

[54] **PRE-STRESSED PRESS FRAME**
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[58] Field of Search..... 100/214; 72/455;
83/701

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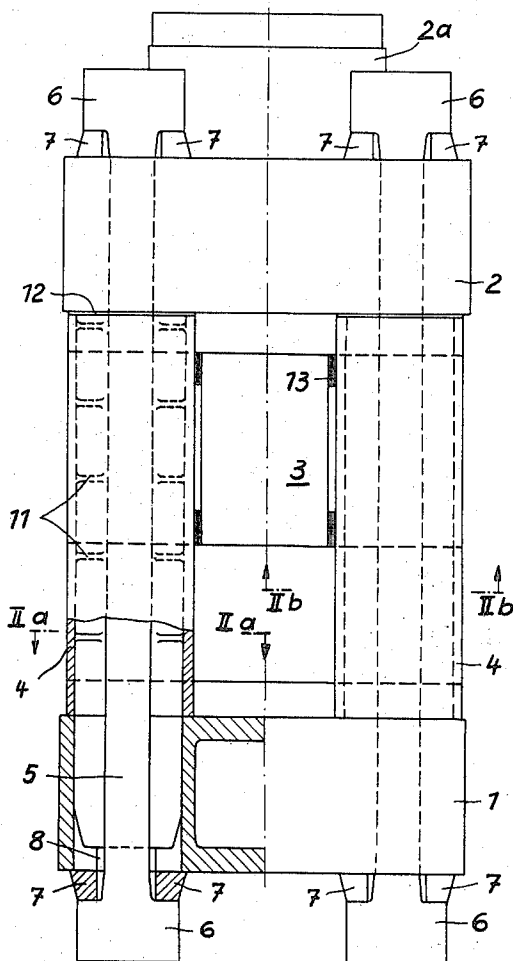
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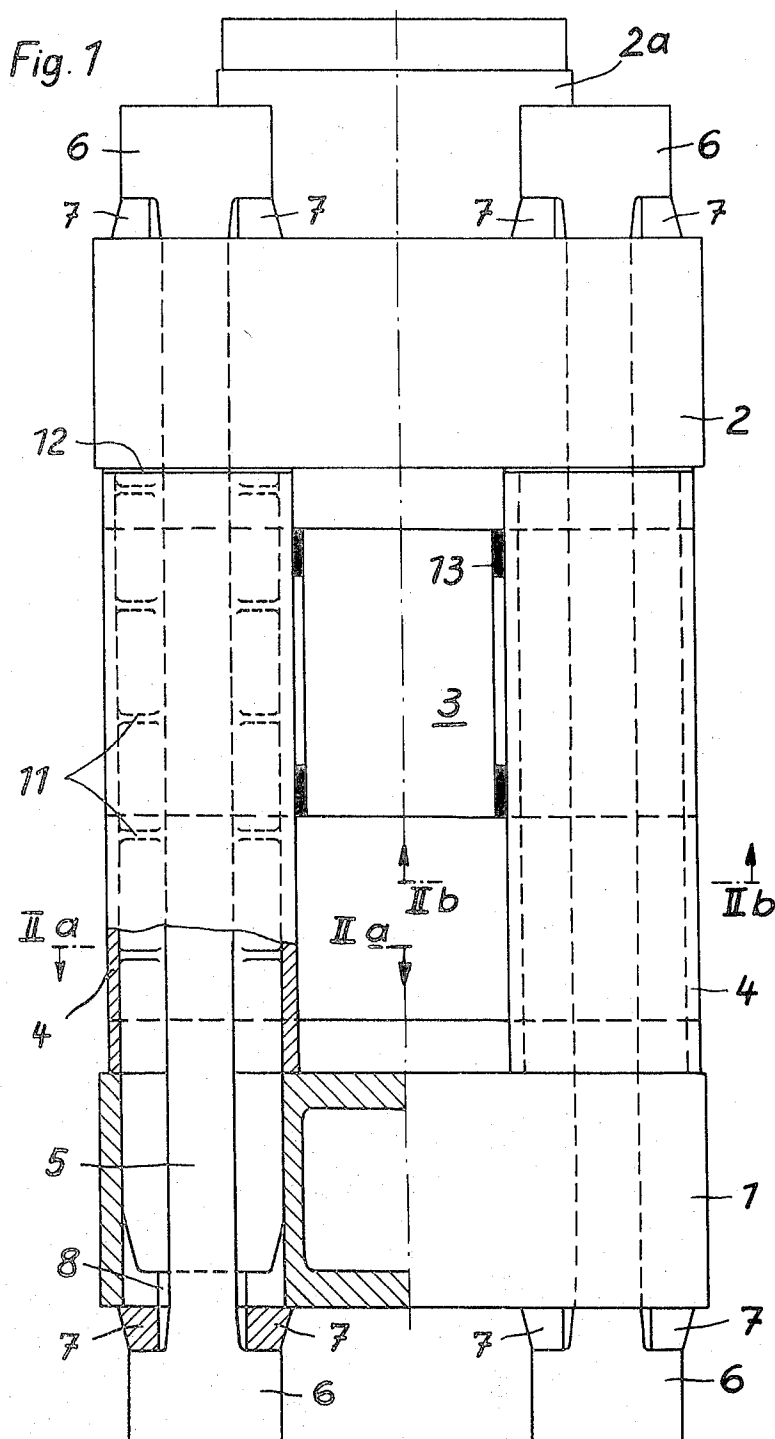
Primary Examiner—Billy J. Wilhite
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[57] **ABSTRACT**

It is known to provide a pre-stressed frame for a hydraulic press in which the frame has two opposed cross-heads with thrust members spacing the cross-heads apart and traction members drawing the cross-heads against the thrust members and thus pre-stressing the frame. There is provided a simpler construction which is easier to manufacture, and which is not so susceptible to notch stresses, by having the traction members in the form of plates.

11 Claims, 8 Drawing Figures





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Fig. 2a

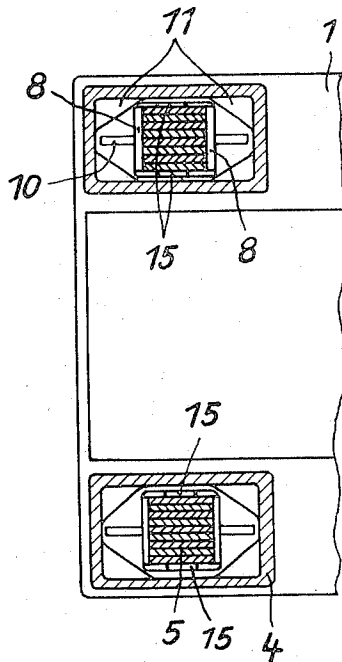


Fig. 2b

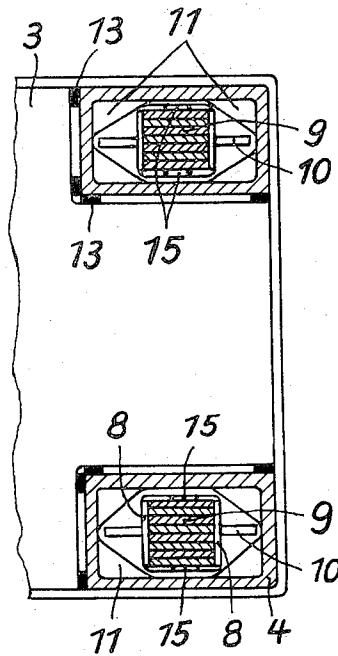


Fig. 3

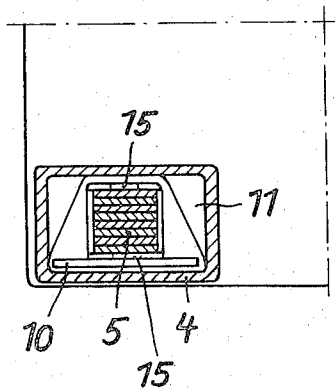
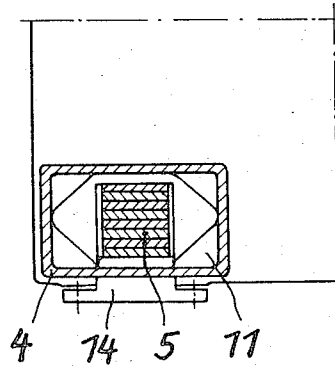


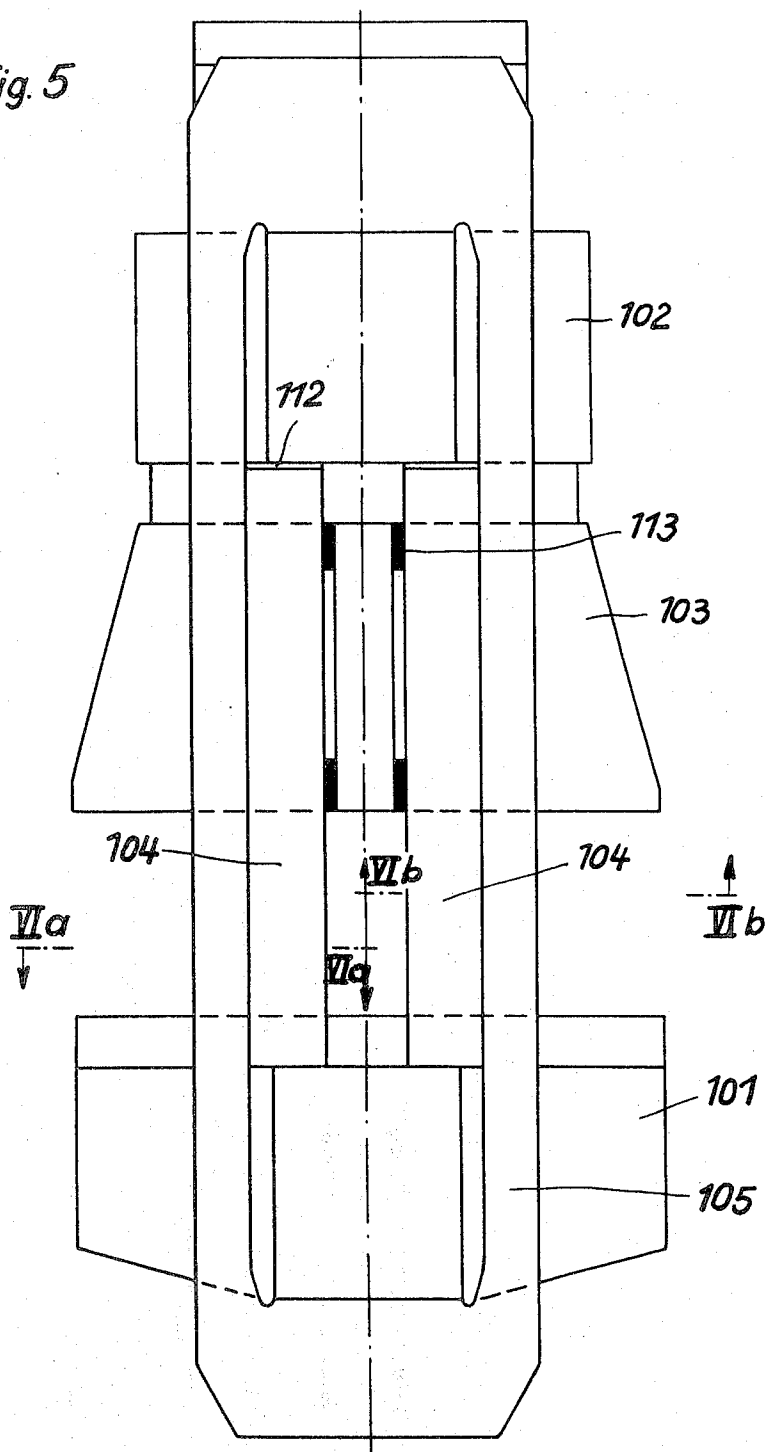
Fig. 4



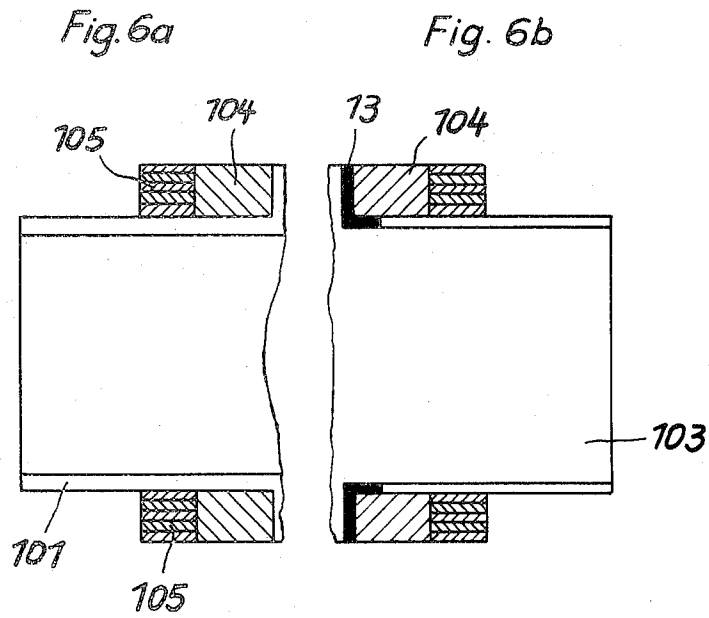
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Fig. 5



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PRE-STRESSED PRESS FRAME

BACKGROUND OF THE INVENTION

The present invention relates to a pre-stressed press frame of the kind including two opposed load-bearing members (normally in the form of cross-heads), thrust members spacing the load-bearing members apart and tensioned traction members interconnecting the load-bearing members and applying thrust to the thrust members. Usually, the arrangement will be such that the thrust members will abut against the sides of the load-bearing members which face the space between the load-bearing members and the traction members will abut against the opposite sides of the load-bearing members. In the pre-stressed press frame, the load-bearing members can be considered to have been shrunk (for instance by stretching the traction members elastically and then releasing them) onto the thrust members, and the press frame can be referred to as being "of shrunk construction." The traction members can be referred to as "shrunk anchors".

PRIOR TECHNIQUES

It is already known to produce the frame of hydraulic presses of shrunk construction, particularly of a shrunk anchor construction. Presses of this construction are very stable and absorb eccentric forces relatively well. The thrust members, which are pretensioned when the press is at rest, suffer a drop in tension as the press force increases. This makes them particularly well suited to absorb eccentric forces, and thus particularly well suited to guide the working ram. The presses are distinguished by only a slight deformation of the press frame. However, the disadvantage has hitherto always been the high cost of such presses.

Generally, the shrunk anchors take the form of round columns which hold together the press frame, the press frame being composed of a number of parts. These round columns are expensive to make since they almost always have to be forged. Moreover, the production of buttress threads at both ends of the columns and of two-part (split) nuts (which are usually steel castings) is also expensive.

A further disadvantage of this design lies in the fact that the threads are highly notch sensitive, so that only a low degree of stress may be permitted in the columns constituting the shrunk anchors. Material costs are therefore relatively high.

In accordance with the invention, the traction members in a press frame of the kind referred to above are in the form of plates.

OBJECTS AND SUMMARY OF THE INVENTION

The invention can produce a hydraulic press frame of shrunk construction which is both simpler and easier to manufacture, in which notch stresses are reduced or as far as possible eliminated and which is simpler and easier to transport.

Although a hydraulic die forging press (German Published Pat. Specification No. 1,226,858) has already been proposed with the press frame closed and composed of bundles of plates, this frame is not braced against any thrust members in a shrunk construction. It is, therefore, substantially more flexible and yielding when subjected to eccentric forces.

In one embodiment of the invention, the thrust members are hollow and the traction members extend longi-

tudinally within the thrust members. In general, each plate forming the traction members may have at least one bi-laterally projecting end portion transmitting force to the respective load-bearing member, the end portions preferably being shaped as hammer heads. In this arrangement, the transition from the shaft of the plate to the end portion may be effected without difficulty in such a manner that when the thrust members are pre-stressed through the cross-heads by means of the hammer heads on the individual plates, the notch stresses set up are slight. Hence, there is a better utilization of material since a higher degree of stress may be permitted in the shafts of the plates.

The load-bearing members can, in general, have openings extending in the direction of pressing, through which openings the traction members extend, and in the embodiment referred to above, the openings are preferably of a size generally equal to the cross-section of a bundle of said plates extending there-through, when not subjected to tensile stress (by which is meant that the openings are only slightly bigger than the cross-section but sufficiently large to enable the plate to be slid therein during assembly), with the openings also having a slot of a size which is at least as large as the cross-sectional dimensions of the bi-laterally-projecting end portion of a plate.

In this manner, single plates may be pushed, with a laterally-projecting end portion leading, in the direction of pressing through the slot in one load-bearing member, through the respective thrust member and through the slot in the other load-bearing member. When both laterally projecting end portions (there will normally be one at each end of the plate) are at the sides of the load-bearing members remote from the space between them (i.e., from the press), the plates are pushed laterally into those parts of the openings which only allow passage to the cross-section of the plate when under tensile stress. The next plate may then be placed in position in the same manner. The slot may be located in the central region of the opening in the load-bearing member. In order to bridge the slot, adapters are preferably provided between the laterally projecting end portions of the plates and the sides of the load-bearing members remote from the space between the load-bearing members. These adapters have the advantage that there is an improvement in the distribution of force from the traction members to the load-bearing members. If, however, the slot is located at one side of the opening, the adapter may be omitted if a spacer member is inserted between the plate last inserted and the walls of the load-bearing members adjacent to the slot, with the spacer member being of a thickness at least equal to that of the plate.

If the slot is located in the central region of the opening, the adapters may be omitted when an even number of plates is used. In this case, a spacer member should be arranged between the plates adjacent to the slot. The spacer member, which has a minimum thickness equal to the thickness of a plate, is arranged adjacent to the respective load-bearing member so as relatively to fix the plates relatively to the opening and the slot.

The hollow thrust members are advantageously of rectangular cross-section, and axially spaced strengthening ribs may be provided internally at the corners of the cross-section. These strengthening ribs have the effect of substantially increasing the rigidity of the hollow members, but there is still sufficient space left between

the ribs for the laterally projecting end portion on the individual plates to be inserted through the slot in the load-bearing member and then through the hollow thrust member.

In a variant, the openings, of a size generally equal to the cross-section of a bundle of said plates extending therethrough, when not subjected to tensile stress, may be recesses provided on the outside of the load-bearing member, with the cover members, such as plates, covering the outsides of the recesses. In this case, there is no need for a slot in the load-bearing member in the shape of the cross-section of the bilaterally projecting end portion.

In another embodiment of the invention, the traction members are formed of plates in the general shape of a chain link providing an aperture therethrough, with the thrust members being arranged in the apertures of the plates and extending parallel to the axis of the press frame. The link-like plates can embrace shoulders on the load-bearing members. In order to ensure that the moving, working ram of a hydraulic press is well guided, it is advisable to provide two thrust members in each of the apertures in the plates.

This invention extends to a hydraulic press incorporating the press frame of the invention.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevation of a press frame for a hydraulic press of shrunk construction, part of which is shown in section;

FIG. 2a is a section along the line IIa — IIa in FIG. 1;

FIG. 2b is a section along the line IIb — IIb in FIG. 1;

FIG. 3 is a section through a traction member and thrust member generally as shown in FIG. 1, but illustrating a modification;

FIG. 4 is a section through a traction member and thrust member generally as shown in FIG. 1, but illustrating another modification;

FIG. 5 is an elevation of another press frame for a hydraulic press of shrunk construction;

FIG. 6a is a section along the line VIa — VIa in FIG. 5; and

FIG. 6b is a section along the line VIb — VIb in FIG. 5.

DETAILED DESCRIPTION OF THE EMBODIMENT

FIG. 1 shows a hydraulic press of shrunk construction in which a frame is constituted by a counter cross-head 1, a cylinder cross-head 2, thrust members in the form of hollow rectangular members 4 and traction members in the form of sheet metal plates constituting shrunk anchors 5; the cylinder cross-head carries a cylinder 2a in which a piston (connected to a working ram 3) is axially slidable. Each end of each plate is shaped as a hammer head 6. Adaptors 7 are provided between the inside of the hammer heads 6 and the outside of the cylinder cross-head 2 and counter cross-head 1. The counter cross-head 1 and the cylinder cross-head 2 have axial openings 8 which are generally equal in size to the cross-section 9 (when not under tension) of the bundle of plates (FIG. 2b), with the sides of the opening adjacent to the short sides of the individual plates

being at least equal in width to the whole bundle of plates while the sides of the opening adjacent to the long sides of the individual plates provide space for at least one suitably dimensioned spacer member 15.

Only at one location (this may be considered alternatively as two opposed locations) within the opening 8 is a widening provided to constitute a slot 10, the size thereof corresponding to the cross-sectional dimensions of the hammer head 6 of a plate (FIGS. 2a and 3). When the slot 10 is located in the central region of the opening 8 within the cross-heads 1 and 2, the adaptors serve mainly to bridge the slot 10 when the portions of the press frame are pre-stressed.

Axially spaced strengthening ribs 11 are provided at the corners within the hollow rectangular members 4 and have the effect of substantially stiffening the hollow members 4, particularly adjacent guides 13. Depending upon the arrangement of the slot 10 in the cross-heads 1, 2, the strengthening ribs 11 may by symmetrical or unsymmetrical in shape (FIGS. 2a and 3).

Shims 12 are provided between the ends of the hollow members 4 and the inside of the cylinder cross-head 2. After the elastic expansion of the bundles of plates constituting the shrunk anchors 5, which is effected by means of a greater force than the operational force of the press, these shims 12 are inserted into the space between the hollow members 4 and the cylinder cross-head 2. Once the force applied to the shrunk anchors 5 is relaxed, the press frame then forms, by means of the traction members, thrust members and cross-heads, a pre-stressed system.

Guide strips 13 are arranged on the hollow members 4 and provide an axial guide for the working ram 3 (FIGS. 1 and 2b).

The cross-heads 1, 2 may also be provided with an axial opening 8 for the cross-section 9 under tension of the shrunk anchors 5, when there is no need to provide a special slot 10 for the passage of the hammer head 6 (FIG. 4). The openings are open towards the outsides of the cross-heads 1, 2 and are only of a size equal to the cross-sections 9 under tension of the bundles of plates of the shrunk anchors 5. In this way, it is possible to insert the individual plates, together with the hollow member 4, from outside into the openings 8. This opening 8 is subsequently closed to the outside by a cover plate 14.

A modified type of shrunk construction for a braced press frame is shown in FIG. 5. Here the press frame is constituted by a counter cross-head 101, a cylinder cross-head 102, thrust members in the form of rectangular columns 104 and traction members constituting a frame, each traction member being a bundle of plates 105, and plate 105 being in the general shape of a chain link. Bundles of the plates 105, on either side of the cylinder, embrace or pass around the shoulders of the cylinder cross-head 102 and of the counter cross-head 101. Between the counter cross-head 101 and cylinder cross-head 102, the rectangular columns 104 are always arranged within the plate frame. Shims 112 are again provided between the columns 104 and the cylinder cross-head 102 and are inserted after the elastic expansion of the plate frame with a greater force than the normal operational force of the press, into the spaces formed by such expansion. A working ram 103 slides along the length of the press on guides 113 arranged on the rectangular columns 104 (FIGS. 5 and 6b).

5

Pre-stressing between the counter cross-head 1 or 101 and the cylinder cross-head 2 or 102 and the thrust members and traction members may also be achieved by heating and temporarily lengthening the traction members, which in this case are the shrunk anchors 5 or the link-like plates 105, and then inserting the shims 12 or 112 as appropriate. As they cool, the traction members shrink and pre-stress the frame.

We claim:

1. A pre-stressed press frame, comprising:
two opposed load-bearing members;
thrust members spacing the load-bearing members apart; and
tensioned traction members interconnecting the load-bearing members and applying thrust to the thrust members, the traction members being in the form of plates, each plate having at least one bilaterally projecting end portion integral with the respective plate, the bilaterally projecting end portion of each plate, defining force-transmitting surfaces at right angles to the longitudinal axis of the respective traction member and force being transmitted to the respective load-bearing member by the direct abutment of the force transmitting surfaces.
2. The press frame as claimed in claim 1, wherein the thrust members are hollow and the traction members extend longitudinally within the thrust members.
3. The press frame as claimed in claim 2 wherein the load-bearing members have openings, extending in the direction of pressing, through which openings the traction members extend, and in which adaptors are provided between the laterally-projecting end portions of the plates and the sides of the load-bearing members remote from the space between the load-bearing members.
4. A press frame as claimed in claim 1, wherein the traction members are formed of plates in the general shape of a chain link providing an aperture there-through, the thrust members being arranged in the apertures of the plates and extending parallel to the axis of the press frame.
5. A press frame as claimed in claim 4, wherein two thrust members are provided in each of the apertures in the plates.
6. A pre-stressed press frame, comprising: two opposed load-bearing members, thrust members spacing the load-bearing members apart, tensioned traction members interconnecting the load-bearing members and applying thrust to the thrust members, the traction members being in the form of plates, the thrust members being hollow and the traction members extending longitudinally within the thrust members, each plate

6

forming the traction members having at least one bilaterally projecting end portion transmitting force to the respective load-bearing member, the load-bearing members having openings, extending in the direction of pressing, through which openings the traction members extend, and a bundle of said plates extending through each said opening and each opening being of a size generally equal to the cross-section of the bundle when not subjected to tensile stress, the openings also having a slot of a size which is at least as large as the cross-sectional dimensions of the bilaterally-projecting end portion of a plate.

7. The press frame as claimed in claim 6, wherein the slot is located in the central region of the opening.

8. The press frame as claimed in claim 6, wherein the slot is located at one side of the opening.

9. The press frame as claimed in claim 6, wherein a spacer member, which has a thickness of at least equal to the thickness of a plate, is arranged adjacent to the respective load-bearing member so as laterally to fix the plates relatively to the opening and to the slot.

10. A pre-stressed press frame, comprising: two opposed load-bearing members, thrust members, spacing the load-bearing members apart, tensioned traction members interconnecting the load-bearing members and applying thrust to the thrust members, the traction members being in the form of plates, the thrust members being hollow and the traction members extending longitudinally within the thrust members, each plate forming the traction members having at least one bilaterally-projecting end portion transmitting force to the respective load-bearing member, the load-bearing members having openings, extending in the direction of pressing, through which openings the tractions members extend, and a bundle of plates extending through each said opening and each opening being of a size generally equal to the cross-section of the bundle, when not subjected to tensile stress, the openings being recesses on the outside of the load-bearing members, and cover members covering the outsides of the recesses.

11. A pre-stressed press frame, comprising: two opposed load-bearing members, thrust members spacing the load-bearing apart, tensioned traction members interconnecting the load-bearing members and applying thrust to the thrust members, the traction members being in the form of plates, the thrust member being hollow and the traction members extending within the thrust members, the thrust members being of rectangular cross-section and axially-spaced strengthening ribs being provided internally at the corners of the cross-section.

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