(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 738 884 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
03.01.2007 Bulletin 2007/01

(51) Int Cl.:
B27F 7/15 *(2006.01)*

(21) Application number: **06253341.9**

(22) Date of filing: **27.06.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **27.06.2005 GB 0513082**

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(54) **Apparatus for making roof trusses and similar structures**

(57) This invention relates to an apparatus for making roof trusses and similar structures. According to the first aspect of the invention there is provided a machine (10) for making trusses and the like comprising a movable bridge (12) carrying a hydraulically activated pressure plate (22), the bridge being movable over a working area (16), the bridge carrying a laser (50) able to act as a laser positioning device. The machine can utilise a number of pedestals, and/or a sensor for determining the position of a timber plank relative to the pressure plate, and/or vertically movable clamping means for the timbers.

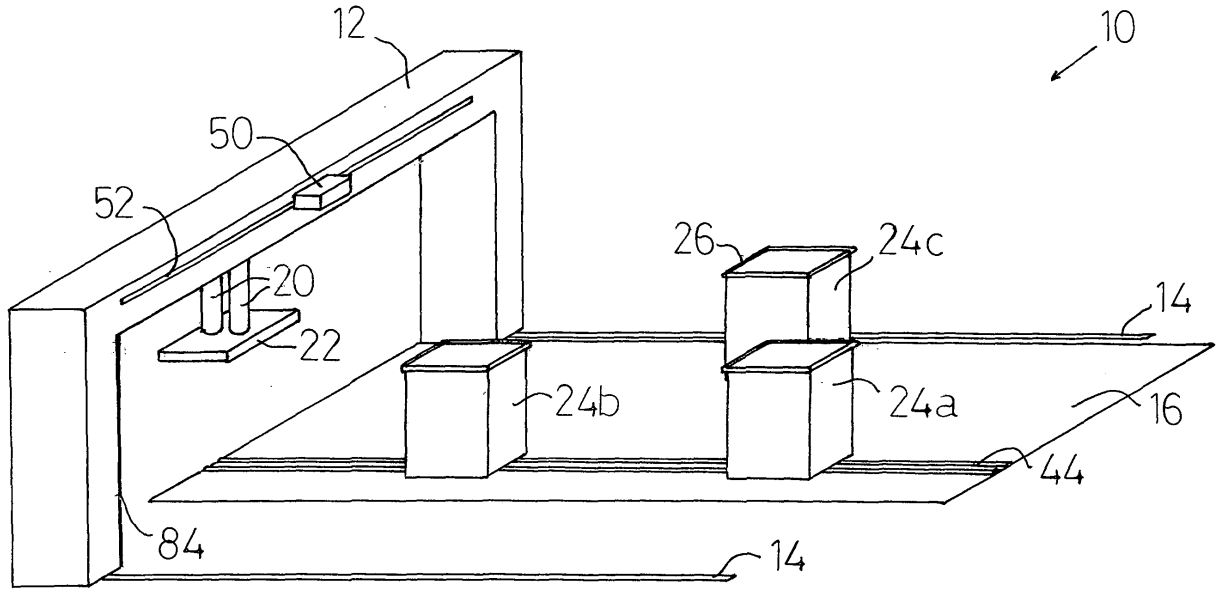

FIG 1

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Description

FIELD OF THE INVENTION

[0001] This invention relates to an apparatus for making roof trusses and similar structures.

BACKGROUND OF THE INVENTION

[0002] Roof trusses are typically constructed from an assembly of timber planks, and serve to support the roof of a building such as a dwelling. The trusses will typically have a generally triangular periphery, the length of each side of the triangle being determined by the dimensions of the roof. Additional intermediate timbers lie within the periphery for providing the support required for the particular design of roof. In some trusses, one or more of the timbers providing the triangular periphery can extend beyond the triangular periphery, for example to provide a "raised tie" truss.

[0003] The timber planks are cut to size as a preliminary manufacturing step, and are subsequently secured together by nail plates which comprise a metal plate from which projects a large number of spikes or nails, the nails being interconnected by the plate. The nails may be integral with the plate and are often pressed out of the plate material. The nail plates are embedded into the timber at both sides of each junction or node between adjacent planks.

[0004] Structures other than trusses can be assembled from timber components held together by nail plates, and some designs of joist can be made in this way for example. Notwithstanding that the invention is suitable for all such structures, the following description will refer almost exclusively to trusses.

[0005] To drive the large number of nails of a nail plate into the timber planks requires significant force, and a hydraulic press is usually used for this purpose.

[0006] During assembly, the timber planks required for the truss are laid together in their required relative positions and a pair of nail plates is laid at each of the junctions between adjacent planks (one on top of the planks and one underneath the planks) and subsequently pressed into both planks so as to secure them together. The completed truss thus comprises a number of planks held together (in their chosen positions) by a number of nail plates.

[0007] An early method and machine for driving the nail plates into the timber planks of a truss was for an operator to hammer the nail plates partially into the timber and then to pass the truss through a roller press which acted like a large mangle to press the nail plates fully into the timber as the truss was passed therethrough. The preliminary hammering step has particular disadvantages, including the loading of only a part of the nail plate at a time leading to possible distortion of the nail plate and nails. Also, the noise generated by the hammering has resulted in this method becoming substantially obsolete in many countries of the World as a result of health and safety legislation.

[0008] The machines presently used for pressing the nail plates into the timber planks fall into two main classes. The first main class comprises "table presses". Such machines utilise a large substantially flat table upon which the timbers are laid out in the form required for the truss, and nail plates are laid at the junctions of the respective timbers. The machine incorporates a bridge which can pass over the table and which carries a hydraulic ram which can be positioned over a junction and drive a pressure plate downwardly towards the table so as to press the nail plates into the planks at that junction.

[0009] The force required to press a pair of nail plates fully into the timber planks can be as high as 50 tonnes for example, and the table must be designed to withstand this force. Specifically, because the position of the nail plates will usually vary between truss designs, the pressure could be applied almost anywhere upon the table so that the whole table must be able to withstand the maximum pressure available.

[0010] Since a table which is both large enough to accommodate a truss and sufficiently strong to withstand a 50 tonne pressing force is very expensive, it is known instead to provide a table with several sets of legs which can be raised and lowered, the legs being lowered under a particular area of the table before pressure is applied to that area. This is not an ideal solution since the legs must be fitted precisely otherwise the table will not be flat and the manufactured trusses will not be flat, and it is known for example for such a table to have areas which are many millimetres out of flat, which distance can cause the nail plates either to be insufficiently embedded or embedded too far, the latter resulting in possible damage to the timbers, and both leading to a joint which may be significantly weaker than specified.

[0011] In addition, a table large enough to accommodate a roof truss will be too large for an operator to reach all of the timbers thereupon, and the operator will need to climb onto the table to arrange the timbers and to locate the nail plates at the junctions. The requirement for the operator to climb up onto, and down from, the table has adverse health and safety implications, and also increases the time required to manufacture the truss, and consequently increases the cost of the truss.

[0012] An alternative design of table press is known which seeks to avoid the above drawbacks. This design uses a series of separate table elements, with gaps therebetween which an operator can walk along to position the timbers and nail plates. These gaps therefore avoid the operator having to climb upon the table. However, it is necessary that make-up elements are provided to bridge the gap between adjacent table elements in the (likely) event that at least one nail plate lies over a gap. The make-up pieces are necessary to support the timber over the gap during pressing in of the particular nail plate, and since the make-up pieces must withstand the force of the press they are necessarily robust and heavy. Po-

sitioning the make-up pieces is therefore arduous work, and this can add significantly to the setting-up time required as part of manufacturing the truss.

[0013] Conventional table presses utilise channels within the table (or table elements) which can locate clamps for securing the timbers. The channels typically run across the table (perpendicular to the direction of movement of the bridge of the press) and so the clamps are universally movable in the direction perpendicular to the direction of movement of the bridge. The channels are typically around 600 mm apart along the length of the table, and so it is not always possible to arrange one or more clamps immediately adjacent to every nail plate as might be required to give full support to the timbers during the pressing operation. Since the clamps are necessarily not universally movable, significant care needs to be taken by the operator to ensure that the clamps are correctly positioned relative to the timbers, and if necessary also to ensure that the truss is suitably positioned for adequate clamping, and this also increases the complexity and time taken to manufacture the truss.

[0014] In some table presses the pressure plate is a beam extending across the bridge so that a pressing force can be applied across a larger area. Such designs can speed up the manufacture of a truss by pressing in the nail plates at two or more junctions simultaneously, but the force which can typically be applied at each nail plate is reduced to around 30 tonnes, so that such machines are not suitable for use in all applications.

[0015] The second main class of machine comprises "pedestal presses", in which a number of pedestals are arranged upon the workshop floor. The area of the workshop floor to be used is covered by a ferrous metal sheet and the pedestals each carry a powerful electromagnet which can be activated to be attracted to the metal sheet so as to retain each pedestal in its chosen position.

[0016] The pedestals have one or more channels therein for locating clamps. The timber planks are laid upon the pedestals in the required arrangement, and are secured thereto by the clamps. The operator can move around and between the pedestals so that access is substantially unhindered, and the pedestals can be positioned as required so that the clamps are substantially universally movable relative to the workshop floor.

[0017] The pressing force to embed the nail plates is provided by a C-shaped hydraulic press, typically suspended from a gantry above the workshop floor. The press is moved to the location of a junction between adjacent planks with one arm of the C-shaped press passing underneath the junction and the other overlying the junction. The nail plates are located upon the pressure plates of the press or upon the timber as desired, and the press activated so as to drive the nail plates into the timbers.

[0018] The C-shaped press can typically generate forces up to around 25 - 30 tonnes, and is necessarily robust and heavy. Notwithstanding that the weight of the C-shaped press can be supported by its mounting upon the gantry, it nevertheless has considerable inertia and momentum so that moving the press around a truss is a time consuming and arduous task.

[0019] Another disadvantage of the pedestal presses is that they are relatively time consuming to set up, i.e. each pedestal has to be appropriately positioned both in relation to the truss being made and to the positioning of the other pedestals (i.e. to ensure that the pedestals can support and secure all of the planks before, during and after the pressing operation without obscuring access to any of the junctions).

[0020] Pedestal presses are therefore particularly suited to larger volume truss manufacture where the pedestals can be left in position for a large number of trusses. However, trusses are increasingly being made in smaller batches with greater variety as house builders in particular seek to build a greater variety of house designs to match customer demand.

[0021] Pedestal presses are also more suitable for trusses using smaller section timbers, such as a traditional "Fink" truss which is typically constructed from timber planks of 38 mm by 100 mm, and weighs a total of around 30-40 kg. A significant proportion of new homes are, however, built with usable attic space, and a "Fink" truss is not suitable for such homes. Instead, an "attic truss" is required, which is typically made of larger-section planks (e.g. 48 mm by 225 mm), and is therefore of considerably greater overall weight (e.g. around 150 kg).

[0022] Also it is known for a roof truss design to be truncated, sometimes known as "stubbing" or "bobtailing".

[0023] Attic trusses and the like, and also trusses made by stubbing or bobtailing, typically require larger nail plates, which in turn require larger pressure plates to ensure that the pressure plates fully cover the nail plates and all of each nail plates is driven in at one time so as to avoid deformation of the nail plate during the pressing operation. Also, larger nail plates generally require a greater force to drive them into the planks, so that a greater capacity press is required. Both of these requirements increase the weight of the C-shaped press and reduce the viability of this method of operation for such trusses. Thus, a typical 25 - 30 tonne C-frame press is not capable of embedding very large nail plates in one operation.

[0024] It will be understood that the setting-up procedure, i.e. positioning the pedestals of a pedestal press, and the positioning of the timber planks and nail plates in both types of machine, takes up a considerable proportion of the total time to manufacture each truss. This is somewhat reduced in large-volume runs where the clamps (and pedestals, as applicable) are left in position for subsequent trusses, but is not avoided since each plank has to be correctly positioned and clamped, and each of the nail plates has to be correctly positioned, for every truss.

[0025] One known method of reducing the time taken in the setting-up procedure is to employ a laser positioning device comprising a laser mounted above the table of a table press. The laser is provided with data from a

CAD computer, and the laser can project an image for each separate design of truss to be manufactured. The laser projects an image onto the table showing the operator where to position the timbers and the nail plates.

[0026] Whilst such laser positioning devices can offer advantages to the operator, they have two main drawbacks. Firstly, the laser is mounted in a fixed position and so the beam of laser light is necessarily directed at an angle to all parts of the table except that immediately beneath the laser, so that parallax errors occur. To reduce the parallax errors the laser must be mounted as high above the table or workshop floor as possible, and so it is usually mounted to the ceiling of the workshop. In practice, however, the laser can rarely be more than 5 metres or so above the table or workshop floor and since the truss may have timbers of greater than 5 metres the parallax error can be significant. Whilst it is not possible to avoid the parallax error totally, it is known to seek to reduce this by using multiple separate lasers above the table, but this of course necessarily increases the cost and complexity of the system.

[0027] A skilled operator can learn to cater for the parallax error, but the assembly of trusses is such an arduous task that an operator will often not remain on the assembly of trusses for long enough to acquire the level of skill required to fully utilise the system. Also, the operators utilised to assemble trusses are often employed on the basis of their strength rather then their intellect and so may be slow in acquiring the level of skill required to fully utilise the laser positioning device. For these reasons, laser positioning devices are not in widespread use, and even in those workshops where they are fitted they are often not utilised.

SUMMARY OF THE INVENTION

[0028] The object of the present invention is to provide a machine for pressing nail plates and the like into timber, in particular for the manufacture of a roof truss, which avoids or reduces the disadvantages of the known table presses and pedestal presses described above.

[0029] According to the first aspect of the invention, there is provided a machine for making trusses and the like comprising a movable bridge carrying a hydraulically activated pressure plate, the bridge being movable over a working area, and a number of pedestals locatable in chosen positions within the working area, the pedestals each having clamping means.

[0030] The invention in this aspect therefore utilises pedestals which avoid the disadvantages of a table press stated above, and also utilises a bridge press which avoids the disadvantages of the C-shaped press described above. The combination of elements proposed therefore provides the advantages of each of the present machines and methods, whilst avoiding or reducing the disadvantages thereof.

[0031] This combination of elements provides the flexibility and universal movability of the pedestals (and the clamps carried thereby) with the greater capacity of a bridge press, allowing the use of pedestals with attic trusses and the like for which the prior art pedestal presses and methods were not always suitable.

[0032] Also, it will be understood that in contrast to the prior art pedestal presses, the pedestals in the present invention will support the junction during pressing in of the nail plates and will act to oppose the pressing force, whereas in prior art pedestal arrangements the pedestals are not sufficiently robust for this purpose, and merely act as timber and nail plate locators.

[0033] Preferably, the pedestals can each provide a location for a nail plate, said nail plate being laid upon the pedestal underneath the timber planks, with another nail plate being laid on top of the timber planks at a particular junction.

[0034] Desirably, the working area is covered by one or more panels containing or comprising a ferrous metal, and each pedestal carries at least one magnet by which the pedestal may be securely located within the working area. Preferably, the magnet(s) are permanent magnets. The use of permanent magnets is preferred over the electromagnets typically used for pedestal presses since the requirement for electrical cabling is avoided, which cabling can present a tripping hazard to the operator, or can become damaged by a less diligent operator.

[0035] If desired, the working area can have at least one track along which one or more pedestals can be guided, the track being preferably provided by two raised convex ribs between which can lie a guide member of the pedestal(s). It is well-recognised that despite the large variety of truss designs, all trusses utilise a ceiling tie comprising the timber plank(s) which will define the ceiling of the finished building. The ceiling tie is typically the longest tie in the truss and is joined to many other planks. Truss manufacturers utilising pedestal presses typically provide linear tracks for the pedestals which will support the ceiling tie since it is known that several pedestals will have to lie along the ceiling tie and providing a track for those pedestals reduces the setting-up time required. However, the track is typically provided by one or more rails which project many centimetres above the workshop floor and present a significant tripping hazard to the operator. Also, if an operator needs to move a pedestal onto or off the track it is often necessary to remove the pedestal from the end of the track since it is not always possible to lift the pedestal over the track.

[0036] According to the second aspect of the invention, there is provided a machine for making trusses and the like comprising a movable bridge carrying a hydraulically activated pressure plate, the bridge being movable over a working area, the bridge carrying a laser usable as a laser positioning device. Preferably, the laser is movable relative to the bridge in a direction substantially parallel to the bridge. Since the bridge is itself movable (in a direction substantially perpendicular to its length) over the working area, the laser can be substantially universally movable relative to the working area. The bridge and

laser can therefore be moved to a chosen position over the work floor to aid in the positioning of {i} the nail plates, and {ii} the timber planks, as well as the pedestals if present. Thus, whilst the invention according to the second aspect is ideally suited to be used in combination with the invention according to the first and other aspects hereof, that is not required and it could be used with conventional table presses if required.

[0037] Notwithstanding that the laser is mounted much lower than the ceiling of the workshop, the fact that it is movable allows the avoidance (or at least a considerable reduction) of parallax errors. Thus, the laser positioning device would typically be utilised by positioning the laser over the approximate centre point of a pedestal (for example) which is to be positioned, and projecting the image of the outline of the pedestal onto the work floor. Even though the laser beam would necessarily be angled whilst projecting the image of the pedestal the parallax error at each side of the pedestal would cancel out since the centre of the pedestal could be correctly (and repeatably) positioned.

[0038] In embodiments of the invention according to the second aspect utilising pedestals, the laser can be used to position the pedestals, which avoids the requirement for any guide tracks upon the floor.

[0039] According to the third aspect of the invention, there is provided a machine for making trusses and the like from a set of timber planks, the machine having a movable bridge carrying a hydraulically activated pressure plate, the bridge being movable over a working area, the machine having a sensor to determine the position of the timber, and in particular the height of the timber below the pressure plate, the sensor communicating with a control means controlling the hydraulically activated pressure plate.

[0040] The sensor may be contactless and rely upon reflected light or sound waves, for example, or can be a probe which is movable into engagement with the timber. The sensor may be mounted upon the bridge, or upon a clamping means for the timber.

[0041] The use of such a sensor can ensure that the nail plates are driven into the timber planks to their chosen depth, so as to reduce the likelihood of split timbers or partially-inserted nail plates. This will ensure that the junction has the specified rigidity and strength.

[0042] Once again, the invention according to the third aspect is ideally suited for use with a machine incorporating also the other aspects of the invention, but could also be used with a conventional table press if desired.

[0043] According to the fourth aspect of the invention, there is provided a machine for making trusses and the like from a set of timber planks, the machine comprising a movable bridge carrying a hydraulically activated pressure plate, the bridge being movable over a working area, and clamping means for the timber planks, the clamping means being vertically movable. This allows the clamping means (and the timber planks clamped thereby) to move vertically during the pressing operation and ensures that a substantially constant clamping force is applied to the planks, which reduces the likelihood of the planks moving relative to one another during the pressing operation.

[0044] The invention according to the fourth aspect is ideally suited for use with a machine incorporating also the other aspects of the invention, but could also be used with a conventional table press if desired.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0045] The invention will now be described in more detail, by way of example, with reference to the accompanying drawings, in which:

Fig.1 shows a perspective, schematic, view of a machine according to certain aspects of the invention;

Fig.2 shows a side sectional view of a pedestal of the machine of Fig.1;

Fig.3 shows a side sectional view of a channel of the pedestal of Fig.2; and

Fig.4 shows a plan view of a pedestal of Fig.2 with three clamps in use at a junction between three planks of a truss.

DETAILED DESCRIPTION

[0046] The machine 10 comprises a bridge 12 which is movable along tracks 14 lying to either side of the working area 16. The precise form of the tracks is not shown. It will be understood that the tracks 14 must prevent the bridge 12 being lifted during the pressing operation.

[0047] The bridge 12 carries a pair of hydraulic rams 20 which are connected to a pressure plate 22. Thus, in this embodiment the bridge carries a pressure plate in the form of a platten, but the precise form of the pressure plate 22 is not critical to the invention. Also, it is of course not necessary that the pressure plate be driven by two hydraulic rams and one, three or more rams could be used if desired. However, two rams has the advantage over the prior art table presses (which typically use a single ram) of allowing greater speed of movement of the pressure plate for a given pressure capacity.

[0048] Several pedestals 24 are located in chosen positions upon the working area 16 (only three pedestals 24 are shown in Fig.1 for simplicity, though a typical truss will require more than three pedestals). Each pedestal 24 has a channel 26 formed around its upper surface, which channel can locate the base of one or more clamps (not shown in Fig.1), by which the timber planks (also not shown in Fig.1) of the truss can be secured in position relative to the pedestal.

[0049] In common with prior art pedestal presses, the working area 16 contains or comprises ferrous metal,

and the pedestals 24 each carry a magnet which is attracted to the work floor sufficiently strongly to securely locate a pedestal 24 upon the working area 16. In this embodiment, each pedestal 24 contains a permanent magnet (or set of permanent magnets), and so does not require electrical cabling or the like as would be required if an electromagnet was used.

[0050] Fig.2 shows a pedestal 24 in more detail. The pedestal 24 is mounted upon rollers 30 which allow the pedestal to be moved in any direction as desired by the operator. Once the pedestal has been moved to its chosen position the magnets 32 (which are mounted upon carriage 34) can be lowered to engage the working area 16. It will be understood that the magnets 32 are designed to provide substantial force, effective to secure the pedestal 24 in its chosen position upon the working area 16.

[0051] It will also be understood that separating the magnets 32 from the working area 16 also requires considerable force, and the pedestal 24 incorporates a jack 36 for this purpose. The jack 36 is connected to the carriage 34 and also to a fixed beam 40. When it is desired to lift the carriage 34 (and hence the magnets 32, the operator can pump the jack 36 by way of the foot plate 42 so as to reduce the separation between the fixed beam 40 and the carriage 34. When the magnets 32 have been lifted clear of the working area 16 the pedestal 24 can be moved around the working area 16 upon its rollers 30 substantially freely, and lowered in its (new) chosen position by reversing the operation of the jack 36, or simply releasing the jack 36 so that the carriage 34 falls under the combined effect of gravity and the attraction of the magnets 32 to the working area 16.

[0052] As also shown in Figs. 1 and 2, in this embodiment the working area 16 has a track 44 running along its length, the track 44 serving to locate and guide roller balls 30 of the pedestals 24. Thus, as above explained, all trusses have a ceiling tie and it is arranged that the truss is assembled with the ceiling tie lying parallel to, and substantially vertically above, the track 44. Since several pedestals 24 will need to be located underneath the ceiling tie to accommodate the many junctions of the ceiling tie, the provision of a track 44 can facilitate the setting-up procedure for the machine 10, as it does with prior art pedestal presses.

[0053] Unlike prior art arrangements in which the track was provided by a rail or the like projecting many centimetres above the workshop floor, the track 44 is provided by two convex ribs 46. The form of the ribs 46 is chosen to minimise the tripping hazard and also to allow the operator to move the pedestal 24 out of or over the track 44 without undue difficulty. The maximum height of the ribs may be around 2 cm, for example.

[0054] Nevertheless, as shown in Fig.2, the separation of the ribs 46 is only just sufficient to accommodate the roller ball 30 of the pedestal 24, so that the ribs locate the roller balls 30 accurately upon the working area. In addition, it will be understood that slight mis-positioning of a ball in the track 44, i.e. with the roller ball(s) raised up on one of the ribs 46, will result in a reduced magnetic attractive force, and the magnetic attraction will act to pull the roller ball 30 down into position between the ribs 46.

[0055] Notwithstanding the possible advantages of a track 44, and the reduction in the tripping hazard of the track disclosed, in embodiments such as that shown which utilise laser-positioning (as described below), a track is not required since the laser can be used to position all of the pedestals. The avoidance of guide tracks will eliminate any tripping hazard altogether.

[0056] The three pedestals 24 shown in Fig.1 could be used to make a truss having a ceiling tie and two apex rafters (the timber planks usually being referred to as "ties" or "rafters" by roof truss manufacturers), with a pedestal 24a and 24b located at the junctions between the ceiling tie and a respective apex rafter, and the pedestal 24c located at the junction of the apex rafters. Alternatively stated the pedestal 24c is located at the apex of the roof truss. However, it will be understood that additional intermediate support ties will typically be provided, with additional pedestals being located under the respective junctions therebetween.

[0057] The bridge 12 carries a laser 50 which can be used as a laser positioning device. The laser is movable longitudinally relative to the working area 16 upon the bridge, i.e. the laser 50 moves longitudinally with the bridge 12. The laser 50 is movable laterally relative to the work floor 16 along a channel 52 of the bridge 12. Accordingly, the laser 50 can be moved to any chosen position above the working area 16.

[0058] In common with prior art laser positioning devices, the laser 50 is connected to a drive means which is computer-controlled, and which can control the laser to project an image onto the working area 16. The image may comprise the outline of a pedestal so that the operator knows where to position each pedestal, or it may comprise the image of a nail plate and/or the planks so that the operator knows where to position these components prior to the nail plates being pressed into the timber. Unlike the prior art machines, however, the laser can be moved above the centre of the component to be positioned, so that the parallax error in projecting the image is virtually eliminated.

[0059] The present machine therefore takes advantage of the fact that the bridge 12 is usually idle during the setting-up procedure, and utilises part of that otherwise idle period to assist in the setting-up.

[0060] The laser positioning device can be connected to a computer as part of a computer-aided-manufacturing facility. Also, the bridge 12 (both when acting as a part of the laser positioning device and when moving to press in the nail plates) can be connected to a computer as part of a computer-aided-manufacturing facility so that the positioning of the pressure plate 22 above the nail plates on the truss is computer-controlled. This helps ensure that the pressure plate 22 is always positioned over the centre of a nail plate, so eliminating eccentric loading

which is a common cause of premature cylinder seal failure in conventional bridge presses.

[0061] In this latter regard, it will be understood by those skilled in the design and manufacture of roof trusses that sophisticated computer programs are nowadays available to assist an architect or designer in designing the roof trusses necessary to withstand the imposed loads on a particular roof design. Thus, when the architect or designer creates a new design of roof the detailed design of each and every truss required therein can be undertaken by computer. However, the use of computers ends with the design process and (with the exception of the often unutilised laser positioning devices as explained above) as far as the inventors are aware there has previously been no computer-aided-manufacturing involved in truss manufacture. The present invention allows a considerable amount of computer-aided-manufacturing for roof trusses and the like, leading to significant reductions in operator involvement and making possible considerable reductions in manufacturing time and cost.

[0062] Fig.2 also shows the channels 26 which can accommodate the clamps for clamping the timbers, one of which channels is shown in more detail in Fig.3. In this preferred embodiment the channels (and therefore the clamps) are vertically movable relative to the body of the pedestal, for the purpose explained below. The channels comprise a generally U-shaped member 54 which lies between an edge 56 of the top surface 60 of the pedestal 24, and a flange 62 securely fixed to the pedestal. The member 54 is mounted by way of spring(s) 64, which permits limited vertical movement of the member 54. The spring(s) 64 are guided by collar 66 and tensioned and adjusted by screw 68.

[0063] Two designs of clamp 70 and 72 which may be fitted to the channels 26 are shown in Fig.4. Both clamps have a base (not seen) which can be located in the channel 26, and specifically within the member 54 thereof. The base has projections which fit below the rails 74 of the member 54, so as to secure the clamps 70,72 to the respective channels 26. To fit a clamp, it is slid along from an open end of the respective channel 26.

[0064] The pedestal 24d shown in Fig.4 is adapted for use with the ceiling tie 76. Because every truss has a ceiling tie such as 76, its position can be fixed in relation to the pedestal 24d and therefore to the working area 16. This pedestal 24d therefore has a guide rail 80 located between respective channels 26, and a fixed clamp 70 mounted in another of the channels 26. After fitment of the two intermediate planks or ties 82, adjustable clamps 72 are fitted to the respective channels 26 and the clamps extended so as to engage the intermediate ties 82 and specifically to clamp them together and to the ceiling tie 76.

[0065] It will be understood that prior to fitment of the ties or planks 76, 82, a first nail plate (not shown) is located beneath the junction between the planks, and that subsequent to fitment of the ties or planks 76, 82, a second nail plate (also not shown) is located on top of the junction in order to connect the planks. The bridge 12 can then be moved to a position in which the pressure plate 22 overlies the junction and the nail plates can thereby be driven into the planks 76, 82.

[0066] The pedestals 24 may carry nail plate locator plates which can be used to enable rapid placement of the nail plates in their correct position. Preferably, the pedestal and/or the locator plates include permanent magnets so that the locator plates can be maintained in their chosen position magnetically, but removed and repositioned when desired.

[0067] It will be understood that when the planks 76, 82 are laid upon the pedestals 24, they are held above the top 60 of the pedestal by the guide 54. In this position, the member 54 is in its extended position as shown in Fig.3, with the clamps 70 and 72 also held above the top 60 of the pedestal 24. As the press is lowered the second nail plate is driven into the top of the planks and the planks are also driven onto the first nail plate. The planks are therefore pressed down relative to the top 60 of the pedestal 24, and the movable members 54 accommodate this movement by allowing the clamps 70, 72 to move with the planks.

[0068] The movable clamps 70, 72 reduce or avoid any slippage between the clamps and the planks during the pressing operation, which slippage may damage the clamps and/or the timber. They also act to maintain the full clamping force upon the planks so reducing or avoiding the tendency of the planks to move apart during the pressing operation.

[0069] The clamps 72 are adjustable and releasable manually, but it would be possible to have automatically actuating clamps if desired, for example pneumatically-operated, electrically operated, or mechanically operated clamps. The use of automatically-actuating clamps could speed up the manufacturing process considerably.

[0070] Though not shown in these drawings, in preferred embodiments of machine there will be incorporated a sensor to determine the amount of travel required for the press. Thus, it is known for the thickness of the timber planks to vary within certain tolerance limits and this variation must be accommodated in order to ensure that the strength and rigidity of the joints in the truss are within specified limits, i.e. it must be ensured that the nail plates are embedded into the planks by the specified distance regardless of the precise thickness of the planks.

[0071] In one embodiment the sensor is mounted upon the bridge. The sensor may be contactless and for example rely upon reflecting a light or sound signal off the plank. Alternatively, the sensor may be a probe carried by the bridge and lowered with the pressure plate into contact with the plank. In another embodiment the sensor is mounted upon the pedestal or upon one or the clamps.

[0072] It will be understood that in some designs of truss, and in particular a "raised tie" truss, one of the apex rafters extends well beyond the ceiling tie. To facilitate

such trusses, the track 14 for the bridge support 84 is separated from the track 44 by a distance of at least one metre, which ensures that the bridge support 84 does not foul a projecting apex rafter.

[0073] During the manufacture of other trusses, however, this large gap is not required, but can nevertheless be utilised if desired. Thus, the gap between the bridge support 84 and the pedestals 24a and 24b can suitably be utilised by a conveyor delivering the timber planks to the operator, the timber planks having been cut to length at another manufacturing location and the conveyor delivering the planks underneath the bridge but yet at a convenient height for the operator.

[0074] Also, if it is arranged that the pressure plate 22 can be moved to overlie the gap, then the gap can be utilised to manufacture other items such as metal web joists or floor beams which are of considerable length but small width, the timber planks and nail plates of the joists being laid upon pedestals lying within the gap.

[0075] To accommodate the vast majority of "raised tie" trusses, the gap between the bridge support 84 and the pedestals 24a and 24b is ideally around 1.2 m.

[0076] In addition, the use of computer-aided manufacture allows certain additional controls to be easily implemented, such as truss identification for example. Thus, a printer can print out a label identifying the truss as this is being manufactured, the label perhaps identifying the date and place of manufacture and other information which might be useful in the event of failure of the truss in service, or for the meeting of certain product liability requirements. In this regard, the European regulation enforceable in the U.K. as BS/EN 14250 requires each truss to be identifiable and therefore traceable.

[0077] It will be understood that the invention does not place a limit on the longitudinal length of the working area 16, i.e. in the direction of movement of the bridge 12. Accordingly, the working area could be made long enough to accommodate two (or more) trusses side by side, one being set up whilst another is being pressed for example, the use of one bridge increasing the utilisation and therefore productivity of the manufacturing facility.

Claims

1. A machine (10) for making trusses and the like comprising a movable bridge (12) carrying a hydraulically activated pressure plate (22), the bridge being movable over a working area (16), the bridge carrying a laser (50) able to act as a laser positioning device.

2. The machine according to Claim 1 in which the laser is movable relative to the bridge in a direction substantially parallel to the bridge.

3. The machine according to Claim 1 or Claim 2 in which the laser is connected to a computer as part of a computer-aided-manufacturing facility.

4. The machine according to any one of Claims 1-3 including a number of pedestals (24) locatable in chosen positions within the working area, the pedestals each having clamping means (70, 72).

5. The machine according to Claim 4 in which the pedestals (24) each have means to locate a nail plate.

6. The machine according to Claim 4 or Claim 5 in which the working area includes or comprises ferrous metal, and in which each pedestal carries at least one permanent magnet (32) by which the pedestal (24) may be securely located within the working area (16).

7. The machine according to any one of Claims 4-6 in which the working area (16) has at least one track (44) along which one or more pedestals (24) can be guided.

8. The machine according to Claim 7 in which the track (44) is provided by two raised convex ribs (46) between which can lie a part (30) of the pedestal (24).

9. The machine according to any one of Claims 1-8 having a sensor to determine the position of a timber of the truss or the like, the sensor communicating with a control means controlling the hydraulically activated pressure plate (22).

10. The machine according to any one of Claims 1-9 in which the clamping means is movable vertically in use.

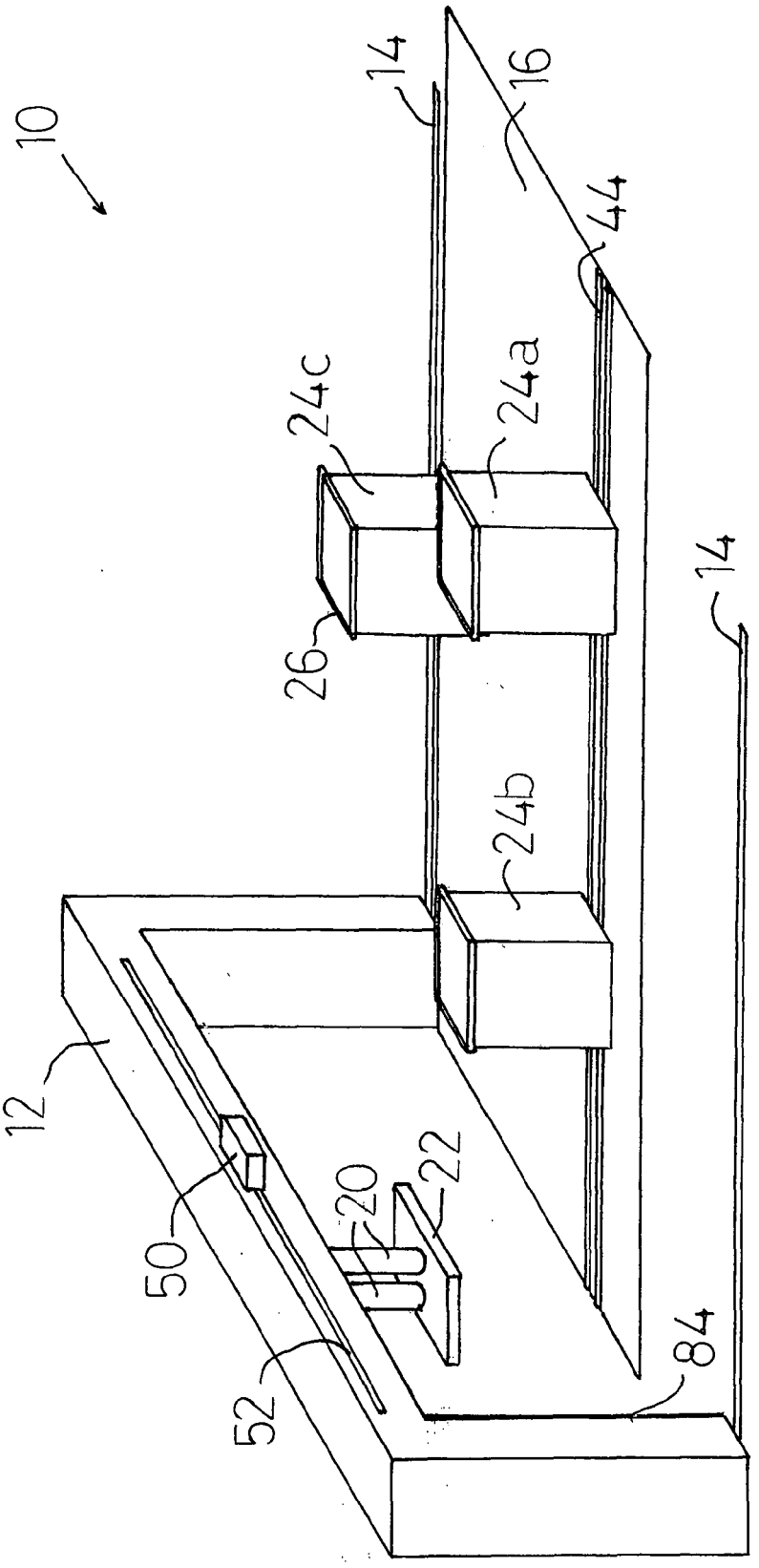

FIG 1

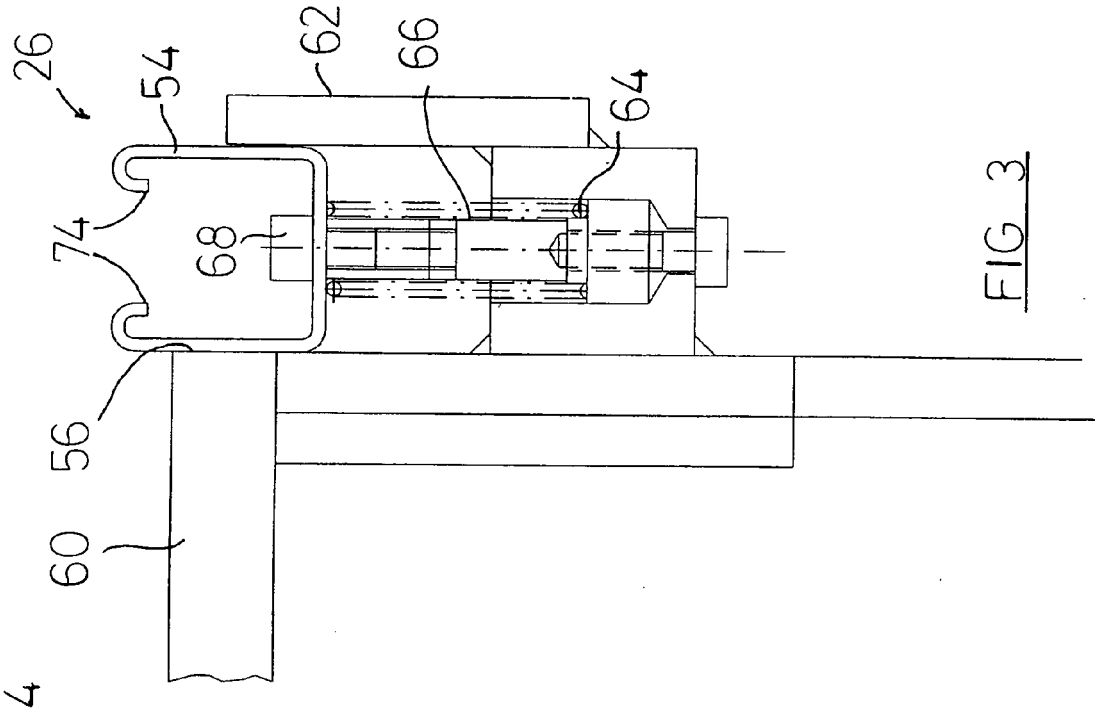

FIG 3

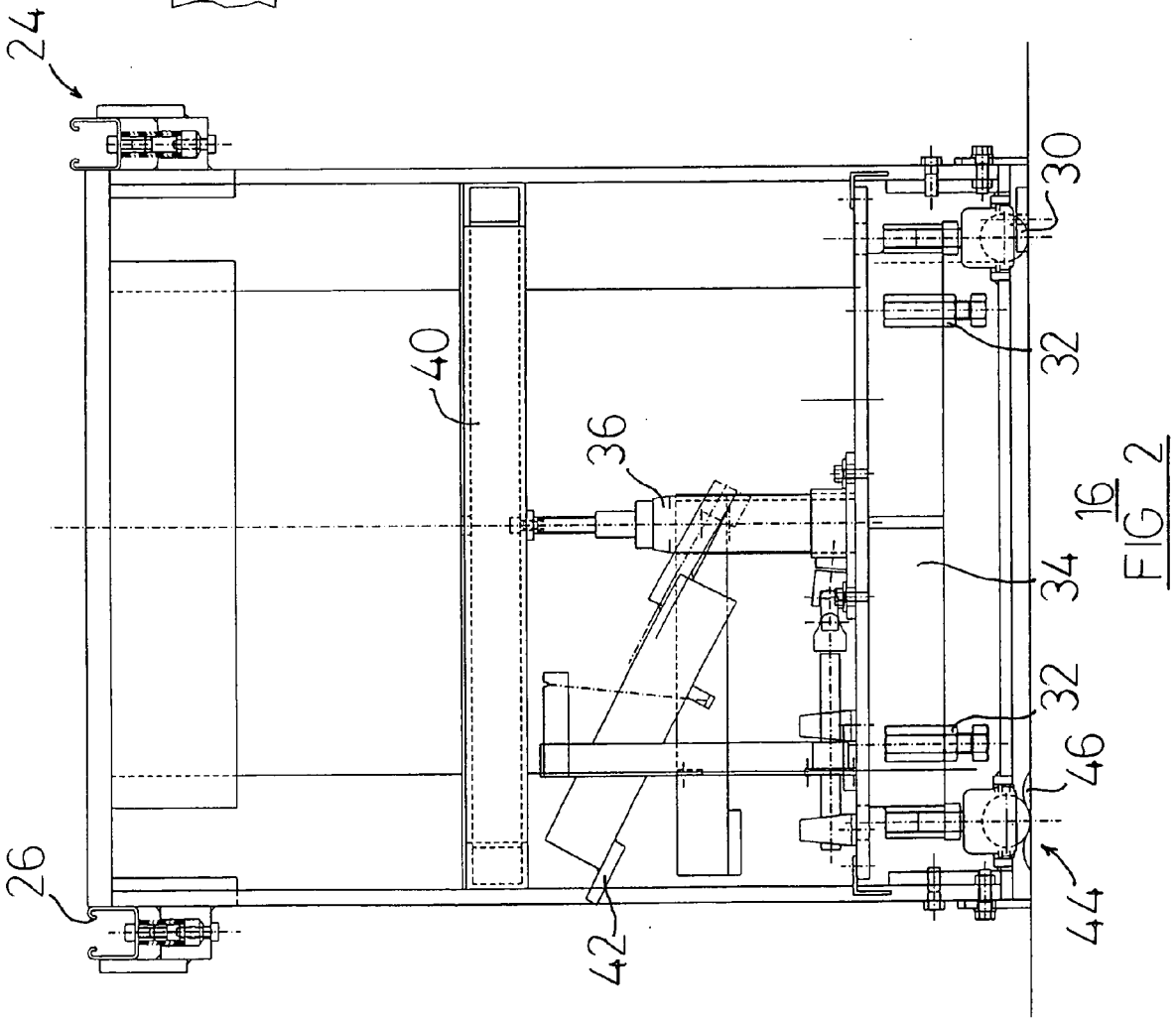

FIG 2

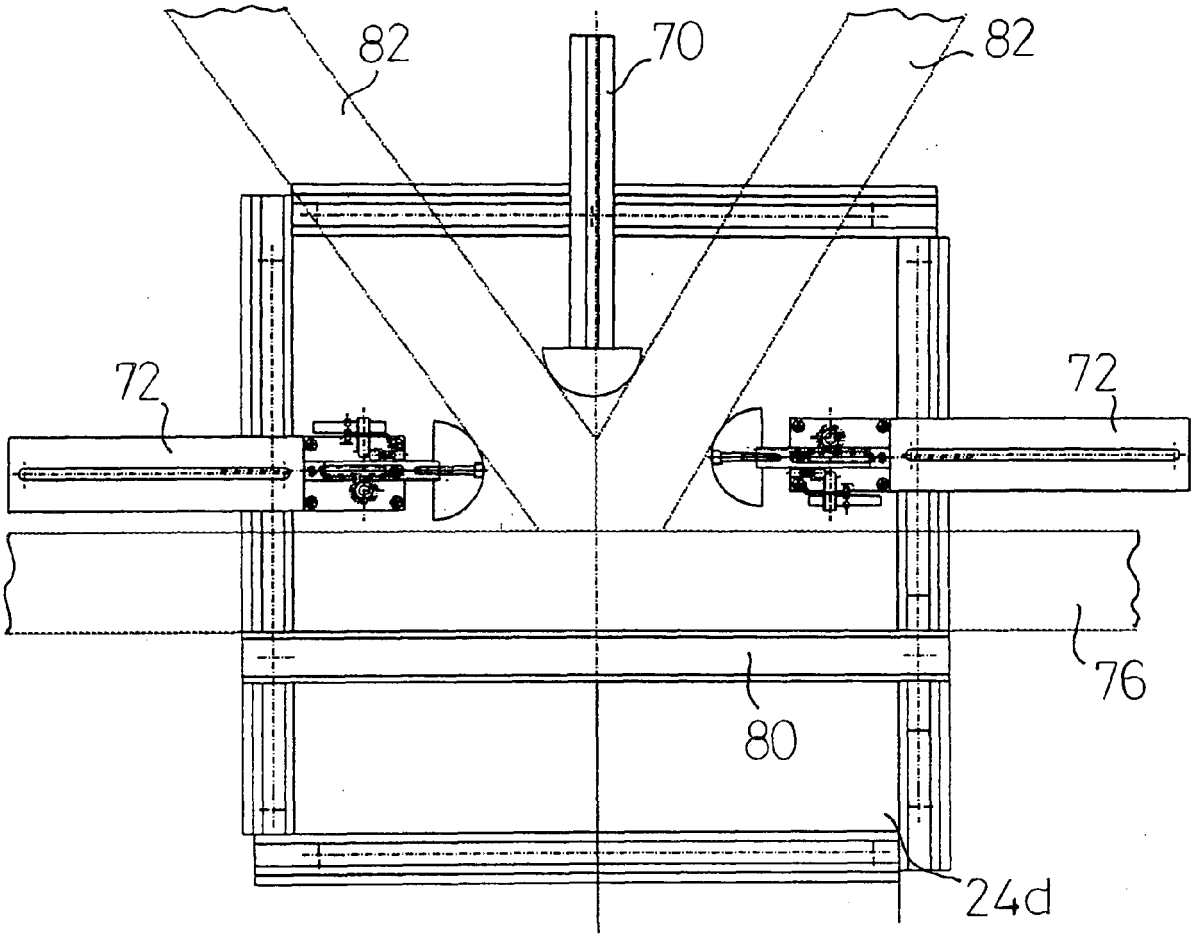

FIG 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 25 3341

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

B27F
E04C
B23Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 September 2006	Meritano, Luciano

CATEGORY OF CITED DOCUMENTS

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82