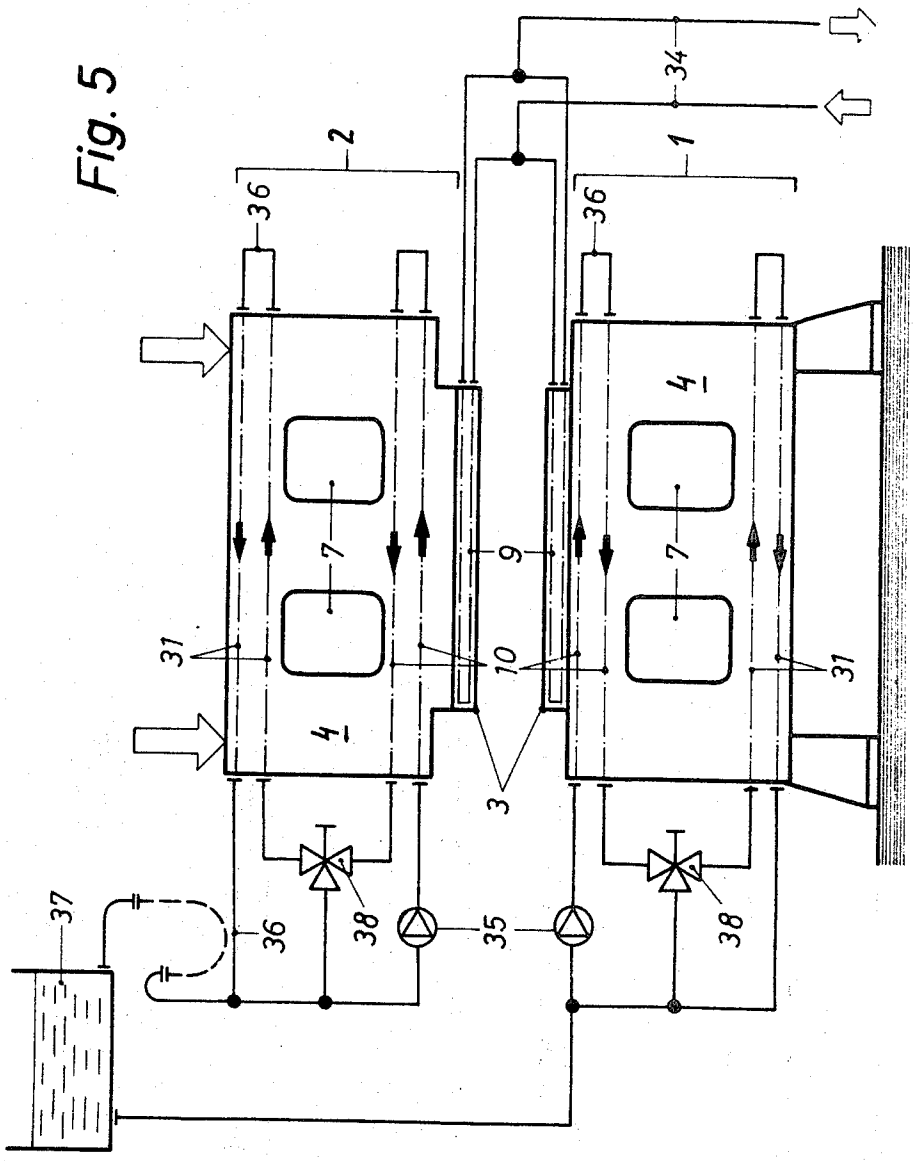
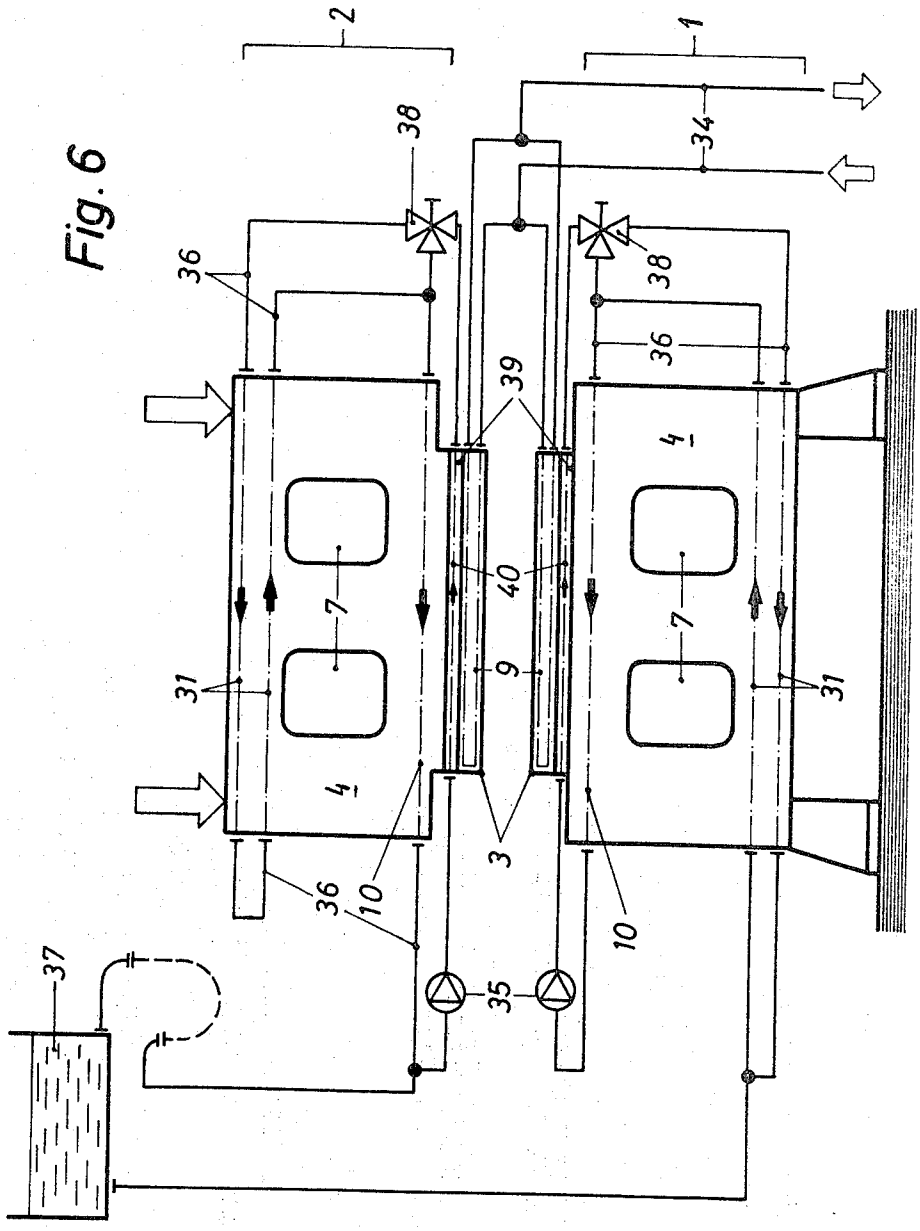


Fig. 6



HEATING PLATEN PRESS

The invention relates to heating platen press and more particularly to heating platen press of the type described in my application Ser. No. 67,412 filed Aug. 27, 1970, now U.S. Pat No. 3,685,932, which is for the manufacture of wood composition panels or the like and may be either of single or multilevel construction.

In my copending application I describe a heating platen press that includes a stationary base structure and a hydraulically displaceable structure, each of the structures being composed of a plurality of individual bridge members and rib members interconnecting the bridge members and forming conjointly therewith a grid extending over the entire width of the press; press platens loosely mounted on the grid at the workpiece-side thereof, the rib members having fluid circulation passages for equalizing longitudinal thermal tensions, and the bridge members having fluid circulation passages for equalizing transverse thermal tensions.

The invention of my afore-mentioned application calls for construction of a heating platen press with controlled heating or cooling thereof by means of several circulatory loops so as to attain thermal equilibrium in the stationary and displaceable press structures, whereby a trouble-free plane-parallel pressure transfer to the material being compressed is assured. The foregoing is also an object of the invention of the instant application.

A further object of my invention is to provide heating platen press wherein the stationary and displaceable press structures, the individual crossbeams, the press platens, the bridge members and the ribs can be subjected to varying thermal effects through varied controllable heating and cooling by means of a plurality of circulatory loops, in order thereby to be able to correct deformations caused by thermal stresses and in order to maintain a compression surface that deviates from a planar surface.

It is an added object of the invention to provide heating platen press which is an improvement over the invention of my aforementioned application by shortening the heating and cooling period of the press platens and of the stationary and displaceable press structures, reducing the heating costs during operation as well as simplifying the heating engineering control of the press structures.

With the foregoing and other objects in view, there is provided in accordance with my invention heatable single or multilevel platen press for manufacturing wood and fiber composition panels or the like comprising a stationary base structure and a displaceable press structure, each of the structures being composed of a plurality of individual bridge members and rib members interconnecting the bridge members and forming conjointly therewith a grid extending over the entire width of the press, press platens loosely mounted on the grid at the workpiece-side thereof, the rib members having fluid circulation passages therein for equalizing longitudinal thermal stresses, and the bridge members having fluid circulation passages therein for equalizing transverse thermal tensions, the passages of both the rib and the bridge members being connected into at least one closed circulatory loop, and at least one pump connected in the circulatory loop for circulating fluid medium therethrough.

An idea underlying the invention is to be able to avoid undesired deformations of the stationary base structure or displaceable press structure due to heat drops, to be able to eliminate the high cost and susceptibility to trouble of several heating or cooling circulatory loops, as well as to be able to dispense with costly outer heat insulations at the stationary base and displaceable press structures. This is attained by inventively directing a channel into the components of the stationary base and displaceable press structures to an internal circulatory loop therein with the intermediate connection of circulating pumps and expansion vessels. The expansion vessels are provided only for maintaining sufficient medium, such as oil or water, in the closed circulatory system.

By means of the invention of the instant application, no additional heat is introduced into the stationary base or displaceable press structure nor is any heat carried off through a coolant circulatory loop.

The principle upon which the invention is based is the distribution of radiation within the stationary and displaceable press structures, which passes into the bridge members and ribs from the heated or cooled press platens, depending upon the particular working process, uniformly or, depending upon the respective press platen characteristics, non-uniformly within the bridge members and ribs so that a result thereof is the formation of a planar or even a concave or convex compression surface.

In accordance with another feature of the invention, accordingly thick insulating layers are interposed between the bridge members and the ribs that are in contact with the press platens for preventing excessive radiation of heat into the stationary and displaceable press structures and thereby adjusting the temperature within the press structures to a contant low or medium value. As the heating of the press platens occurs, the aforementioned heat distribution in the press structures occurs so that after the temperature thereof has reached that of the press platens, the press is then ready for operation.

In accordance with a further feature of the invention and in order to attain equilibrium temperature, the fluid medium is circulated in a sinuous path through one or more circulatory loops within the stationary base and displaceable press structures, the heat distribution beginning by the removal of heat in bores formed in the bridge members and the ribs adjacent the press platens, is then passed through connecting lines repeatedly to other bores formed in the bridge members and the ribs located opposite the first-mentioned bores and successively more distant from the press platens, until the medium discharges from bores located in the vicinity of the neutral axis of the press structures and is conducted to circulating pump.

In accordance with yet another feature of the invention, the medium is circulated in sinuous and series path within the press structures from the bores adjacent the press platens to the bores of the bridge members and ribs located opposite the first-mentioned bores, so that a continuously declining temperature gradient is produced from the parts of the press structures located adjacent the press platens to the parts of the press structures located farther removed therefrom, which imparts a slightly convex bend to the press structures toward the compression surfaces.

In accordance with an additional feature of the invention, three-way mixing valves are connected into the circulatory loop or loops and are adjustable for ef-

fecting a heat distribution in the stationary base and displaceable press structures so as to attain uniform or nonuniform thermal expansion of the bridge members and the ribs.

In accordance with an added feature of the invention, relatively thin congruent heat reducing grids are interposed between the press platens and the respective stationary base and displaceable press structures and provided with transverse and/or longitudinal bores, for the purpose of ensuring the formation of a concave bending of the press structures to the compression surface. Due to the removal from the heat-reducing grids of the heat emanating from the press platens and the preferred distribution thereof in the parts of the stationary base and displaceable press structures located opposite the press platens, a greater thermal expansion occurs in those parts so as to form a concave bend in the press structures.

If negative tolerances within the longitudinal side of the press structures are to be corrected, the possibility exists of supplying the bridge members and/or the ribs unilaterally with more heat.

In accordance with another feature of the invention, the connecting lines for the closed circulatory loops located at different levels of the press structures are in the form of bores located at a marginal surface of the bridge members and extending perpendicularly to the previously mentioned bores of the circulatory loops formed in the bridge members and the ribs.

The advantages deriving from the invention of the instant application are that the heating platen press is ready for operation upon the attainment of the press platen temperature the heat losses are exceptionally small, and costly control devices for several circulatory loops can be dispensed with.

Other features which are considered as characteristic for the invention are set forth in the appended claims.

Although the invention is illustrated and described herein as embodied in heating platen press, it is nevertheless not intended to be limited to the details shown, since various modifications and structural changes may be made therein without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

The construction and method of operation of the invention, however, together with additional objects and advantages thereof will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a side elevational view, partly in section of the heating platen press according to the invention;

FIG. 2 is a front elevational view of FIG. 1;

FIG. 3 is a schematic view corresponding to FIG. 1 of the heating platen press showing the circulatory system for effecting thermal equilibrium in the stationary and displaceable component structures of the press;

FIG. 4 is a schematic view similar to that of FIG. 3 wherein a circulatory system effecting a nonuniform thermal distribution in the component press structures is shown;

FIG. 5 is a schematic view similar to FIG. 3 of another embodiment of the invention which includes the introduction of a three-way mixing valve into the circulatory system; and

FIG. 6 is a schematic view similar to FIG. 3 of yet another embodiment of the invention having a three-way mixing valve and a heat-reduction grid.

Referring now to the drawing and first particularly to FIGS. 1 and 2 thereof, there is shown a heating platen press constructed in accordance with the invention and having as its main parts a stationary press structure 1 and a displaceable press structure 2, the stationary structure being formed of a number of individual crossbeams 1*a*, and the displaceable structure of a number of individual crossbeams 2*a*. The displaceable structure 2 is braced, with the aid of return stroke devices, against the press cylinder piston devices formed of the pressure pistons 26, the tension columns 27 and the press cylinders 25. The individual cross beams 1a and 2a are erected as a relatively high structure having torsional stiffness and capable of coping with thermal expansion, the crossbeams being assembled so that their wide side, i.e. the outer faces of their bridge members 4 define the length of the stationary and displaceable structures 1 and 2 of the heating platen press. Rib members 19 and 20 which are disposed perpendicularly to the bridge members 4, are of bipartite construction in order to attain better division of the thermal flux above and below the neutral plane A– B while the ribs 5 passing through the structures 1 and 2 stabilize the latter in the center and in both longitudinal sides thereof. In the effective compression surface region, the press platens 3 are loosely mounted at the displaceable and stationary press structures 1 and 2. Bores 9 are formed in the press platens 3 and also bores 11 are provided in the rib members 5, 19 and 20, as well as bores 10, 31 and 32 in the bridge members 4.

To equalize thermal expansion during the heating and cooling of the press, and also to effect minimally stressed welding of the individual crossbeams 1*a* and 2*a*, thermal expansion openings 7, 8 and 15 are provided about the neutral plane A–B in the bridge members 4 and the rib members 5, the openings 7 and 15 aiding in the division of the thermal flux above and below the neutral plane A–B.

In accordance with one feasible embodiment that provides for heating and cooling of the stationary and displaceable press structures 1 and 2, in FIGS. 1 and only the bores 11 of the rib members 5 and 20 located opposite the press platens 3 are provided, which are interconnected by connecting lines 30. As required, bores 11 can also be provided in the part of the rib members 5 and the ribs 19 located adjacent the press platens 3, as well as additional bores 33 located between the thermal expansion openings 7 of the bridge members 4.

The bores 9, 10, 11, 31 and 33 of the press platens 3, the bridge members 4 and the ribs 5, 19 and 20, respectively, are connected into several heating and cooling circulatory loops having their own heat sources, so that stationary and displaceable press structures 1 and 2 having parallel faces or faces that are convexly or concavely curved are formed.

The press platens 2 which are relatively thin as compared to the thickness of the stationary and displaceable press structures 1 and 2, act flexibly and can freely expand because they are loosely mounted and can assume the shape of the structures 1 and 2 during the compression operation. Furthermore, the individual bores 10, 11, 31 and 33 of the bridge members and the ribs 5, 19 and 20, respectively, can be discriminately

supplied with heating or cooling media so that the individual bridge members **4** and ribs **5, 19** and **20** mutually assume a varying shape (deformation) and thereby correct the negative (+ or −) tolerances of the material being compressed.

As shown in the schematic views of FIGS. **3** to **6**, this heat engineering effect upon the stationary and displaceable press structures **1** and **2** is provided, in accordance with the invention, by one or more closed circulatory loops. Hereinafter, the function of the heat distribution is explained with respect to a compression operation with heated press platens **3.** It is understood, however, that the function is also analogous for cooled press platens **3.**

In FIG. **3**, there is shown uniform heat distribution into the stationary and displaceable press structures **1** and **2** wherein fluid medium is driven by the circulatory pumps **35** in a meandering or substantially helical path about the neutral plane A–B.

FIG. **3** shows how the medium is advanced by the circulating pumps **35** into the bores **10** and **11** of the bridge members **4** and the ribs **5** and **19** through the connecting lines **36** at the left-hand side of the figure and then back to the circulating pumps **35** through the connecting lines **36** at the right-hand side of the figure and into the bores **31** and **11** formed in the bridge members **4** and the ribs **5** and **20** and located opposite the press platens **3.** Lines from an expansion vessel **37** also communicate with the connecting lines **36.**

The lines **34** indicate the working circulatory system through the bores **9** of the press platens **3.**

In the embodiments of FIGS. **4** and **5**, the bores **10** and **11** adjacent the press platens **3** extend sinuously or in series connection over the connecting lines **36** to the bores **31** and **11** located opposite the press platens **3.** Also, the bores **33** on one or both sides can be connected into the circulatory loop, the bores **33** on only one side being connected into the circulatory system when correction to the left and right-hand sides of the longitudinal center line is necessary.

When three-way mixing valves **38** are installed into the closed circulatory loop, as shown in FIGS. **5** and **6**, the possiblity is afforded of concentrating the heat either in the parts of the respective press structure **1** or **2** located adjacent the press platens **3** or in the parts of the respective press structure **1** or **2** located opposite the press platens **3,** in order to produce a convex or concave bend in the stationary and displaceable press structures **1** and **2** in direction of the press platens **3,** as well as also to maintain a flat compression surface for the press platens **3.** By interposing a heat-reducing grid **39** between the press platens **3** and the stationary and displaceable press structures **1** and **2,** respectively, it is especially possible in an extreme manner to concentrate heat radiating from the press platens **3** into the parts of the press structures **1** and **2** located opposite the press platens **3.** Transverse bores are formed in the heat-reducing grid **39,** which is constructed congruently to the grid of the bridge members **4** and the ribs **5** and **19.** To minimize excessive thermal radiation into the stationary and displaceable press structures **1** and **2,** insulation layers **41,** as shown in FIG. **1,** are interposed between the bridge members **4** and ribs **5** and **19** in close contact with the press platens **3.**

I claim:

1. Single or multilevel heating platen press for manufacturing wood and fiber composition panels or the like comprising a stationary base structure and a displaceable press structure, each of said structures including a plurality of individual bridge members and rib members interconnecting said bridge members and forming conjointly therewith a grid extending over the entire width of the press, press platens loosely mounted on said grid at the workpiece-side thereof, said press platens having fluid circulation passages therein, said passages being connected respectively to at least one heating and cooling circulatory loop, said rib members having fluid circulation passages therein for equalizing longitudinal thermal stresses, and said bridge members having fluid circulation passages therein for equalizing transverse thermal stresses, the passages of both said rib members and said bridge members being connected into at least one closed circulatory loop and at least one pump connected in said circulatory loop for circulating fluid medium therethrough.

2. Heating platen press according to claim **1,** including relatively thick insulating layers interposed between said bridge members and said rib members in contact with said press platens.

3. Heating platen press according to claim **1** wherein each of said structures has a neutral plane, said circulatory loop extending sinuously about said neutral plane, and said fluid circulation passages being made up of bores formed in said bridge members and said rib members, and including connecting lines interconnecting said bores.

4. Heating platen press according to claim **1** wherein said fluid circulation passages are made up of bores formed in said bridge members and said rib members, said bores being interconnected serially and being traversible by the fluid medium in a direction from those bores thereof located adjacent said press platens to the bores thereof located more distant therefrom.

5. Heating platen press according to claim **1,** including at least one three-way mixing valve connected in said closed circulatory loop for controlling the flow of the fluid medium therethrough so as to adjust heat distribution in said structures and consequent thermal expansion of said bridge members and said rib members.

6. Heating platen press according to claim **1,** including congruent relatively thin heat-reducing grids interposed between said press platens, on the one hand, and the respective structures, on the other hand, said heat-reducing grids being formed with a plurality of bores.

7. Heating platen press according to claim **1** wherein said fluid circulation passages of said bridge members are formed of bores extending completely across said bridge members and partial bores extending partly across said bridge members at at least one side thereof, all of said bores being interconnected in said closed circulatory loop.

8. Heating platen press according to claim **3** wherein said connecting lines are formed of vertical bores located at a marginal side of said bridge members.

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