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(54) DEVICE FOR THE MANUFACTURE OF LAMINATED WOOD BENT ELEMENTS

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APPAREIL POUR LA FABRICATION DE PIECES DE BOIS COURBEES ET STRATIFIEES

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EP 3 416 791 B1

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Description

[0001] The present invention relates to a device for the manufacture of laminated wood bent elements, according to the preamble of claim 1. Such a device is known from the document EP1125700A1.

[0002] Wooden arches and bent structural rafters are increasingly used as bearing elements in building structures. The strength of this kind of elements manufactured from laminated wood is many times greater than the parameters of elements which are the same in dimensions but manufactured and bent from solid wood. In structural applications laminated wood makes it possible to make large span covers and is used when high strength of material is needed. Laminated wood is made by gluing together layers of wood with a thickness typically from 5 mm to 50 mm. The thickness of layers is selected depending on the application and the required bending radius of the final profile. Laminated wood during gluing can be formed in curvatures which are difficult to obtain from solid wood. Individual layers in the form of wooden slats are interlaid with layers of adhesive, and then pressed. During the pressing process, before the adhesive hardens, they are bent and in that bent shape are maintained until the layers connecting the surfaces of individual slats are hardened. A number of solutions of devices used for this purpose is known.

[0003] A known solution is disclosed in the Polish patent specification of application number P.400102. It discloses a device for pressing resilient material, particularly wood material, comprising a frame with an openwork table and a holding beam and containing an upper load plane in the form of a casing. The device according to this known solution comprises a bottom unit and an upper unit and rolls for tapes on both of the units. The bottom unit contains a frame with an openwork table and a moving holding beam and a moving pins assembly and a guide assembly of binding material. The upper unit contains a multi-part moving casing. A method of pressing resilient material, particularly wood material is accomplished by placing material on the openwork table, holding it from the top by the casing and binding. Small bundles of material are placed on the openwork table, and then pushed using the holding beam to the vertically arranged moving casing. From the bottom and from the top a wire or a binding tape is spread from the rolls on the binding material. The material by being put between the binding material is then pressed by the casing turning through an angle of 90°.

[0004] The known solution according to document US 333615 discloses a device for the manufacture of laminated wood bent elements comprising a working board with fixing holes and a clamps assembly attached to the working board. Each clamp comprises a bottom beam to which a retaining plate with the screw is fixed, perpendicular to the bottom beam and a clamping plate perpendicular to the bottom beam are attached. The clamping plate is slidably attached in the clamp by means of a screw. Another known solution is disclosed in the specification of the Chinese utility model application number CN203738952. The solution according to this utility model is used to bend and cold form laminated wood. According to this utility model, two hydraulic cylinders are respectively arranged at two ends of a worktable longitudinally. One of the hydraulic cylinders is connected with a pressing die. The other hydraulic cylinder is connected with a push plate. An arc-shaped recess is formed in an end surface, which is opposite to the push plate. Sliding ways are arranged on the worktable for moving the pressing die and the push plate. The push plate and the pressing die with the arc-shaped recess can move along the sliding ways. The worktable is provided with supports and an upper crane runway with an electric hoist. The bending forming cold press according to this utility model is useful in the manufacture of bent and cold formed laminated and at the same time shaped wooden elements in the form of slats.

[0005] Another known solution is disclosed in american patent specification number US 4,711,281. According to this known solution, a curved wood bending machine for bending wooden members has a support frame with a generally semicircular planar top member on which a plurality of guide rails are connected in circumferential relationship containing clamping plates horizontally sliding along the rails. Said clamping plates slidably mounted on the guide rails have suitable means actuating the clamping plates mounted on said guide rails to predetermined positions relative each other. The clamping assemblies have a fixed vertical shoes by which they are mounted to the guide rails and contain a coacting movable shoes of the clamping plates. The shifting of each clamping plate is activated by a pressure device or a pneumatic device in the form of a pneumatically operated cylinder. A desired curvature of a wooden member can be established on the surface of the clamping plates where, if the member is clamped to the clamping plates, the wooden member is bent and the designed curvature is obtained. The shape for bending is determined by locking members to which a wooden member is clamped by the clamping plates. In another embodiment of this known solution, the clamping plates are moved along the guide rails by means of a screw mechanism fitted to each clamping assembly. In this known solution safety shields are provided to prevent uncontrolled release of a wooden member as a result of its resilience. In this know solution it is possible to obtain different bend angles of a wooden member by moving the clamping plates along the guide rails, the length of which is provided by the whole required series of types of bent members on a semicircular working surface of the table covered by the length of the radially extending guide rails.

[0006] In a number of known solutions the bending profile of a laminated wood element is obtained by clamping this element to the previously made mould, the working surface of which has a shape corresponding to the shape of the final product. Within one process the final element

is bent and adhesive-coated slats are pressed here by being clamped to the mould surface. This means that for different bending profiles and the pressing of the final element, forms with appropriate bending profiles need to be previously prepared. However, a mould prepared for one profile cannot be used for a differently curved wooden element.

[0007] The purpose of the invention is to develop one device for bending with simultaneous pressing laminated wood bent elements with different bending profiles. The device is to enable the manufacture of not only arches but also bent elements, such as S-shaped elements, and other shapes.

[0008] The solution according to the invention is disclosed in claim 1 and the subsequent claim.

[0009] According to the invention, a device for the manufacture of laminated wood bent elements comprises a working board with fixing holes and a clamps assembly attached to the working board. Each clamp comprises a bottom beam to which a retaining plate perpendicular to the bottom beam and a clamping plate perpendicular to the bottom beam are attached. The clamping plate is slidably attached to the bottom beam by means of a hydraulic cylinder. The maximum distance between the retaining plate and the clamping plate is bigger than the width of a laminated wood element.

[0010] The fixing holes are regularly spaced on the surface of the working board, according to the directions of the Cartesian coordinate system x, y. In addition, the bottom beam of each clamp comprises at least one base pin rotatably and detachably mounted in the fixing hole of the working board.

[0011] Each fixing hole in the working board preferably contains assigned parameters of the Cartesian coordinate system x, y.

[0012] The clamp is preferably provided with an upper beam, where the bottom beam and the upper beam are connected together at the ends by a connecting member from one side and by a connector from the other.

[0013] The retaining plate of the clamp is attached to the connector of the clamp by means of a position adjustment assembly of the retaining plate.

[0014] According to the invention, the device is characterised in that the position adjustment assembly of the retaining plate is two adjustment screw mounted one above the other, mounted in the connector of the bottom beam and the upper beam. According to the invention, the heads of the two adjustment screws constituting the position adjustment assembly of the retaining plate are connected together by a transmission chain.

[0015] The camping plate is attached to the clamp, in a preferred embodiment of the invention, by means of at least one hydraulic cylinder mounted in the connecting member of the bottom beam and the upper beam.

[0016] In another preferred embodiment of the invention, in the clamp the clamping plate can be attached to the clamp by means of piston rods of two hydraulic cylinders mounted one above the other in the connecting member of the bottom beam and the upper beam.

[0017] In the solution according to the invention, a new solution of a clamp cooperating with a working board is proposed. Each clamp contains at least one round base pin mounted in at least one of the round holes of the working board. The same, subsequent clamps are mounted in further holes of the working board.

[0018] The holes in the working board are arranged in the form of a regular grid of holes along the Cartesian coordinate lines x,y, in horizontal rows and in vertical columns, in the same distances from one another. This enables the design and computer selection of holes in the working board where the base pins of the clamps are to be mounted.

[0019] After mounting the base pins of the clamps in holes, owing to adjustment on adjustment screws it is possible to precisely arrange the retaining plates so that the surface of the retaining plates of the clamps assembly reproduces the designed final shape of a wooden element. Then, between the retaining plates and the clamping plates being apart from each other a pack of adhesive-coated wooden slats is arranged. Then, in all clamps the clamping plates are hydraulically moved towards the retaining plates resulting in the pressing of individual slats into one pack, and at the same time in the shaping of a wooden element in accordance with the designed curvatures. After the bonding time specified in the technological process, the clamping plates are hydraulically moved away from the retaining plates and a shaped laminated wood bent element is removed from the clamps assembly for finishing. The clamps assembly is ready to manufacture another, the same glued element. The clamps can also be removed from the holes in the working board and their base pins put into other holes of the working board to manufacture another bent element with different curvatures.

[0020] According to the invention, the working board with a regular grid of holes arranged in horizontal rows and vertical columns along the Cartesian coordinate lines x, y enables, at the project stage, the determination of the coordinates of the fixing holes intended to be used for mounting another clamps. The same working board can be used for the manufacture of wooden elements with various curvatures. On one working board according to the invention, several wooden elements with the same or various curvatures can also be manufactured at the same time. One bent wooden element with large dimensions can also be manufactured on several working boards put together.

[0021] An important advantage of the solution according to the invention is the mounting of one round base pin of each clamp in one round fixing hole of the working board. This enables, by the rotation of the clamp on the base pin, the natural adjustment of the proper position of the clamp with respect to the surface of a bent wooden element, when the bending process with the simultaneous bonding process starts.

[0022] The subject of the invention is shown in the em-

bodiment in the accompanying drawing in which the individual figures show:

Fig. 1 - the working board with the clamps assembly.
Fig. 2 - part of the working board, according to Fig. 1 .
Fig. 3 - a side view of the clamp.
Fig. 4 - a top view of the clamp.
Fig. 5 - a perspective view of the clamp.

[0023] Fig. 1 in the embodiment shows the working board 1 with the fixing holes 2. The fixing holes 2 are arranged on the working board 1 in the Cartesian coordinate system x,y. This means that individual fixing holes 2 are arranged in horizontal rows and in vertical columns. In the embodiment shown in Fig. 1, the working board 1 comprises 35 horizontal rows and 70 vertical columns of the fixing holes 2. The fixing hole 2 shown as an example in Fig. 1 is placed in horizontal row 2 and in vertical column 46. Thus, the board shown in Fig. 1 contains 2,450 fixing holes 2. In other embodiments the working board 1 can have different numbers of rows and columns of the holes 2.

[0024] Distances between individual rows and between individual columns of the fixing holes 2 are the same, and the symmetry axes of the fixing holes 2 are arranged regularly, on the theoretical Cartesian coordinate lines x,y. In this embodiment, the working board 1 is made of layered plywood with a thickness of approx. 150 mm, but the use of the board 1 made of a different material is not excluded in other embodiments.

[0025] Fig. 1 also shows the clamps 3 assembly, mounted in the fixing holes 2 of the working board 1. As shown in this figure, the clamps 3 are arranged radially, where each of them is clamped on a wooden element 4. Pressure lines 6 and return lines 7 of hydraulic cylinders 12 of individual clamps 3 shown schematically here are supplied from the main pressure and return line 5. The lines are connected by means of known quick couplers to the known hydraulic fluid supply system.

[0026] Fig. 2 shows part of the working board 1 with the clamps 3 assembly from Fig. 1. The clamps 3 are clamped on the wooden element 4, and because they are mounted in the holes 2 of the working board 1, the wooden element 4 has taken an arched shape, in accordance with the configuration of mounting the clamps 3 in the board 1, as designed by the designer.

[0027] Fig. 1 and Fig. 2 show that in this embodiment the wooden element 4 is clamped in eleven clamps 3. However, the working board 1 has a large surface with the arrangement of the fixing holes 2, shown in Fig. 1 in the amount of 2,450 holes. By increasing the number of the clamps 3 and mounting their base pins 17 in other fixing holes 2, the length of the wooden element 4 being shaped can be significantly increased, and its bending range and direction can also be freely changed.

[0028] If it is necessary to bend the wooden element 4 which is longer than the size of the working board 1, there are no obstacles to adding another working board 1 of the same or a different size. The board 1 in this embodiment is designed so that the distance of the extreme rows and columns of the holes 2 from the edge of the board is half the standard distance between the rows and columns of the holes 2. Therefore, the putting together of two boards 1 makes that in their point of contact the distance between the extreme rows and the extreme columns of the holes 2 in the adjacent boards 2 is the same, as on the whole surface of each of the working boards 1. This is particularly important in the production of bent rafters for the construction industry, often of considerable dimensions, exceeding the size of a single working board 1. Therefore, the solution according to the invention makes it possible to add further working boards 1 to the first working board 1.

[0029] Fig. 2 shows that hydraulic cylinders of each clamp 3 have a working medium supplied through the pressure line 6 and discharged through the return line 7.

[0030] Fig. 3, Fig. 4 and Fig. 5 show the structure of the clamp 3, according to the invention. Fig. 3 shows a side view of the clamp 3. The clamp 3 comprises the bottom beam 8 and the upper beam 9. The extreme parts of the beams 8,9 are connected together by the connecting member 10 from one side and by the connector 11 from the other.

[0031] In this embodiment, two hydraulic cylinders 12 are fixed in the connecting member 10. On the piston rods 14 of the hydraulic cylinders 12 the clamping plate 13 is mounted, perpendicular to the working board 1 and to the bottom beam 8 and to the upper beam 9 of the clamp 3. The clamping plate 13 is slidably mounted between the bottom beam 8 and the upper beam 9 on the piston rods 14 of said hydraulic cylinders 12. Thus, the clamping plate 13 can be moved between the bottom beam 8 and the upper beam 9, along the beams, as a result of the movement of the piston rods 14 of the hydraulic cylinders 12. In another embodiment, one hydraulic cylinder 12 can be mounted in the connecting member 10 and in this solution of the clamp 3, the clamping plate 13 is mounted on one piston rod 14. With the use of a hydraulic distributor 16 in the hydraulic system of the clamp 3, the clamping plate 13 can be moved in the clamp 3 in the direction of the retaining plate 19 and back.

[0032] Fig. 4 and Fig. 5 show that in this embodiment the bottom beam 8 and the upper beam 9 have holes 15 allowing the shifting of the attachment point of the connecting member 10 of the two beams 8,9, if needed, resulting from significant changes in the size of the wooden element 4. Usually this adjustment is not needed, because differences in the thickness of subsequent wooden elements 4 is adjusted by the extension of the piston rods 14 with the clamping plate 13. The holes 15 in the upper beam 9 cooperating with the connecting member 10 and with the connector 11 also enable the removal of the upper beam 9 from the clamp 3 for the removal of a finished bent element 4 and for the placement between the plates 13,19 of a new wooden element 4 to be bent and pressed.

[0033] The described embodiment proposes in one

clamp 3 two hydraulic cylinders 12, supplied from the same distributor 16. The hydraulic cylinders 12 work through the piston rods 14 on the clamping plate 13, in the bottom part and in the upper part of the clamping plate 13. As a result of tests, it has been found that the use of two hydraulic cylinders 12, arranged one above the other, as clearly shown in Fig. 3, is conductive to the uniformity of the force exerted by the clamping plate 13 over the entire width of the wooden element 4, and thus it is conducive to the uniformity of connections of bonded slats in the wooden element 4. This does not exclude in other embodiments the use of only one hydraulic cylinder 12 on the piston rod 14 of which said clamping plate 13 is fixed. It is noted that the bonding and pressing technology of wooden elements from previously prepared slats is generally known to those skilled in the art and as such is not a subject of the present invention.

[0034] On the second extreme end the bottom beam 8 and the upper beam 9 are connected together by the connector 11, which in this embodiment is terminated at the bottom with the base pin 17. The base pin 17 is a member cooperating with the selected hole 2 in the working board 1 and is the sole member fixing the clamp 3 in the working board 1. The clamp 3 is rotatably mounted in the hole 2 and its base pin 17 can be removed from the hole 2 and rotatably mounted in another hole 2 of the working board 1.

[0035] In the clamp 3, in the upper part of the connector 11 in this embodiment there are two threaded holes, one above the other. In the holes there are two adjustment screws 18. Between the bottom beam 8 and the upper beam 9, to the ends of the screws 18 the retaining plate 19 is fixed at the ends of the screws. The arrangement of the retaining plate 19 in a particular place along the beams 8,9 can be set by turning both adjustment screws 18. The retaining plate 19 by turning the screws 18 is set at a position appropriate for the final shape of the wooden element 4. When a set of wooden slats with adhesive-coated surfaces is arranged between the plates 13,19, the upper beam 9 is put on the connecting member 10 and on the connector 11, in the clamp 3. Then, the clamping plate 13 is hydraulically moved towards the retaining plate 19 previously put in the designed place. Pressure is applied on the prepared wooden element 4 as a result of which the wooden slats are glued, and a bent glued wooden element is obtained after a period of time appropriate for the raw materials used. Then, the clamping plates 13 are hydraulically put back and the upper beams 9 are removed from the clamps 3 and the formed laminated wood element 4 is taken out.

[0036] To make the handling of the adjustment screws 18 easier, their heads can have the form of known gear wheels, and in this embodiment they are connected by the chain 20 which is shown in Fig. 3, Fig. 4 and Fig. 5. Thus, according to the invention the turn of one adjustment screw 18 causes the simultaneous turn of the other adjustment screw and the uniform shift of the retaining plate 19 along the beams 8,9 towards the planned position of the retaining plate 19 over the length of the clamp 3.

[0037] The arrangement of the fixing holes 2 on the board 1 in the Cartesian coordinate system x,y has made it possible to determine the position of the base pin 17 of each clamp 3 in the hole described by the number of the horizontal row x and the number of the vertical column y in the Cartesian coordinate system x,y by the computer. However, the computer program for this purpose is not a subject of the present invention.

[0038] The adoption of the specified space between the horizontal rows and the vertical columns of the fixing holes 2 in the working board 1 has made that the range of adjustment of the retaining plate 19 in each clamp 3 should cover the whole distance between the adjacent fixing holes 2 in the working board 1, both in lines consistent with the course of the rows and columns of the holes 2, and in oblique directions between the adjacent holes 2. This has made it possible to arrange the retaining plates 19 of subsequent clamps 3 virtually at every point of the working board 1. To mount the base pins 17 of the clamps 3, the fixing holes 2 which are the most similar to the designed shape of the wooden element 4 are used. The final, exact arrangement of individual retaining plates 19 of subsequent clamps 3 is performed by the turn of the adjustment screws 18. When the retaining plates 19 are arranged, according to the designed shape of the wooden element 4, a set of adhesive-covered slats are arranged between the retaining plates 19, and the clamping plates 13 of subsequent clamps 3. The clamps 3 are previously mounted with their base pins 17 in the holes 2 of the working board 1, according to the designed shape of the wooden element 4.

[0039] The proposed solution according to the invention, where the base pin 17 of each clamp 3 can be easily removed from the hole 2 in the board 1 and mounted in another hole 2 of the same or adjacent working board 1 makes it possible to arrange the clamps assembly 3 virtually in every configuration to produce a wooden element 4 of any bending shape of this element in the x,y plane of the Cartesian coordinate system. The solution according to the invention also enables the production on one working board 1 two or more wooden elements 4 of the same or different bending shapes at the same time. Two or more clamps 3 assemblies can be used here. It is also possible to put together more than one working board 1 to produce the wooden elements 4 with dimensions exceeding the size of a single working board 1.

List of designations in the drawings

[0040]

1. Working board.
2. Fixing hole.
3. Clamp.
4. Wooden element.
5. Pressure and return line.

6. Pressure line.
7. Return line.
8. Bottom beam.
9. Upper beam.
10. Connecting member.
11. Connector.
12. Hydraulic cylinder.
13. Clamping plate.
14. Piston rod of the hydraulic cylinder.
15. Hole.
16. Distributor.
17. Base pin.
18. Adjustment screw.
19. Retaining plate.
20. Chain.

Claims

1. Device for the manufacture of laminated wood bent elements comprising a working board (1) with fixing holes (2) and a clamps (3) assembly attached to the working board (1), wherein each clamp (3) comprises a bottom beam (8) to which a retaining plate (19) perpendicular to the bottom beam and a clamping plate (13) perpendicular to the bottom beam are attached, wherein the clamping plate (13) is slidably attached in the clamp (3), wherein the maximum distance between the retaining plate (19) and the clamping plate (13) is bigger than the width of a laminated wood element, wherein the fixing holes (2) in the working board (1) are regularly spaced, and each clamp (3) comprises at least one base pin (17) rotatably and detachably mounted in the fixing hole (2) of the working board (1), wherein each fixing hole (2) in the working board (1) contains the assigned number of the horizontal row and the number of the vertical column, whereas the clamp (3) is provided with the upper beam (9), and the retaining plate (19) is attached in a connector (11) of the bottom beam (8) and the upper beam (9) of the clamp (3) by means of a position adjustment assembly of the retaining plate (19), **characterised in that**, the fixing holes (2) in the working board (1) are regularly spaced according to the directions of the Cartesian coordinate system (x, y), **in that** the clamping plate (13) is slidably attached in the clamp (3) by means of at least one hydraulic cylinder (12), **in that** the position adjustment assembly of the retaining plate (19) is two adjustment screws (18) mounted in the connector (11) one above the other, wherein in the position adjustment assembly of the retaining plate (19), the heads of the adjustment screws (18) are connected together by a transmission chain (20).

2. The device according the claim 1, **characterised in that** in the clamp (3), the clamping plate (13) is attached to a connecting member (10) by means of piston rods (14) of two hydraulic cylinders (12) mounted in the connecting member (10) one above the other.

Patentansprüche

1. Maschine zur Herstellen vom gebogenen Leimbindern, mit Arbeitsplatte (1) mit Befestigungslöchern (2) und an der Arbeitsplatte (1) befestigte Klemmsatz (3), wobei jede Klemme (3) untere Balken (8) enthält, an der Druckplatte (19) angebracht ist, der senkrecht zur unteren Balken gerichtet ist, und senkrecht zur unteren Balken gerichtete Klemmplatte (13), wobei die Klemmplatte (13) in der Klemme (3) gleitend montiert ist, wobei der maximale Abstand zwischen Druckplatte (19) und Klemmplatte (13) größer ist als die Breite des Leimbinders, wobei die Befestigungslöchern (2) an der Arbeitsplatte (1) regelmäßig eingerichtet sind, und jede Klemme (3) mindestens ein Grundbolzen (17) enthält, der drehbar und lösbar im Befestigungsloch (2) an der Arbietsplatte (1) gelagert ist, wobei jedes Befestigungsloch (2) an der Arbietsplatte (1) ihm horizontal und vertikal zugewiesene Zeilennummer enthält, und die Klemme (3) der obere Balken (9) enthält, und die Druckplatte (19) ist mittels der Satz für die Einstellung der Sitzplätze der Druckplatte (19) in dem Bindeglied (11) des unteren (8) und oberen (9) Balken von der Klemme (3) montiert, **dadurch gekennzeichnet, dass** die Befestigungslöchern (2) an der Arbeitsplatte (1) regelmäßig nach den Anweisungen des Kartesisches Koordinatensystem (x, y) angeordnet sind, wobei die Klemmplatte (13) in der Klemme (3) mittels mindestens eines Hydraulikzylinders (12) gleitend montiert ist und der Satz für die Einstellung der Sitzplätze der Druckplatte (19) ist von zwei Einstellschrauben (18) gebildet, die in dem Bindeglied (11) übereinander eingesetzt sind, wobei in dem Satz für die Einstellung der Sitzplätze der Druckplatte (19) die Schraubenköpfe von den Einstellschrauben (18) durch eine Antriebskette (20) verbunden sind.

2. Vorrichtung gemäß Anspruch 1., **dadurch gekennzeichnet, dass** in der Klemme (3) die Klemmplatte (13) an dem Bindungselement (10) mittels der Kolbenstande (14) von zwei im Bindungselement (10) übereinander montierten Hydraulikzylindern (12) befestigt ist.

Revendications

1. Appareil pour la fabrication de pièces de bois courbées et stratifiées, comprenant un plan de travail (1) avec des trous de fixation (2) et un ensemble de clamps (3) fixés à ce plan de travail (1), et chaque clamp (3) comprend une poutre inférieure (8) à la-

quelle est fixée une plaque de retenue (19) perpendiculaire à cette poutre inférieure et une plaque de serrage (13) perpendiculaire à cette poutre inférieure, et la plaque de serrage (13) est fixée dans le clamp (3) de manière coulissante où la distance maximale entre la plaque de retenue (19) et la plaque de serrage (13) est supérieure de la largeur de la pièce de bois, et les trous de fixation (2) dans le plan de travail (1) sont espacés régulièrement, et chaque clamp (3) comprend au moins une tige de base (17) installée de manière rotative et détachée dans le trou de fixation (2) du plan de travail (1) où chaque trou de fixation (2) dans le plan de travail (1) comprend un numéro lui attribué du rang horizontal et un numéro de la colonne verticale, et le clamp (3) est équipé d'une poutre supérieure (9), et la plaque de retenue (19) est installée dans le connecteur (11) de la poutre inférieure (8) et de la poutre supérieure (9) du clamp (3) par l'intermédiaire d'un ensemble de réglage de la position de cette plaque de retenue (19), **caractérisé en ce que** les trous de fixation (2) dans le plan de travail (1) sont régulièrement espacés conformément aux directions du système de coordonnées cartésiennes (x,y), et la plaque de serrage (13) est fixée de manière coulissante dans le clamp (3) à l'aide d'au moins un cylindre hydraulique (12), et l'ensemble de réglage de la position de la plaque de retenue (19) se compose de deux vis de réglage (18) installées dans le connecteur (11) l'une au-dessus de l'autre, et dans l'ensemble de réglage de la plaque de retenue (19) les têtes des vis de réglage (18) sont liées ensemble par une chaîne de transmission (20).

2. Appareil selon la revendication 1, **caractérisé en ce que** dans le clamp (3), la plaque de serrage (13) est fixée à l'élément de liaison (10) par l'intermédiaire des tiges de pistons (14) de deux cylindres hydrauliques (12) installés dans l'élément de liaison (10) l'un au-dessus de l'autre.

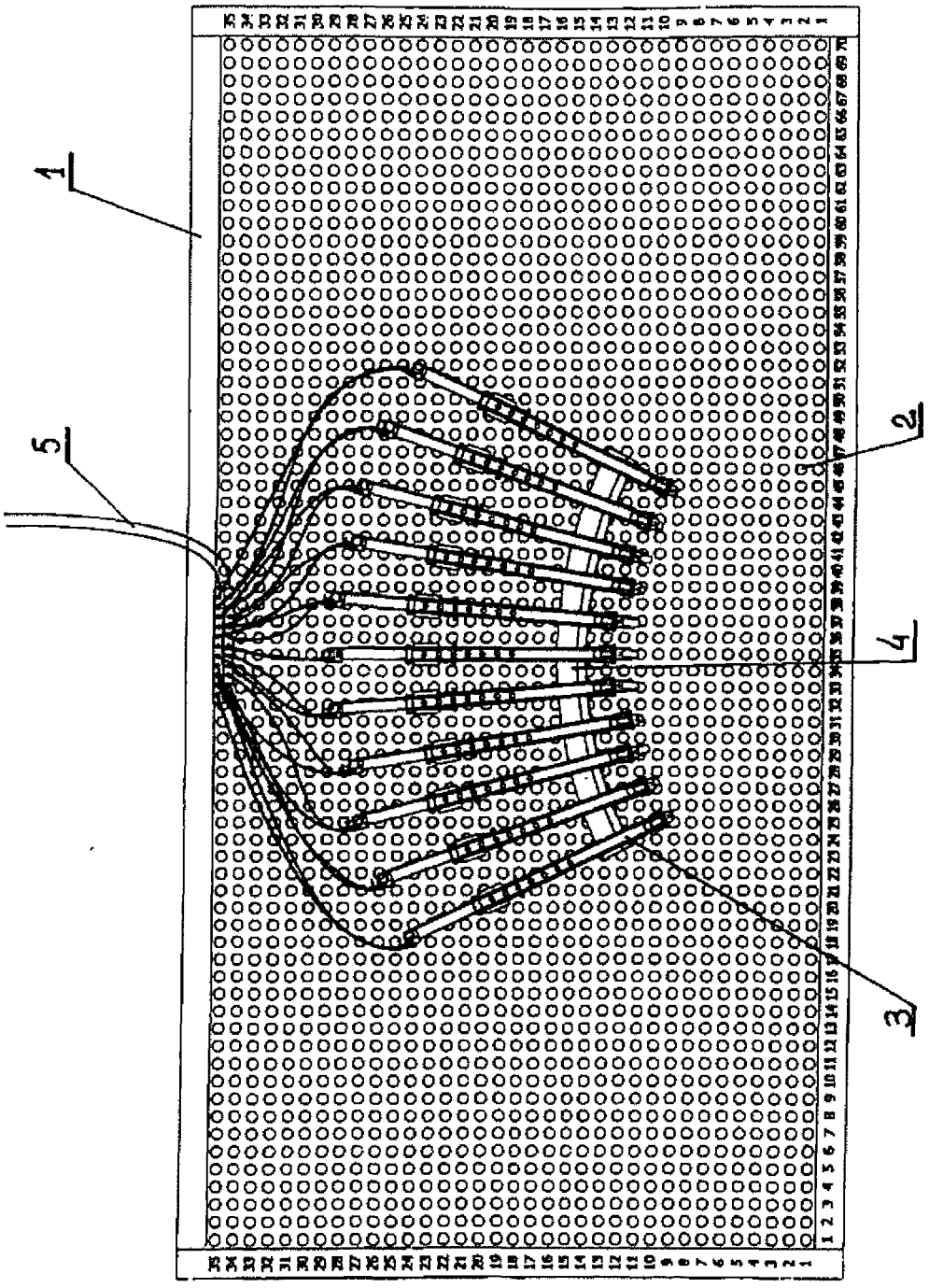

Fig. 1

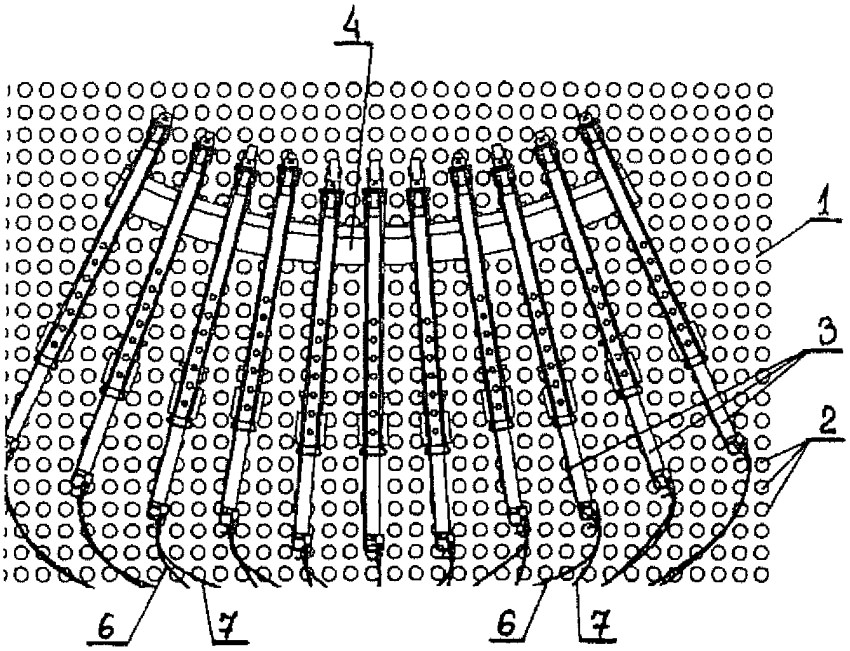

Fig. 2

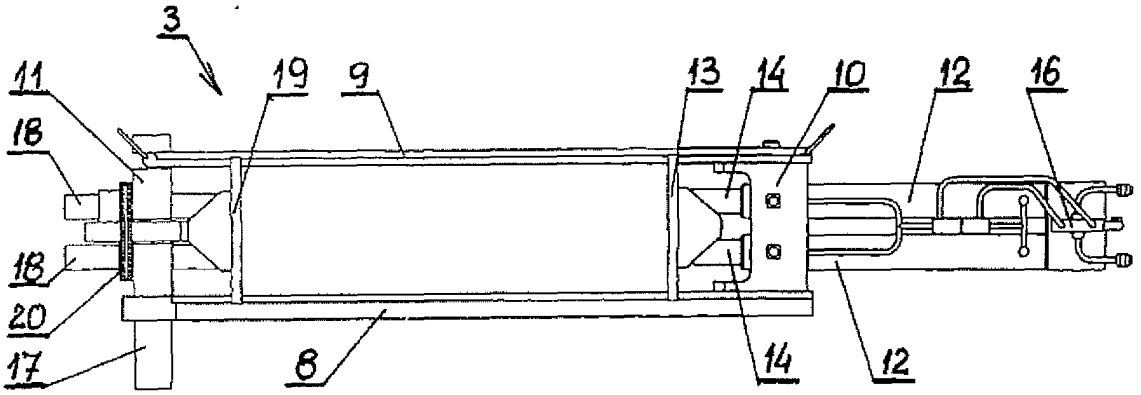

Fig. 3

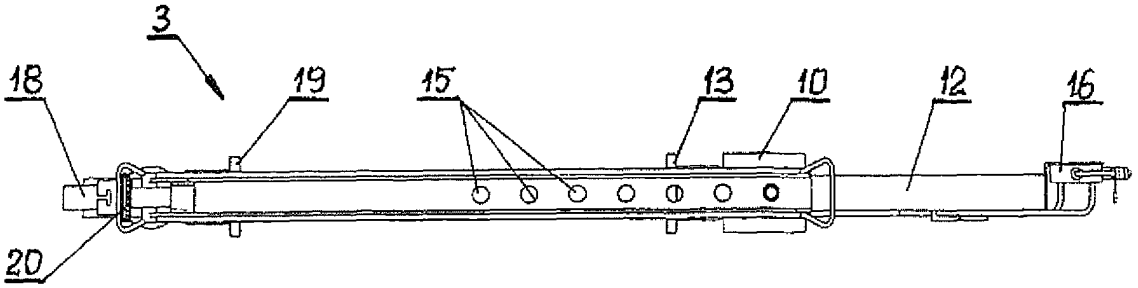

Fig. 4

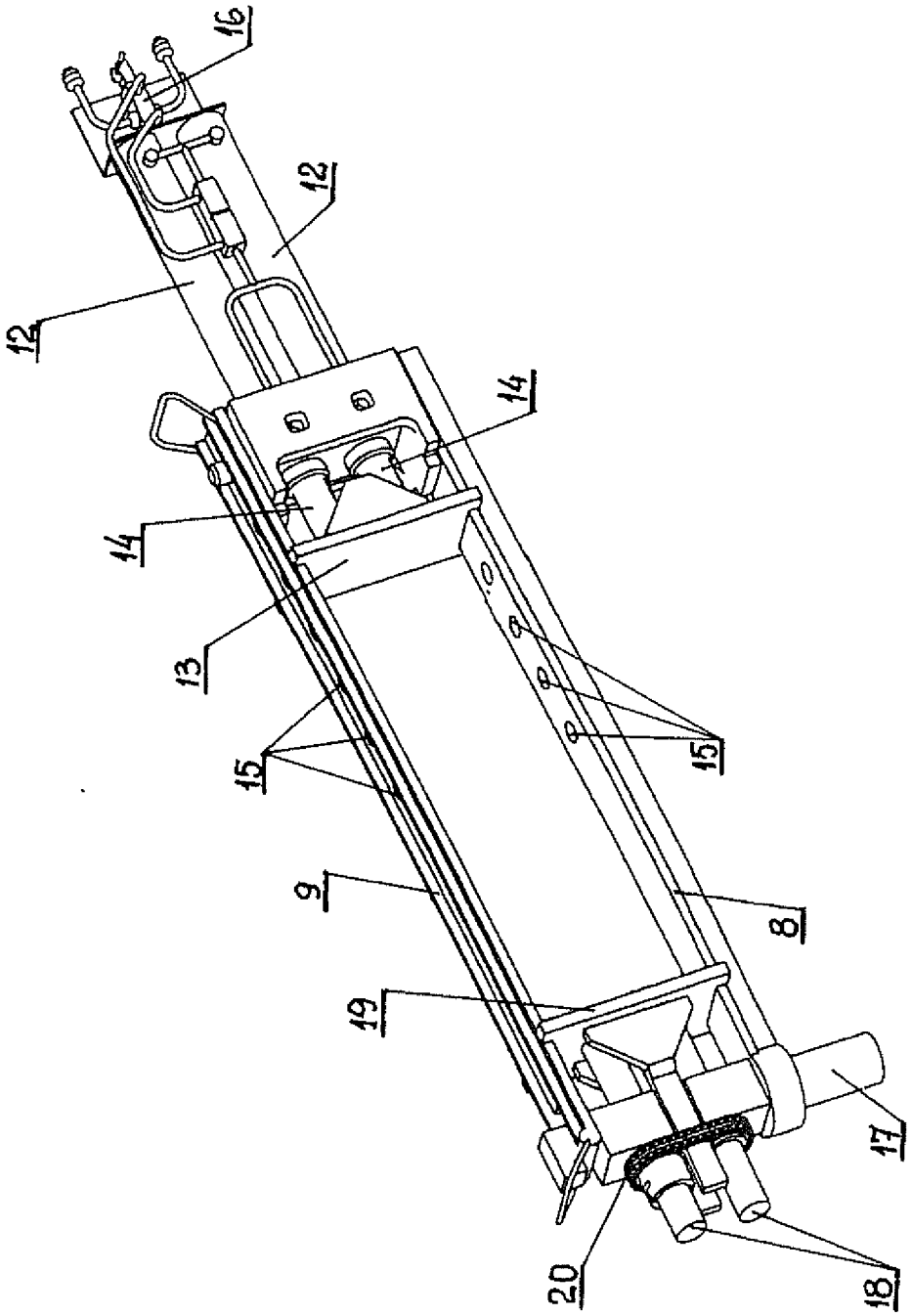

Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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