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(54) **EQUIPMENT FOR THE MANUFACTURE OF SLABS OF CERAMIC MATERIAL**

(57) The equipment (1) comprises:

- a load-bearing structure (2);
- one supporting surface (3) associated with the load-bearing structure (2) and movable along a direction of forward movement (D), the supporting surface (3) being intended to support a continuous slab (L) made of a ceramic material to be compacted;
- pressing means (6) associated with the load-bearing structure (2) and comprising one pressing body (7) arranged above the supporting surface (3) and movable

between a home position, wherein it is moved away from the supporting surface (3) and allows the forward movement of the continuous slab (L), and an operating position, wherein it is moved close to the supporting surface (3) so as to press a portion (P) of the continuous slab (L) and to obtain one compacted slab (C) of predefined dimensions, separate from the continuous slab (L);

- containment means of the portion (P) in the operating position which are locked together with said pressing body (7).

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Description

Technical Field

[0001] The present invention relates to an equipment for the manufacture of slabs of ceramic material.

Background Art

[0002] As is well known, the manufacture of slabs made of ceramic material is generally carried out by preparing a predetermined amount of material to be compacted, placing this predetermined amount of material on a supporting surface and compacting it using suitable pressing means.

[0003] The traditional method of pressing, relating to the manufacture of small-medium sized products, involves that the ceramic material to be compacted is placed inside a cavity into which a relevant pressing pad is fitted. Once the pressing action is over, the material thus compacted is removed from the cavity and made to move forward towards the subsequent drying or firing stations.

[0004] This method of pressing is characterized by low production outputs due to the high discontinuity of the production process.

[0005] In the case of large sized slabs, the supporting surface may be of the type of a belt, on which the ceramic material in powder form to be compacted is then placed. The pressing of the material is achieved by the superimposition of a further belt on the supporting surface carrying the material to be compacted and the crushing action of these belts on the material located between them. The material compacted in this way is then made to move forward from the supporting surface itself towards the subsequent drying or firing stations.

[0006] Also in this case, the production output is limited because of the need to have a close correlation between the forward movement of the supporting surface and the pressing phase. In particular, the supporting surface must be made to move forward by the pitch corresponding to the size of the length of the material deposited thereon, so as to bring it exactly to the point where the pressing means are located.

[0007] Moreover, the known type of equipment applying the aforementioned methods of pressing do not allow obtaining slabs of defined dimensions and require subsequent edge finishing operations aimed at obtaining a slab having dimensions equal to those of the finished slab.

[0008] These finishing operations cause a lengthening of production times and, in addition, lead to the formation of large amount of processing waste that can hardly be reused for further processing.

Description of the Invention

[0009] The main aim of the present invention is to de-

vised an equipment for the manufacture of slabs of ceramic material which allows overcoming the drawbacks of the prior art and, in particular, obtaining a higher production output, while maintaining high quality characteristics of the compacted slab.

[0010] Within this aim, one object of the present invention is to minimize the downtime related to the forward movement and pressing phases of the ceramic material and, at the same time, to obtain high quality standards in terms of thickness, flatness and minimization of the processing waste.

[0011] A further object of the present invention is to devise an equipment for the manufacture of slabs of ceramic material which is small in size and has considerable structural simplicity.

[0012] Another object of the present invention is to devise an equipment for the manufacture of slabs of ceramic material which allows overcoming the aforementioned drawbacks of the prior art within a simple, rational, easy and effective to use as well as low cost solution.

[0013] The aforementioned objects are achieved by the present equipment for the manufacture of slabs of ceramic material having the characteristics of claim 1.

Brief Description of the Drawings

[0014] Other characteristics and advantages of the present invention will become more apparent from the description of a preferred, but not exclusive, embodiment of an equipment for the manufacture of slabs of ceramic material, illustrated by way of an indicative, yet non-limiting example in the accompanying tables of drawings wherein:

Figure 1 is a side cross-sectional view of the equipment for the manufacture of slabs of ceramic material according to the invention;

Figure 2 is an axonometric view of the fluid-operated cylinder of the equipment according to the invention; Figures 3-5 are side cross-sectional views in detail of the equipment according to the invention, in different positions of use.

Embodiments of the Invention

[0015] With particular reference to such figures, reference numeral 1 globally indicates an equipment for the manufacture of slabs of ceramic material.

[0016] The equipment 1 comprises a load-bearing structure 2, at least one supporting surface 3 associated with the load-bearing structure 2 and movable along a direction of forward movement D, the dispensing means 4 of a ceramic material onto the supporting surface 3 and pressing means 6 of the ceramic material.

[0017] The ceramic material is of the type of ceramic powdered material.

[0018] In the embodiment shown in the figures, the supporting surface 3 is of the type of a continuous belt

wrapped around a plurality of motor-driven pulleys.

[0019] The supporting surface 3 is intended to support a continuous slab L made of a ceramic material to be compacted.

[0020] For this purpose, the dispensing means 4 are adapted to release the ceramic material onto the supporting surface 3 to form the continuous slab L to be compacted.

[0021] Specifically, the dispensing means 4 comprise one or more hoppers 5 arranged on top of the supporting surface 3.

[0022] In the embodiment shown in the figures, the dispensing means 4 comprise a plurality of hoppers 5 arranged in succession with each other along the direction of forward movement D.

[0023] The hoppers 5 are adapted to dispense a plurality of different ceramic materials in order to give the final slab a particular aesthetic effect.

[0024] The pressing means 6 are associated with the load-bearing structure 2.

[0025] Conveniently, the load-bearing structure 2 comprises a plurality of sheet metal elements 2a, called ribs, adapted to support the pressing load, which are pack-linked to each other to provide high stiffness of the load-bearing structure itself.

[0026] In particular, the pressing means 6 are arranged downstream of the dispensing means 4 with respect to the direction of forward movement D.

[0027] Advantageously, the stretch of the supporting surface 3 extending between the dispensing means 4 and the pressing means 6 is seamless, it being understood by this definition that the supporting surface 3 is uninterrupted.

[0028] The pressing means 6 comprise at least one pressing body 7 arranged above the supporting surface 3 and movable with respect thereto, adapted to press the ceramic material.

[0029] In more detail, the pressing body 7 is movable between a home position, wherein it is moved away from the supporting surface 3 and allows the forward movement of the continuous slab L along the direction of forward movement D, and an operating position, wherein it is moved close to the supporting surface 3 so as to press a portion P of the continuous slab L and to obtain at least one compacted slab C of predefined dimensions, separate from the continuous slab L.

[0030] Conveniently, the pressing body 7 has at least one pressing surface 9, facing the supporting surface 3 and adapted to contact the continuous slab L in the operating position.

[0031] In the embodiment shown in the figures, the pressing means 6 comprise a fluid-operated cylinder 7,8 provided with a piston 7a, movable with respect to the main body 8 of the fluid-operated cylinder itself between the home position and the operating position, and with which is associated a pressing pad 7b, made e.g. of a resinous material, intended to contact the ceramic material to be compacted. The pressing surface 9 is, there-

fore, defined by the pad 7b.

[0032] Conveniently, the pad 7b is magnetically associated with the piston 7a, e.g. by means of a magnetic plate 10 positioned between them. The piston 7a and the pad 7b define the pressing body 7.

[0033] The pressing means 6 also comprise an abutment element 11, which is arranged below the supporting surface 3 and adapted to act as a stop to the force exerted by the pressing body 7. The abutment element 11 is locked together, e.g. magnetically, with the load-bearing structure 2.

[0034] Advantageously, the supporting surface 3 and the pressing means 6 are operable intermittently and alternately with each other. In other words, activation of one of the two corresponds to interruption of the other, i.e., when the supporting surface 3 is moved along the direction of forward movement D, the pressing means 6 are stationary, and when the pressing means 6 are active, the supporting surface 3 is stationary.

[0035] Following the compaction of the portion P, the movement of the supporting surface 3 causes the forward movement of the compacted slab C thus obtained, which is then displaced downstream of the pressing means 6, and the simultaneous positioning of a further portion P of the continuous slab L at the point where the pressing means 6 are located.

[0036] According to the invention, the equipment 1 comprises containment means for containing the portion P in the operating position.

[0037] The containment means have the function of containing the ceramic material during pressing and allow obtaining a compacted slab C with defined edges and which does not require further finishing operations.

[0038] The containment means are locked together with the pressing body 7.

[0039] As a result, the containment means move together with the pressing body 7, between the home position and the operating position.

[0040] Specifically, the containment means are associated with the pressing surface 9.

[0041] The containment means comprise at least one containment element 12 associated with the pressing surface 9 and protruding below it.

[0042] More specifically, the containment element 12 is associated with the perimeter edge of the pressing surface 9.

[0043] In use, therefore, the containment element 12 is positioned between the pressing surface 9 and the supporting surface 3.

[0044] The containment element 12 defines with the supporting surface 3 a containment volume 13 of the portion P, with the pressing body 7 in the operating position.

[0045] In other words, as shown in Figure 2, following the approach of the pressing body 7 to the supporting surface 3, the containment element 12 fits itself into the ceramic material until it contacts the supporting surface itself, thus bounding the portion P.

[0046] The containment volume 13 is, therefore,

bounded below by the supporting surface 3 and above by the pressing surface 9.

[0047] In the operating position, the containment element 12 contacts the ceramic material of the portion P laterally and holds it inside the containment volume 13 during pressing.

[0048] Conveniently, the containment element 12 defines a substantially closed perimeter.

[0049] The term "substantially closed" means that the containment element 12 extends seamlessly.

[0050] The containment volume 13 is, therefore, in turn, peripherally closed.

[0051] The containment element 12 is made in a single body piece.

[0052] It cannot, however, be ruled out that the containment element 12 be made of several parts contiguous to each other to define the aforementioned closed perimeter.

[0053] Specifically, the containment element 12 may comprise several parts arranged in a polygonal fashion, depending on the shape intended to be given to the compacted slab C. For example, in order to give the compacted slab C a rectangular shape, the containment element 12 may be made of two side parts, arranged parallel to the direction of forward movement D, and two front parts, arranged transversely to the direction of forward movement D.

[0054] In the embodiment shown in the figures, the containment element 12 has a substantially wedge-shaped profile.

[0055] The wedge-shaped profile allows the containment element 12 to gradually fit inside the ceramic material, laterally and gradually displacing the ceramic material itself until it contacts the supporting surface 3.

[0056] It cannot, however, be ruled out that the containment element 12 may have a different conformation.

[0057] Advantageously, the containment element 12 comprises at least one material of the elastically deformable type.

[0058] The containment element 12 is, in fact, adapted to compress during pressing.

[0059] Once the containment element 12 contacts the supporting surface 3, the pressing force of the pressing body 7 on the ceramic material tends to further push the containment element 12 towards the supporting surface 3, by compressing it. (Figure 4)

[0060] The elastically deformable material allows the containment element 12 to regain its initial shape as a result of compression.

[0061] The elastically deformable material is of the type of a polymeric foam material.

[0062] For example, the elastically deformable material may be elastic polyurethane foam.

[0063] Conveniently, as shown in detail in Figure 1, the containment element 12 comprises at least one internal portion 12a made of the aforementioned elastically deformable material and at least one external portion 12b made of a non-stick material.

[0064] The external portion 12b defines a contact surface 14 intended, in use, to contact the ceramic material.

[0065] In more detail, the external portion 12b is made of a non-stick material so as to prevent the ceramic material from adhering to the contact surface 14 during pressing.

[0066] The non-stick material allows, therefore, avoiding the cleaning operations of the containment element 12 after each pressing phase.

[0067] The non-stick material is also of an elastically deformable type.

[0068] For example, the non-stick material may be of the thermoplastic polyurethane type.

[0069] The external portion 12b is associated with the internal portion 12a so as to cover it.

[0070] The operation of the equipment 1 according to the invention is as follows.

[0071] The dispensing means 4 dispense the ceramic material onto the supporting surface 3 so as to form the continuous slab L to be compacted.

[0072] In more detail, the hoppers 5 release the ceramic powdered material onto the supporting surface 3 during the movement of the latter along the direction of forward movement D.

[0073] The continuous slab L is moved along the direction of forward movement D.

[0074] The supporting surface 3 stops at the point where the pressing means 6 are located, so that the portion P can be pressed.

[0075] For this purpose, the pressing body 7 is brought to the operating position, in which it is moved close to the supporting surface 3.

[0076] During such movement, the containment element 12 contacts the supporting surface 3 and bounds the containment volume 13.

[0077] The pressing body 7 continues its movement towards the operating position and, by crushing the portion P with a force of predefined intensity, causes the compression of the containment element 12.

[0078] At the end of pressing, the pressing body 7 moves away from the supporting surface 3, towards the home position, to allow the release of the compacted slab C and the containment element 12 acquires the initial conformation again. (Figure 5)

[0079] The supporting surface 3 is operated so as to simultaneously move the compacted slab C and the continuous slab L along the direction of forward movement D.

[0080] In particular, the compacted slab C, which is, therefore, distinct and separate from the remaining part of the continuous slab L, is moved downstream of the pressing means 6, while a new portion P of the continuous slab L is arranged at the point where the pressing means themselves are located in order to proceed with a further pressing phase.

[0081] It has in practice been ascertained that the described invention achieves the intended objects and, in particular, the fact is emphasized that the equipment to which the present invention relates, makes it possible to

optimize the phases of feeding and pressing of the ceramic material, thus reducing downtimes to a minimum and increasing the output with respect to processes and equipments of known type.

[0082] Moreover, the presence of the containment means makes it possible to simplify the handling of the material to be pressed, by carrying out a partial or total compartmentalization of a portion of the continuous slab that is intermittently fed at the point where the pressing means are located.

[0083] Finally, the particular conformation of the containment means gives extremely small dimensions to the present equipment and makes it of remarkable structural simplicity.

Claims

1. Equipment (1) for the manufacture of slabs of ceramic material, comprising:

- a load-bearing structure (2);
- at least one supporting surface (3) associated with said load-bearing structure (2) and movable along a direction of forward movement (D), said supporting surface (3) being intended to support a continuous slab (L) made of a ceramic material to be compacted;
- pressing means (6) associated with said load-bearing structure (2) and comprising at least one pressing body (7) arranged above said supporting surface (3) and movable between a home position, wherein it is moved away from said supporting surface (3) and allows the forward movement of said continuous slab (L) along said direction of forward movement (D), and an operating position, wherein it is moved close to said supporting surface (3) so as to press a portion (P) of said continuous slab (L) and to obtain at least one compacted slab (C) of predefined dimensions, separate from said continuous slab (L);

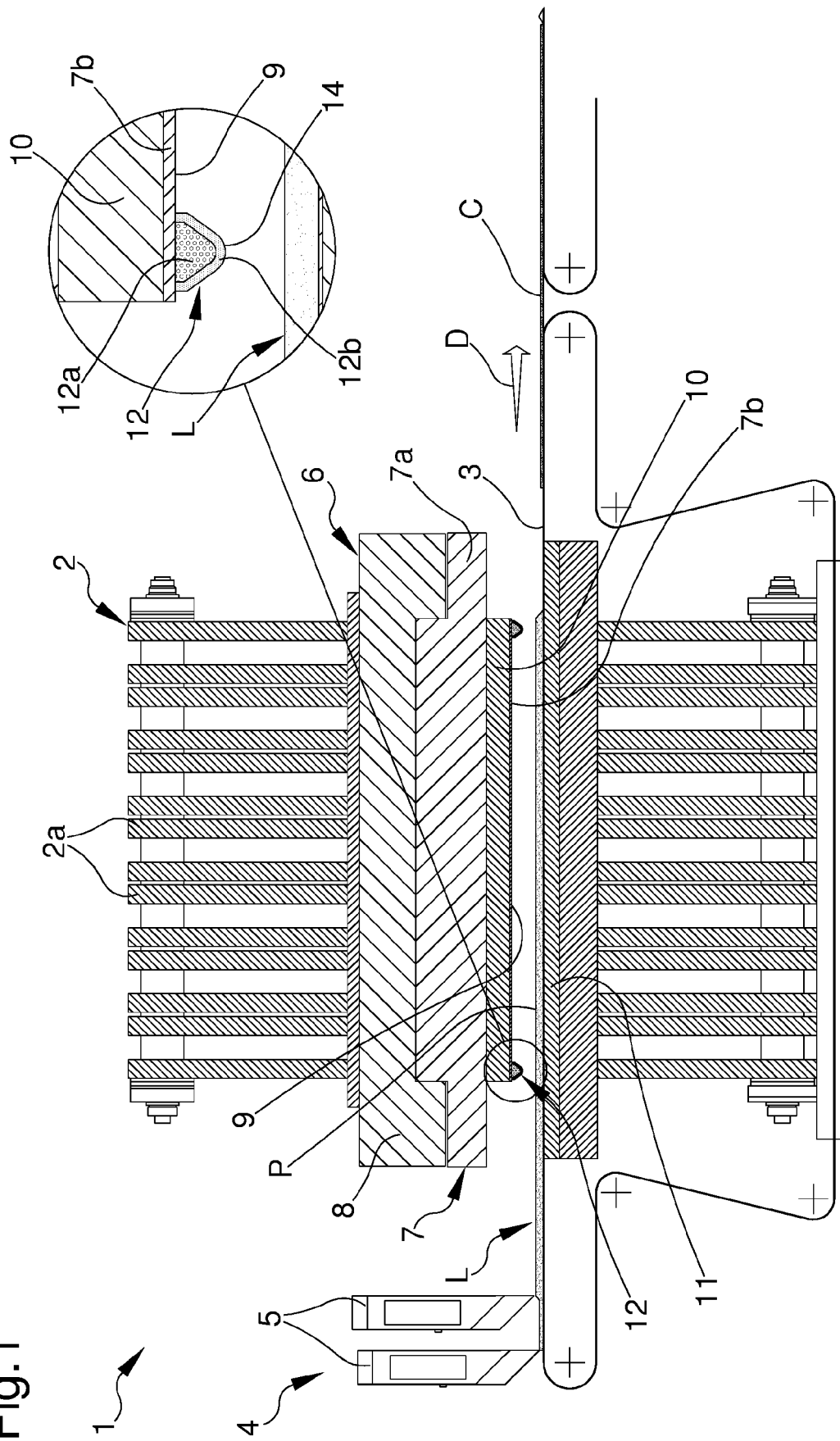
characterized by the fact that it comprises containment means of said portion (P) in said operating position which are locked together with said pressing body (7).

2. Equipment (1) according to claim 1, **characterized by** the fact that said pressing body (7) has at least one pressing surface (9), facing said supporting surface (3) and adapted to contact the continuous slab (L) in said operating position, and by the fact that said containment means are associated with said pressing surface (9).
3. Equipment (1) according to claim 2, **characterized by** the fact that said containment means comprise

at least one containment element (12) associated with said pressing surface (9) and protruding below it, said containment element (12) defining with said supporting surface (3) a containment volume (13) of said portion (P), with said pressing body (7) in the operating position.

4. Equipment (1) according to claim 3, **characterized by** the fact that said containment element (12) defines a closed perimeter.
5. Equipment (1) according to one or more of the preceding claims, **characterized by** the fact that said containment element (12) has a substantially wedge-shaped profile.
6. Equipment (1) according to one or more of the preceding claims, **characterized by** the fact that said containment element (12) comprises at least one material of the elastically deformable type, said containment element (12) being adapted to compress during said pressing.
7. Equipment (1) according to claim 6, **characterized by** the fact that said elastically deformable material is of the type of a polymeric foam material.
8. Equipment (1) according to claim 6 or 7, **characterized by** the fact that said containment element (12) comprises at least one internal portion (12a) made of said elastically deformable material and at least one external portion (2b), made of a non-stick material and associated with said internal portion (12a) so as to cover it, said external portion (2b) defining a contact surface (14) intended, in use, to contact said ceramic material.

Fig.1



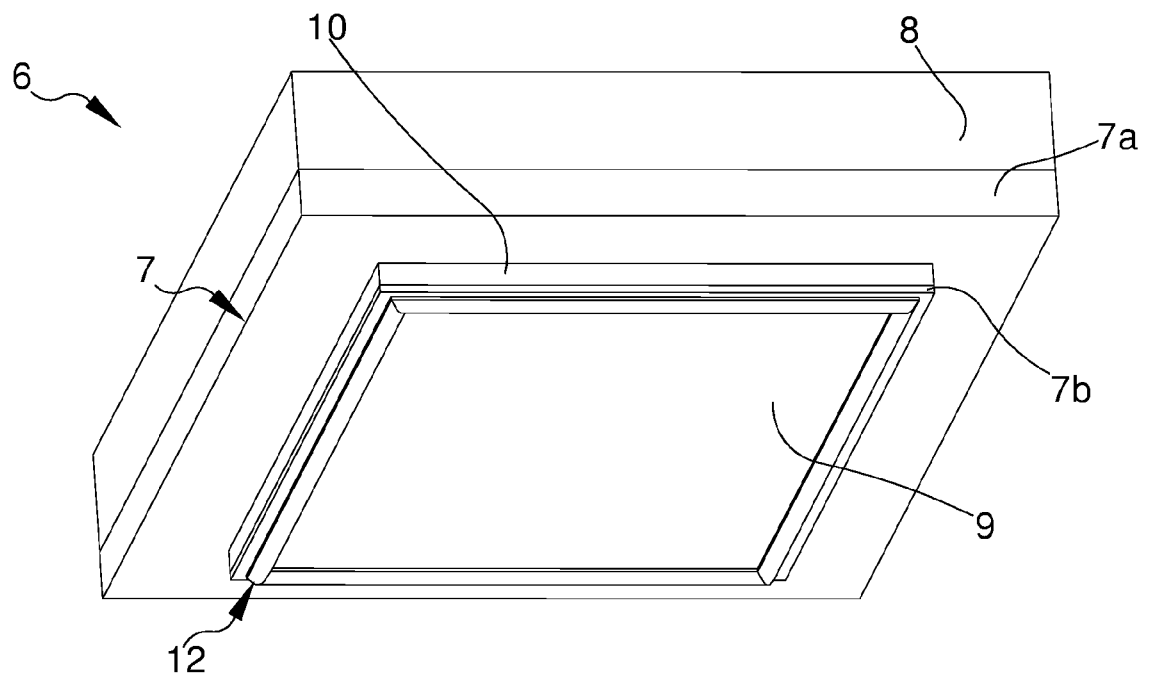


Fig. 2

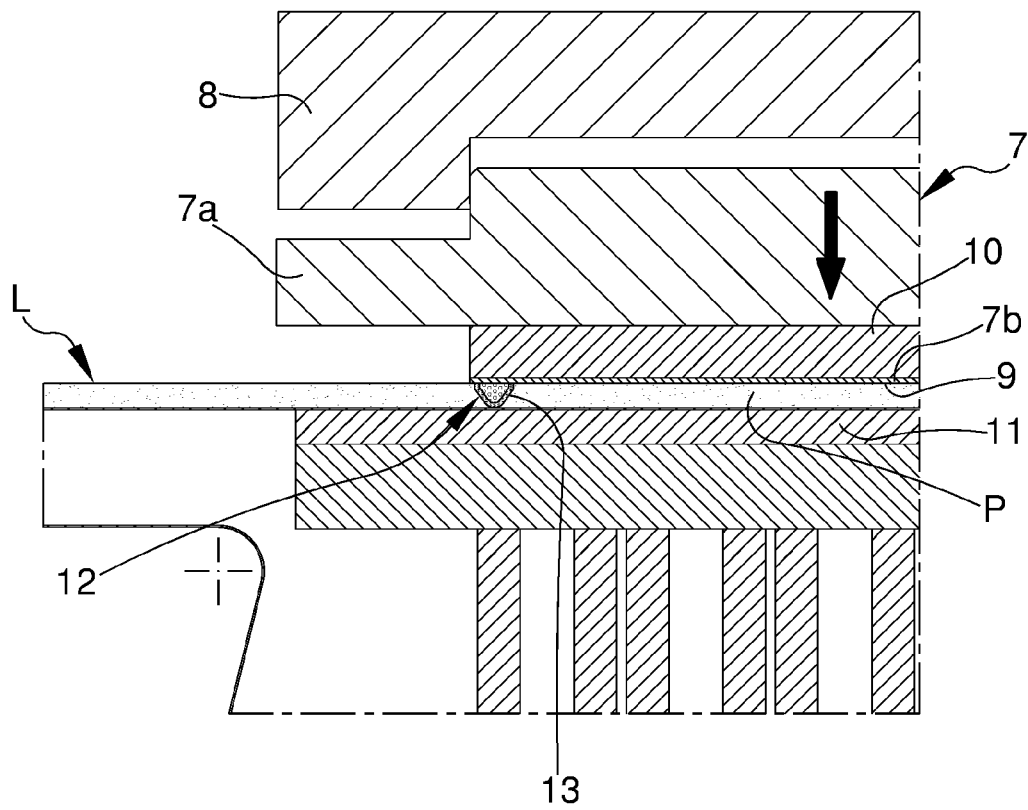


Fig. 3

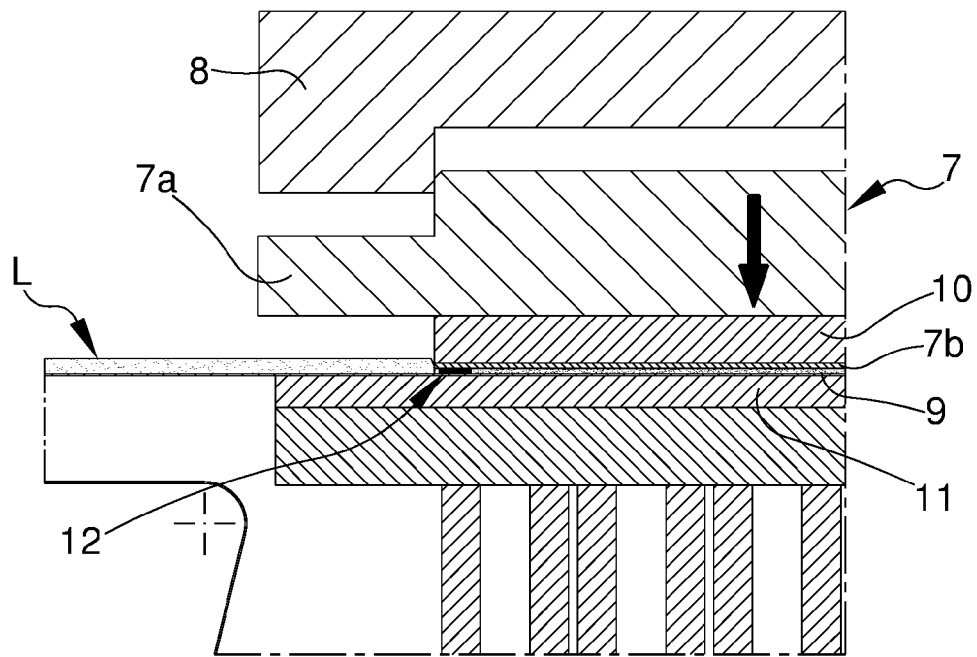


Fig.4

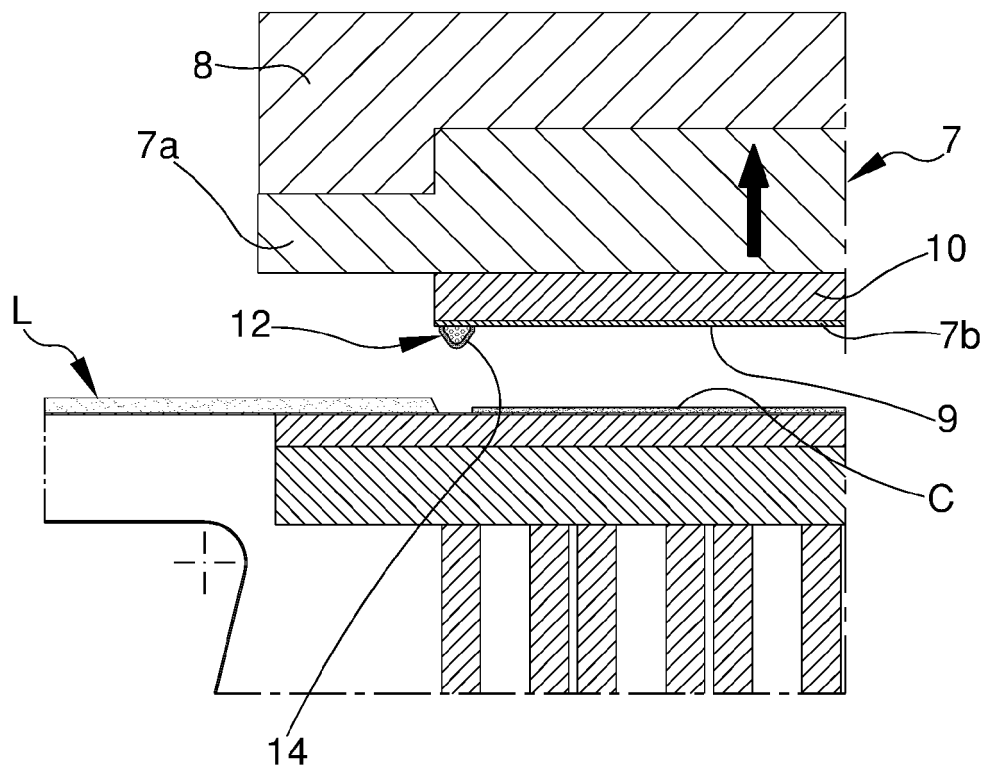


Fig.5



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Place of search The Hague		Date of completion of the search 16 November 2021	Examiner Papakostas, Ioannis	
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