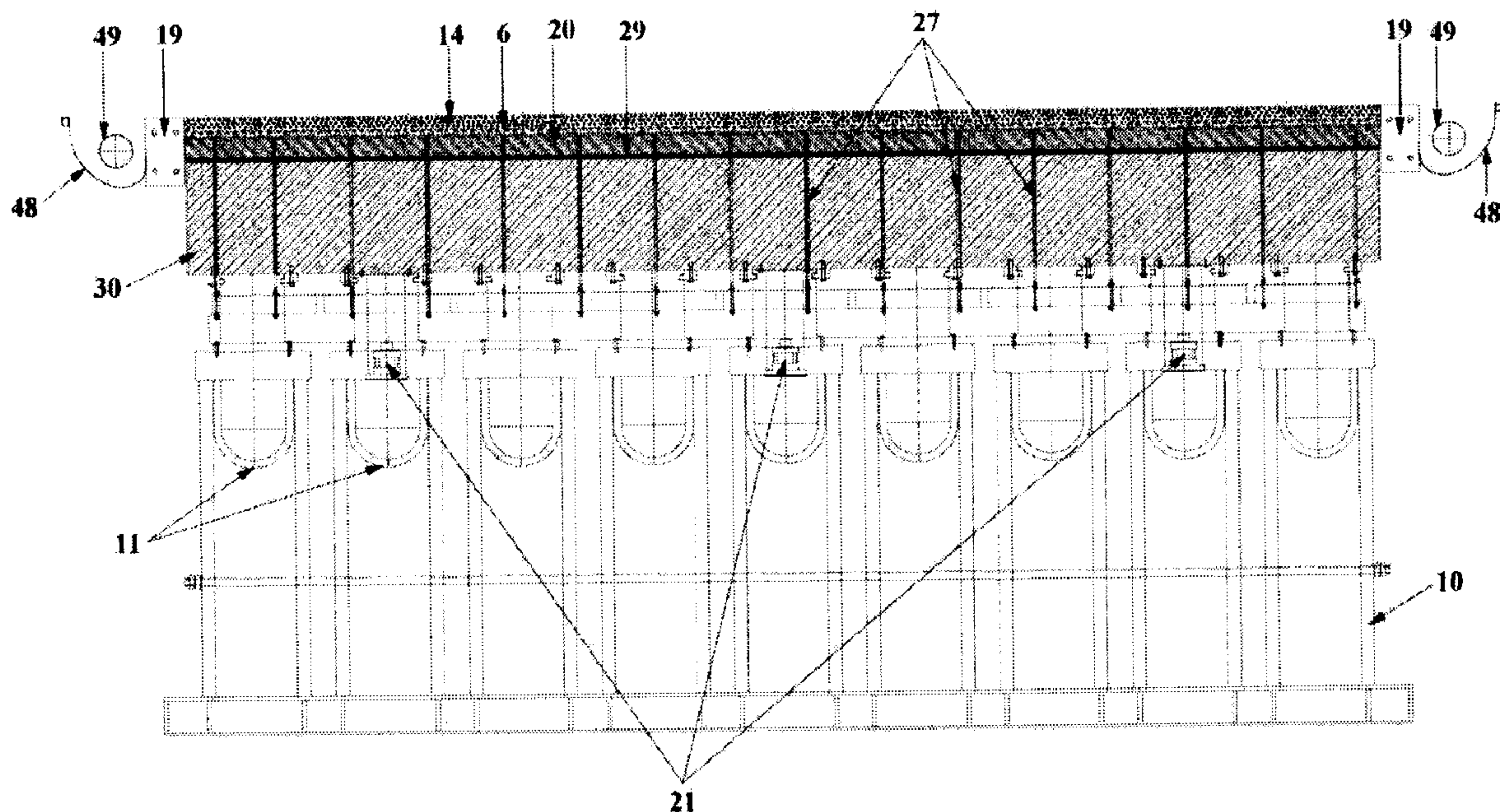




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(54) **Titre : PANNEAU ALVEOLAIRE ET MOULE DESTINE A SA FABRICATION**
(54) **Title: HOLLOW PANEL AND MOULD FOR THE MANUFACTURE THEREOF**



(57) **Abrégé/Abstract:**

The hollow panel (1) includes a hollow central board or body (2) and two external sheets (3) forming a sandwich. The central body (2) is made of wood fibre and glues and made in the mould, said mould having an uneven surface with oblique walls (4) and truncated vertices. Next, the external sheets (3), made from the same material as the central body (2), are joined using the same glues. The mould has a fixed peripheral frame (19), a thrust platform (30) and a heating plate (20) with a serrated plate (6) to which another, similar plate (7) is brought close - the two serrated plates constituting the mould - the latter plate being rigidly secured to the upper hot plate (12) of the press for forming the central board or body (2). The teeth of the two plates are offset in a staggered pattern, and do not meet, to form the uneven surface with the desired thickness (2).

ABSTRACT

The hollow panel (1) includes a hollow central board or body (2) and two
5 external sheets (3) forming a sandwich. The central body (2) is made of wood
fibre and glues and made in the mould, said mould having an uneven surface
with oblique walls (4) and truncated vertices. Next, the external sheets (3),
made from the same material as the central body (2), are joined using the same
glues. The mould has a fixed peripheral frame (19), a thrust platform (30) and a
10 heating plate (20) with a serrated plate (6) to which another, similar plate (7) is
brought close - the two serrated plates constituting the mould - the latter plate
being rigidly secured to the upper hot plate (12) of the press for forming the
central board or body (2). The teeth of the two plates are offset in a staggered
pattern, and do not meet, to form the uneven surface with the desired thickness
15 (2).

HOLLOW PANEL AND MOULD FOR THE MANUFACTURE THEREOF

DESCRIPTION

The present invention, as expressed in the heading of this specification, relates to a mould for the manufacture of hollow panels and the panel manufactured with said mould, having very advantageous characteristics in the production of this type of hollow panels. They enable the construction of furniture using panels of little weight instead of solid ones or panels manufactured traditionally using a central reinforcement of strips forming a framework and the two external sheets that give the assembly a sandwich structure.

An object of the invention is to form hollow panels from the construction of the central body or core of this sandwich in a mould, this central body being hollow.

An object of the invention is being able to use as external covers or sheets of the sandwich structure of the hollow panel, sheets also of wood fibre or MDF which are glued to the hollow central core with the same ureaformaldehyde glues.

BACKGROUND OF THE INVENTION

Currently hollow panels or hollow doors are manufactured which include a framework or hollow central core formed by crossbeams and longitudinal beams whereto different plywood covers are attached, joined with adhesives or glues.

There is also a light type of hollow doors that include as central core said framework and an internal honeycomb structure as sufficiently resistant reinforcement to at least maintain the parallel nature of the covers of the sandwich structure.

It is important to highlight that the present invention considerably improves the patents owned by the inventor no. ES 2,334,082 and ES 2,328,203, as they manage to resolve a series of problems that these patents had in their execution and manufacturing.

On the other hand, with respect to the mould whereby the cores or central panels of hollow panels are manufactured in accordance with the present invention, we can cite Patent of Invention no. ES 2,289,928 of the same applicant of the present invention, wherein it provides that door cores can be formed with the hollows for panelling or glazing so that material is not wasted since the core of the

door is perfectly finished and completed, only lacking the final veneering and without requiring any machining.

This Patent of Invention provides that the mould both for hollow doors and for hollow panels is formed by a fixed peripheral frame which follows the contour of the door core, or a multiple of the surface thereof to be able to simultaneously obtain several door cores in the same pressing phase, later being separated by cuts.

The lower horizontal platform is vertically displaceable by way of a plunger by hydraulic cylinders, resting thereon a first rectangular framework adjusted to the dimensions of the hollow of the peripheral frame and which can slide telescopically in the interior, having as many windows on its surface as door cores are provided in the mould. These windows receive in turn second frameworks independent from one another but which are also telescopically displaceable, including therein the respective hollows if any for panelling or glazing.

The mould is located in a frame press and so that the upper moving and hot plate of the press closes the mould on contacting with the fixed peripheral frame. The hollows to panel or glaze are occupied with metal blocks that remain fixed in a raised position and flush with the peripheral frame of the mould.

The first and second or second rectangular frameworks are actuated hydraulically from below and constitute in themselves the lower hot plate of the press since they are heat resistant. The blocks that prevent the product from accessing the mould surface, located in the place where it is designed that the hollows for panelling or glazing are formed, are maintained in a raised position by the hydraulic cylinders that serve them, and if the door is compact, i.e. solid, and without hollows for panelling or glazing, the second frame is solid and all its surface will receive the blanket of wood fibre and glue.

In Patent of Invention no. ES 2,296,543 which is also of the same applicant of the present invention, improvements are provided in the aforementioned structure, whereby it achieves automatism and versatility in the manufacturing of different types and models of doors with a same mould. For this it has a rectangular frame with different spaces or windows with the contour of the core of the door to be manufactured, to simultaneously achieve several totally finished units defining a composite mould. The blocks that occupy the position of the cavities to panel or glaze are defined by a plurality of transversal elements that can be individually displaced, having the same or different width. The useful surface of the

first rectangular framework defines an area where a greater amount of product is received since it lowers to a greater extent than the rest does, so that a considerably greater density is obtained in the pressing than in the rest.

The first and second rectangular frameworks, as well as the independent intermediate blocks that the hollows for panelling or glazing can be formed with, are supported by vertical rods passing through an upper horizontal platform that is actuated by the lower hydraulic cylinders of the press, an operation which is performed once the upper hot plate of the press has covered the mould.

In the Certificate of Addition no. ES 2,325,712 to the main Patent of Invention no. ES 2,296,543 commented above, improvements are provided in the mould for the manufacture of door cores which are centred both on the fixed part of the mould and the raising and lowering structure of the first and second frameworks to vary the displacement path depending on the thickness that the door core must have.

With regard to the rectangular frame or walls of the mould wherein several units can be manufactured in the same pressing phase, instead of being fixed to manufacture standard door cores, it is divided in two parts: one fixed external part peripheral to each independent unit and another moving internal one displaceable telescopically therein and able to occupy two positions: an upper one which remains flush with the external peripheral part to manufacture standard door cores and another lower position for the manufacture of door cores of greater dimensions in length and width, as they lower to the same extent as the first rectangular framework to receive a greater volume of material to press.

The hydraulic cylinders that serve these first and second frameworks are extended or withdrawn to the desired extent depending on the order received from the automatic computer-controlled unit that the installation includes. The admission movements (downward) are sequential during the advance of the dosage apparatus that supply the product to press, since in the displacement towards one side of the press the product contained in the hoppers is discharged which, in this case, may be DM or wood fibre and glue with different densities when sandwich type cores or doors are manufactured. When the moving frame wherein the one or more dosage apparatus are mounted exits the press, the pressing is performed and thus when it returns to the other side the removal of the manufactured door cores has simultaneously taken place, which is carried out at the same time as the upper plate

of the press has been raised and the lower cylinders thereof have been extended to remove the door core from the mould.

The dosage apparatus includes a large central hopper with the product which must constitute the central area of the sandwich of the two-density door and another two smaller side hoppers which contain the product of the standard layers thereof. In the bottom of the hoppers there are rotating blade rollers that distribute the product towards the sides and furthermore the entire bottom of the hopper is occupied by two conveyer belts which advance towards the centre where there are rollers with blades in charge of filling the mould. In the lower part of this displaceable chassis or carriage, there are cleaning rollers on the surface of the mould to avoid undesired incrustations from forming.

DESCRIPTION OF THE INVENTION

It is important to highlight that the present invention considerably improves the patents owned by the inventor, no. ES 2,334,082 and ES 2,328,203, as it manages to resolve a series of problems that these patents have in their execution and manufacturing.

The invention is directed to a mould for the manufacture of hollow panels, being of the type that include a hollow central panel and two external covering sheets joined with adhesive to the central panel, and the mould being disposed in a frame press an upper hot plate whereof is raised to allow the entry of a dosage apparatus which discharges in the mould a product of wood fibre and glues, which then lowers in a pressing phase closing the mould in a top part, a lower hot plate of the press defining a displaceable bottom of the mould, the mould comprising:

- a fixed peripheral frame of dimensions corresponding to a panel,
- a heating plate which is adapted to be vertically displaced by hydraulic cylinders, a free surface of said heating plate being occupied by a first serrated profile plate which forms the mould of striations parallel with an angle and desired height, being interchangeable,
- a thrust platform and the heating plate, actuated by the hydraulic cylinders of the press,
- a second serrated plate which forms part of the mould the second plate being rigidly secured to the upper hot plate of the press, with an identical serration to that of the first serrated plate but offset in a

staggered pattern with respect thereto to form the oblique walls of the hollow central body of the hollow panel.

In general terms, the mould for the manufacture of hollow panels, as well as the hollow panel obtained by the mould, proposed by the invention, allow the construction of a hollow panel which, even being of the type of those formed by a hollow central panel and two external sheets or covers which give the assembly a sandwich structure, offers the special characteristic that the central panel or core of the sandwich is constructed by moulding in the mould object of the invention.

The hollow core has as novel solution compared with that commented in the previous section, the geometric form of its central core and specifically of the hollow area thereof, being differentiated therefrom by the uniform geometric distribution of the recesses which are determined and which, in this case, are established as truncated pyramid or truncated conical inlets disposed both

longitudinally and transversally, i.e. in two perpendicular directions and in total symmetry.

As regards the lateral sheets of this sandwich, it offers the advantage that they are also of the same pressed material of wood fibre or MDF and urea-formaldehyde glues and they are joined to the central body with this same type of glue.

The recesses of one face, preferably trunk-pyramid, are offset with respect to the other face to form walls of little thickness, thus achieving the proper resistance and also lightening the weight, in addition to forming the panel on attaching the external sheets to this central core. This hollow panel can be marketed alone, i.e. without the external covers of the sandwich, or it can be supplied just lacking the final finish (lacquering, rejection of wood) on both faces and thus it is used by furniture manufacturers to be cut into small pieces by cutting to the desired measurements, or as decorative panels.

To achieve these hollows or recesses on moulding the central core, the serrated plate of the bottom of the mould and that attached to the upper hot plate of the press are determined by separate plates whose faces incorporate a plurality of truncated pyramid or truncated conical protuberances, with the commented distribution, to form the recesses in the blanket of wood fibre and glues poured into the mould by the corresponding dosage apparatus, as it is deposited on the bottom plate and as the hot plate lowers to close the mould.

The vertices of this serrated surface constructed in the mould are truncated to increase the gluing surface of the external covers or sheets of the sandwich.

For its part, the mould is loaded with the product of a single density which is found in a measuring hopper disposed in a carriage which has a swinging movement from one side to the other of the mould, exiting the press to allow the upper hot plate to lower to close in the top part the mould. This plate includes another plate with serrated profile similar to the lower one but with its teeth offset in a staggered pattern, and both do not meet, to form the uneven surface with the desired thickness.

In these conditions before the filling of the mould the lower hydraulic cylinders of the press act making the thrust platform rise to determine the gauge of the blanket, in addition to making the final pressing of the panel, which, once set, will also perform the function of demoulding. After this initial step and once

the mould has been filled, the upper serrated plate which has a flat peripheral extension with respect to its serrated area lowers since the mould has to totally close. The serration is only localized in the central area, although it is large.

5 In the pressing, the upper protuberances interconnect with the lower ones without establishing contact and the walls of the planned thickness are formed with them. In addition to it being possible to achieve the different core thicknesses by varying the path of the thrust platform, by a gauge system, the serrated plates can also be interchanged with others that have the protuberances of the suitable length.

10 To facilitate the understanding of the characteristics of the invention and forming an integral part of this specification, sheets of plans are attached in the figures whereof the following has been represented with illustrative and non-limiting character:

15 BRIEF DESCRIPTION OF THE DRAWINGS

- Figure 1. - Is an elevation cross-section of a hollow panel formed by a hollow central body and two external panels or sheets acquiring a sandwich structure, in accordance with the invention.
- 20 Figure 2. - Is a view similar to figure 1, observing only the hollow central body, as made in the mould object of the invention.
- Figure 3. - Detail of plan view of the upper central body.
- Figure 3'. - Detail of plan view of the lower central body.
- Figure 4. - Is a longitudinal elevation view of the mould for the simultaneous manufacture of a hollow panel, disposed in a frame press and with the measuring hopper situated on the mould.
- 25 Figure 5. - Is a view similar to figure 4, without including the measuring hopper or the upper part of the press.
- Figure 6. - Is an elevation cross-section of that shown in figure 4, without including the measuring hopper.
- 30 Figure 7. - Is a view of the frames of the press
- Figure 8. - Is a partial elevation and profile view, of the serrated plates rigidly fixed to the lower and upper hot plate of the press to obtain the hollow central body.

- Figure 9. - Is a plan view of the demoulding system of the mould panel once the press is open, and we can also observe thrusters which have the function of pulling off the panel from said mould serration.
- Figure 10. - Is a longitudinal elevation view, according to the displacement, of the measuring hopper of the moving carriage.
- Figure 11. - Is a plan view of that shown in figure 10.
- Figure 12. - Is a view of the lower mould serration, representing the thrusters that pull off the panel from the mould.
- Figure 13. - Is a view of the upper mould serration, representing the upper hydraulic cylinders that close the press.
- Figure 14. - Plan view of the thrust platform, representing the thruster for pulling off the panel from the mould and the gauges of the thickness of the end panel.
- Figure 15. - Represents the thrust platform with the hydraulic cylinders and the thruster for pulling off the panel from the lower mould.
- Figure 16. - View in 3 dimensions of the core of figure 8.

DESCRIPTION OF A PREFERRED EMBODIMENT

Making reference to the numbering adopted in figures and in particular figures 1 to 3, the hollow panel object of the invention is generally referred to with number (1) and has a sandwich structure formed by the hollow central body (2) which is the part obtained by pressing in the mould, and two external covers or sheets (3).

The core or central panel (2) constitutes in itself the most novel part of the invention since it is formed by the pressing of wood fibre and urea-formaldehyde glues, by heat received from the hot plates of the frame press wherein it is found and of which the mould forms part as we will see later on.

The central panel (2) has a structure formed by oblique partitions (4) in zigzag by way of an accordion but which do not reach the edges of the panel.

When the sheets (3) are later glued to this central panel (2), the hollow panel (1) becomes very resistant and light.

The zigzag disposal of the hollow body is formed on incorporating serrated plates (6) and (7) in the hot plates of the press, which in the pressing phase interconnect without joining together, the thickness of the partitions (4) of the core or central panel (2) defining their separation. The product pressed

between the plates (6) and (7) offers the interlinked disposal of oblique partitions with the truncated vertices defining surfaces (8) of application of the adhesive joining the external covers (3).

Therefore, the troughs of the serration of the serrated plates (6) and (7) are flat. The peaks of the teeth are rounded to facilitate the demoulding, whilst increasing resistance (see figure 8, 12 and 13).

In figures 4 to 7 we see the frame press (10) provided with the lower hydraulic cylinders (11) which perform three functions in the total of the process: first they lift the mould to the height we determine for the thickness of the blanket formed by the product (14). Once the mould is formed with the product (14), dosed and poured from the measuring hopper (15) of the displaceable carriage (16) holding the wheels (17) (figure 10) and which circulate along the tracks (18) rigidly secured to the frames of the press (figure 6), and the upper hot plate (12) has lowered when the upper cylinders (13) actuate, the mould closes and the thrust platform (30) is raised in the pressing operation until reaching gauges.

Later, the upper hot plate (12) is lifted by means of the hydraulic cylinders (9) and the hydraulic cylinders (11) are raised, the core (2) is thrust by said cylinders to the height of the peripheral frame (19), then, and as we can observe in figure 9, a group of thrusters (27) rise to pull the panel off the mould serration (6), said thrusters are actuated by the pneumatic cylinders (21).

Once outside the mould the core is removed by one of the carriages with grippers (not represented in the drawings) to the stacking area of the hollow panel whilst the hopper again fills the mould. When the carriage (16) exits, a new pressing takes place at the opposite side of the press and then it is the other carriage with grippers from the other opposite side of the carriage (16) which removes it, whilst the mould is again filled with the hopper (15).

As seen in figure 5, the serrated plate (6) of the bottom of the mould is fixed to the heating plate (20), this in turn rests on an insulating sheet (29) which prevents transmitting heat to the thrust platform (30) (figure 14) and which is displaceable downward to receive the product (14) to press (see figure 5), which takes place by a series of hydraulic cylinders (11), figure 15. The product (14) received in the mould (6) is called product blanket; this blanket is pressed to a certain gauge which can be variable depending on its thickness and is determined by the gauges (5) (figure 6 and 14).

Something similar happens on the upper surface of the core, since on closing the mould (lowering the upper hot plate 12 with its serrated plate 7) the flat extensions (34) of said upper plate (7) close the mould (figure 4 and 6).

On the other hand, the hopper (15) containing the product (14) is outside
5 the press, on one side or the other thereof, to allow the lowering of the upper hot plate which closes the mould to perform its compacting.

Figures 10 and 11 show the geometry of the carriage (16) with the large hopper (15) containing the product (14). As it advances, the product dosed with the four central rotating rollers (39), provided with blades and which are
10 perfectly supplied with product (14) by the two conveyer belts (40) which advance towards the centre, are discharged. There are distributors (41) (see figure 10) which help the distribution to be uniform along the whole width of the mould.

Figure 11 shows the lower plant where four cleaning rollers (43) can be
15 distinguished, which are longer and sweep the horizontal surface of the peripheral frame, avoiding incrustations.

It has also been provided that the surplus product swept by the cleaning rollers (43) is collected in one or another channel (48) provided at the ends of the mould, being redirected for its recovery with the rotation of separate worm
20 gears (49) disposed in the bottom of the respective channel (48). (Figure 4)

CLAIMS

1. Mould for the manufacture of hollow panels, being of the type that include a hollow central panel and two external covering sheets joined with adhesive to the central panel, and the mould being disposed in a frame press an upper hot plate whereof is raised to allow the entry of a dosage apparatus which discharges in the mould a product of wood fibre and glues, which then lowers in a pressing phase closing the mould in a top part, a lower hot plate of the press defining a displaceable bottom of the mould, the mould comprising:
 - a fixed peripheral frame (19) of dimensions corresponding to a panel,
 - a heating plate (20) which is adapted to be vertically displaced by hydraulic cylinders (11), a free surface of said heating plate (20) being occupied by a first serrated profile plate which forms the mould of striations parallel with an angle and desired height, being interchangeable,
 - a thrust platform (30) and the heating plate (20), actuated by the hydraulic cylinders (11) of the press,
 - a second serrated plate (7) which forms part of the mould the second plate being rigidly secured to the upper hot plate (12) of the press, with an identical serration to that of the first serrated plate (6) but offset in a staggered pattern with respect thereto to form the oblique walls (4) of the hollow central body (2) of the hollow panel (1).
2. Mould for the manufacture of hollow panels, according to claim 1, wherein a dosage carriage (16) adapted to move from one side of the mould to the other to discharge the product (14) contained in a large measuring hopper (15) equipped with rotating rollers (39) in transversal disposal and equipped with radial blades to discharge the product (14) which accesses on two conveyer belts (40) collateral thereto and which is mixed in this central area by two blade distributors (41) which access transversally and guide the product (14) so that the distribution is uniform along the whole width of the mould.

3. Mould for the manufacture of hollow panels, according to claim 2, wherein the dosage carriage (16) includes in a front and rear area, in the direction of a swinging movement, lower sweeping rollers (43) that clean the mould surface and unify the poured layer of product (14).

4. Mould for the manufacture of hollow panels, according to claim 3, wherein an excess product (14) swept by the lower sweeping rollers (43) is collected in one or another channel (48) provided at ends of the mould and carried for recovery with different worm gears (49) of a bottom of the respective channel (48).

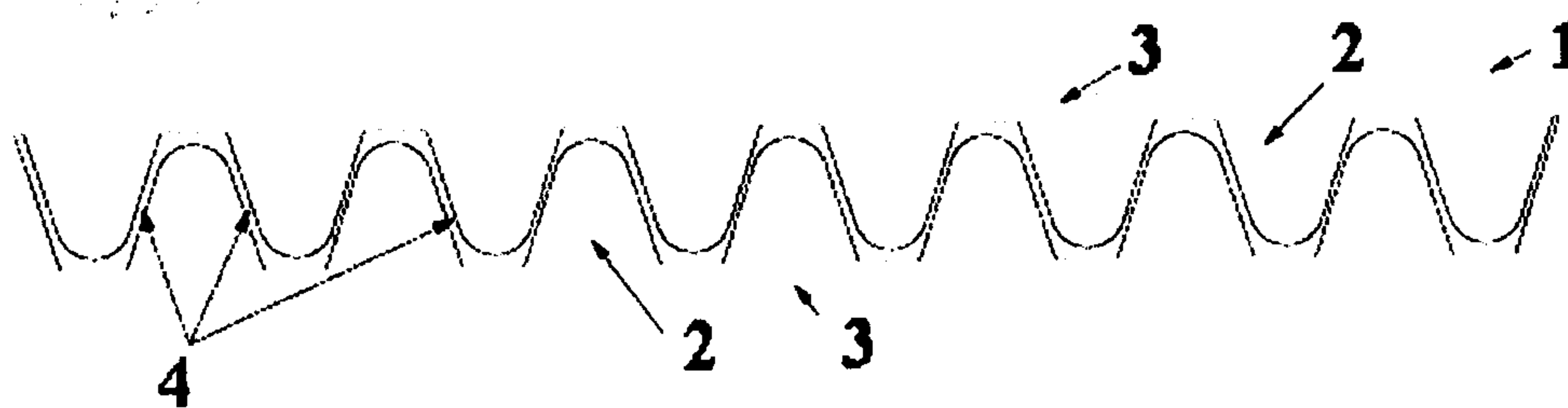
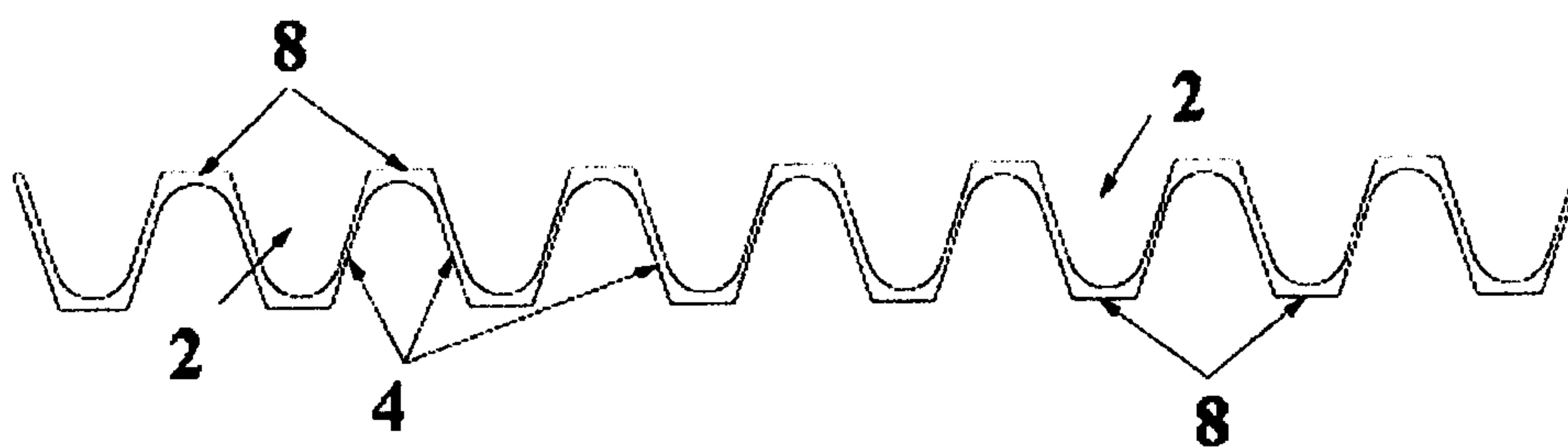
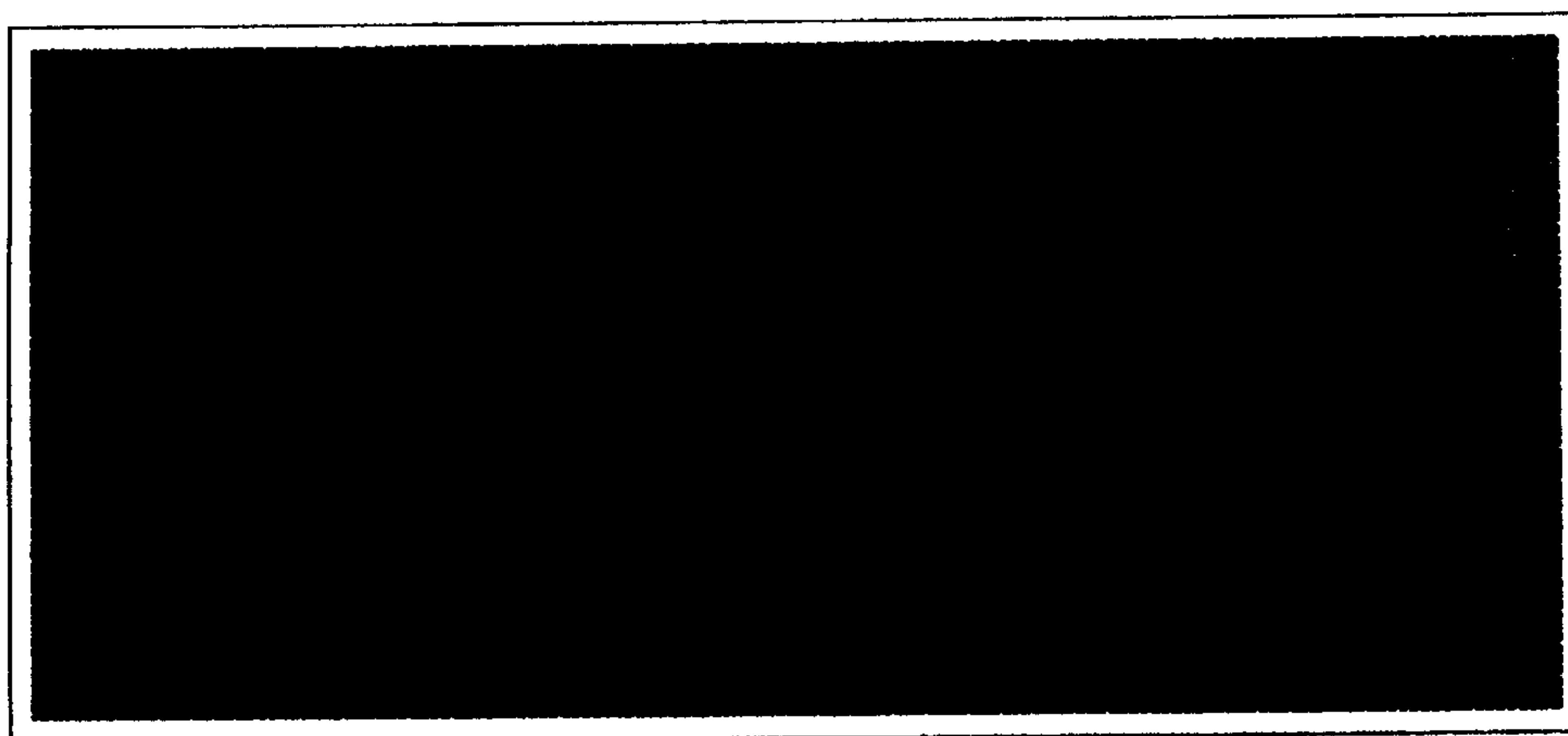
5. Hollow panel, comprising:

a sandwich structure defined by a hollow central panel or body, and
a honeycomb structure, closed on both sides with external sheets or covers joined by gluing,

wherein the hollow central body (2) is formed by a pressed layer of wood fibre and urea-formaldehyde glues forming an uneven surface of oblique transversal walls (4) in zigzag with V-shaped profile of truncated vertices, the parallel bands (8) corresponding to the truncations for application of the adhesive joining the external sheets or covers (3) of the sandwich being coplanar.

6. Hollow panel, according to claim 5, wherein the external sheets or covers are also made of wood fibre or MDF and urea-formaldehyde glues, of a given thickness.

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**FIGURA 1****FIGURA 2****FIGURA 3**

2/12

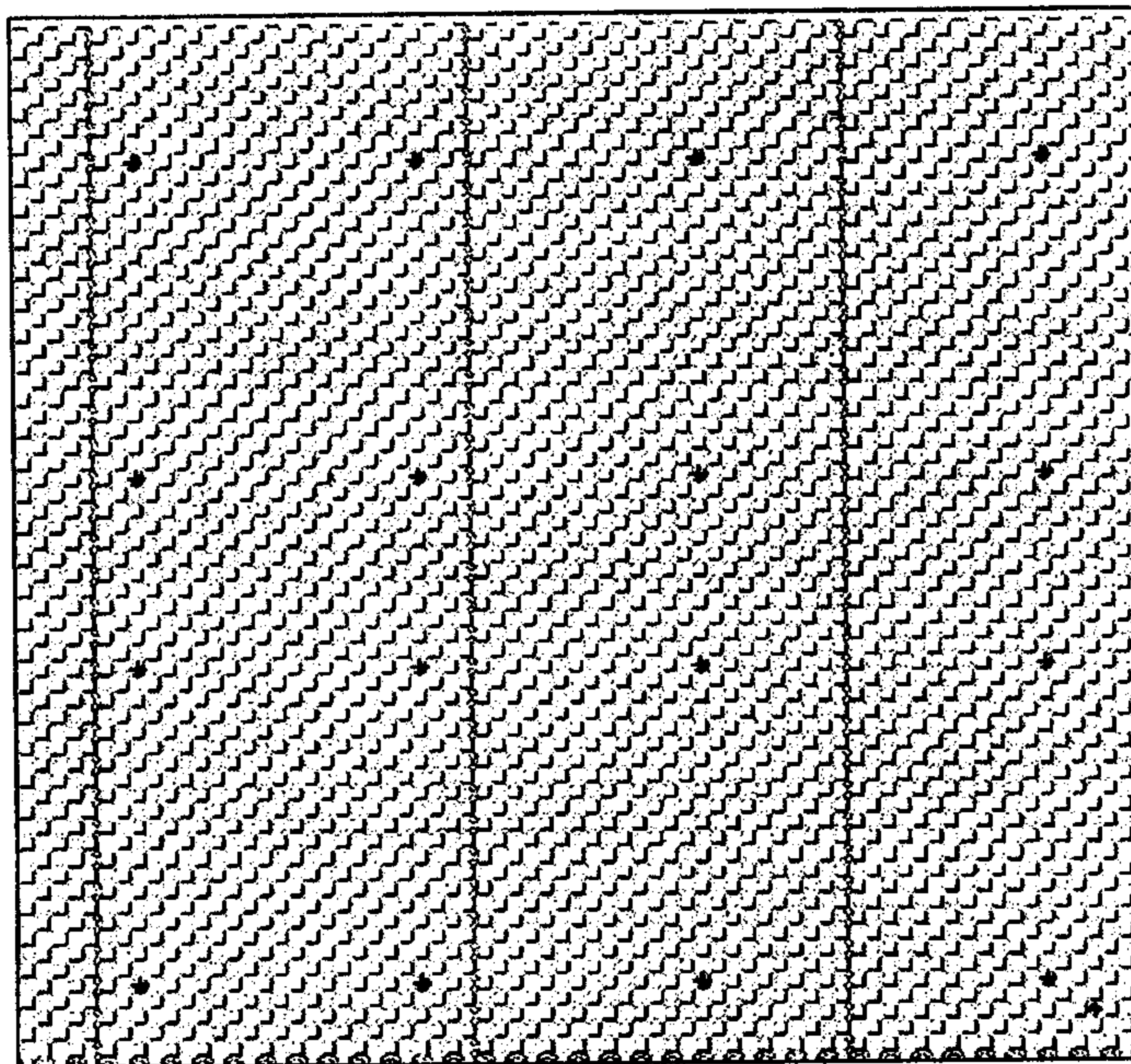


FIGURA 3'

3/12

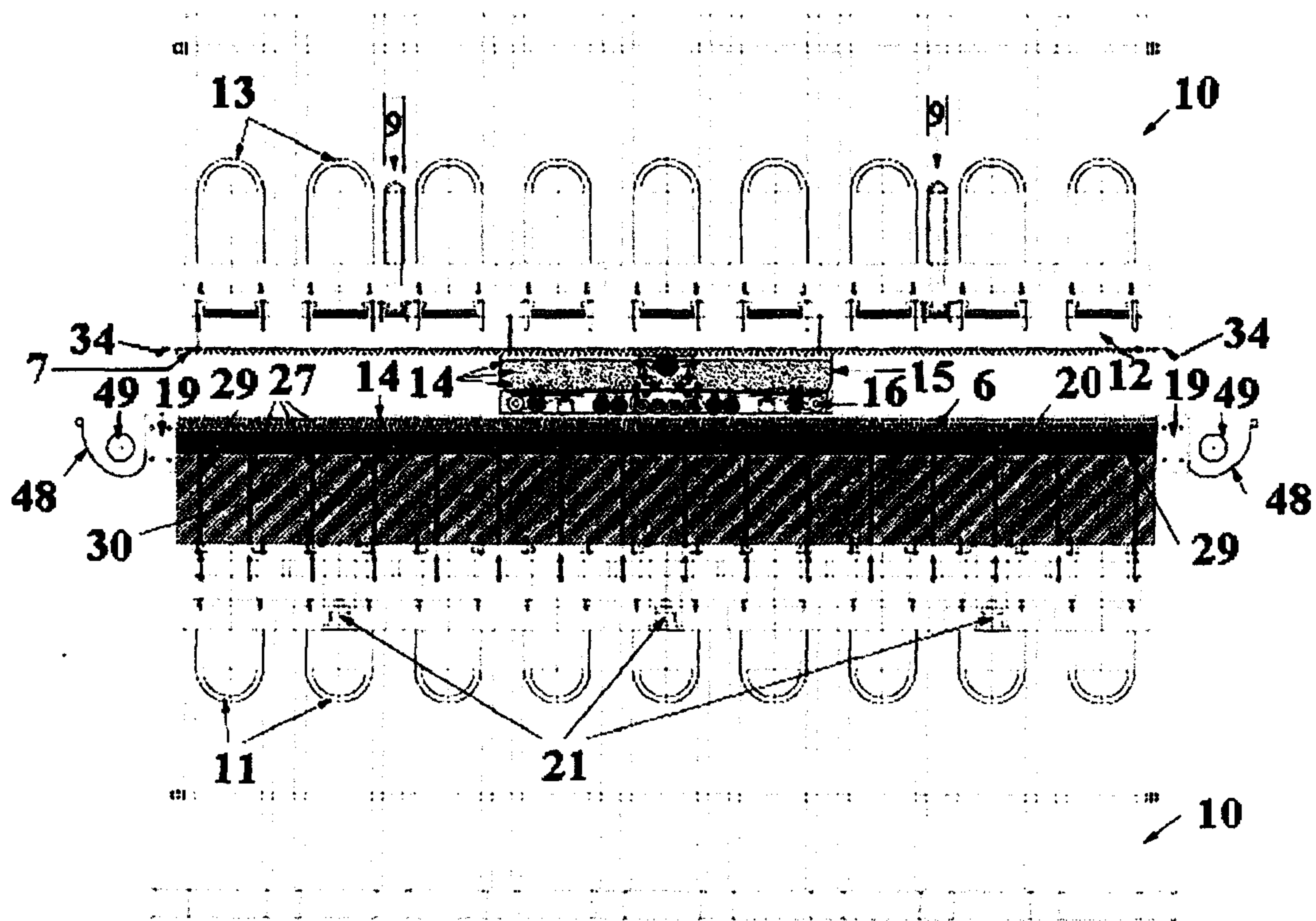


FIGURA 4

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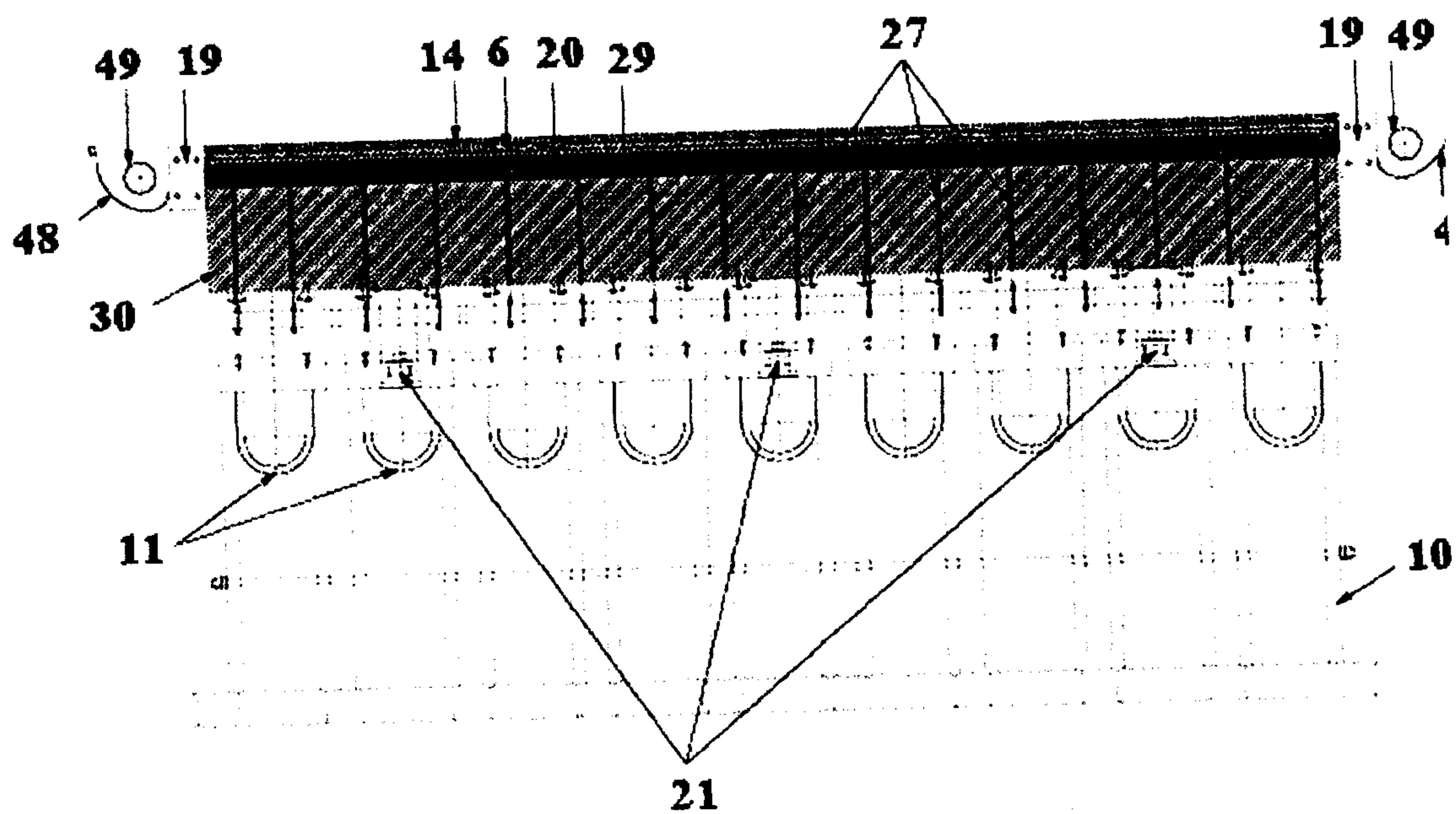


FIGURA 5

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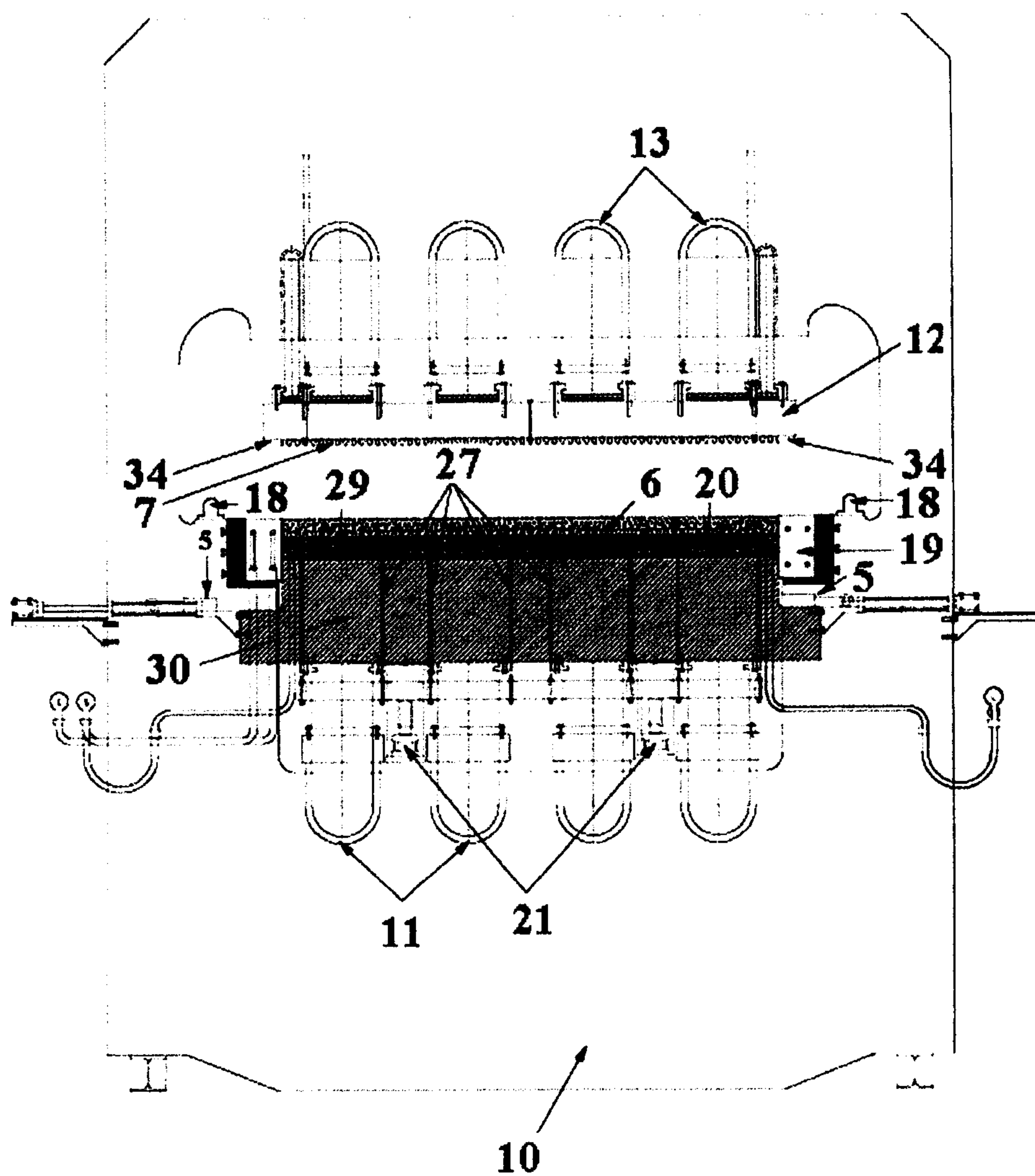


FIGURA 6

HOJA DE REEMPLAZO (Regla 26)

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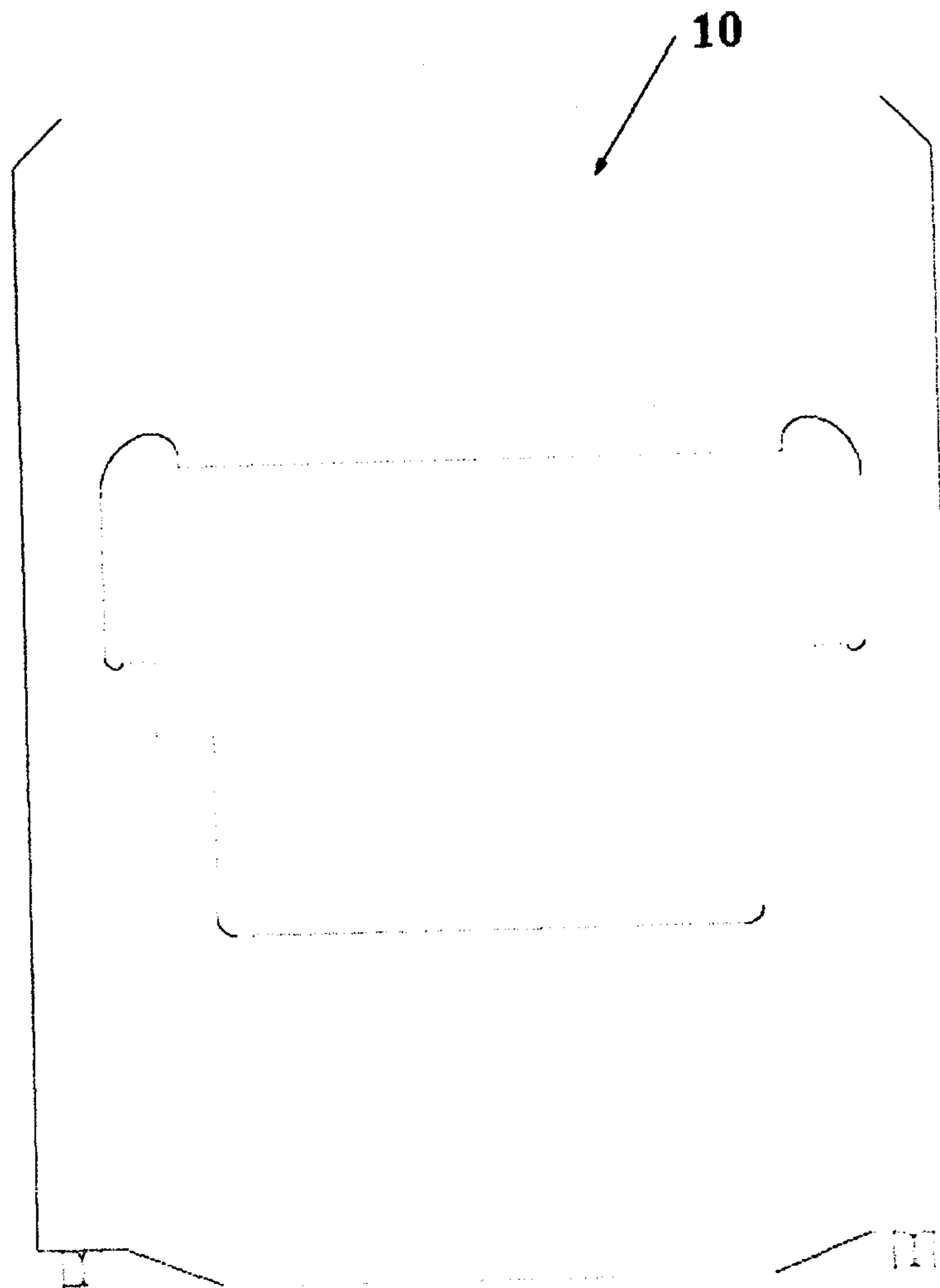
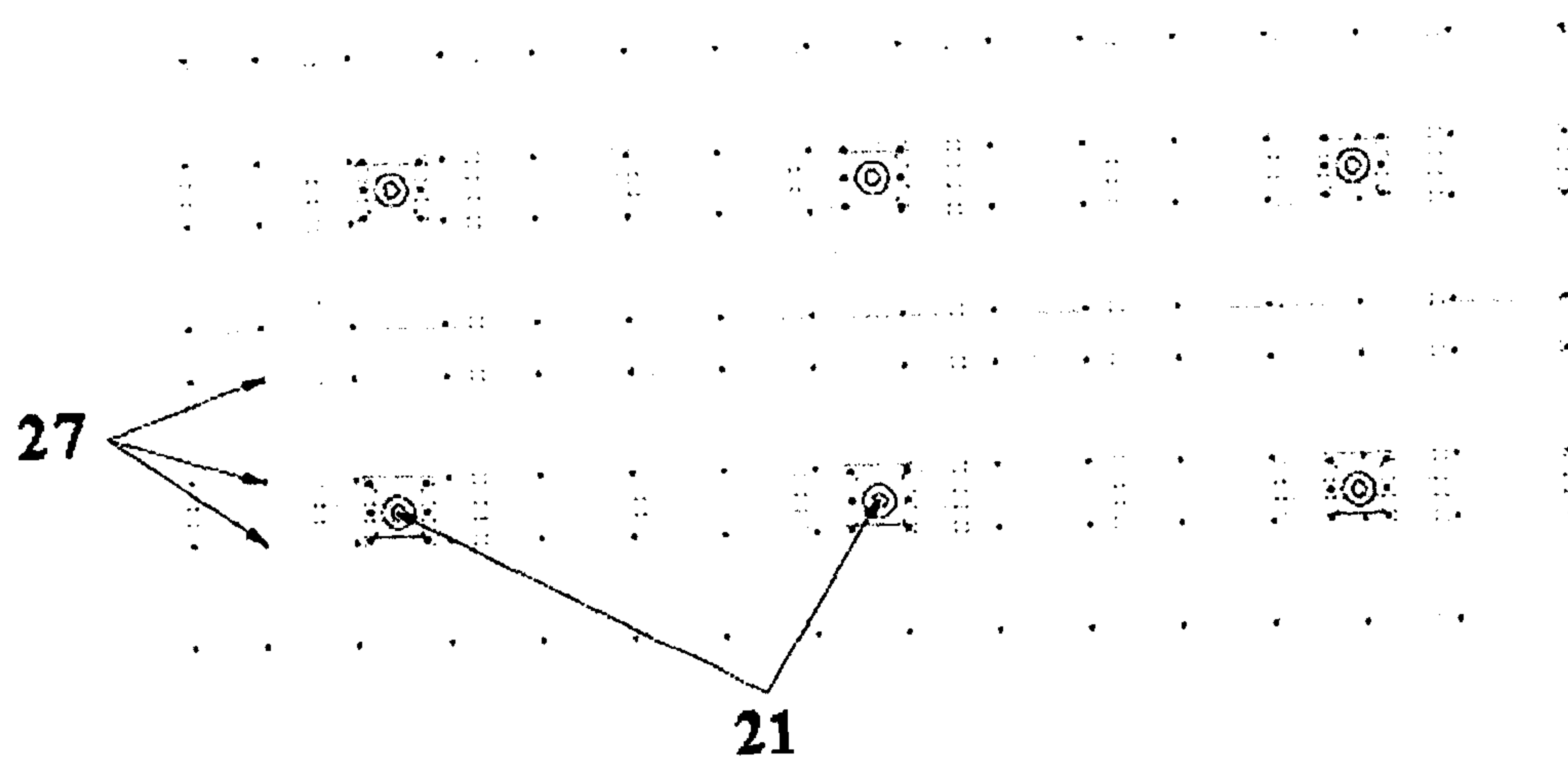
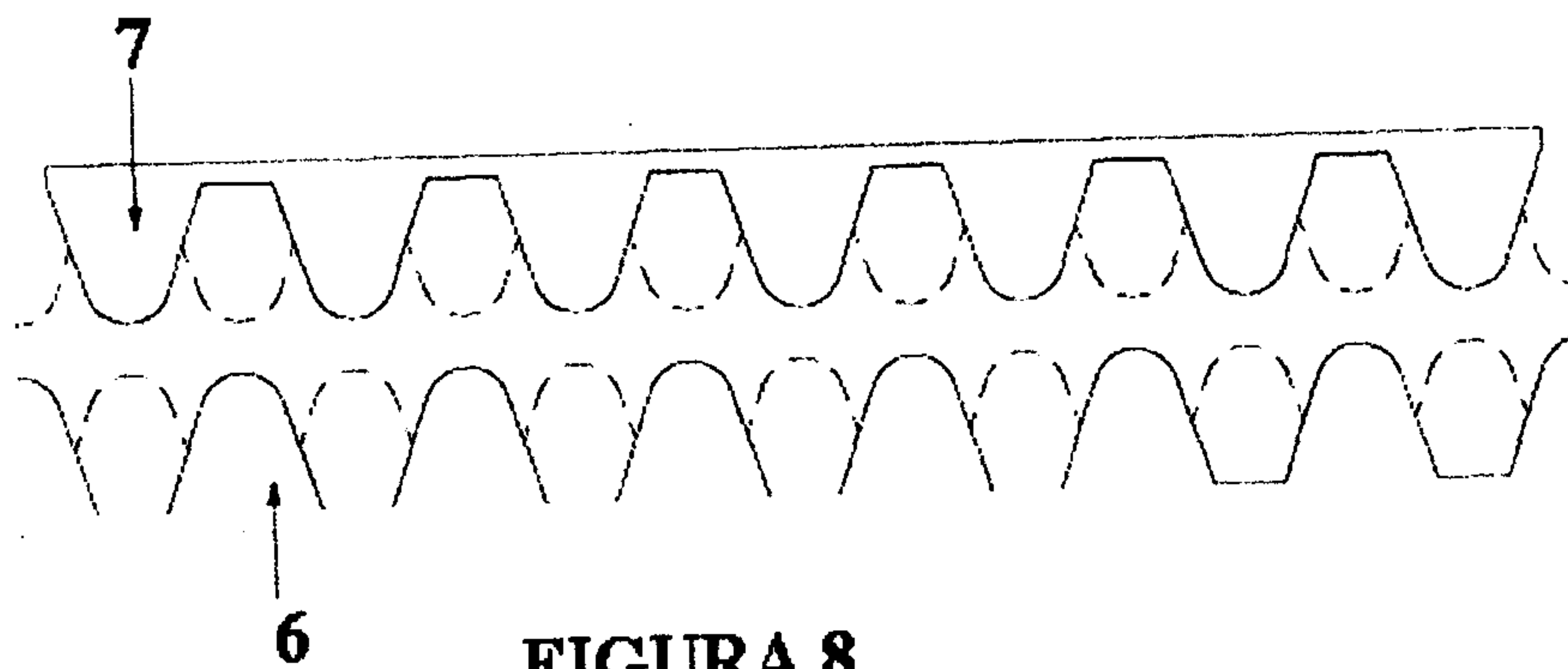


FIGURA 7

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**FIGURA 9**

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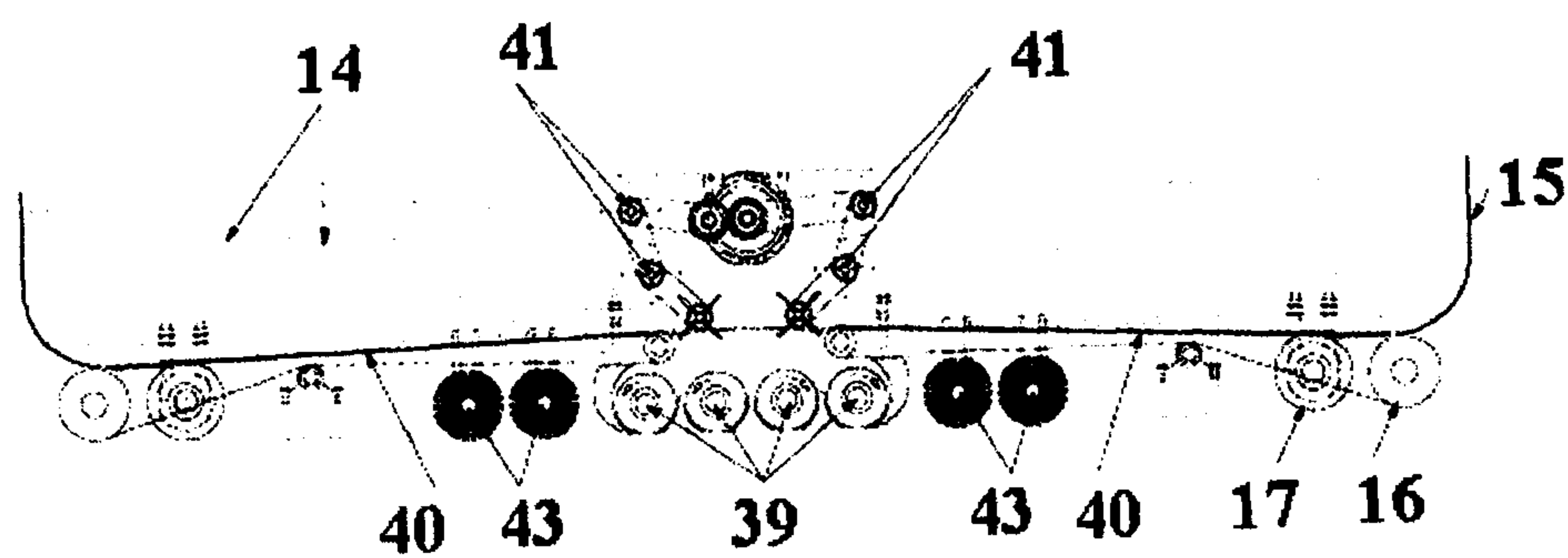


FIGURA 10

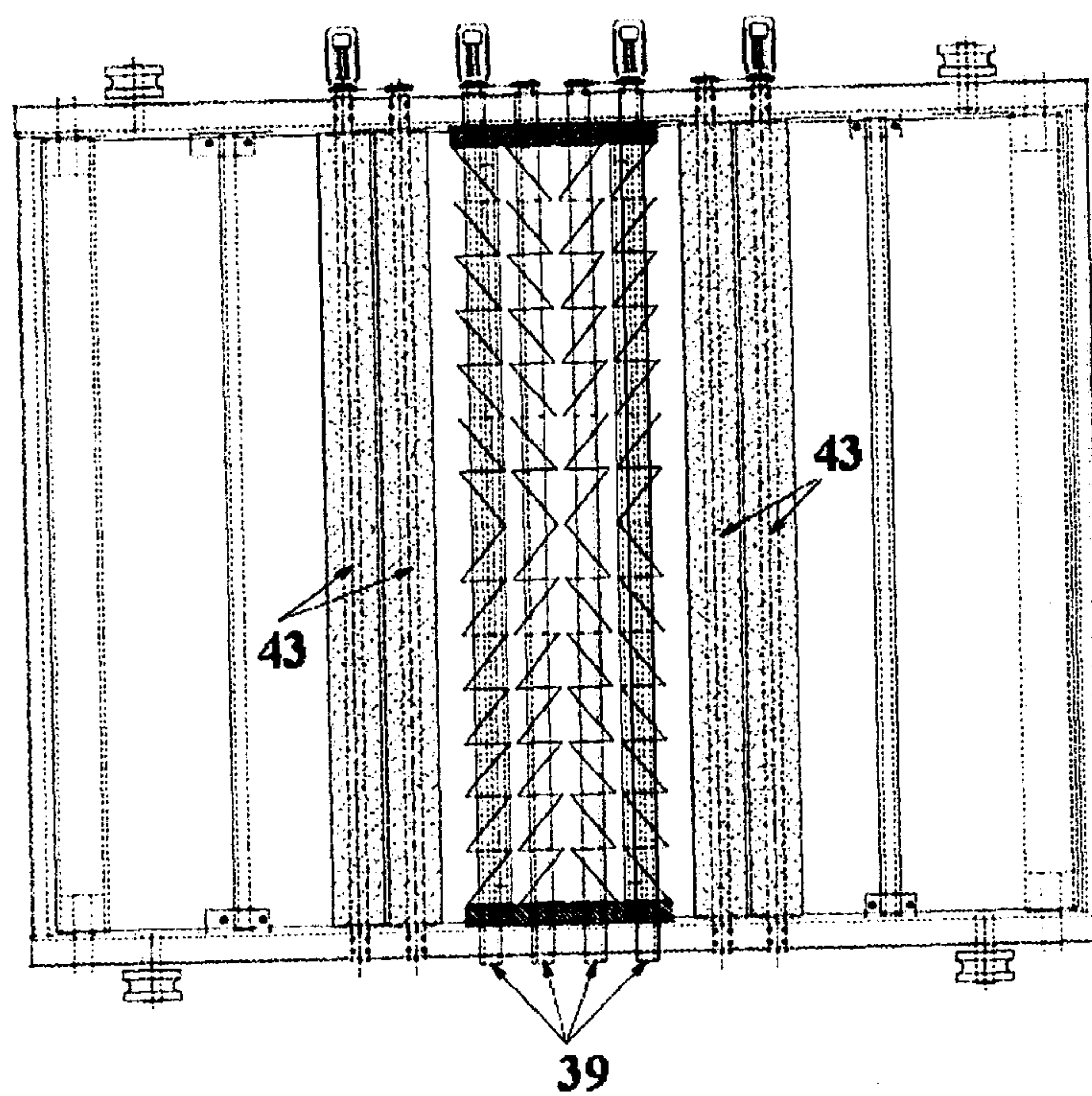


FIGURA 11

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27

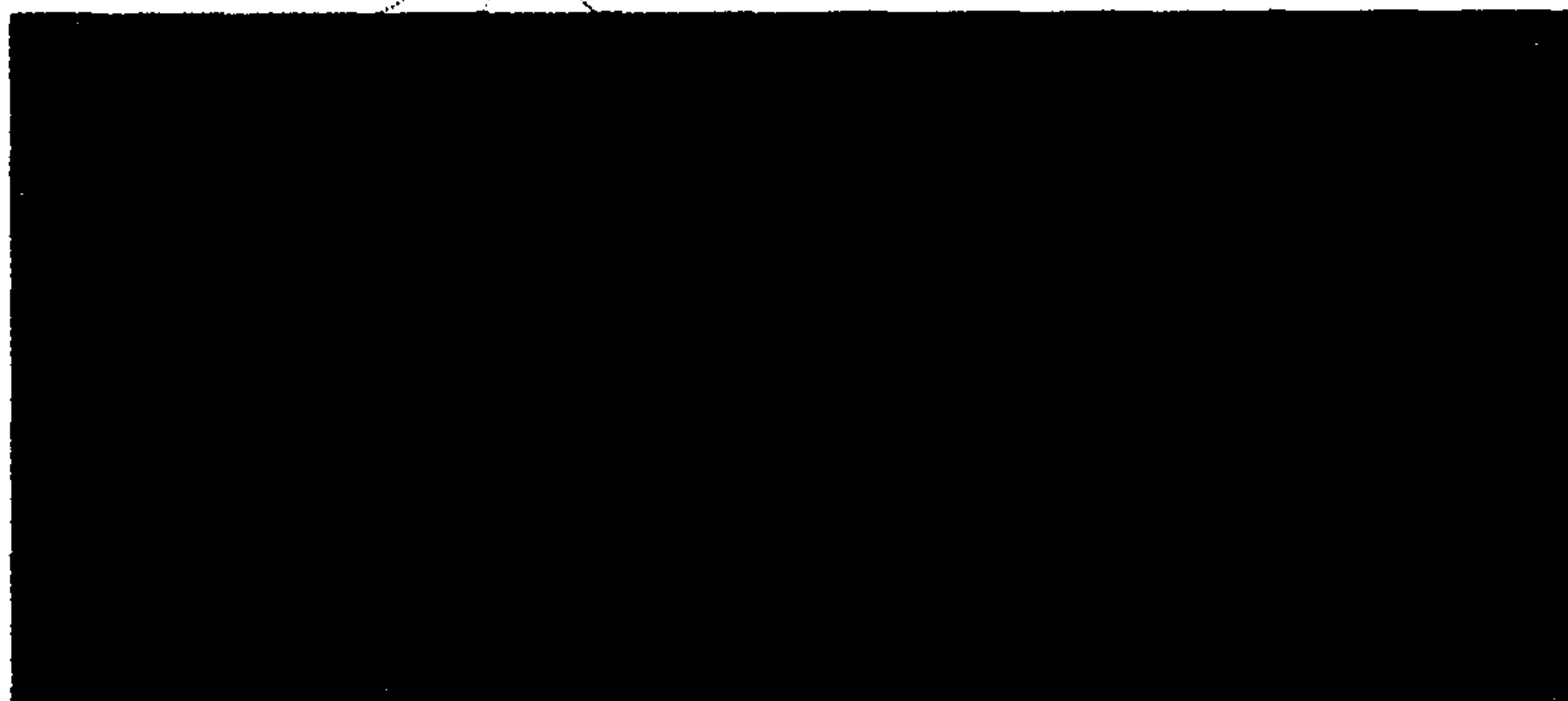


FIGURA 12

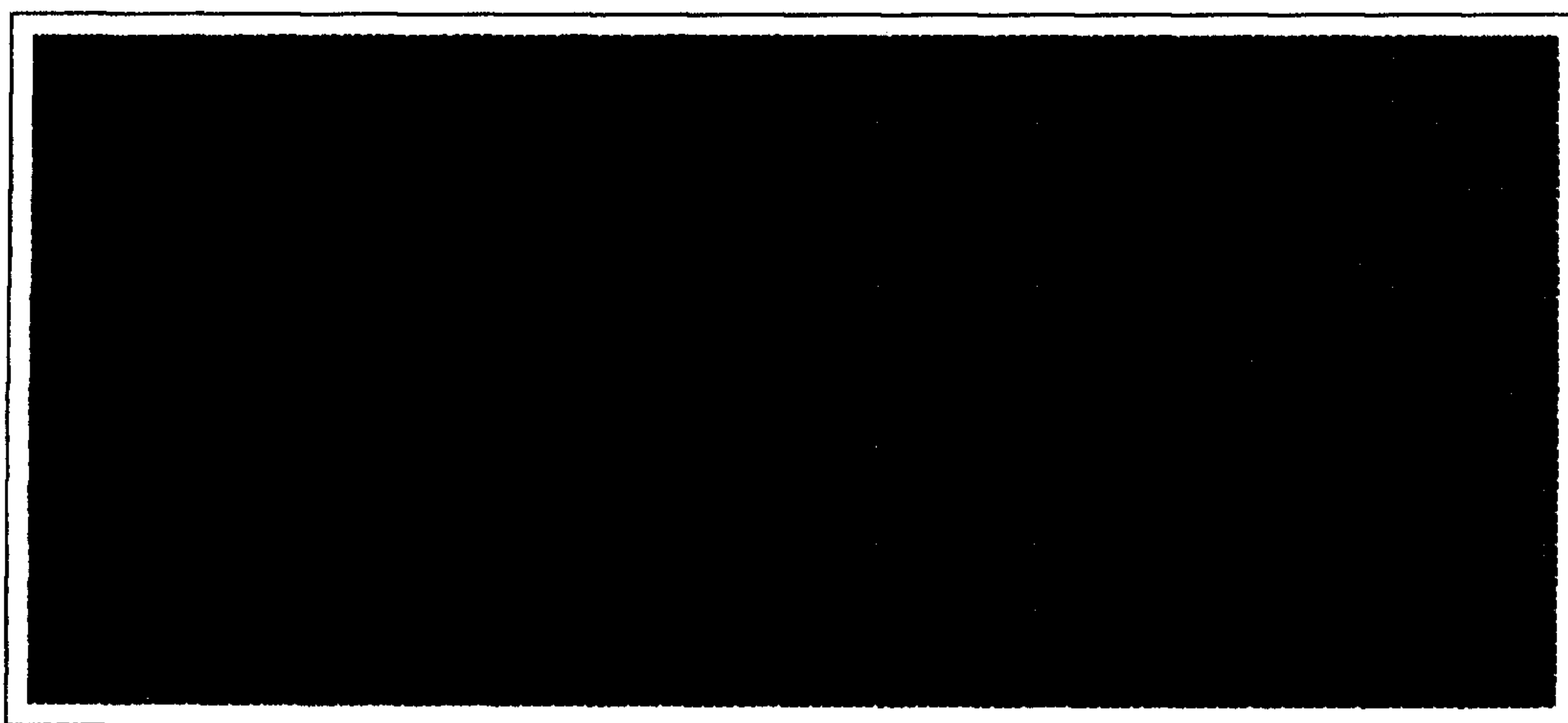


FIGURA 13

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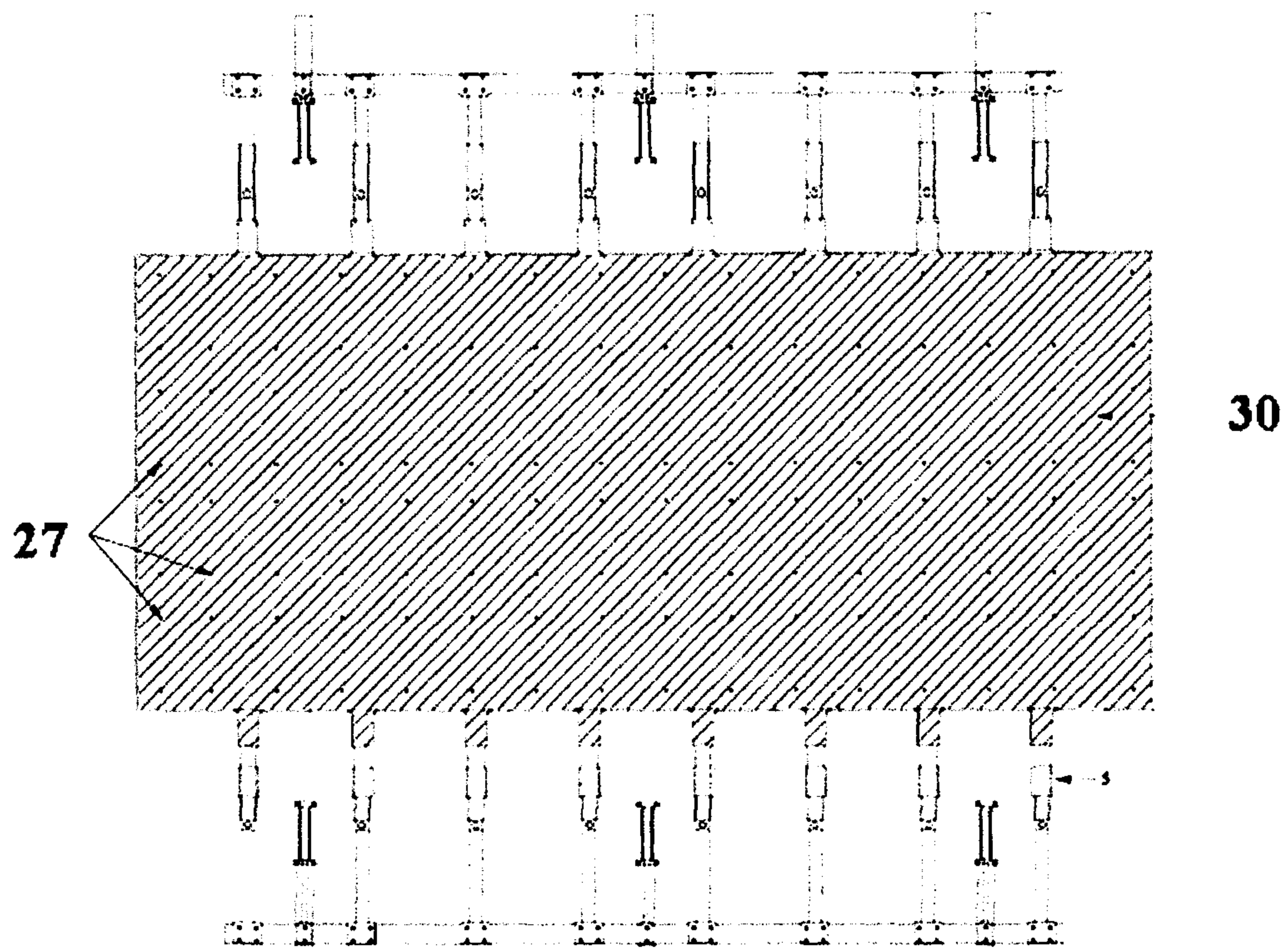


FIGURA 14

11/12

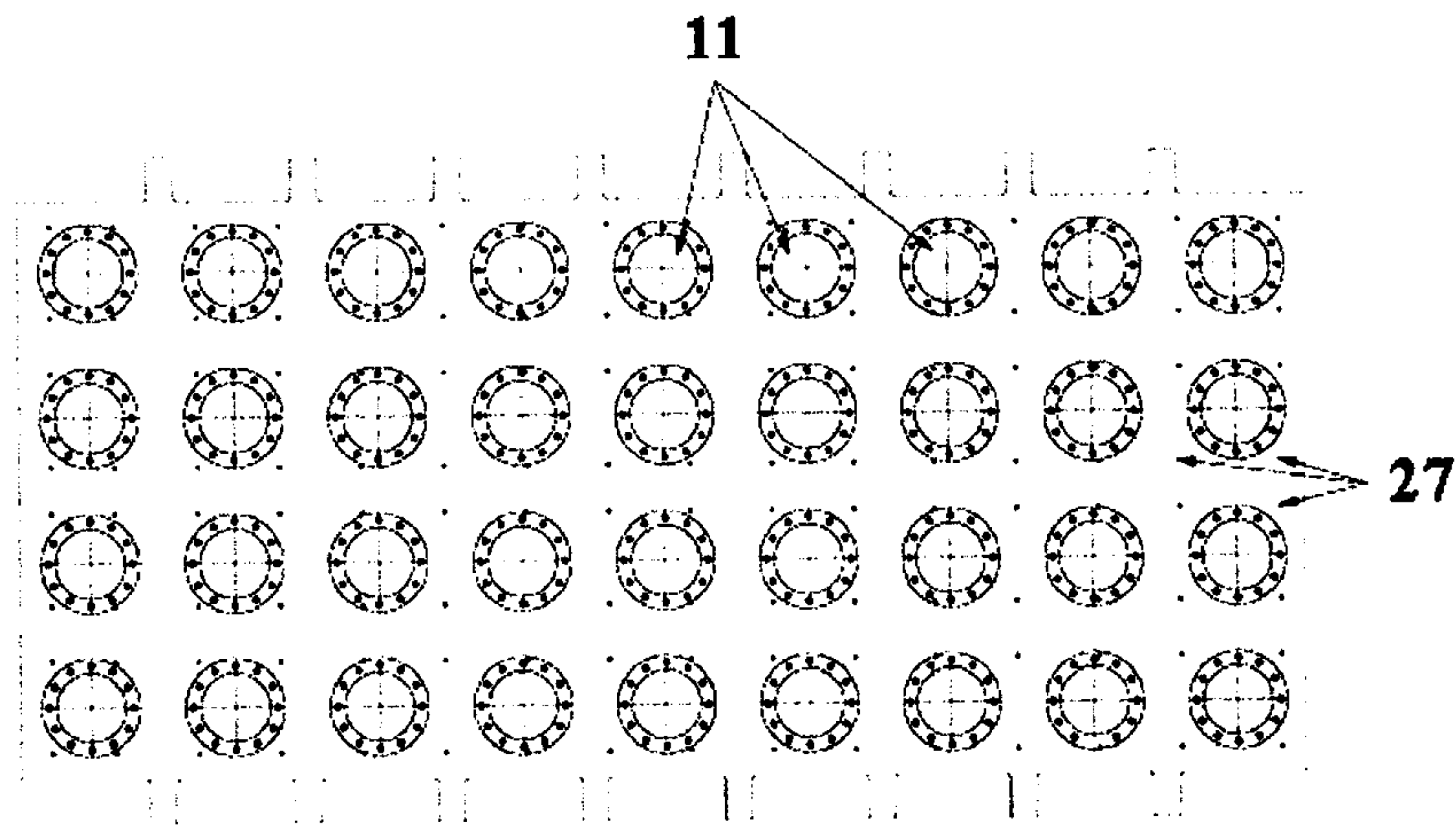


FIGURA 15

12/12

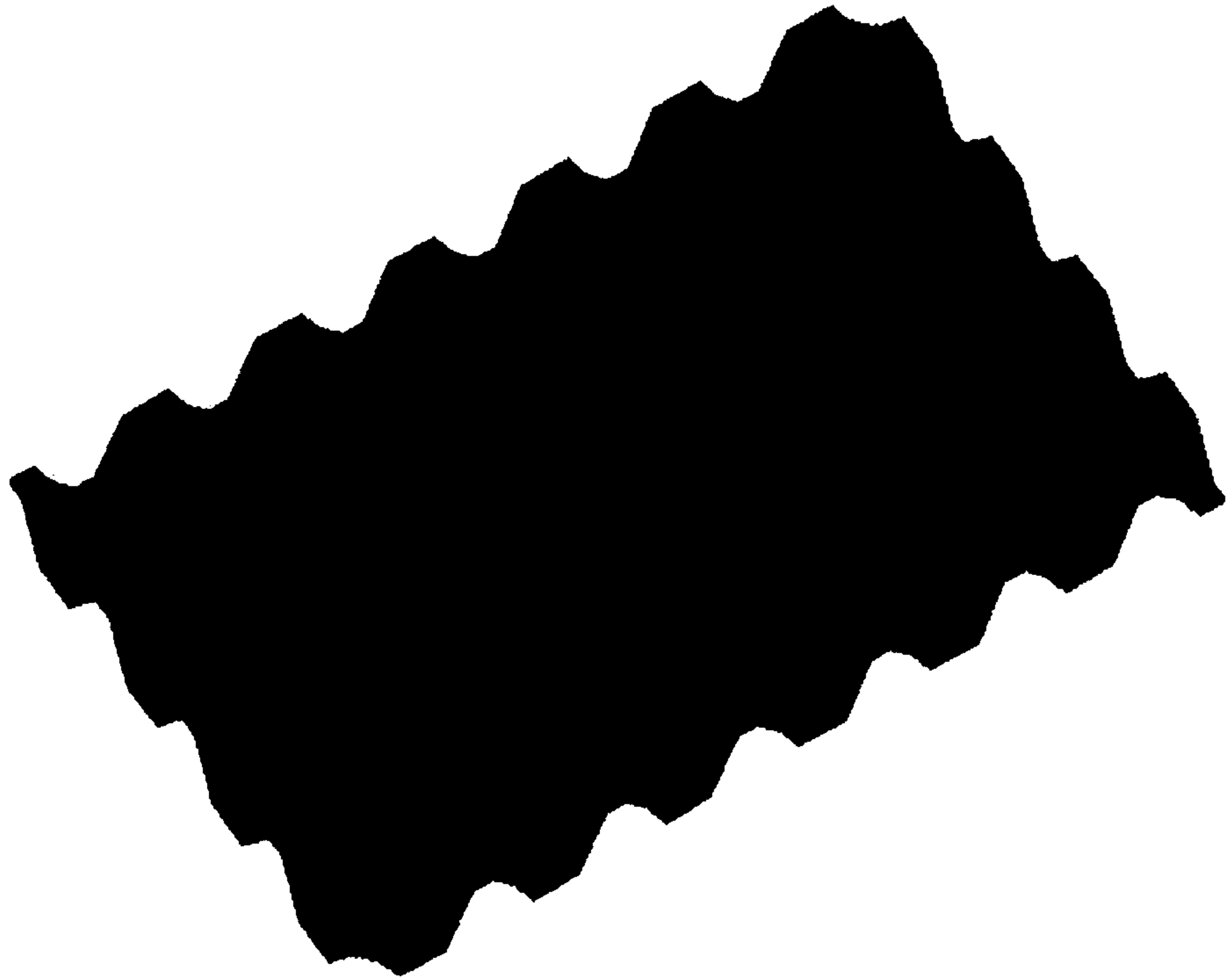


FIGURA 16

