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(72) Inventor: **Annovi, Nunzio**
41042 Fiorano Modense (Modena) (IT)

(74) Representative: **Crugnola, Pietro**
Luppi & Crugnola S.r.l.,
Via Virgilio 56/F
41100 Modena (IT)

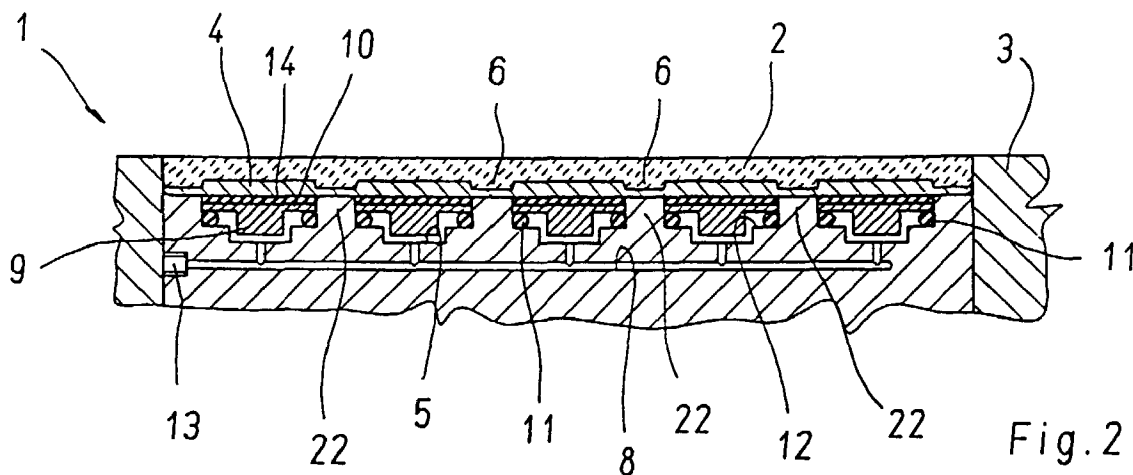
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(71) Applicant: **Annovi S.r.l.**
41049 Sassuolo (MO) (IT)

(54) Isobaric punch for pressing ceramic tiles and method for making said punch

(57) The isobaric punch (1) for pressing ceramic tiles (2) comprises a punch body provided with inter-communicating cavities (5) containing an incompressible fluid and having an end closed by an elastic membrane (4), the other end having a bottom portion provided with annular elastic positioning means (11; 20;

23) in contact with respective rigid inserts (9) inserted into the cavities themselves; the method comprises vulcanizing the elastic membrane onto the punch at such a pressure as not to deform the elastic means (11; 20; 23).



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Description

The invention concerns an isobaric punch for pressing ceramic tiles and a method for making said punch.

From IT-U-214739, dies for ceramic tiles are known, comprising a punch body provided with a plurality of intercommunicating cavities containing oil, said cavities being closed at an active end by an elastic membrane; inside each cavity a respective piston, peripherally provided with a sealing ring, is interposed between the oil and the membrane.

However, for a correct working of such dies, it is necessary, before using them, to introduce pressurized oil to detach the piston from the bottom of the respective cavities in such a way as to enable the pistons to move towards the inside of the cavities or towards the outside of the cavities as a result of the action, on the one hand, of the oil, and, on the other hand, of the powders to be pressed. The pressure of the oil which is necessary to obtain the detachment of the pistons is very high.

From EP-A-0759346 isobaric dies are also known, in which membrane control elements are provided, instead of pistons, which are kept at an intermediate position in the respective cavities by means of positioning elements which are squashed, or broken, or somehow neutralized, after the vulcanization of the membrane, thus releasing the control elements which are so free to move towards the powders to be pressed, or in opposite direction, due to the action, respectively, of the oil, or of the powders. In addition, positioning elements made of elastic material are described, which are interposed between the bottom of each cavity and the central portion of each control element. As a consequence, the control elements may be relatively unstable and, sometimes, may tend to block in the respective cavities when they are non uniformly stressed by the powders. Moreover, when the vulcanization of the membrane is to be made, the particular allocation of the elastic positioning elements makes necessary to carry out the vulcanization with the cavities turned downwards, to avoid the fluid material, from which the membrane will be made, filling said cavities completely.

A further drawback of such known isobaric dies is found when they have to be regenerated, because the elastic membrane, which first is heated, then torn from the body of the die, comes off from the pistons, leaving them inside the respective cavities. So the cavities have to be emptied of the pistons by extracting them one by one, and this implies a considerable waste of time.

Aim of the present invention is to improve the dies for pressing ceramic powders eliminating the drawbacks indicated above.

According to the invention, there is provided an isobaric punch for pressing ceramic tiles, comprising a punch body provided with intercommunicating cavities containing an incompressible fluid and having an end which is closed by an elastic membrane, the other end

being provided with a bottom portion, a respective rigid insert, cooperating with respective elastic positioning means, being accommodated inside each cavities, each said insert being facing, on one side, said membrane and, on the opposite side, being in contact with the respective elastic positioning means, characterized in that said elastic positioning means have an annular shape.

In this way, a greater stability of the rigid elements inserted into the cavities is ensured.

In an advantageous embodiment, said elastic means are received in a corresponding annular seat provided in said bottom portion.

This facilitates the insertion of the positioning elements into the respective cavities.

According to an advantageous embodiment, each rigid insert has a central zone and a peripheral zone, the peripheral zone having a thickness which is less than the thickness of the central zone.

In this way, risks of the rigid insert being blocked in the respective cavity, for a given radial play between the cavity and the rigid insert inserted therein, are considerably reduced.

According to another preferred embodiment, a peripheral sealing element is interposed between each rigid insert and the membrane, to avoid the leakages of liquid plastic material during vulcanization.

According to a further aspect of the invention there is provided a method for making an isobaric die for pressing ceramic tiles, comprising, in succession, preparing a die body with intercommunicating cavities having respective openings facing upwards, inserting an elastic positioning element and a respective rigid insert into each cavity, as well as vulcanizing a membrane in elastic material on the rigid inserts and on the said die body, characterized in that, during vulcanization, a pressure is exerted on the rigid inserts, said pressure being such as not to deform the elastic positioning elements, which are active during pressing.

Preferably, before said vulcanization, sealing means are located on the rigid inserts, said sealing means being suitable to prevent portions of said material from penetrating into said cavities, during vulcanization.

The invention will be better understood and carried into practice referring to the enclosed drawings, showing some exemplary but not restrictive embodiments of it, wherein:

Figure 1 is a plan view of a punch of isobaric die; Figure 2 is an enlarged section taken along line II-II of Figure 1, with a tile to be pressed introduced into the die;

Figures 3 and 4 are sections as in Figure 1, but referred to embodiments of a gasket or sealing element having an annular shape with a circular and rectangular section, respectively;

Figure 5 is a section as in Figure 2, but with a rigid

insert centrally provided with cavities to improve the anchorage of the membrane;

Figures 6, 7 and 8 are sections as in Figure 2, but referred to embodiments of the elastic means with peripheral outer edge wrapping up the insert in the respective cavity;

Figure 9 is a section as in Figure 2, but referred to an embodiment without sealing elements on the side of the insert facing the membrane.

An isobaric punch 1 for pressing ceramic tiles 2 inside a matrix 3, comprises an elastic membrane 4 vulcanized on the outer face of the punch and reproducing, in negative, the back side of the tile 2. The punch 1 is provided with a plurality of cavities 5, obtained in the punch body in the areas amongst supporting appendices 6 of the tile. The membrane 4 is provided with corresponding grooves 7 corresponding to the appendices 6.

As shown in Figure 2, the cavities 5 are intercommunicating through a series of holes 8 obtained in the punch body in such a way as to form a circuit, closed by a screw cap 13, wherein some oil is injected.

Inside each cavity 5 there is accommodated a respective insert 9 which is free to move, during pressing, towards the tile 2, or away from it, depending on the local density of the powders forming the said tile. Each insert 9 has, preferably, an edge portion 10 having a reduced thickness, to avoid blockings even when the combined action of the powders and of the oil forces the insert to tilt with respect to the relevant cavity 5.

Between the part of edge portion 10 facing the oil and the bottom of the respective cavity 5, there is accommodated an annular shaped elastic means 11, for example consisting of a ring having circular section and preferably inserted into an annular seat 12 of each cavity.

The annular shaped elastic means 10 acts itself as a gasket element when, in making the punch, a liquid resin is poured onto the inserts and onto the free surface of the punch body to form the membrane 4. In fact, as shown in Figure 9, each insert may be directly in contact with the membrane 4 without interposition of any gasket element.

However, for a greater guarantee of sealing, it is possible to provide each insert 4 with a disk-shaped gasket element 14, which is located on each insert before the resin being poured, or before the rubber being applied.

As shown in Figure 3, the gasket element may consist of a ring 15 like the annular shaped elastic means 11, so as to obtain a reduction of the variety of pieces forming the punch 1.

In addition, Figure 5 shows that the disk-shaped gasket element 14 may have a central hole 16 to facilitate anchoring of the membrane 4 to the respective insert, so that, when it is necessary to remove the membrane for regenerating the die, the inserts stay attached

to the membrane and follow it, so emptying automatically the respective cavities.

For the same reason explained above, each insert 9 may have, upon its face facing the membrane 4, a depression 17, which is advantageously truncated-cone shaped, for further improving anchoring of the membrane to the inserts 9.

As shown in Figure 6, the depression 17 may extend up to the periphery of the insert 9, so defining a raised edge 18 which may be wrapped up by a lip 19 of the elastic medium underneath, which includes, for example, a ring 20 with rectangular section. The presence of the lip 19 constitutes a further guarantee against blocking of the insert 9 in the respective cavity 5, because it makes even impossible any contact between the insert and the lateral walls of the cavity, avoiding, in this way, blockings or seizures.

As shown in Figure 7, the annular shaped elastic means 20 may even not require the presence of the raised edge 18 of the insert 9, i.e. the lip 19 may simply wrap up the outer peripheral surface of the insert 9. It is to be noted that the cavities may be made communicating with each other by means of through-openings 21 obtained on the walls 22 which define the cavities 6, or by means of holes 24 converging in a V-shaped formation.

In a preferred embodiment, the elastic means may have a semicircular section 23, in such a way as to have greater yieldingness during pressing. The various forms of cross section of the elastic means make the insert 9 more or less freely movable. For example, an insert with circular section may enter the respective cavity owing to forces which are less than forces that should be required if the insert would be provided with a rectangular or square section having corresponding dimensions.

As already said, the elastic means, in its various versions, should substantially not alter its form and dimensions during the vulcanization of the membrane 4, so that the inserts 9 are allowed to stay in an intermediate position in the respective cavity up to solidification of the membrane 4.

Subsequently, oil is introduced into the cavities, at a pressure much less than the the pressure usually used, and subsequently, after the circuit 8 has been closed, pressing may start. Since the pressures exerted on the punch during pressing are much greater than the the pressures used during the vulcanization, the inserts 9 will move into the cavities 5 to compensate possible non-uniform densities of powders.

The form of the inserts 9 and of their respective edge 10 having less thickness, is such that the central portion protrudes towards the bottom of the cavity 5. Thus, the central portion may constitute a stop means of the motion of the insert towards the bottom of the cavity to prevent the elastic means from being damaged.

Claims

1. Isobaric punch (1) for pressing ceramic tiles (2), comprising a punch body provided with intercommunicating cavities (5) containing an incompressible fluid and having an end closed by an elastic membrane (4), the other end being provided with a bottom portion, a respective rigid insert (9), co-operating with respective elastic positioning means (11; 20; 23), being accommodated inside each cavity (5), each said insert (9) being facing, on the one side, said membrane (4) and, on the opposite side, being in contact with the respective elastic positioning means (11; 20; 23), characterized in that said elastic positioning means (11; 20; 23) have an annular shape. 5
2. Punch according to claim 1, characterized in that said elastic positioning means (11; 20; 23) are received in a correspondingly annular seat (12) of said cavity (5). 10
3. Punch according to claim 1, or 2, characterized in that said elastic positioning means have a circular cross section (11). 15
4. Punch according to claim 1, or 2, characterized in that said elastic positioning means have a rectangular cross section (20). 20
5. Punch according to claim 1, or 2, characterized in that said elastic positioning means have a cross section including at least one semicircular portion (23). 25
6. Punch according to any preceding claims, characterized in that said elastic positioning means (11; 20; 23) have a lip (19) peripherally wrapping up the respective insert (9). 30
7. Punch according to claim 1, characterized in that said insert (9) has a depression (17) to receive the membrane (4) and to anchor itself thereto. 35
8. Punch according to claim 1, characterized in that said insert has a peripheral zone (10) having a less thickness than the thickness of the central zone. 40
9. Punch according to claim 1, characterized in that said insert (9) has a central zone which protrudes towards said bottom portion to constitute a stop surface when the insert is pushed into of the cavity (5). 45
10. Punch according to any preceding claims, characterized in that a peripheral sealing element (14; 15) is interposed on the side of said insert (9), between the insert and the membrane (4). 50
11. Punch according to claim 10, characterized in that said peripheral sealing element (14; 15) is formed by a ring having dimensions and shape equal to those of said elastic means (11; 20; 23). 55
12. Punch according to claim 10, characterized in that said peripheral sealing element comprises an element (14) having, in plan view, the same shape of the respective cavity (5) and being forcibly insertable thereinto.
13. Punch according to claim 12, characterized in that said sealing element (14) is provided with a central opening (16).
14. Method for making an isobaric die (1) for ceramic tiles (2), comprising, in sequence, preparing a die body with intercommunicating cavities (5) having respective openings facing upwards, inserting an elastic positioning element (11; 20; 23) and a respective rigid insert (9) into each cavity (5), and vulcanizing a membrane (4) of elastic material onto the rigid inserts (9) and onto said die body, characterized in that, a pressure is exerted on the rigid elements (9) during vulcanizing, said pressure being such as not to deform the elastic positioning elements (11; 20; 23).
15. Method according to claim 14 characterized in that, sealing means (14; 15) are located on the rigid inserts (9) before said vulcanizing, to avoid that, during said vulcanizing, portions of said material may penetrate into said cavities (5).

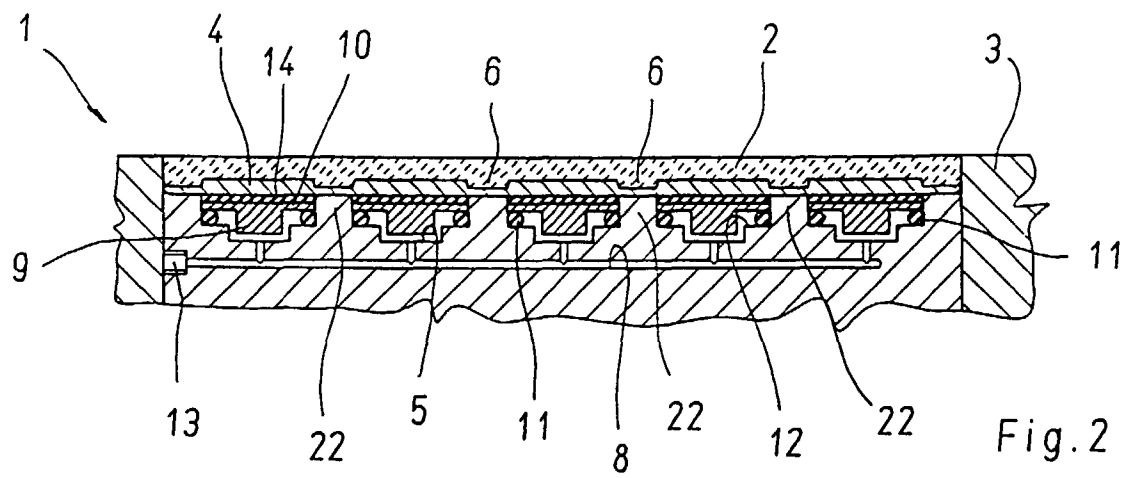
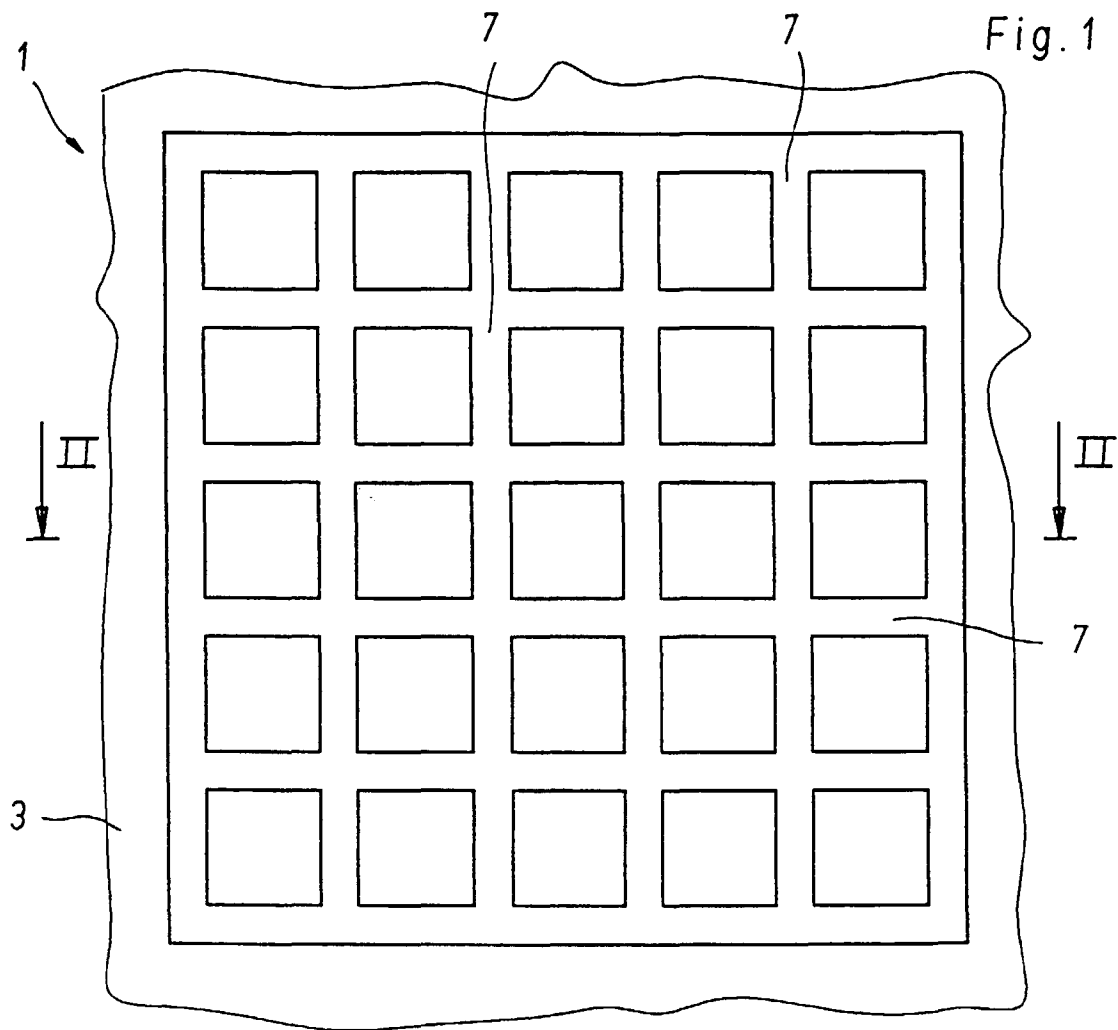


Fig.3

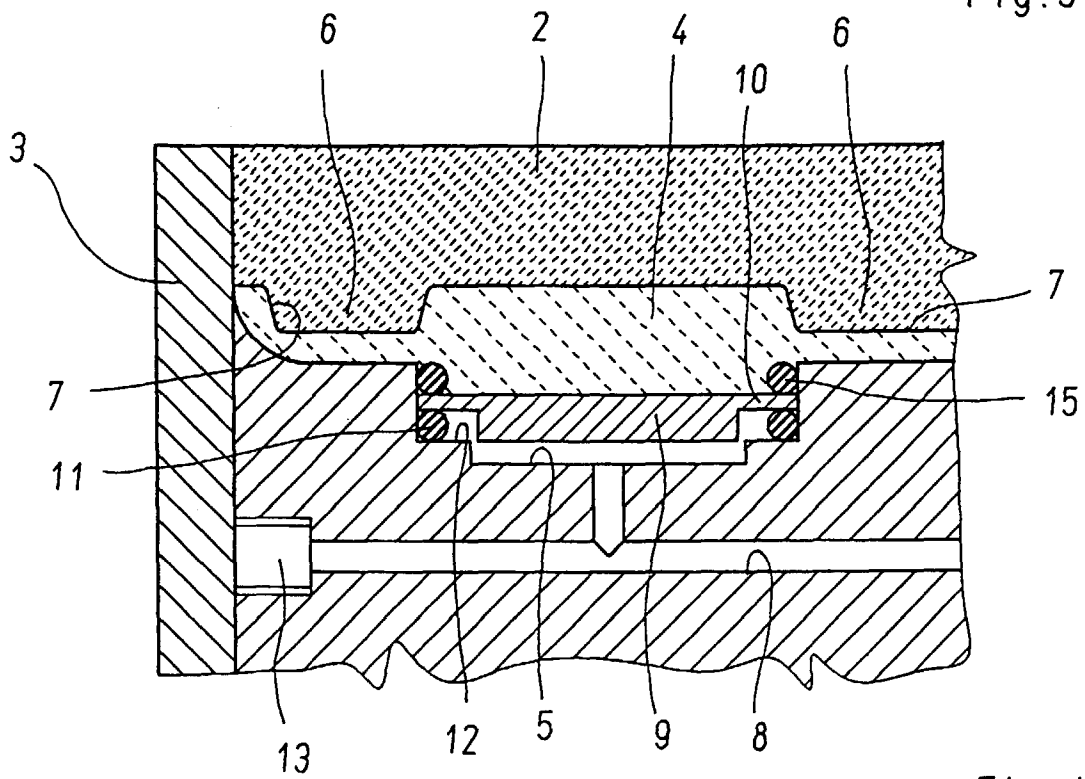


Fig.4

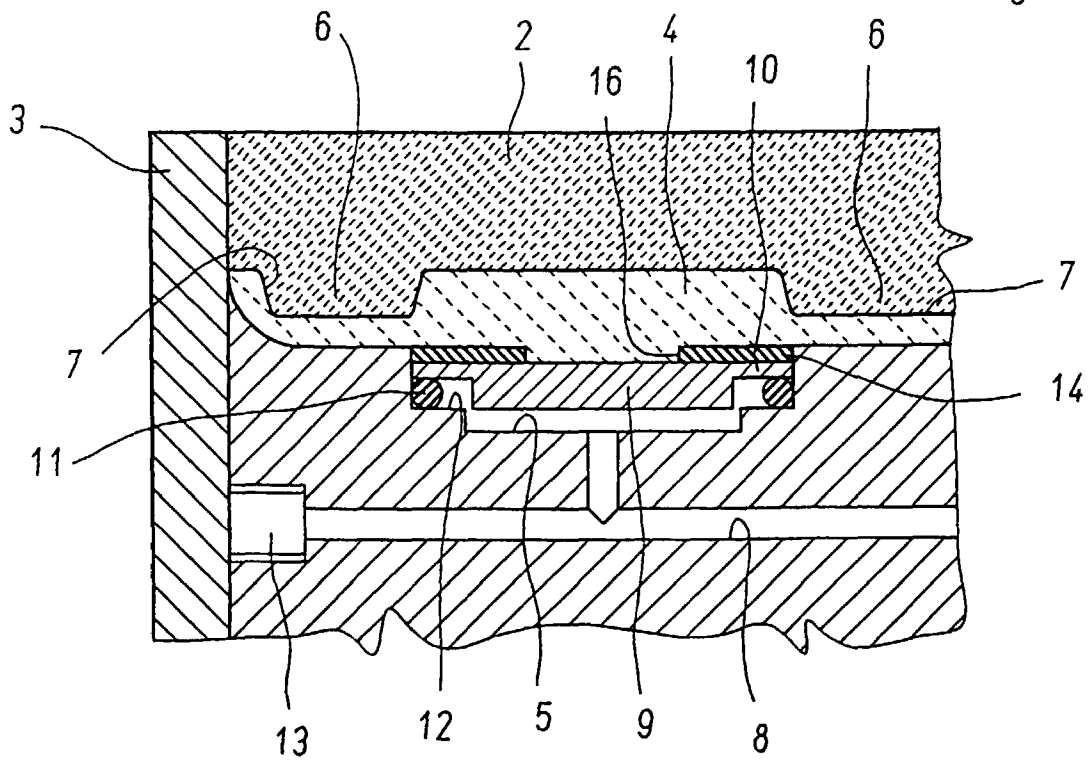


Fig.5

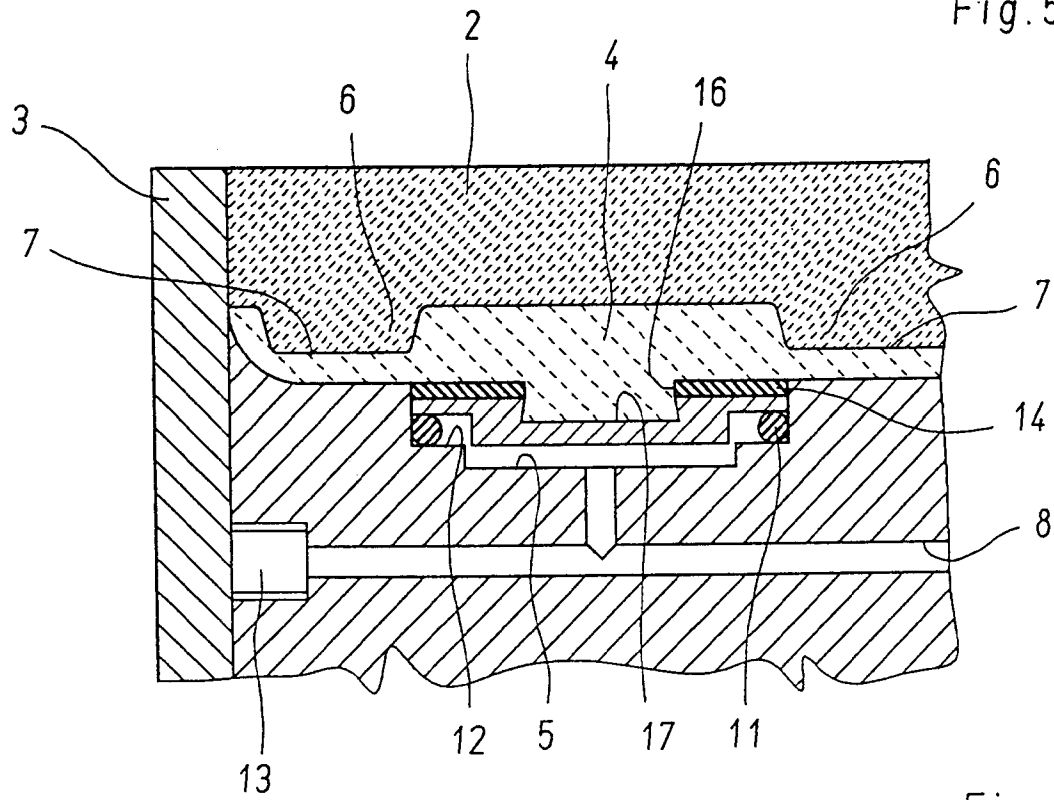
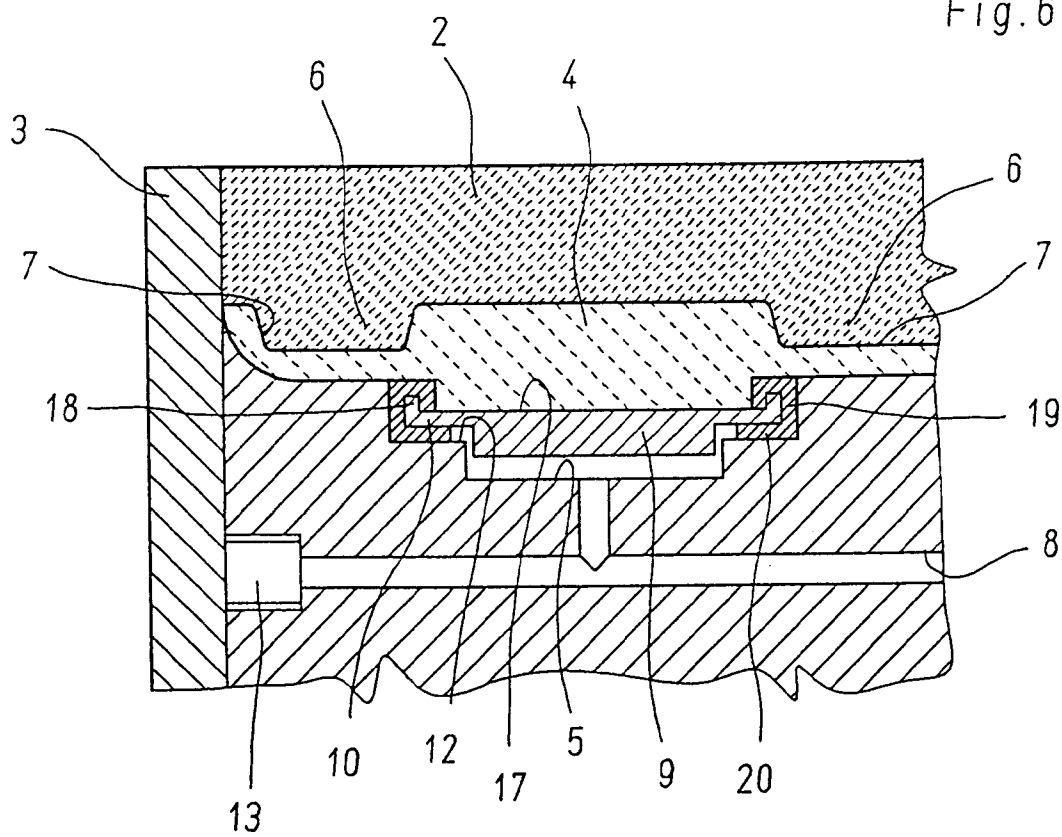
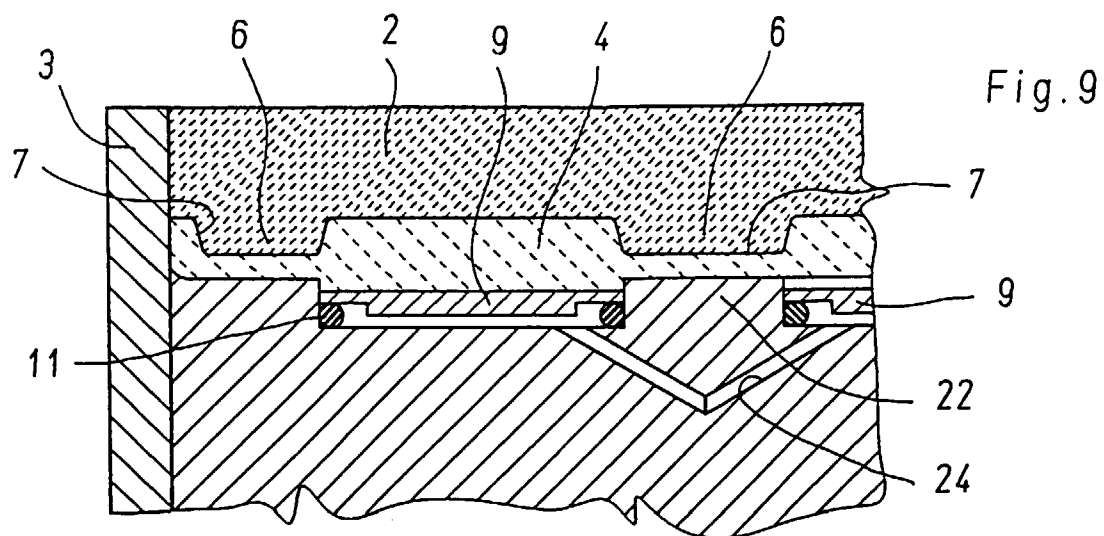
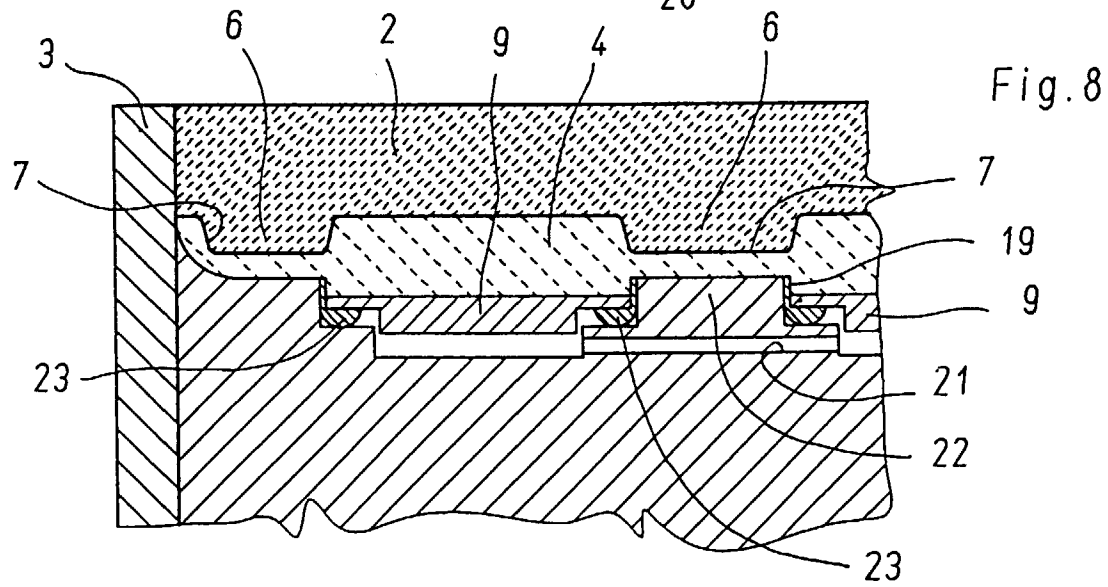
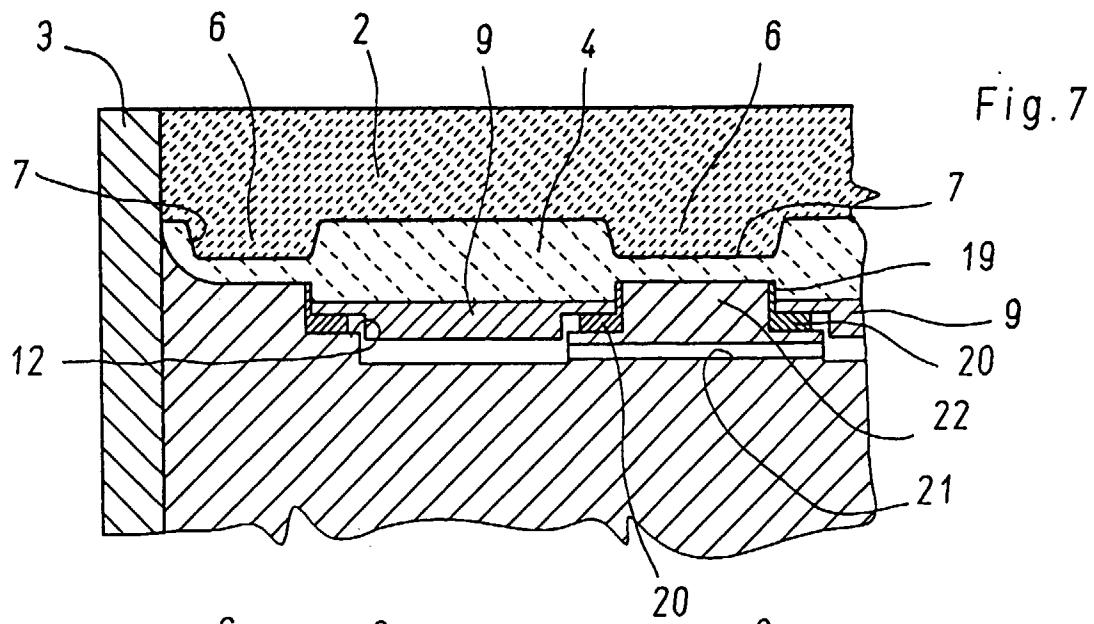


Fig.6







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EUROPEAN SEARCH REPORT

Application Number
EP 98 10 4765

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A,D	EP 0 759 346 A (CAMORANI CARLO ANTONIO ;ALGERI MARIS (IT)) 26 February 1997 * the whole document *	1,3,4,9, 14,15	B28B3/02 B28B7/34
A	EP 0 701 889 A (ALGERI MARIS) 20 March 1996 * the whole document * * figures 24-34,50,51 *	1,3,4, 14,15	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B28B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 12 June 1998	Examiner Gourier, P
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