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(71) Applicant: **Ribawood, S.A.**
50004 Zaragoza (ES)

(72) Inventors:
- **Sanchez Duran, Daniel Emilio**
  08203 Sabadell (Barcelona) (ES)
- **Duran Fuentes, Manuel**
  08203 Sabedell (Barcelona) (ES)

(74) Representative: **Hernandez Covarrubias, Arturo**
c/o Clarke, Modet & Co.,
Avda. de los Encuartes 21
28760 Tres Cantos (Madrid) (ES)

(54) A machine for shaping boxes from a heat-weldable material

(57) The machine includes means for supply of the unfolded(2) boxes, means of transport picking up the boxes from the means of supply and arranging them in a heating unit, means for immobilizing the unfolded boxes in the heating unit, a box former (14), a treader-former (20) introducing the unfolded box in the former, obtaining the folding of its sides with respect to the base, means of pressing determining the heat welding of the opposite ends of the adjoining sides of the shaped box and means for removing the shaped boxes by the machine.

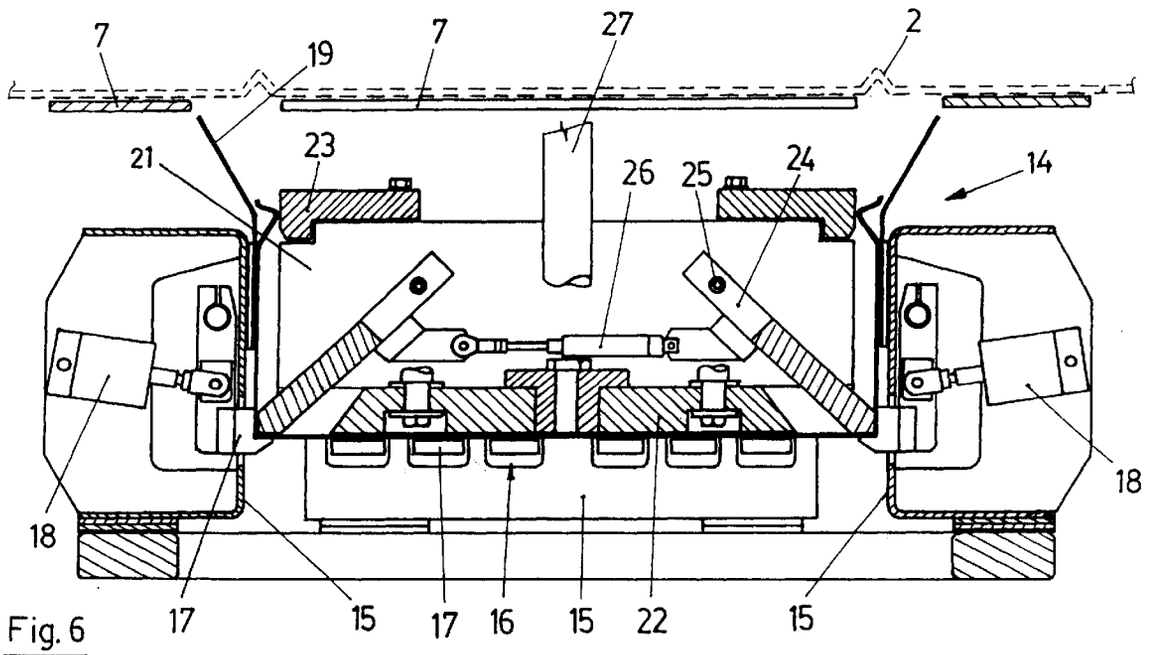

Fig. 6

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Description

OBJECT OF THE INVENTION.

This invention refers, as its title indicates, to a machine for shaping boxes from sheets or plates of heat-weldable material, whose configuration exactly corresponds to the development of the box or, in other words, with the unfolded box. This machnine includes means for supply of the unfolded boxes, means of transport picking up the unfolded boxes from the supply unit, then locating them in a heating unit; means for immobilizing the unfolded boxes in the heating unit, a box former, a treader-former which introduces the unfolded box in the former, hence obtaining the folding of its sides with respect to the base; means of pressing which determines the heat-welding of the opposite ends of the adjoining sides of the shaped box, previously heated in the heating unit and means to remove the shaped boxes by the machine.

BACKGROUND OF THE INVENTION

At present, different types of machines are known for shaping boxes from die-cast sheets, generally of cardboard and having a series of movable items destined to fold said die-cast sheet to shape the box, this type of machine usually including means to apply adhesive products in those areas of the sheet to be joined, determining the adhesion of said areas for the shaped box to have a specific form.

There is no record of machines currently destined to the shaping of boxes frcm heat-weldable material, therefore they have an operation and composition different to the machines being described in this invention.

DESCRIPTION OF THE INVENTION

The machine described in this invention includes means of supply of the unfolded boxes; means of transport picking up the boxes from the supply unit, and then locating them in a heating unit; means of immobilizing the unfolded boxes in one heating unit to prevent their immobilization during the heating phase, a box former, a reader-former introducing the unfolded box in the former, obtaining the folding of the sides with respect to the base, means of pressing which determines the heat-welding of the opposite ends of the adjoining sides of the shaped box and means to remove the shaped box by the machine.

According to the invention, the means of supplying the unfolded boxes consists of a lifting platform, over which the unfolded boxes are piled; above said means of supply, the mentioned transport means are arranged, consisting of a horizontal motorized displacement carriage over which is assembled a pneumatic cylinder which vertically displaces an arm equipped with a pneumatically activated suction pad to hold the unfolded boxes from the supplier to the heating unit.

This heating unit includes coplanary plates, over which the transporter places the unfolded boxes, the latter being supported on the plates by means of which will be their sides, such that the box base arranged in said unit does not lean over any surface.

Some displaceable heaters are arranged in this heating unit which heat the opposite ends of the adjoining sides of the boxes by means of the projection over the same of hot air; this heaters are equipped with nozzles defining a flat square-shaped outlet, through which the hot air emerges, permitting that each one of them simultaneous heat the opposite ends of two of the adjoining sides of the box to be shaped.

This heating will later allow the heat-welding of the ends of the adjoining sides of the box to be performed as it is made of heat-weldable material.

To prevent the unfolded box from being moved or warped during the mentioned heating, the invention foresees that one machine includes means of immobilization consisting of some treaders, activated by pneumatic cylinders assembled over an upper fixed bridge and which vertically pressed the sides of the unfolded box against the coplanary plates included in the heating unit.

According to the invention, the former includes some side walls having a cap between them of dimensions slightly higher than the size of the box to be shaped, said shaper being arranged at the lower area of the heating unit.

The shaper walls have in their lower part some windows through which emerge, towards the central gap, some concealable stops defining, as a whole, a coplanary surface, perpendicular to the walls of the shaper.

These concealable stops are installed with the possibility of rotation over the back sides of the shaper walls and those corresponding to each one of the walls are activated by a same pneumatic cylinder determining the arrangement in a hidden or protruding position with respect to the corresponding walls.

The side walls of the shaper are extended at their upper end in some diverging ramps destined to collaborate in the folding of the sides of the box with respect to its base.

The treader-former includes two side walls joined together by a lower base of less length than the former and by two upper crossbars, fixed at their ends, the set defining the treader-former a width equal to the inside width of the box to be shaped.

This treader-former includes between the side walls two ending wedges, arranged perpendicularly to the former and fixed to them with the possibility of rotation; said bending wedges being activated by two pneumatic cylinders arranged inside the treader-former and which arranges them in an open or closed position.

The invention considers that the bending wedges have at their free end two chamfers set against each

other which define a right-angled rim.

This treader-former is fixed to a pneumatic cylinder obliging it to describe alternative vertical motions, passing from the upper area of the heating unit to the interior of the former and viceversa; the base of the treader-former is aligned vertically with the inner gap of the former, such that on vertically descending, the base of the treader-former presses the base of the box, still unfolded, and introduces it in the former, the ramps defined in its sides, determining the folding of the box, until it reaches a position perpendicular to its base, said perpendicular position being achieved when the box is totally introduced inside the former. This limit position is determined by the contact of the base of the box against The concealable stops which during this operation are in a protruding position.

When the box reaches this limit position, the bending wedges are open and press to of the lower edges of the box against the concealable stops arranged on two of the opposite sides of the former, obliging the sides of the box to define a right angle with the base.

For the box to adopt this form definitely, the invention contemplates that the machine includes in the corners of the former means of pressing, consisting of tightening clamps which, on gripping the opposite ends of the opposite sides of the adjoining sides of the shaped box, determine their heat-welding thanks to the heating previously made.

The gripping clamps are provided with gripping devices having a length equal or slightly greater than the height of the boxes to be shaped, said gripping devices being able to have flat profiles or profiles with alternating recesses and salients.

Due to the fact that the gripping devices act over the hot box material, the invention considers the possibility that the former have an internal conduit for cooling liquid to pass, said conduit defining in the gripping device an inlet and an outlet for connection thereof to the corresponding outside cooling circuit.

The opening and closing of the clamps is determined by some pneumatic cylinders which act over them.

According to the invention, the means of removing the boxes, once shaped and heat-welded, consist of a motorized conveyor belt, arranged beneath the former, the finished boxes falling over it due to the concealment of the concealable stops of the former.

DESCRIPTION OF THE DRAWINGS

To aid the description of the invention being made and to permit a greater understanding of the characteristics of the invention, this specification is accompanied by a set of drawings which illustrate and do not limit it:

- Figure 1 shows a schematic view of the end elevation of the machine object of this invention, where, the former has not been including so as to obtain greater clarity in the drawings.
- Figure 2 shows a schematic profile view of the unfolded box supplier.
- Figure 3 shows a profile view of the machine where the heating unit may be observed, together with two boxes arranged respectively in the shaping area where the shaper is not shown and the other arranged over the means for removal.
- Figure 4 shows a plan view of the machine.
- Figure 5 shows a plan view of the machine, sectioned by a horizontal plane where the arrangement of the pressing means determining heat welding of the box may be observed.
- Figure 5 shows a detail of the former and treader-former, vertically sectioned during the shaping of a box. Moreover, this view represents the plates supporting the unfolded boxes in the heating unit, determining the position of the former in the whole machine.

PREFERED EMBODIMENT OF THE INVENTION.

As may be observed in the mentioned figures, the machine object of this invention, presents means of supply of the unfolded boxes, consisting of a lifting platform (1), over which the unfolded boxes are piled (2).

On the platform (1) some means of transport of the unfolded boxes (2) are arranged consisting of a motorized carriage (3), permitting displacement in a horizontal direction, and over which, is installed a pneumatic cylinder (4) causing the vertical displacement of an arm (5) equipped a suction pad (6) activated pneumatically, and which hold the unfolded boxes (2) during their transport.

The carriage (3) picks up the boxes one by one from the platform (1) and transports them to the heating unit placing them on coplanary plates (7) where they are supported with what will be the sides of the box.

Moreover, this heating unit includes some heaters (8) that may be placed mear or far away from the opposite ends of the adjoining sides of the box by the action by some lower cylinders (9).

The mission of these heaters (8) is to project hot air over the opposite ends of the adjoining sides of the unfolded boxes, being equipped with nozzles (10) defining a flat right angled outlet, which permits them to simultaneously heat said opposite ends of the adjoining sides of the box to be shaped.

To prevent the unfolded boxes from being moved during heating, the machine includes means of immobilizing them, consisting of some treaders (11) which are activated by pneumatic cylinders (12) installed over a fixed upper bridge (13).

The treaders (11) vertically press the sides of the unfolded box against the coplanary plates (7) include in the heating unit.

Beneath the heating unit, the box former is arranged, shown in the figure as (14) and including side walls (15) which define a gap between them having di-

mensions slightly higher than that of the box to be shaped.

The walls (15) of the shaper define in their lower area some windows (16) through which emerges, towards the central gap, some concealable stops (17).

The set of concealable stops (7) defines a coplanary surface, perpendicular to the walls (15) of the shaper.

The concealable stops (17) are assembled with the possibility of rotation over the back sides of the walls (15), the concealable stops (15) being activated, installed over each one of the walls (15), by a pneumatic cylinder (18) determining their arrangement in a hidden or protruding position with respect to the corresponding walls (15).

The side walls (15) of the shaper (14) are extended at their upper end in some diverging ramps (19) destined to collaborate in the folding of the unfolded boxes (2) when they are displaced towards the interior of the former by a treader-former, shown as a whole as (20) in figure 3.

As may be observed in the detail of the figure 6), the treader-former 20), consists of two side walls 21) which are joined to each other by a lower base (22) of less length that the former and by two upper cross bars (23), fixed at their ends, the treader-former having a width equal to the inside width of the box to be shaped.

The treader-former (20) includes between the side walls 21) two bending wedges (24) arranged perpendicular to the former and fixed to them with the possibility of rotation by means of the respective axles (25).

The bending wedges may be arranged in an open or closed position due to the action of two pneumatic cylinders (26) over them and have at their free end two chamfers set against each other which define a right angle.

The treader-former (20) is fled to a pneumatic cylinder (27) fitted over the upper fixed bridge (13).

The pneumatic cylinder (27) transmit to the treader-former an alternative vertical motion, displacing it from the upper area of the heating unit to the inside of the former and viceversa.

The base of the treader-former (20) is aligned vertically with the interior gap of the former (14), and in its vertical descent acts over the base of the box (2) arranged in the heating unit and over which the heaters (8) have previously acted, projecting hot air over the opposite ends of the adjoining sides of the box to be shaped; in this descent, the treader-former (20) induces the introduction of the box inside the former (14), bending its sides with respect to the base, first of all by the action of the ramps (19) over them and secondly, by the action of the sides (15) of the former over said sides.

The treader-former (20) provokes the descent of the box to be shaped until it makes contact with the concealable stops (17) when the bending wedges (24) open to activate with their ends, against the edges defined by the base of the box and two of its sides, this moment corresponding with that representing in figure 6.

For the sides of the shaped box to be kept in a position perpendicular to the base thereof, the machine includes in the corners of the former (14), some means of pressing, consisting of tightening clamps (28) which are activated by pneumatic cylinders (29); these clamps (28) press the opposite ends of the adjoining sides of the box which are still hot, determining their heat-welding, by which the box is definitely shaped.

Once the box has been shaped and the adjoining sides heat-welded at their ends, the bending wedges (24) pass to the closing position and the treader-former set is displaced towards the upper area, by the action of the cylinder (27); simultaneously the concealable stops (17) are concealed in the walls (15) and the finished box falls under its own weight towards means for removal, consisting of motorized transport means (30), responsible for removing the boxes from the machines.

We do not consider it necessary to extend this description more, as any expert in the matter can understand the scope of the invention and the benefits derived from it.

The terms in which this report has been drafted should always be interpreted in the widest sense without limitations.

The materials, form, size and arrangement of the items may be varied, provided it does not change the basic characteristics of the invention which is claimed below.

Claims

1. A machine to shape boxes from heat-weldable material, as from unfolded boxes; characterized in that it includes means of supply of one unfolded boxes, means of transport picking up the boxes from the means of supply and arranges them in a heating unit; means of immobilization of the unfolded boxes in the heating unit; a box former; a treader-former introducing the unfolded box in the former, obtaining the folding of its sides with respect to the base; means of pressing determining the heat-welding of the opposite ends of the adjoining sides cf the shaped box and means of removal of the shapes boxes by the machine.

2. A machine, according to the claim above, characterized in that the means of supply of unfolded boxes consist of a lifting platform, over which the unfolded boxes are piled.

3. A machine according to the previous claims, characterized in that the means of transport if the unfolded boxes consists of a horizontal motorized displacement carriage over which is assembled a pneumatic cylinder which vertically displaces an arm equipped with a pneumatically activated suc-

tion pad to hold the unfolded boxes during transport.

4. A machine, according to the previous claims, characterized in that the heating unit includes coplanary plates, over which the unfolded boxes are placed by the transporter, and some displaceable heaters which project not air over the opposite ends of the adjoining sides of the boxes.

5. A machine, according to previous claims, characterized in that the heaters are equipped with nozzles defining a flat right angled outlet, through which hot air emerges, permitting opposite ends of the adjoining sides of the box to be shaped to be simultaneously heated.

6. A machine, according to the previous claims, characterized in that the means of immobilizing the unfolded boxes in the heating unit consist of treaders activated by pneumatic cylinders assembled over a fixed upper bridge and which vertically press the sides of the unfolded box against the coplanary plates included in the heating unit, preventing their mobility during the heating process.

7. A machine, according to the previous claims, characterized in that the former consists of side walls defining a gap between them having dimensions slightly greater than the side of the box to be shaped.

8. A machine, according to the previous claims, characterized in that the shaper is arranged at the lower area of the heatina unit.

9. A machine, according to the previous claims, characterized in that the walls of the shaper define in its lower area some windows through which concealable stops emerges cowards the central gap.

10. A machine, according to the previous claims, characterized in that the concealable stops define a coplanary surface, perpendicular to the walls of the shaper.

11. A machine, according to the previous claims, characterized in that the concealable stops are assembled with the possibility of rotation over the back sides of the shaper walls.

12. A machine, according to the previous claims, characterized in that the concealable stops assembled over each one of the walls are activated by a pneumatic cylinder determining their hidden or protruding position with respect to the corresponding walls.

13. A machine, according to the previous claims, characterized in that the side walls of the shaper are extended by their upper end in some diverging ramps.

14. A machine, according to the previous claims, characterized in that the treader-former includes two parallel side walls joined to each other by a lower base having less length than the former and by two upper cross bars, fitted to their ends, the treader-former defining a width equal to the inside width of the box to be shaped.

15. A machine, according to the previous claims, characterized in that the treader-former includes between the side walls two bending wedges, arranged perpendicularly to them and fixed to them with the possibility of rotation.

16. A machine, according to the previous claims, characterized in that inside the treader-former, two pneumatic cylinders are arranged which act over the bending wedges arranging them in an open or closed position.

17. A machine, according to the previous claims, characterized in that the bending wedges have at their free end, two chamfers set against each other defining a right angled rim.

18. A machine, according to the previous claims, characterized in that the treader-former is fixed to a pneumatic cylinder obliging it to describe alternative vertical movements, passing from the upper area of the heating unit to the inside of the former and vice-versa.

19. A machine, according to the previous claims, characterized in that the base of the treader-former is aligned vertically with the inside gap of the former, acting during the descent of the treader-former over the base of the unfolded box arranged in the filling unit, provoking its introduction inside the former and the bending of its sides until reaching a position perpendicular to its base.

20. A machine, according to the previous claims, characterizzd in that the means of pressing which determine the heat-welding of the opposite ends of the adjoining sides of the shaped box consist of tightening clamps arranged at the corners of the former.

21. A machine, according to the previous claims, characterized in chat the gripping devices of the tightening clamps have a length equal or slightly greater than the height of the boxes to be shaped.

22. A machine, according to the previous claims, characterized in than the gripping devices of the clamps have an internal conduit for the circulation of cooling fluid.

23. A machine, according to the previous claims, characterized in that the internal conduit of the clamps has external outlet and inlets for the connection of the ccrresponding external cooling circuit.

24. A machine, according to the previous claims, characterized in that the tightening clamps are activated by pneumatic cylinders.

25. A machine, according to the previous claims, characterized in that the means of removal of the shaped boxes consist of a motorized conveyor belt.

26. A machine, according to the previous claims, characterized in that the motorized conveyor belt is arranged beneath the former, the boxes falling over it once shaped, when the concealable stops of the former are concealed.

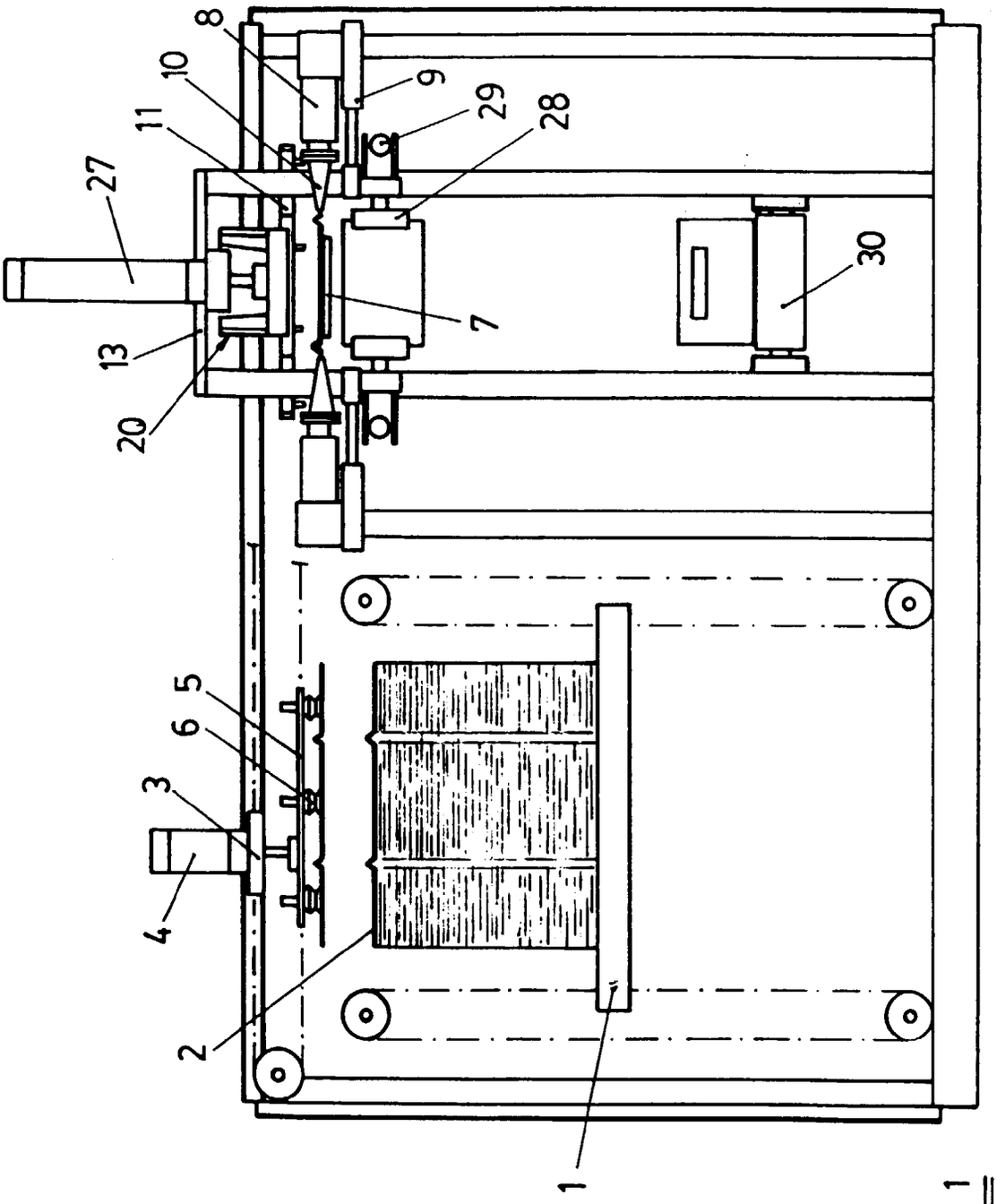

Fig. 1

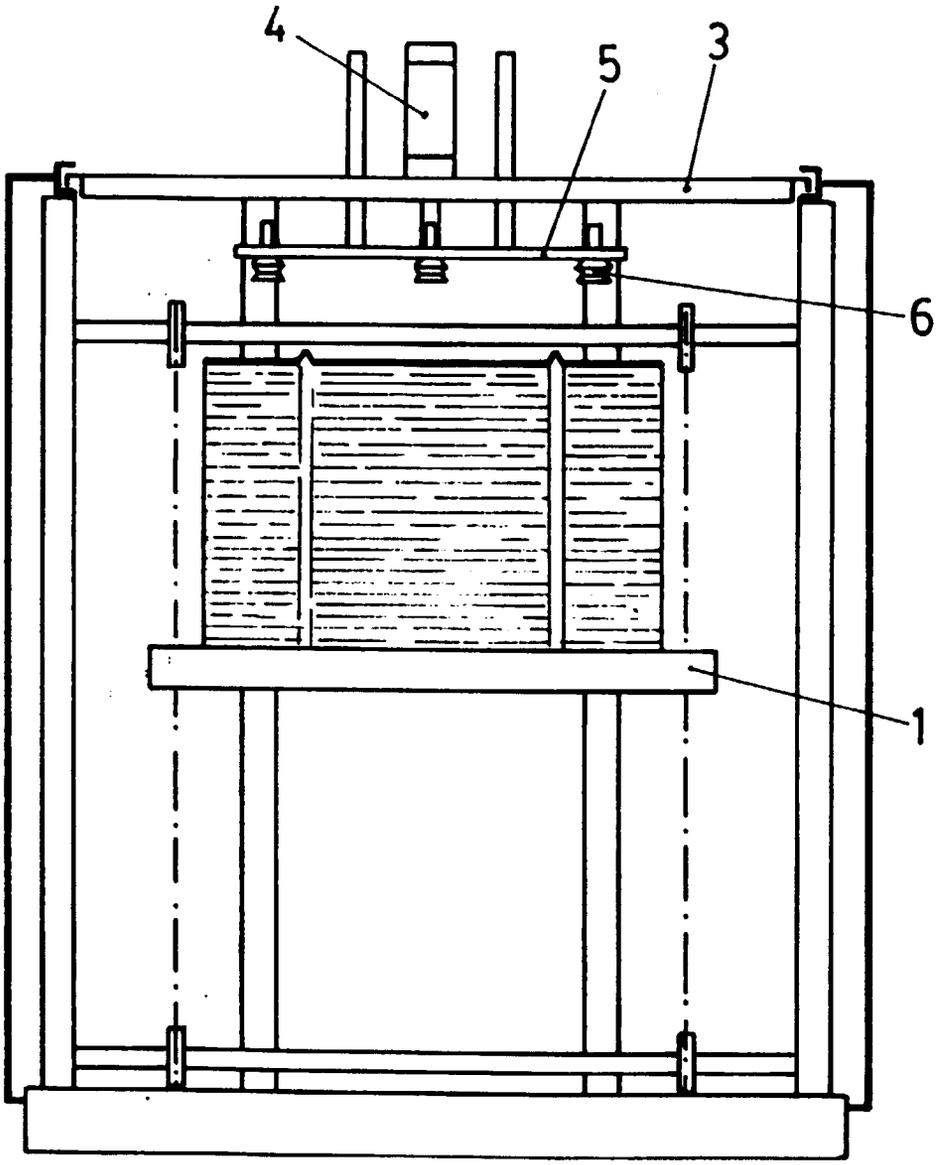

Fig. 2

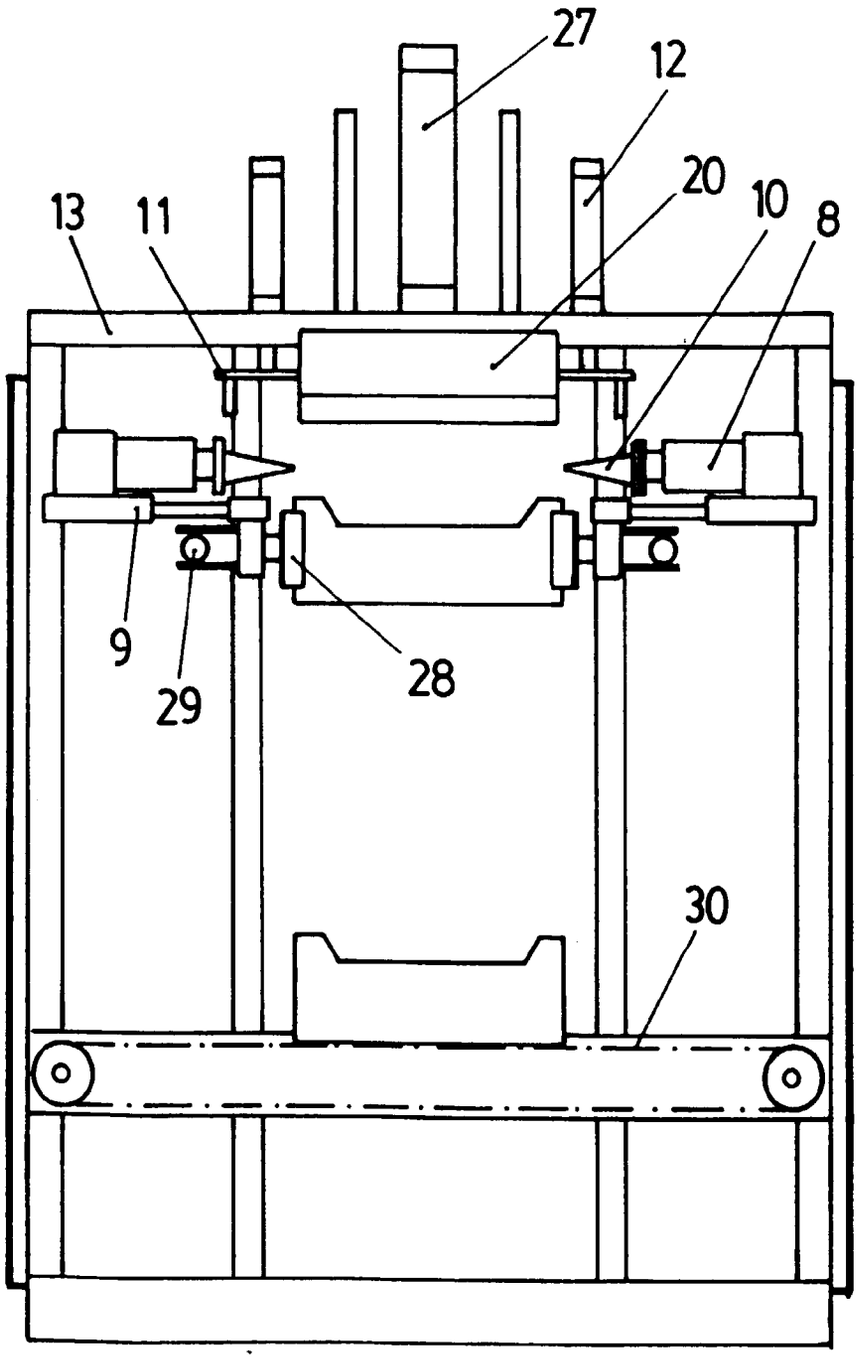

Fig. 3

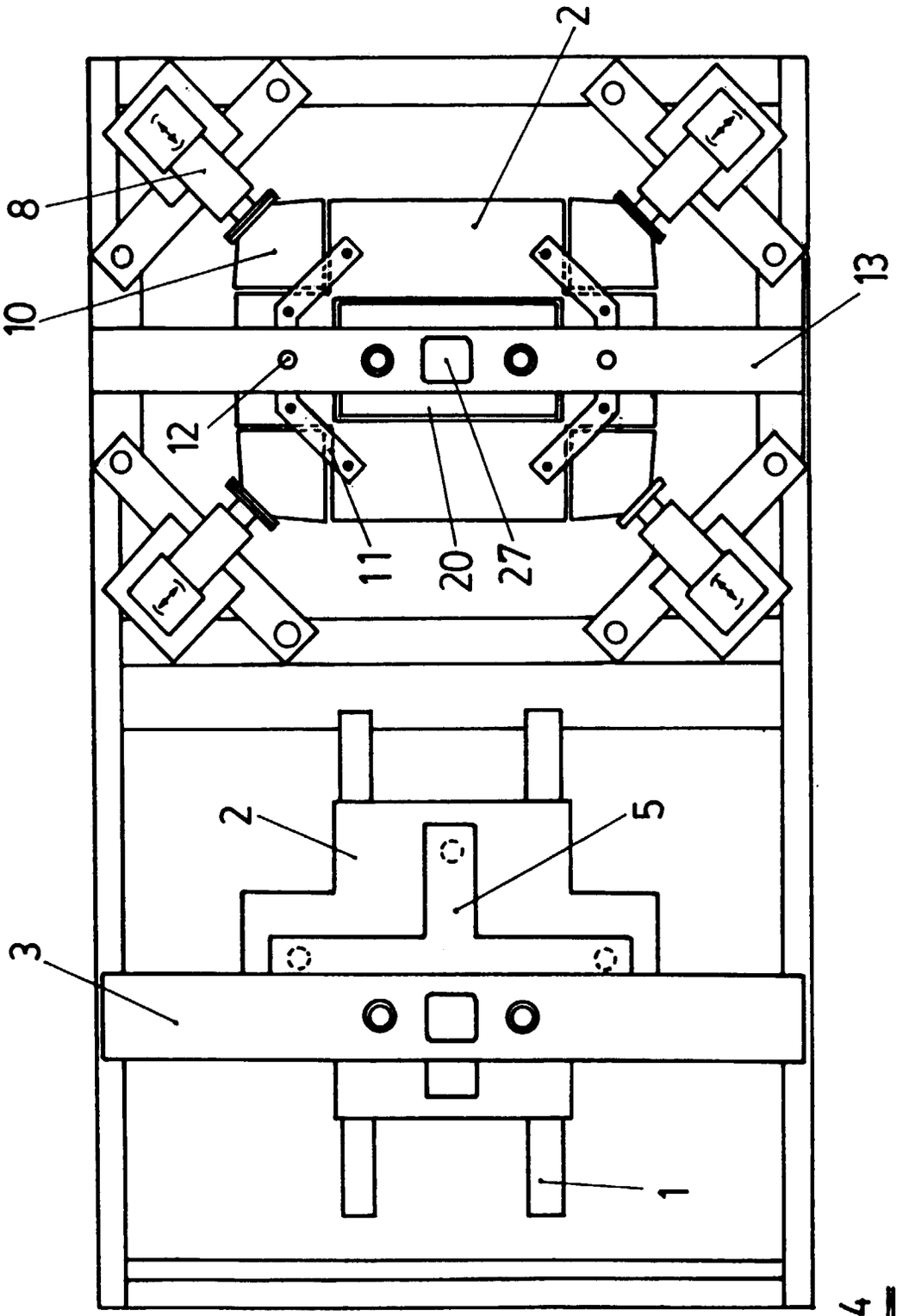

Fig. 4

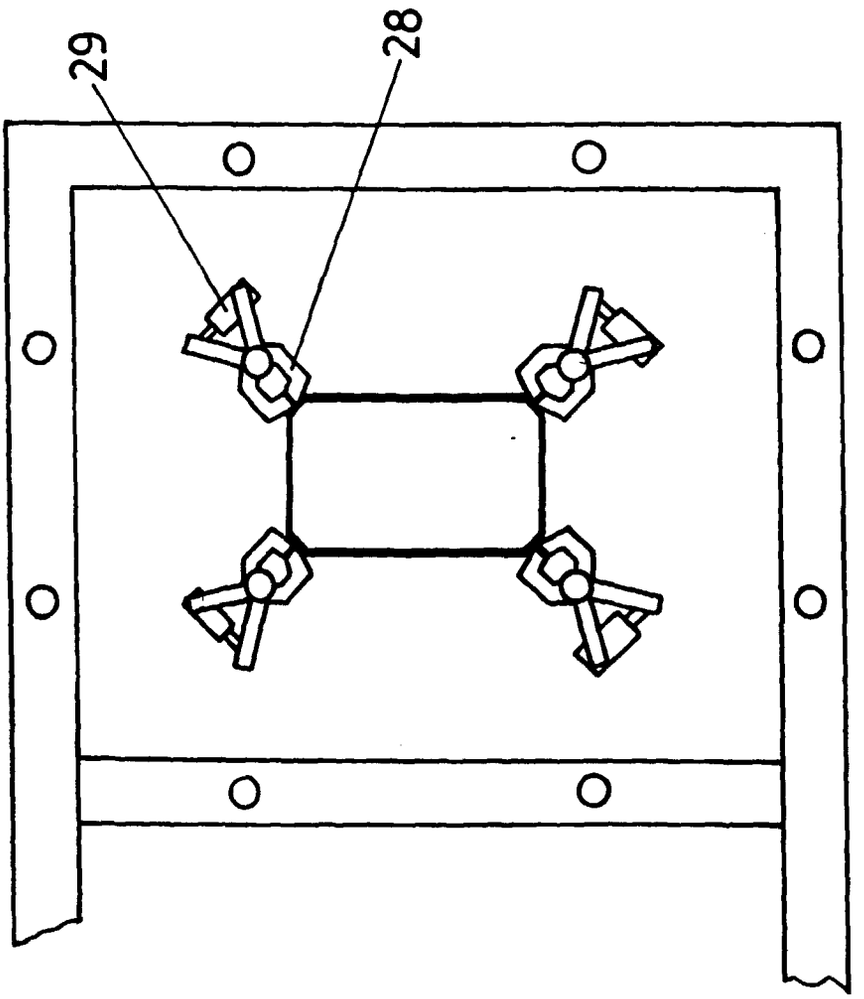

Fig.5

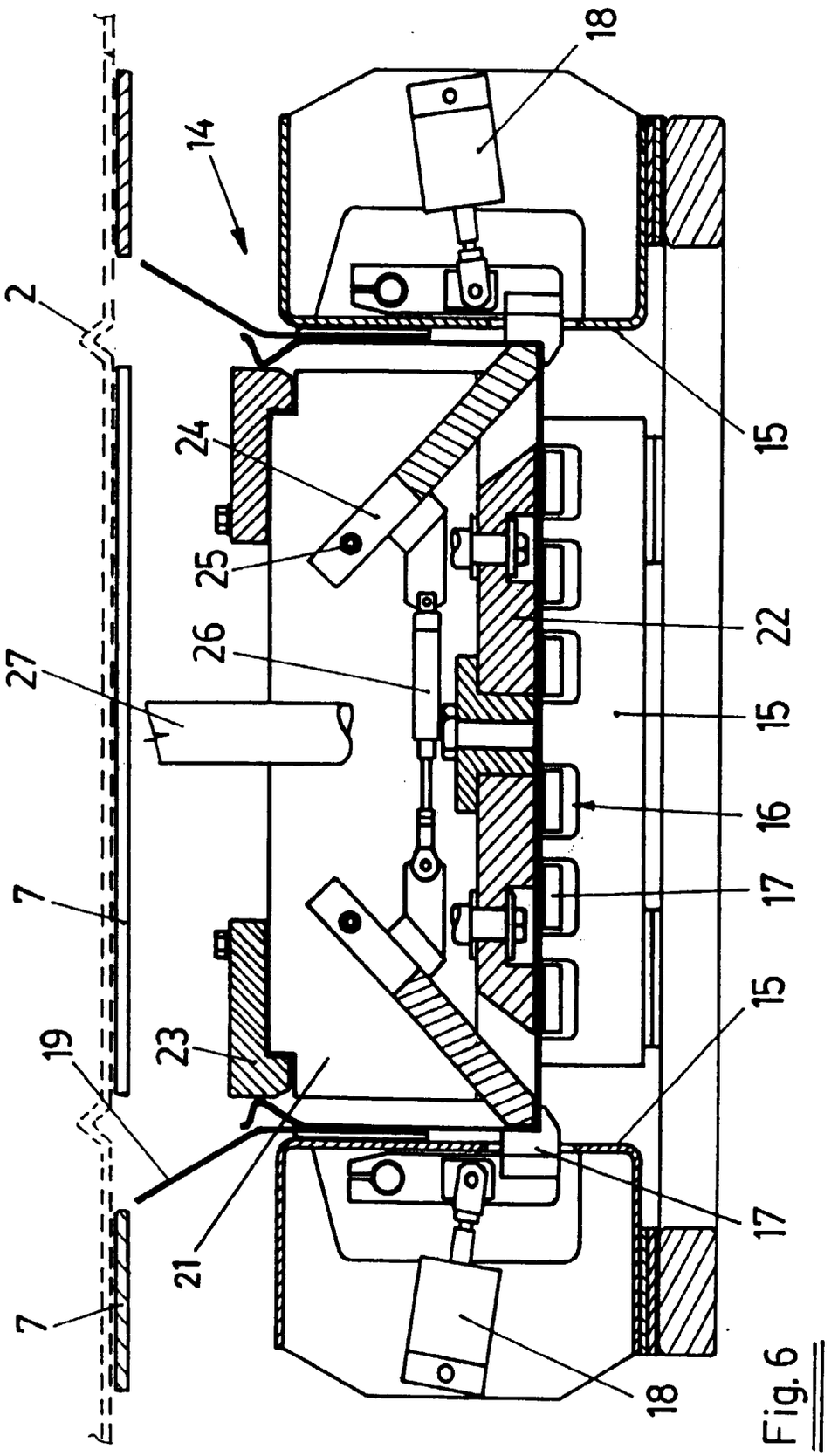

Fig.6