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

(11) **EP 1 714 760 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
18.08.2010 Bulletin 2010/33

(51) Int Cl.:
B28B 3/00 *(2006.01)* ***B30B 15/00*** *(2006.01)*

(21) Application number: **06112866.6**

(22) Date of filing: **21.04.2006**

(54) **Mold for making ceramic tiles**

Form für das Pressen von keramischen Fliesen

Moule pour le pressage de carrreaux en céramique

(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

(30) Priority: **21.04.2005 IT BO20050268**

(43) Date of publication of application:
25.10.2006 Bulletin 2006/43

(73) Proprietor: **Trebax S.R.L.**
42014 Castellarano RE (IT)

(72) Inventor: **CASOLARI, Romano**
42014, CASTELLARANO RE (IT)

(74) Representative: **Modiano, Micaela Nadia**
Dr. Modiano & Associati SpA
Via Meravigli 16
20123 Milano (IT)

(56) References cited:
EP-A- 0 543 772
EP-A- 0 694 381
EP-A2- 0 736 363
IT-B- 1 158 781

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 714 760 B1

Description

[0001] The present invention relates to a mold for making ceramic tiles.

[0002] Known molds for making ceramic tiles comprise two superimposed half-molds, in which the upper one is composed of a plurality of male plugs and the lower one is constituted by a die in which there are a plurality of receptacles, the bottom of which is constituted by complementary plugs.

[0003] When the mold is open, i.e., when the upper mold part is spaced from the lower mold part, the receptacles are filled with powder, the powder is pressed in the receptacles, and the resulting tiles are expelled and subsequently fired.

[0004] The receptacle filling techniques currently used in ceramics factories use a slide valve which has a bottom provided with a grille, which is actuated with a reciprocating motion between a loading position, below a hopper which contains the powder, and a position for unloading the powder into the receptacles. The excess powder discharged into the receptacles is removed by skimming by the grille.

[0005] However, during firing, the tiles are subject to differentiated shrinkage, which causes deformations and a reduced mechanical strength of said tiles. These deformations are due to the uneven particle size distribution of the powder and more frequently to an uneven distribution of the powder in the receptacles, causing a different compaction of the powder during pressing, so that some regions of the tiles are denser than others and therefore exhibit less shrinkage during firing. In particular, due to the technical methods used to fill the receptacles, the powder is less dense in the central region than in the peripheral region of the receptacles.

[0006] In order to avoid this drawback, complementary plugs have already been proposed which can differentiate the pressure on the surface of the receptacles so as to make powder compaction as uniform as possible.

[0007] Refinements of this type are disclosed in US-4,576,092 and US-5,330,346, in Italian utility model No. 694,381, in French patent No. 686,942, in IT-B-1 158 781, in EP-A-0 543 772, and in Italian patent No. 1,286,224 in the name of this same Applicant. EP-A-0 694 381 discloses a mold for making tiles according to the pre-amble of claim 1 and shows a floating plane for press punches for the formation of ceramic tiles, that comprises a base support on which a punch is fixed by means of an intermediate partition filled with non-compressible operating oil. Along the perimeter of the intermediate partition there is provided elastic walls of a monolithic elastic element that fit between the edge of the base and the punch, which are all mutually interconnected by means of screws to provide a perfect hydraulic seal for the oil in the intermediate partition, for allowing appropriate elastic orientation of the punch with respect to loading uneveness of clays and/or powders to be pressed.

[0008] The aim of the present invention is to provide a mold which allows to further reduce the risks of deformations of the tiles due to uneven density of the powder introduced in the receptacles.

[0009] In accordance with the invention, there is provided a mold for making tiles, as defined in the appended claims.

[0010] Further characteristics and advantages of the present invention will become better apparent from the following detailed description of some preferred exemplary embodiments and constructive details, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a plan view of a complementary plug of the mold of the invention, which illustrates the plate and, in broken lines, the underling base;

Figure 2 is a plan view of the base of the complementary plug, assuming that the plate has been removed;

Figure 3 is a view of a corner portion of the complementary plug;

Figure 4 is a sectional view of the complementary plug, taken along the line IV-IV of Figure 3;

Figure 5 is a sectional view of a first variation of the complementary plug;

Figure 6 is a sectional view of a second variation;

Figure 7 is a sectional view of a third variation;

Figure 8 is a sectional view of a fourth variation;

Figure 9 is a sectional view of a fifth variation;

Figure 10 is a sectional view of a sixth variation;

Figure 11 is a sectional view of a seventh variation;

Figure 12 is a sectional view of an eighth variation;

Figure 13 is a sectional view of a ninth variation;

Figure 14 is a plan view of the complementary plug, which illustrates a variation of the plate;

Figure 15 is a plan view of the complementary plug, illustrating another variation of the plate.

[0011] With reference to Figures 1 to 4, the reference numeral 1 generally designates one of the complementary plugs that compose the lower half of a mold for making ceramic tiles.

[0012] Such complementary plug, in a manner which

is known and therefore not illustrated in detail, is guided hermetically in a seat of a die 1a of the press, where it forms a receptacle 1b for forming the tiles.

[0013] Likewise, the other parts of the mold, i.e., the male plugs that compose the upper half-mold and the elements for pressing and moving the plugs, are not shown, since they have a traditional structure which is not pertinent to the present invention.

[0014] The complementary plug 1 comprises a quadrangular plate, which is termed base 2 hereinafter for the sake of convenience in description and in which, in an upper region, a hollow 3 is provided, which is delimited perimetrically by a raised portion 4. A plate 5 rests on the raised portion 4 and has, in an upper region, a concavity 6 for accommodating a pressure-resistant sheet 7 of rubber-like material, which is vulcanized therein and is not shown in Figures 1 and 2 but only in Figure 4. The sheet 7 is provided with protrusions and grooves which are designed to form the face, in particular the back, of the tile.

[0015] The plate 5 is fixed to the raised portion 4 by means of a plurality of screws 8, which are driven from below through a plurality of holes 9 which are formed in the raised portion 4 of the base 2 and are screwed into the plate 5. The holes 9 are mutually equidistant, and the perimetric raised portion 4 around them expands with portions 10 (Figure 3) which protrude into the hollow 3. Therefore, the internal wall of the raised portion 4 that surrounds the hollow 3 forms a sequence of bends 11 which lie between the portions 10.

[0016] At the base of the internal wall of the perimetric raised portion 4 there is a slot 12, which has a substantially semicircular cross-section and surrounds the bottom of the hollow 3. Therefore, between the plate 5 and the base 2 there remains a chamber 13, which is delimited above and below by the mutually opposite faces of the plate 5 and of the base 2 and is delimited perimetrically by the internal wall of the raised portion 4.

[0017] The chamber 13 accommodates an elastic membrane 14, the edge of which is shaped complementarily with respect to the internal wall of the raised portion 4 and is provided with a rib 15, which engages in the slot 12.

[0018] An interspace 16 is enclosed hermetically between the membrane 14 and the upper face of the base 2 and is filled with an incompressible liquid by means of a duct 17. In the plate 5, at the portions of the rib 15 which, by following the shape of the bends 11, lie between the portions 10, there are elongated slotted holes 18, which run parallel to the respective sides of the plate 5. The slotted holes 18 accommodate tabs 19 which are shaped complementarily and are as high as the plate 5. The tabs 19 are vulcanized below the plate 7, rest on the membrane 14 proximate to the rib 15, and can slide in the slotted holes 18 so that their upper face remains flat and parallel with respect to the upper face of the plate 5.

[0019] According to the present invention, a perimetric slit 20 is formed around the base 2, is flat and parallel with respect to the plate 5, and divides in two the thickness of the base, forming two flanges 21, 22.

[0020] A lamina 23 is inserted in the slit 20 and is thinner than the slit is high; therefore, a gap 24 remains the height of which is calibrated as a function of the thickness of the lamina 23.

[0021] The arrangement of the lamina 23 in the slit 20 is justified by the fact that it would be technologically very onerous to provide a slit by machining, in view of the reduced height (a few tenths of a millimeter) and the considerable depth of the slit.

[0022] Respective holes 25 are formed through the lower flange 22 and the lamina 23, in alignment with the screws 8, and have a larger diameter than the holes 9, in order to allow the head of the screws 8 to pass and rest against the flange 21 during fixing to the plate 5.

[0023] The function of the gap 24 is to allow the upper peripheral flange 21 of the base 2 to flex with respect to the lower flange 22 during the pressing step and therefore allow uniform compaction of the powder over the entire surface of the complementary plug.

[0024] It is in fact necessary to bear in mind that, as already mentioned initially, the cause that must be corrected in order to prevent uneven compaction is the lower density that the powder introduced in the receptacles, due to the loading techniques, has in the central region of the plate 5 with respect to the peripheral region.

[0025] Accordingly, the denser powder of this last region reaches compaction values such that the pressing male plug cannot advance further, thus leaving the less dense powder that is in the central region of the receptacle less compressed and therefore less compact, with the consequence that the tiles, during firing, are subject to different shrinkages and therefore to deformations and reduced mechanical strength.

[0026] With the above described improvement of the complementary plug 1, when the compaction already achieved by the denser powder of the peripheral region of the receptacle no longer allows further movement of the male plug toward the plate 5, by continuing the pressing thrust applied by the male plug, the upper flange 21 of the base 2 flexes on the lower flange 22 and the edge 26 of the plate 5 flexes, and therefore the male plug can perform a further advancement stroke, which allows to press the less dense powder of the central region of the receptacle, making it match the compactness of the powder of the peripheral region.

[0027] In particular, the flexibility of the edge 26 is facilitated by the presence of the slotted holes 18, which reduce the cross-section by which it is joined to the central part of the plate 5. It should be noted that the pressure of the incompressible liquid contained in the interspace 16 is constant over the entire surface of the plate 5 and is calibrated so as to ensure the uniform distribution of the compaction of the tile.

[0028] As it is evident, the described invention perfectly achieves the intended aim and objects. In particular, it is noted that the tabs 19, in the versions of Figures 4 and 9, in addition to entering the slotted holes 18 when there

is a higher density of the material in the peripheral region of the receptacle, can protrude from said slotted holes if the density of the material is higher at the center of the receptacle.

[0029] Numerous modifications and variations, all within the scope of the appended claims, are possible in the practical embodiment of the invention.

[0030] Advantageously, in order to facilitate the operations for assembly of the complementary plug, a metal lamina 27 (Figure 4) is conveniently integrated in the membrane 14 and has, at the tabs 19, openings for forming elastic inserts 28 suitable to allow the movements of the tabs 19.

[0031] According to a first variation of the invention, shown in Figure 5, instead of the slotted holes 18 there is a channel 29, which forms a perimetric weakening region 30 which is directly internal to the rib 15 of the membrane 14 and ensures the elastic flexibility of the edge 26 of the plate 5.

[0032] The channel 29 accommodates inserts 31 made of rigid material, which act as a support for the sheet 7.

[0033] One solution which is equivalent to the solution of Figure 5 is provided in the variation of Figure 6, in which the channel 29 is open downward and the weakening region 30 is in contact with the sheet 7.

[0034] Figure 7 is a view of a variation which is equivalent to the embodiment of Figure 5 but does not use the membrane 14. In this embodiment, the seal is ensured by a ring 32 accommodated in the slot 12.

[0035] Figure 8 illustrates a variation which is equivalent to the embodiment of Figure 6, with the difference that the membrane 14 is absent and the inserts 31 rest on the bottom of the hollow 3, so as to absorb any overpressures.

[0036] Advantageously, a seat 33 is formed in the bottom of the hollow 3 in order to accommodate a rubber pad 34 which is suitable to absorb shocks.

[0037] Figure 9 is a view of an embodiment in which the two flanges 21, 22 of the base 2 are mechanically separate and mutually coupled by a plurality of screws 35, which are driven through holes 36 of the lower flange 22 and engage in the upper flange 21.

[0038] A spacer ring 37 is interposed between the head of each screw 35 and the flange 21, and a collar 38 of the lower flange 22 is guided on said ring and protrudes inside the hole 36.

[0039] The axial thickness of the collar 38 is lower than the axial length of the spacer ring 37, and therefore between the opposite faces of the flanges 21, 22 there remains a gap 24 which is equivalent to the gap 24 of the previously cited versions.

[0040] In the upper flange 21, around each engagement hole of the screws 35, there is an annular slot 39 which accommodates an elastic ring 40, made for example of elastomeric material, which acts as a return spring. The flange 21 is provided centrally with a cylindrical cavity 41, whose diameter is smaller than that of the interspace 16 and which is connected to the interspace 16 by means of a passage 42. A cylindrical portion 43 is inserted in the cavity 41, acts as a piston, and is formed in the flange 22. An annular gasket 44 is interposed between the bottom of the cavity 41 and the piston 43 and separates hermetically the cavity 41 and, therewith, the interspace 16 of the gap 24. Conveniently, the gasket 44 comprises a tubular lip 45, which fits between the cylindrical walls of the cavity 41 and of the piston 43.

[0041] From what has been described above, it is evident that during the pressing step, owing to the larger surface of the interspace 16 with respect to the cavity 41, the pressure that acts on the peripheral region of the flange 21 that surrounds the cavity 41 produces the yielding of said peripheral region and, therewith, of the plate 5 with respect to the base 2, with the above described powder compaction equalization effects.

[0042] Figure 10 illustrates a variation which combines the provision of the base of Figure 9 with the shape of the plate 5 shown in Figure 5.

[0043] Figure 11 illustrates a variation which combines the provision of the base of Figure 9 with the shape of the plate 5 shown in Figure 6.

[0044] Figure 12 illustrates a variation which combines the provision of the base of Figure 9 with the shape of the plate 5 shown in Figure 7.

[0045] Figure 13 illustrates a variation which combines the provision of the base of Figure 9 with the shape of the plate 5 shown in Figure 8.

[0046] In the practical embodiment of the invention, a ring 46 (Figure 10) is applied around the base and is interposed between the flanges 21, 22 so as to prevent the inflow of powder or foreign objects in the gap 24.

[0047] Figure 14 illustrates a variation of the plate 5, in which the slots 18 and the tabs 19 have a circular shape.

[0048] In Figure 15 there is a double row of slotted holes 18 and tabs 19 having a circular shape, which are mutually offset so as to form a grid-like weakening region 30.

[0049] In another variation of the invention, in the upper surface of the sheet 7 there is a concave portion 47 (see the broken line of Figure 9), so as to compensate for the lower density of the powder in the central region of the plate with a greater thickness and therefore a greater amount of powder. In this manner, during pressing it is possible to obtain tiles which are uniformly compact and have a uniform thickness.

[0050] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A mold for making tiles, comprising an upper half-mold, which is composed of a plurality of male plugs, and a lower half-mold, which is composed of a plurality of complementary plugs (1) accommodated in respective receptacles (1b) of a die (1a) which are aligned with respective male plugs, each complementary plug being provided with a base (2), a plate (5) which is associated with said base by a plurality of fixing means (8) distributed along a peripheral line and has an upper face (6, 7) which forms the bottom of the receptacle and a lower face which, together with said base, encloses a chamber (13, 16) which is filled with an incompressible liquid and reaches the vicinity of said peripheral line, said base (2) being provided with means (21-24; 35-45) which, during pressing, cause a yielding of the peripheral region (26, 30) of said plate with respect to its central region, so as to equalize the compaction of the powder over the entire surface of the receptacles during pessing, **characterized in that** in said base (2) there being a perimetric slit (20) which is formed around the base (2) and which is flat and parallel to said plate (5) and which forms an upper flange (21) and a lower flange (22) and a gap (24) between said flanges (21, 22), said gap (24) allowing flexing of said upper flange (21) with respect to said lower flange (22) during the pressing step.

2. The mold according to claim 1, **characterized in that** said base (2) has a hollow (3) which is delimited preliminarily by a raised portion (4) to which a plate (5) is fixed by way of screws (8), said plate forming, together with said hollow (3), a chamber (13, 16) which is filled with incompressible liquid.

3. The mold according to claim 2, **characterized in that** said upper flange (21) is provided with said raised portion (4), and said gap (24) having a height that is calibrated so as to allow, during powder pressing, a yielding of the upper flange (21) on the lower flange (22), such as to achieve equalization of the compaction of the powder over the entire surface of the receptacles.

4. The mold according to claim 3, **characterized in that** said upper flange (21) and said lower flange (22) are mutually coupled by screws (35) so as to form between them said gap (24), said upper flange (21) being provided with a central cylindrical cavity (41), which is connected to said chamber (13, 16) and in which a cylindrical portion (43) of said lower flange (22) engages, the surface of said cavity being smaller than the surface of said chamber, said chamber and said cavity being filled with incompressible liquid.

5. The mold according to claim 2, **characterized in that** it comprises a lamina (23) for calibrating the gap (24), which is inserted in said perimetric slit (20).

6. The mold according to one of claims 1 to 5, **characterized in that** said plate (5) comprises an elastic membrane (14), which is accommodated in said chamber (13) and has a peripheral rib (15) which is clamped between said plate (5) and said base (2), a plurality of slotted holes (18) which are formed along the edge (26) of said plate (5) at the upper flange (21) of said base (2) and at the rib (15) of said membrane (14), which is clamped between said plate and said base (2), said slots (18) accommodating respective plates (19) which can move at right angles to said plate.

7. The mold according to one of claims 2 to 3, **characterized in that** said plate (5) comprises an elastic membrane (14), which is accommodated in said chamber (13) and has a peripheral rib (15), which is clamped between said plate (5) and said base (2), and a channel (29), which is formed along the edge (26) of said plate (5) proximate to the peripheral region of said upper flange (21).

8. The mold according to one of claims 2 to 7, **characterized in that** said lower flange (22) is provided with holes (25) for the passage of the screws (8) for fastening said plate (5) to said raised portion (4) of said upper flange (21).

9. The mold according to one of claims 4 to 8, **characterized in that** an annular slot is provided around said screws (35) for coupling said flanges (21, 22) in order to accommodate a ring (40) made of elastomeric material, which acts as a return spring between said flanges, and **in that** in the bottom of said cavity (41) there is an interposed gasket (44), which prevents the connection between said cavity (41) and said gap (24).

10. The mold according to one of claims 4 to 9, **characterized in that** a spacer ring (37) is interposed between the head of said coupling screws (36) and said upper flange (21) and a collar (38) of the lower flange (22) is guided on said ring, said collar (38) protruding inside the hole (36) for the passage of said screws, said collar (38) and said spacer (37) having such an axial length as to form said calibrated gap (24).

11. The mold according to one of claims 6 to 10, **characterized in that** said slotted holes (18) are arranged along two rows in the edge (26) of said plate (5) so as to form a weakening region (30) which has a substantially grid-like shape.

12. The mold according to one of the preceding claims,

characterized in that said plate (5) has a concavity (6) for accommodating a sheet (7) of rubber-like material which is vulcanized therein.

13. The mold according to claim 12, **characterized in that** said sheet (7) has a concave portion (47) in the face that constitutes the bottom of the receptacle (1b).

Patentansprüche

1. Form für das Pressen von Fliesen, die eine obere Formhälfte, die von einer Mehrzahl von positiven Einsätzen gebildet wird, und eine untere Formhälfte aufweist, die von einer Mehrzahl von komplementären Einsätzen gebildet wird, die in jeweiligen Aufnahmen (1b) eines Formkastens (1a) aufgenommen sind, die mit jeweiligen positiven Einsätzen ausgerichtet sind, wobei jeder komplementäre Einsatz mit einer Grundplatte (2) und einer Platte (5) versehen ist, die durch eine Vielzahl von Befestigungsmitteln (8) der Grundplatte zugeordnet ist, die entlang einer Umfangslinie verteilt sind, wobei die Platte eine obere Fläche (6, 7), die die Unterseite der Aufnahme bildet und eine untere Fläche bildet, die zusammen mit der Grundplatte eine Kammer (13, 16) einschließt, die mit einer inkompressiblen Flüssigkeit gefüllt ist und die Umgebung der Umfangslinie erreicht, wobei die Grundplatte (2) mit Mitteln (21-24; 35-45) versehen ist, die während des Pressens ein Ausweichen des Umfangsbereichs (26, 30) der Platte bezogen auf ihren mittigen Bereich hervorrufen, um die Verdichtung des Pulvers über die gesamte Oberfläche der Aufnahmen während des Pressens zu vergleichmäßigen, **dadurch gekennzeichnet, dass** in der Grundplatte (2) ein umlaufender Schlitz (20) vorgesehen ist, der um die Grundplatte (2) herum ausgebildet ist und der flach und parallel zu der Platte (5) verläuft und der einen oberen Flansch (21) und einen unteren Flansch (22) und einen Spalt (24) zwischen den Flanschen (21, 22) ausbildet, wobei der Spalt (24) eine Verformung des oberen Flansches (21) relativ zu dem unteren Flansch (22) während des Pressschrittes ermöglicht.

2. Form nach Anspruch 1, **dadurch gekennzeichnet, dass** die Grundplatte (2) einen Hohlraum (3) aufweist, der im wesentlichen von einem erhöhten Abschnitt (4) begrenzt ist, an den mittels Schrauben (8) eine Platte (5) festgelegt ist, wobei die Platte zusammen mit dem Hohlraum (3) eine Kammer (13, 16) ausbildet, die mit einer inkompressiblen Flüssigkeit gefüllt ist.

3. Form nach Anspruch 2, **dadurch gekennzeichnet, dass** der obere Flansch (21) mit dem erhöhten Abschnitt (4) versehen ist und der Spalt (24) eine Höhe aufweist, die so kalibriert ist, dass während des Pressens des Pulvers ein Ausweichen des oberen Flansches (21) an dem unteren Flansch (22) ermöglicht ist, um eine Vergleichmäßigung der Verdichtung des Pulvers über die gesamte Oberfläche der Aufnahmen zu erzielen.

4. Form nach Anspruch 3, **dadurch gekennzeichnet, dass** der obere Flansch (21) und der unteren Flansch (22) mittels Schrauben (35) aneinander gekoppelt sind, um zwischen sich den Spalt (24) auszubilden, wobei der obere Flansch (21) mit einem mittigen zylindrischen Hohlraum (41) ausgebildet ist, der mit der Kammer (13, 16) verbunden ist und in den ein zylindrischer Abschnitt (43) des unteren Flansches (22) eingreift, wobei die Oberfläche des Hohlraums kleiner ist als die Oberfläche der Kammer und die Kammer sowie der Hohlraum mit einer inkompressiblen Flüssigkeit gefüllt sind.

5. Form nach Anspruch 2, **dadurch gekennzeichnet, dass** sie eine dünne Schicht (23) zur Kalibrierung des Spaltes (24) besitzt, die in den Spalt (20) am Umfang eingesetzt ist.

6. Form nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die Platte (5) eine elastische Membran (14), die in der Kammer (13) aufgenommen ist und eine umlaufende Rippe (15) besitzt, die zwischen der Platte (5) und der Grundplatte (2) geklemmt ist, und eine Vielzahl von geschlitzten Löchern (18) besitzt, die entlang des Randes (26) der Platte (5) an dem oberen Flansch (21) der Grundplatte (2) und an der Rippe (15) der Membran (14) besitzt, die zwischen der Platte und der Grundplatte (2) geklemmt ist, wobei die Schlitze (18) jeweilige Platten (19) aufnehmen, die sich in rechten Winkeln zu der Platte bewegen können.

7. Form nach einem der Ansprüche 2 bis 3, **dadurch gekennzeichnet, dass** die Platte (5) eine elastische Membran (14) aufweist, die in der Kammer (13) aufgenommen ist und eine umlaufende Rippe (15) aufweist, die zwischen der Platte (5) und der Grundplatte (2) geklemmt ist, und einen Kanal (29), der entlang des Randes (26) der Platte (5) benachbart zu dem Umfangsbereich des oberen Flansches (21) ausgebildet ist.

8. Form nach einem der Ansprüche 2 bis 7, **dadurch gekennzeichnet, dass** der untere Flansch (22) mit Löchern (25) für den Durchtritt von Schrauben (8) zur Befestigung der Platte (5) an dem erhöhten Abschnitt (4) des oberen Flansches (21) versehen ist.

9. Form nach einem der Ansprüche 4 bis 8, **dadurch gekennzeichnet, dass** ein ringförmiger Schlitz um die Schrauben (35) vorgesehen ist zur Verbindung

der Flansche (21, 22) zur Aufnahme eines Rings (40), der aus einem elastomeren Werkstoff gebildet ist, der als eine Rücksprungfeder zwischen den Flanschen wirkt und dadurch, dass an dem Boden des Hohlraums (41) eine zwischen gelegte Dichtung (44) vorgesehen ist, welche die Verbindung zwischen dem Hohlraum (41) und dem Spalt (24) vermeidet.

10. Form nach einem der Ansprüche 4 bis 9, **dadurch gekennzeichnet, dass** ein Abstandshalterring (37) zwischen dem Kopf der Verbindungsschrauben (36) und dem oberen Flansch (21) zwischengelegt ist und ein Kragen (38) des unteren Flansches (22) an dem Ring geführt ist, wobei der Kragen (38) innerhalb des Loches (36) für den Durchtritt der Schrauben vorkragt, wobei der Kragen (38) und der Abstandshalter (37) eine solche axiale Länge besitzen, dass sie den kalibrierten Spalt (24) ausbilden.

11. Form nach einem der Ansprüche 6 bis 10, **dadurch gekennzeichnet, dass** die geschlitzten Löcher (18) entlang von zwei Reihen an dem Rand (26) der Platte (5) angeordnet sind zur Ausbildung eines Schwächungsbereichs (30), der eine weit gehend gitterförmige Form besitzt.

12. Form nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Platte (5) eine Austiefung (6) besitzt zur Aufnahme einer Lage (7) eines gummiähnlichen Werkstoffs, welcher daran anvulkanisiert ist.

13. Form nach Anspruch 12, **dadurch gekennzeichnet, dass** die Lage (7) einen konkaven Abschnitt (47) an der Fläche aufweist, die die Unterseite der Aufnahme (1b) ausbildet.

Revendications

1. Moule pour fabriquer des tuiles, comprenant une moitié de moule supérieure composée d'une pluralité de noyaux, et d'une moitié de moule inférieure, composée d'une pluralité de noyaux complémentaires (1) venant se loger dans les réceptacles respectifs (1b) d'une matrice (1a) qui sont alignés avec les noyaux respectifs, chaque noyau complémentaire étant doté d'une base (2), d'une plaque (5) associée à ladite base au moyen d'une pluralité de moyens de fixation (8) répartis sur une ligne périphérique et comporte une face supérieure (6, 7) qui forme le fond du réceptacle et une face inférieure qui, avec ladite base, entoure une chambre (13, 16) remplie d'un liquide incompressible et atteint le voisinage de ladite ligne périphérique, ladite base (2) étant dotée de moyens (21-24; 35-45) qui, pendant la compression, entraînent un fléchissement de la zone périphérique (26, 30) de ladite plaque par rapport à sa région centrale, de façon à égaliser le compactage de la poudre sur l'intégralité de la surface du réceptacle pendant la compression,
caractérisé par le fait que
dans ladite base (2) se trouve une fente périmétrale (20) formée autour de la base (2), plate et parallèle à ladite plaque (5) et formant une collerette supérieure (21) et une collerette inférieure (22) et un espace (24) entre lesdites collerettes (21, 22), ledit espace (24) permettant la flexion de ladite collerette supérieure (21) par rapport à la collerette inférieure (22) pendant l'étape de compression.

2. Moule selon la revendication 1, **caractérisé par le fait que** ladite base (2) comporte un creux (3) délimité de façon préalable par une partie surélevée (4) sur laquelle une plaque (5) est fixée à l'aide de vis (8), ladite plaque formant, avec ledit creux (3) une chambre (13, 16) qui est remplie d'un liquide incompressible.

3. Moule selon la revendication 2, **caractérisé par le fait que** ladite collerette supérieure (21) est dotée de ladite partie surélevée (4) et ledit espace (24) d'une hauteur calibrée de façon à permettre, pendant la compression de la poudre, le fléchissement de la collerette supérieure (21) sur la collerette inférieure (22), de façon à pouvoir égaliser le compactage de la poudre sur l'intégralité de la surface des réceptacles.

4. Moule selon la revendication 3, **caractérisé par le fait que** ladite collerette supérieure (21) et ladite collerette inférieure (22) sont réciproquement couplées à l'aide de vis (35) de façon à former entre elles ledit espace (24), ladite collerette supérieure (21) étant dotée d'une empreinte centrale cylindrique (41), raccordée à ladite chambre (13, 16) et dans laquelle une partie cylindrique (43) de ladite collerette inférieure (22) s'engage, la surface de ladite empreinte étant inférieure à la surface de ladite chambre, ladite chambre et ladite empreinte étant remplies d'un liquide incompressible.

5. Moule selon la revendication 2, **caractérisé par le fait qu'**il comprend une lamelle (23) utilisée pour calibrer l'espace (24), insérée dans ladite fente périmétrale (20).

6. Moule selon l'une des revendications 1 à 5, **caractérisé par le fait que** ladite plaque comprend une membrane élastique (14) logée dans ladite chambre (13) et comportant une nervure périphérique (15) encastrée entre ladite plaque (5) et ladite base (2), une pluralité de trous rainurés (18) formés le long du bord (26) de ladite plaque (5) au niveau de la collerette supérieure (21) de ladite base (2) et la nervure (15) de ladite membrane (14), qui est encastrée entre

ladite plaque et ladite base (2), lesdites rainures (18) logeant les plaques respectives (19) pouvant se déplacer à angle droit par rapport à ladite plaque.

7. Moule selon l'une des revendications 2 à 3, **caractérisé par le fait que** ladite plaque (5) comprend une membrane élastique (14), logée dans ladite chambre (13) et comporte une nervure périphérique (15) encastrée entre ladite plaque (5) et ladite base (2), et un canal (29), formé le long du bord (26) de ladite plaque (5) à proximité de la zone périphérique de ladite collerette supérieure (21).

8. Moule selon l'une des revendications 2 à 7, **caractérisé par le fait que** ladite collerette inférieure (22) est dotée de trous (25) pour le passage des vis (8) afin de fixer ladite plaque (5) sur ladite partie surélevée (4) de ladite collerette supérieure (21).

9. Moule selon l'une des revendications 4 à 8, **caractérisé par le fait qu'**une rainure annulaire est prévue autour desdites vis (35) pour coupler lesdites collerettes (21, 22) afin de loger une bague (40) fabriquée dans un matériau élastomère, agissant comme ressort de rappel entre lesdites collerettes, et **par le fait qu'**au fond de ladite empreinte (41) se trouve un joint d'étanchéité intercalé (44), destiné à empêcher le contact entre ladite empreinte (41) et ledit espace (24).

10. Moule selon l'une des revendications 4 à 9, **caractérisé par le fait qu'**une bague d'écartement (37) est intercalée entre la tête desdites vis de couplage (36) et ladite collerette supérieure (21) et que le collier (38) de la collerette inférieure (22) est guidé sur cette bague, ledit collier (38) dépassant à l'intérieur du trou (36) pour le passage desdites vis, ledit collier (38) et ladite bague d'écartement (37) présentant une longueur axiale de façon à former ledit espace calibré (24).

11. Moule selon l'une des revendications 6 à 10, **caractérisé par le fait que** lesdits trous rainurés (18) sont disposés sur deux rangées sur le bord (26) de ladite plaque (5), de façon à former une zone d'affaiblissement (30) ayant essentiellement la forme d'une grille.

12. Moule selon l'une des revendications précédentes, **caractérisé par le fait que** ladite plaque (5) présente une concavité (6) visant à loger une feuille (7) de matériau de type caoutchouc qui est vulcanisé à l'intérieur.

13. Moule selon la revendication 12, **caractérisé par le fait que** ladite feuille (7) présente une partie concave (47) sur le côté qui constitue le fond du réceptacle (1 b).

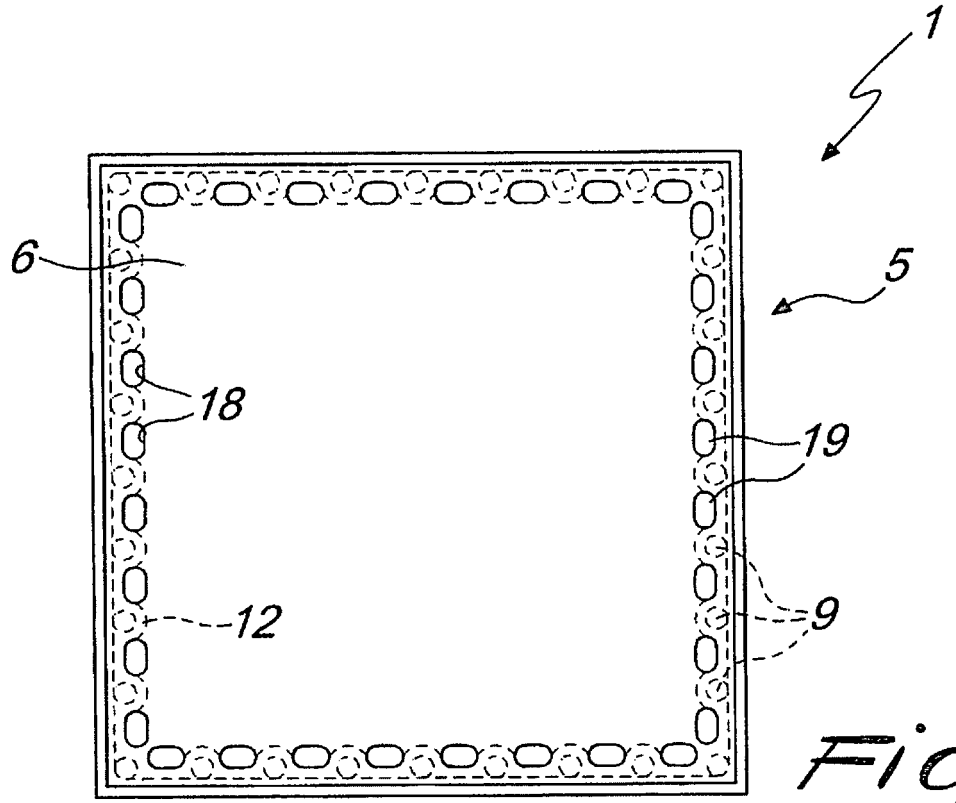


Fig. 1

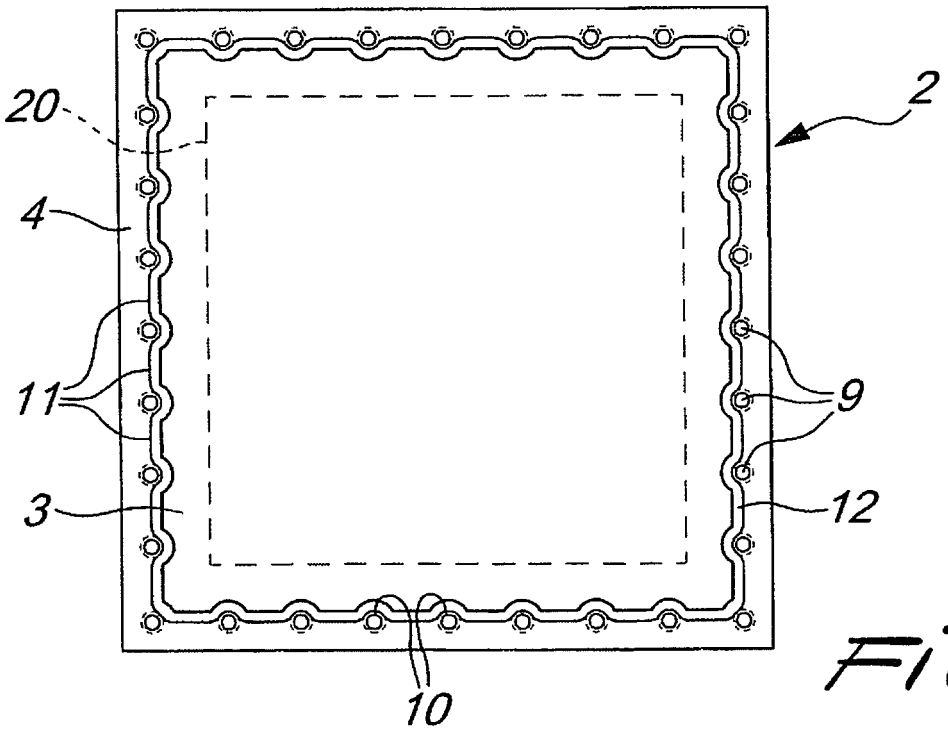


Fig. 2

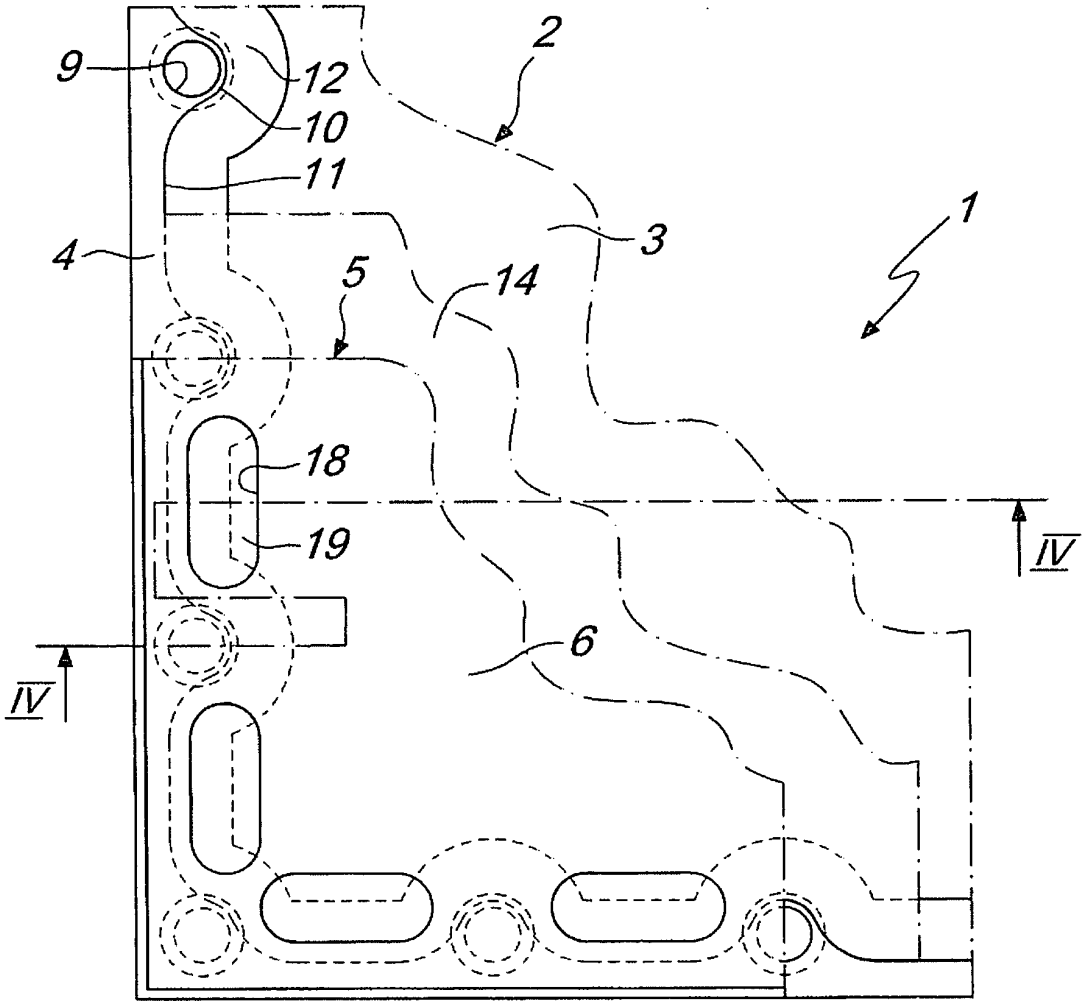

9
12
10
11
2
1
4
3
5
14
18
19
IV
IV
6

Fig. 3

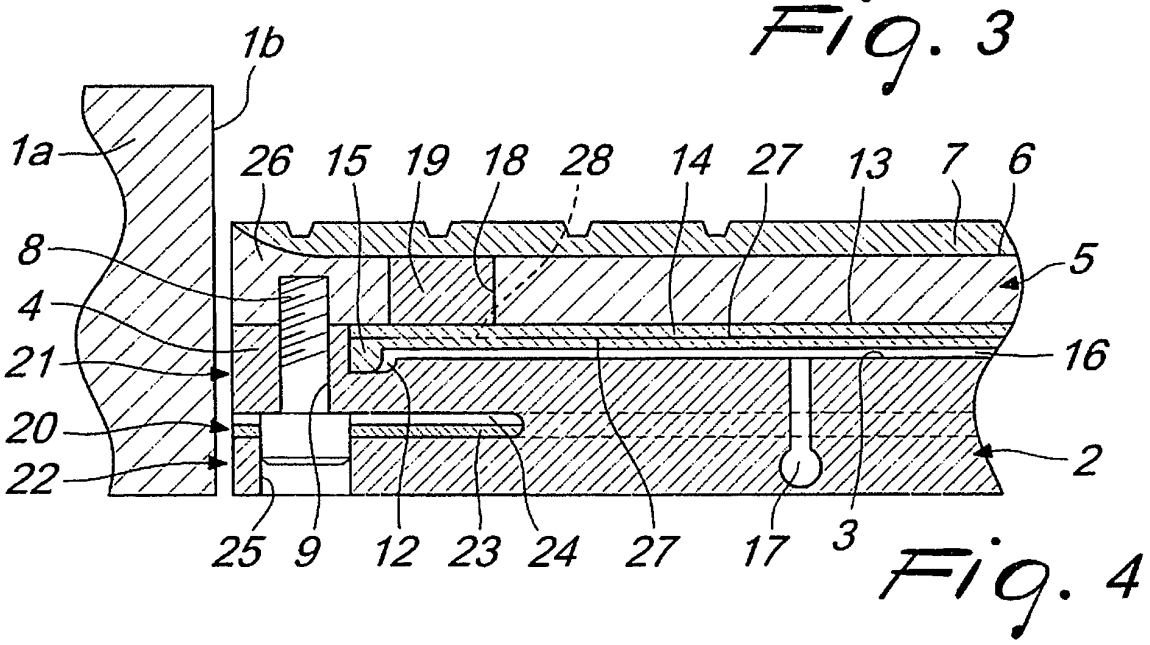

1b
1a
26
15
19
18
28
14
27
13
7
6
8
5
4
16
21
20
2
22
25
9
12
23
24
27
17
3

Fig. 4

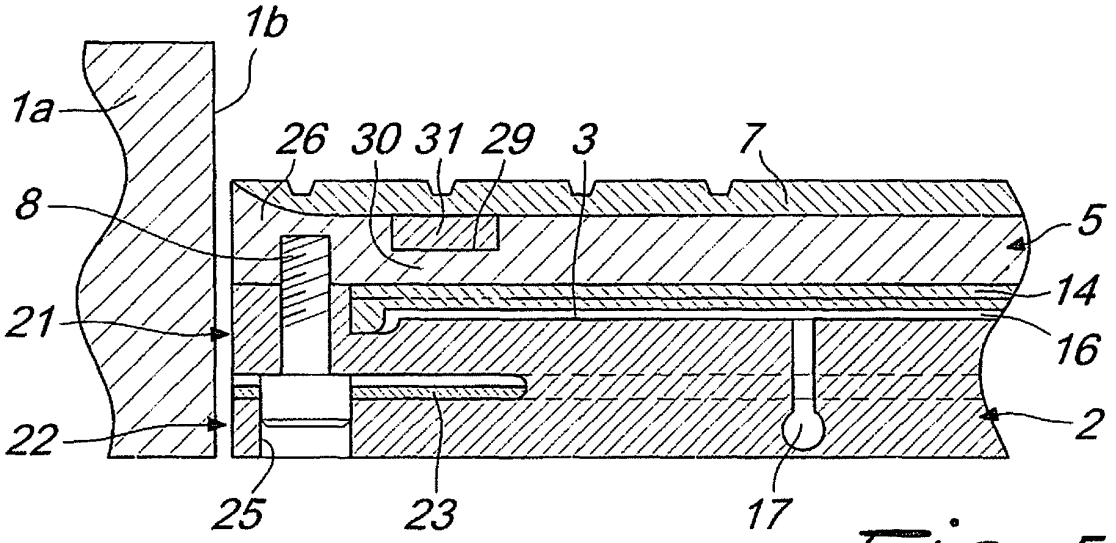


Fig. 5

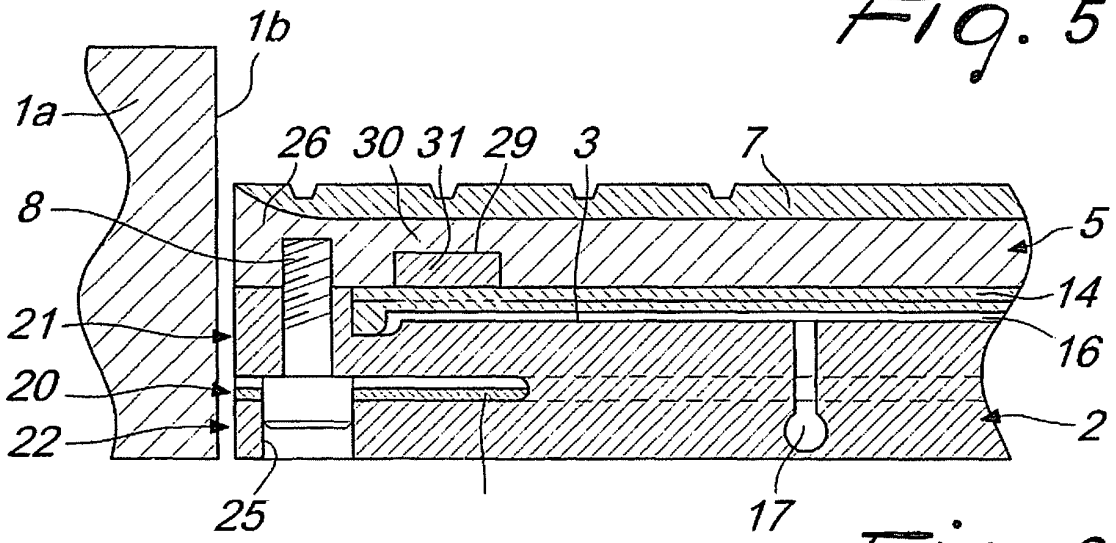


Fig. 6

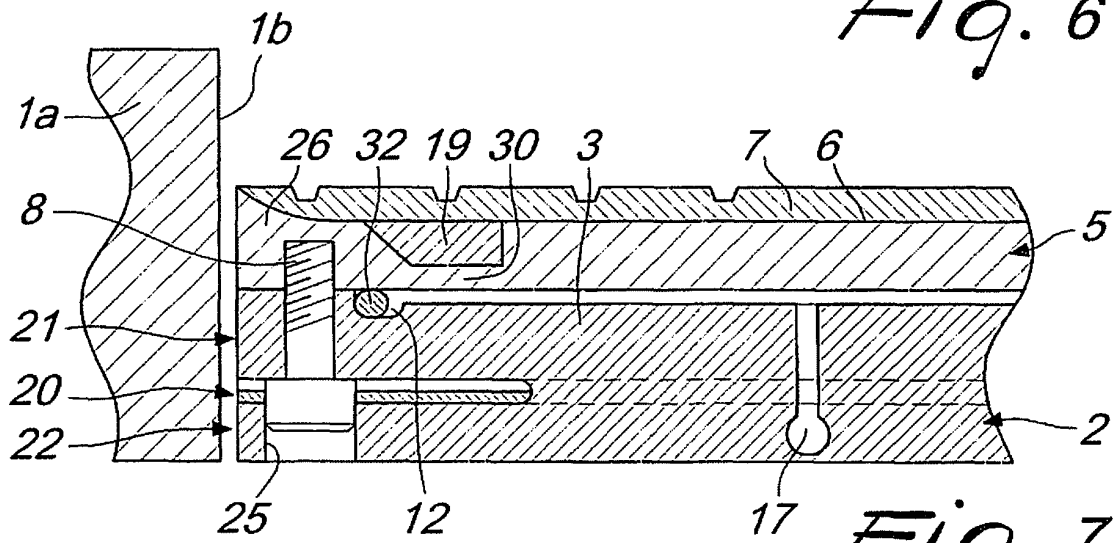


Fig. 7

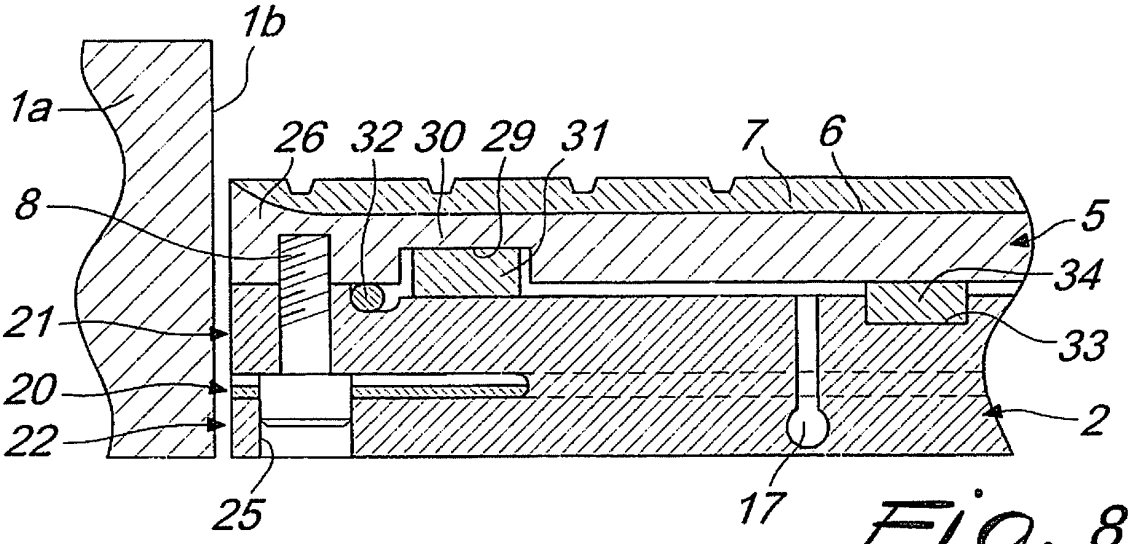


Fig. 8

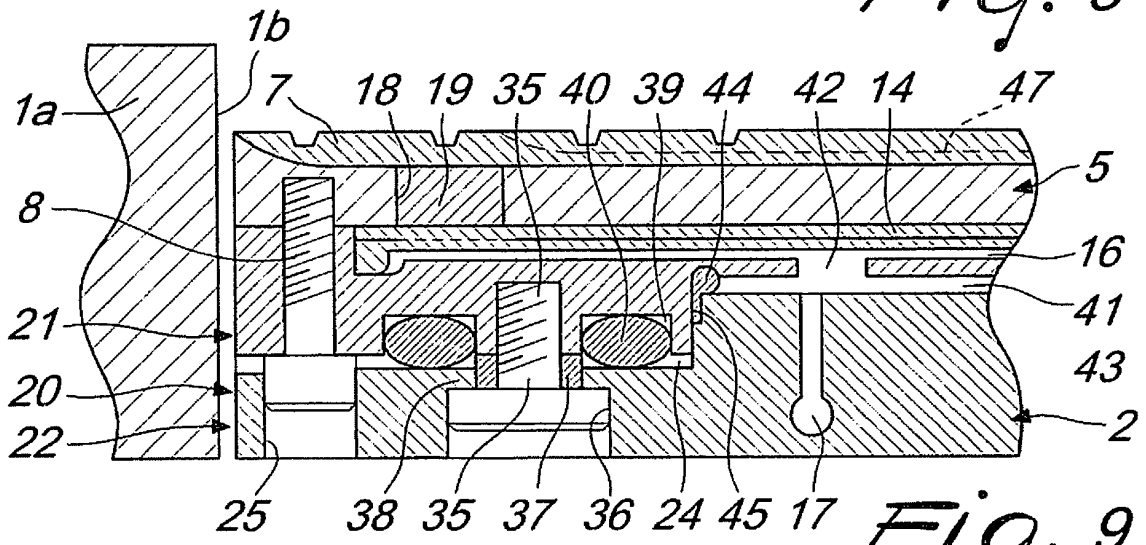


Fig. 9

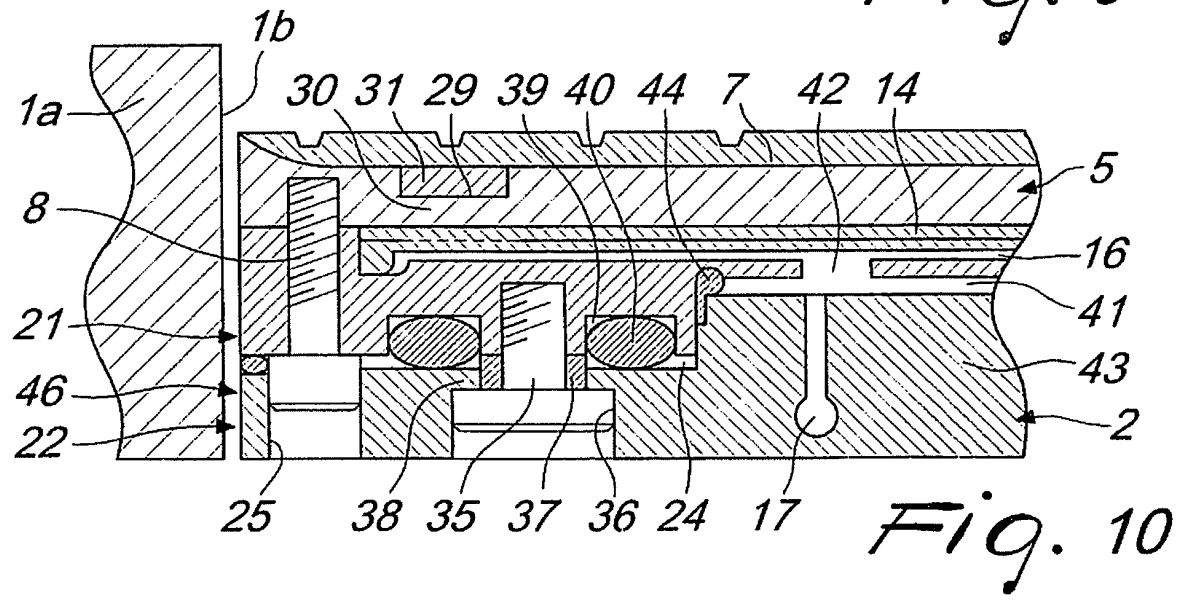


Fig. 10

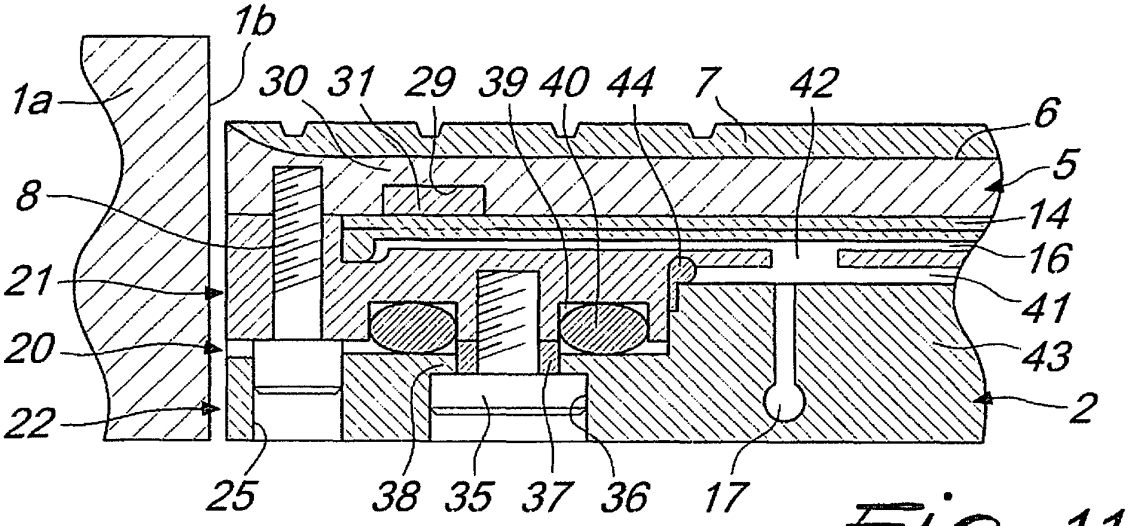


Fig. 11

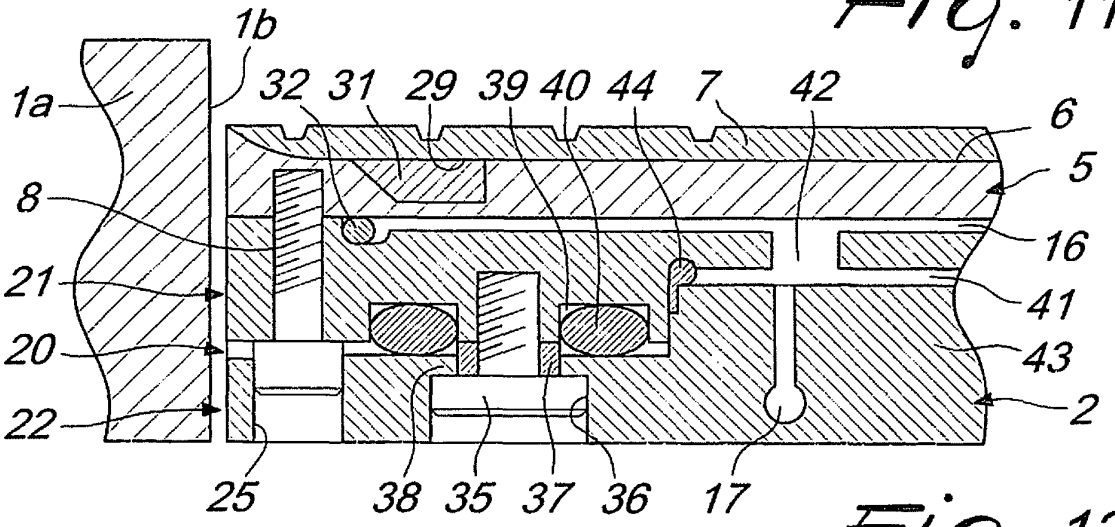


Fig. 12

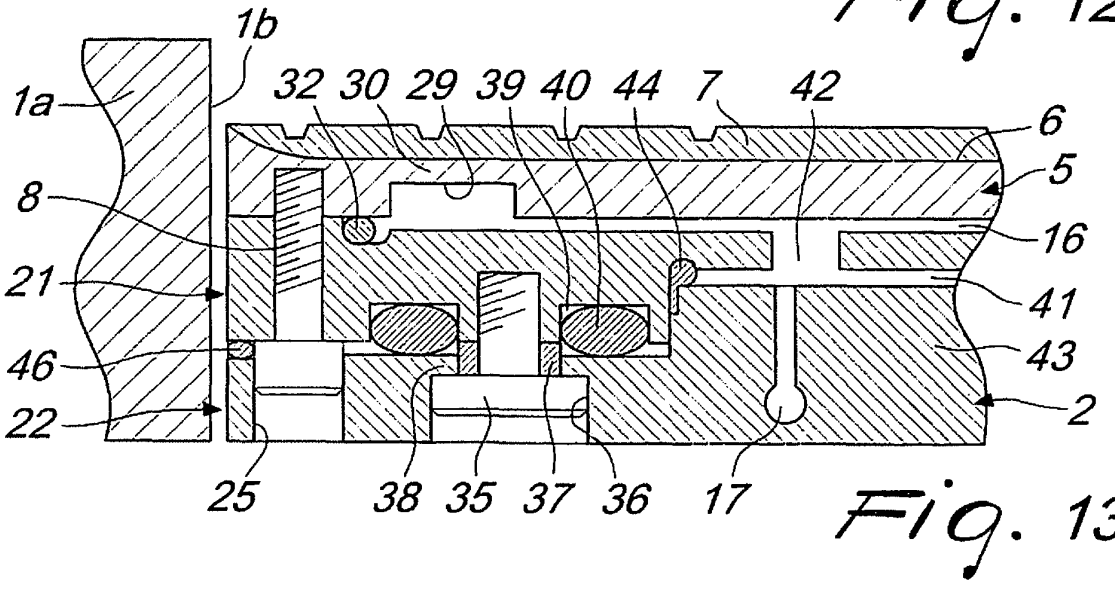


Fig. 13

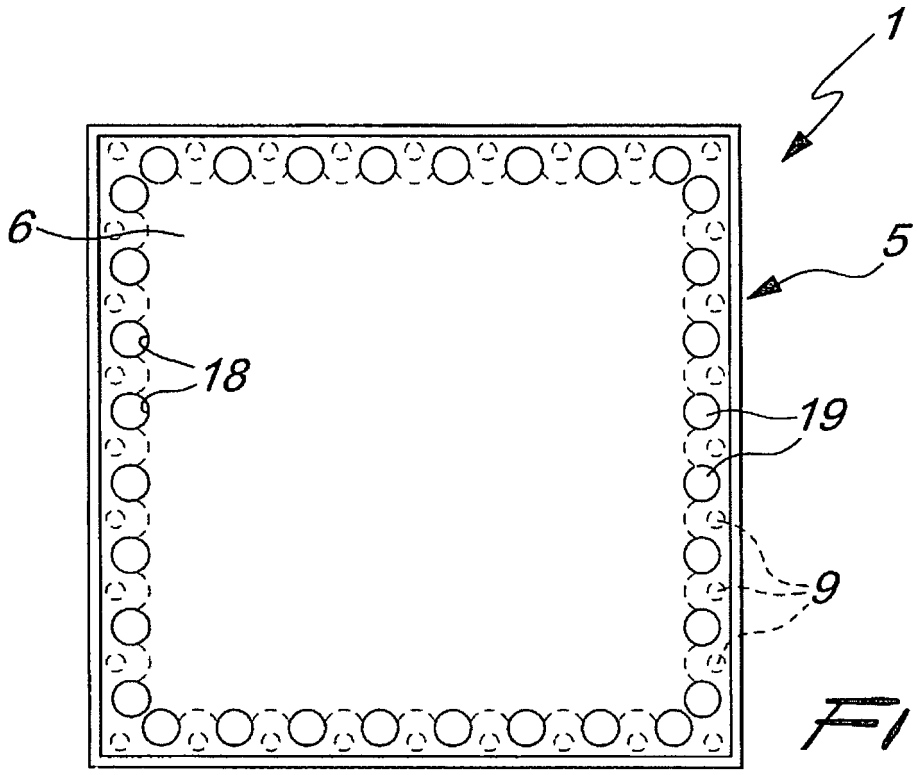


Fig. 14

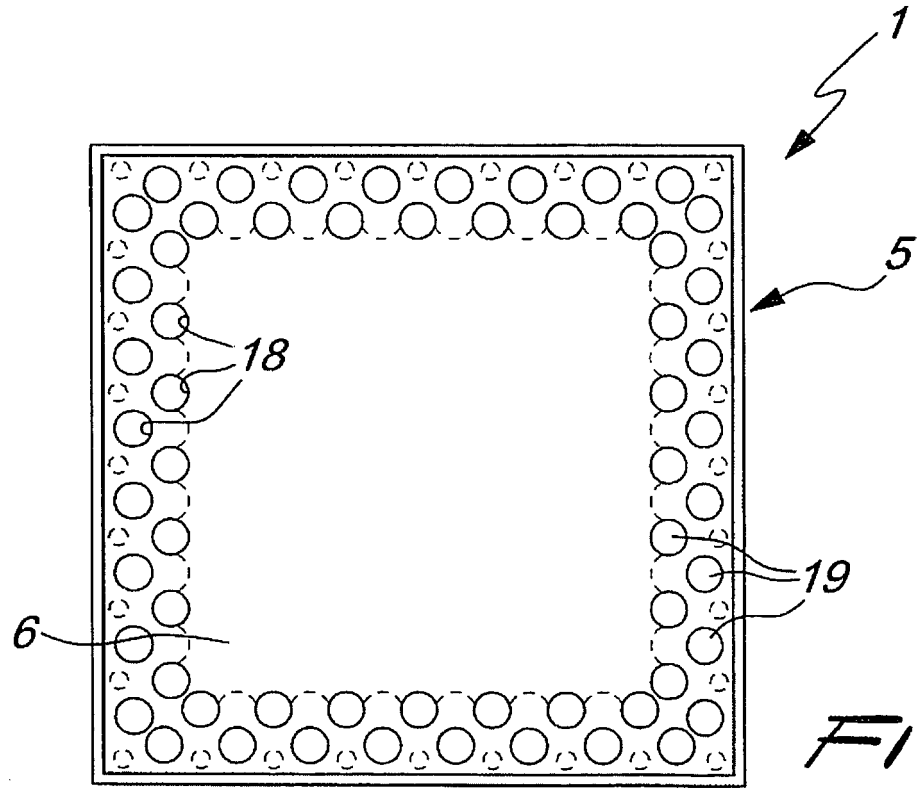


Fig. 15

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 4576092 A **[0007]**
- US 5330346 A **[0007]**
- IT 694381 **[0007]**
- FR 686942 **[0007]**
- IT 1158781 B **[0007]**
- EP 0543772 A **[0007]**
- IT 1286224 **[0007]**
- EP 0694381 A **[0007]**