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**(54) Method for transferring ceramic powder from a pick-up region to a utilization region**

(57) A method for transferring ceramic powder from a pick-up region to a utilization region, characterized in that it comprises: depositing the ceramic powder on a porous medium (1) which is permeable to air but not to the powder, so as to produce a layered arrangement (2) of powder; placing on the layered arrangement a porous diaphragm (4) which is permeable to air but not to the powder; connecting the diaphragm (4) to a suction

source, so that a portion (6) of the layered arrangement having preset dimensions continues to adhere to the diaphragm (4); transferring the portion onto the utilization region; connecting the suction diaphragm to a source of air in overpressure, so that the portion (6) separates from the porous diaphragm and is deposited on the region.

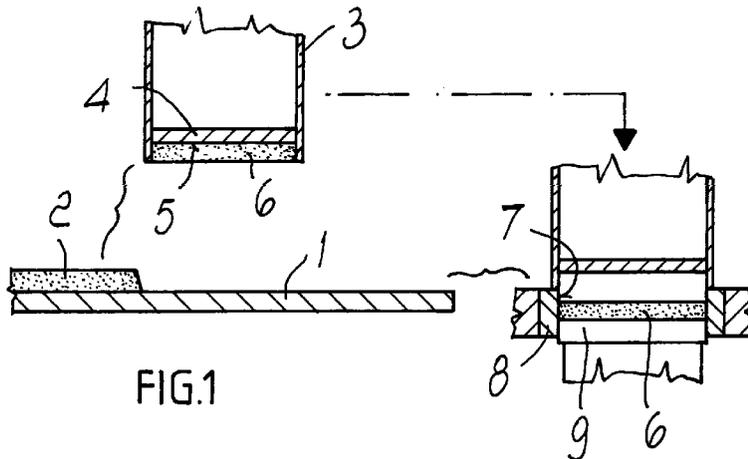


FIG.1

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## Description

The present invention relates to a method for transferring ceramic powder from a pick-up region to a utilization region, particularly for transferring ceramic powder into the mold of a tile-making press.

It is known that in the field of ceramics the powder is transferred with transfer systems consisting of conveyors or channels which connect a pick-up region (silos, hoppers) to a utilization region (press loading trolleys). For example, powder is fed to the mold of a press by a trolley which comprises a grid and is actuated with a back-and-forth motion between a position that lies below a loading hopper, whereat the grid is filled with ceramic powder, and an unloading position, whereat the powder is discharged from the grid into the recesses of an underlying ceramic press mold.

After filling the recesses, the grid, during the return stroke below the hopper, removes the excess powder by skimming.

With conventional transfer methods, the ceramic powder undergoes uncontrollable mixing and, in the case of press loading grids, the skimming effect produces a different compaction of the powder in the recesses, particularly proximate to the edges of the recesses. This different compaction can lead to the molding of tiles having uneven thickness (i.e., wedge-shaped) which thus tend to deform irregularly during baking in the kiln.

Another shortcoming of loading performed with conventional means is the fact that when multilayer tiles must be produced, it is difficult to avoid a certain mixing of the powders in the regions where the various layers overlap, so that besides physical alterations, unpredictable and nonrepeatable aesthetic effects occur.

In view of the above, the aim of the present invention is to provide a new powder transfer method which allows to overcome the limitations of conventional methods and, in relation to the feeding of a press, to obviate the shortcomings in terms of uncontrollable mixing in the recesses of the mold.

Within the scope of this aim, an object of the present invention is to provide a method which allows to achieve aesthetic effects which cannot be achieved with conventional methods.

This aim and this object are achieved with a method for transferring ceramic powder from a pick-up region to a utilization region, characterized in that it comprises: depositing the ceramic powder on a porous medium which is permeable to air but not to the powder, so as to produce a layered arrangement of powder; placing on said layered arrangement a porous diaphragm which is permeable to air but not to the powder; connecting said diaphragm to a suction source, so that a portion of said layered arrangement having a preset size continues to adhere to said diaphragm; transferring said portion onto the utilization region; connecting said suction diaphragm to a source of air in overpressure, so that said

portion separates from said porous diaphragm and is deposited on said region.

If it is necessary to transfer ceramic powder into the recesses of the mold of a tile-making press, the method is characterized in that it comprises: depositing the ceramic powder on a porous supporting surface which is permeable to air but not to the powder, so as to produce a layered arrangement of powder; placing on said layered arrangement a porous diaphragm which is permeable to air but not to the powder; connecting said diaphragm to a suction source, so that a portion of said layered arrangement having dimensions that correspond to those of a recess of said mold continues to adhere to said diaphragm; vertically transferring and positioning said portion on the recess of said mold; connecting said suction diaphragm to a source of air in overpressure, so that said portion separates from said porous diaphragm and is deposited in said recess.

In a preferred embodiment, the layered arrangement of powder is obtained in a containment element whose dimensions correspond to those of the recess of the mold of the press.

If the layered arrangement of powder is obtained on a porous supporting surface, the suction diaphragm is advantageously associated with a duct which can be connected to a source of suction or air in overpressure; said duct, together with said diaphragm, forms a compartment for containing the portion removed from said formation.

In an advantageous embodiment of the method, if the layered arrangement of powder is obtained in a containment element, the suction diaphragm closes a duct which can be connected to a source of suction or air in overpressure so that the portion removed from said layered arrangement is external to the mouth of said duct.

Further characteristics and advantages of the method according to the present invention will become apparent from the following description on the basis of the accompanying drawings, wherein:

figure 1 is a schematic view of the steps of the method for transferring ceramic powder into the recess of the mold of a press;

figure 2 is a plan view of the porous surface for supporting the layered arrangement of powder;

figure 3 is a view of a second embodiment of the method, related to the step for depositing the powder in a recess of the mold;

figure 4 is a schematic view of the steps of a modified method;

figure 5 is a plan view of the porous surface for supporting the layered arrangement of powder for performing the modified method of figure 4;

figure 6 is a view of a third embodiment of the step for depositing the powder in a recess of the mold according to the modified method of figure 4;

figure 7 is a view of a fourth embodiment of the method.

With reference to figures 1 and 2, the reference numeral 1 designates a horizontal supporting surface, made of a porous material which allows the through passage of air but not of the ceramic powder wherewith the tiles are to be formed.

The ceramic powder is deposited on the surface 1 and shaped so as to produce a layered arrangement 2 having the chosen thickness.

The reference numeral 3 designates a duct which can be connected, through a selector valve, to a source of suction or of air in overpressure. The mouth of the duct 3 is closed by a porous diaphragm 4 whose porosity is such as to allow the passage of air but not of the ceramic powder.

The diaphragm 4 is located inside the mouth of the duct 3 so as to delimit a compartment 5 which is substantially as high as the arrangement 2 is thick.

The duct 3 is subjected to a movement thanks to which, during a first step, the duct 3 is rested on the porous surface 1, so that a portion of the layered arrangement 2 occupies the compartment 5.

In a second step, prior to the lifting of the duct 3, said duct 3 is connected to the suction source, so that the layered portion 6 is retained in the compartment 5 against the diaphragm 4.

In a third step, the duct 3 is transferred onto a recess 7 of a mold of a ceramic press, formed by a containment rim 8 and by a punch 9.

In a fourth step, the duct 3 is rested on the containment rim 8 so that the mouth of the duct 3 is centered on the edge of the recess 7.

In a fifth step, suction is deactivated and the duct 3 is connected to a source of air in overpressure.

Said overpressure causes the portion 6 to exit from the containment compartment 5 and to be deposited in the recess 7. The compaction whereto the ceramic powder is subjected in the compartment 5 by virtue of the suction prevents the portion 6 from flaking during transfer into the mold of the press.

Figure 1 illustrates a solution wherein the recess 7 is higher than the portion 6 is thick, so that above the portion 6, once it has been deposited in the recess 7, there is still an empty space wherein an additional layer of material can be deposited.

In figure 3, the recess 7 is as high as the portion 6 is thick; the upper surface of said portion is flush with the upper face of the containment rim.

It is evident that the invention perfectly achieves the intended aim and object. In particular, the method allows to fill the recess 7 without altering the structure of the aspirated portion, thus maintaining a uniform density of the powder in all the regions of the recess. The portion 6 in fact falls into the recess without undergoing compaction and mixing, as instead occurs with conventional loading grids.

Another advantage is the possibility to prepare the powder on the supporting surface 1 according to requirements, for example providing depressions or the

like which can be transferred into the recess and thus allowing to obtain aesthetic effects which cannot be obtained with conventional methods.

The above-described method is susceptible of numerous variations according to requirements. Figures 4 and 5 illustrate an embodiment wherein the portion to be transferred into the recess of the mold of the press is obtained by filling suitable cavities 10 formed in the porous supporting surface 2, thus forming decorated tiles 11. In this case, the porous diaphragm 4 is arranged flush with the edge of the mouth of the duct 3 so that the decorated tile 11 made of ceramic powder removed by suction from the cavity 10 is retained outside the duct and can be deposited into the recess 7 of the mold.

In this case also, the compartment 7 delimited by the containment rim 8 and by the punch 9 can be higher than (figure 4), or as high as (figure 6), the removed decorated tile.

Figure 7 illustrates a different embodiment which uses a duct 3 provided with a containment compartment 5 (such as the one described in relation to the method of figures 1 to 3) and with a cavity 10 (such as the one described in relation to the method of figures 4 to 6). The dimensions of the duct 3 are such that the duct engages in the cavity 10, so that the decorated tile 11 fully occupies the compartment 10. The steps for removing and depositing the decorated tile in the recess 7 of the mold proceed as described above.

It is noted that the method according to the present invention is not limited to the transfer of the powder into the recesses of the mold of a ceramic press but can also be applied to the transfer of the powder into the grid of a ceramic press. The powder deposited by the duct 3 in the grid in fact undergoes a significantly reduced mixing, which does not appreciably alter its physical and aesthetic characteristics.

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 method for transferring ceramic powder from a pick-up region to a utilization region, characterized in that it comprises: depositing the ceramic powder on a porous medium (1) which is permeable to air but not to the powder, so as to produce a layered arrangement (2) of powder; placing on said layered arrangement a porous diaphragm (4) which is permeable to air but not to the powder; connecting said diaphragm (4) to a suction source, so that a portion (6) of said layered arrangement (2) having a preset size continues to adhere to said diaphragm (4);

transferring said portion onto the utilization region; connecting said diaphragm to a source of air in overpressure, so that said portion (6) separates from said porous diaphragm (4) and is deposited on said region.

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2. A method according to claim 1 for transferring ceramic powder into the recesses (7) of the mold (8, 9) of a tile-making press, characterized in that it comprises: depositing the ceramic powder on a porous supporting surface (1) which is permeable to air but not to the powder, so as to produce a layered arrangement (2) of powder; placing on said layered arrangement a porous diaphragm (4) which is permeable to air but not to the powder; connecting said diaphragm (4) to a suction source, so that a portion (6) of said layered arrangement having dimensions that correspond to those of a recess (7) of said mold continues to adhere to said diaphragm (4); transferring and vertically positioning said portion (6) on the recess (7) of said mold (8, 9); connecting said diaphragm (4) to a source of air in overpressure, so that said portion (6) separates from said porous diaphragm (4) and is deposited in said recess (7).
3. A method according to one of claims 1 or 2, characterized in that a duct (3) is provided for aspirating and depositing said portion (6), said duct being connectable, through valve means, to a source of suction and alternatively of air in overpressure and having a mouth which is closed by said porous diaphragm (4).
4. A method according to one of the preceding claims, characterized in that said diaphragm (4) forms, together with the mouth of said duct (3), a compartment (5) for containing said portion (6).
5. A method according to one of the preceding claims, characterized in that said porous support (1) is provided with cavities (10) for forming decorated tiles (11) to be transferred into the recesses (7) of the mold (8, 9) of the press.

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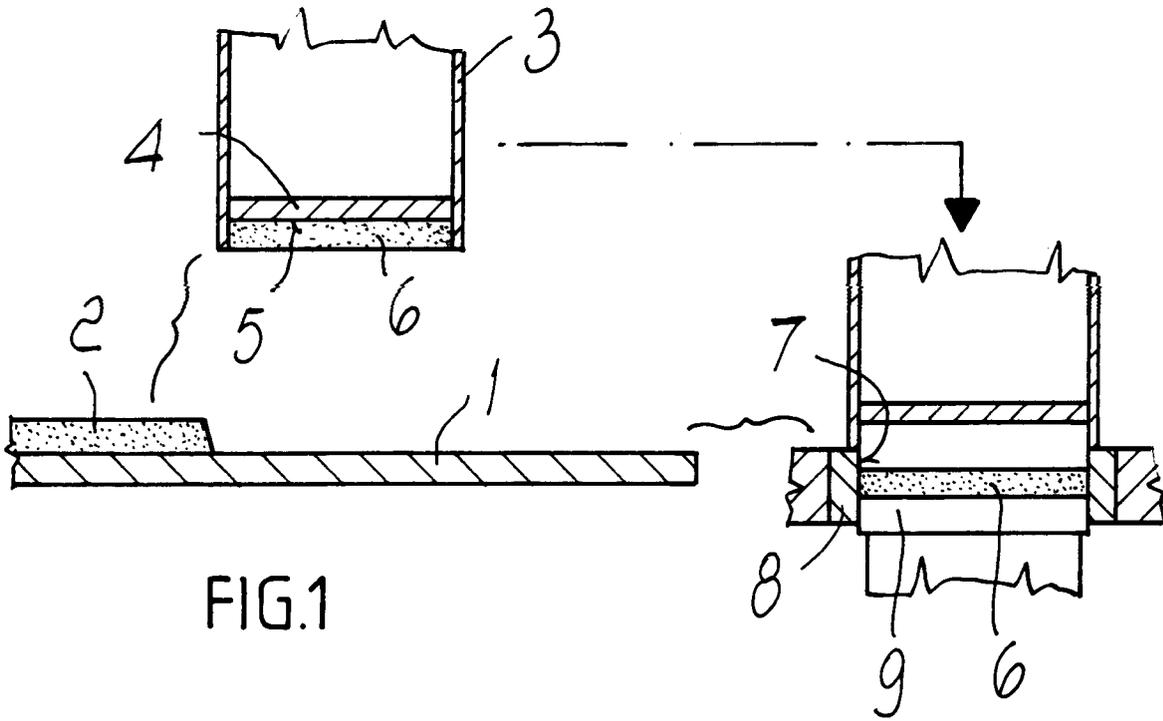


FIG. 1

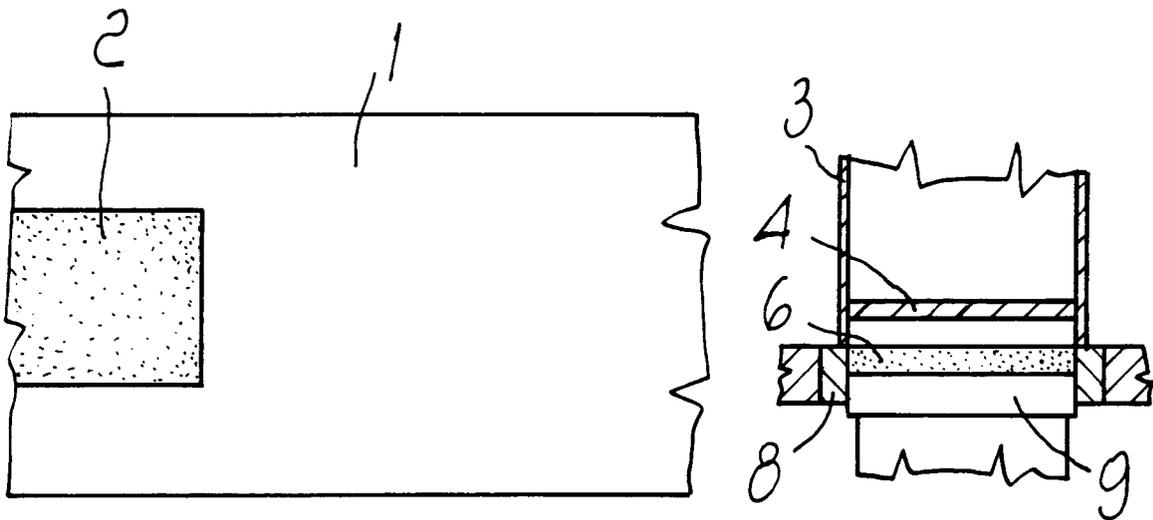


FIG. 2

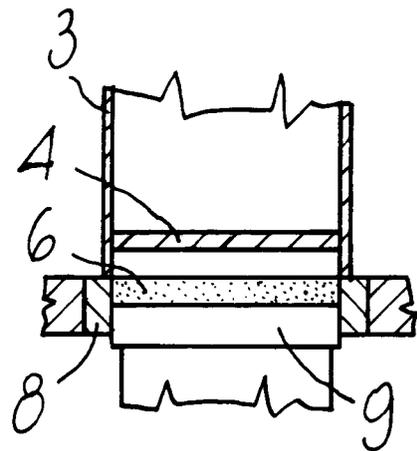
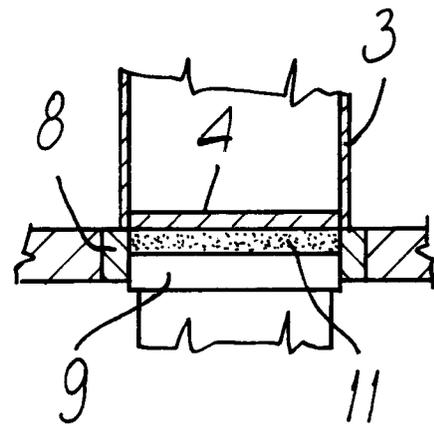
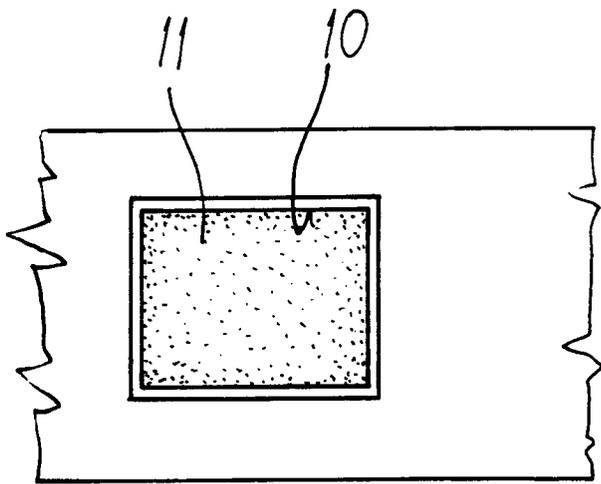
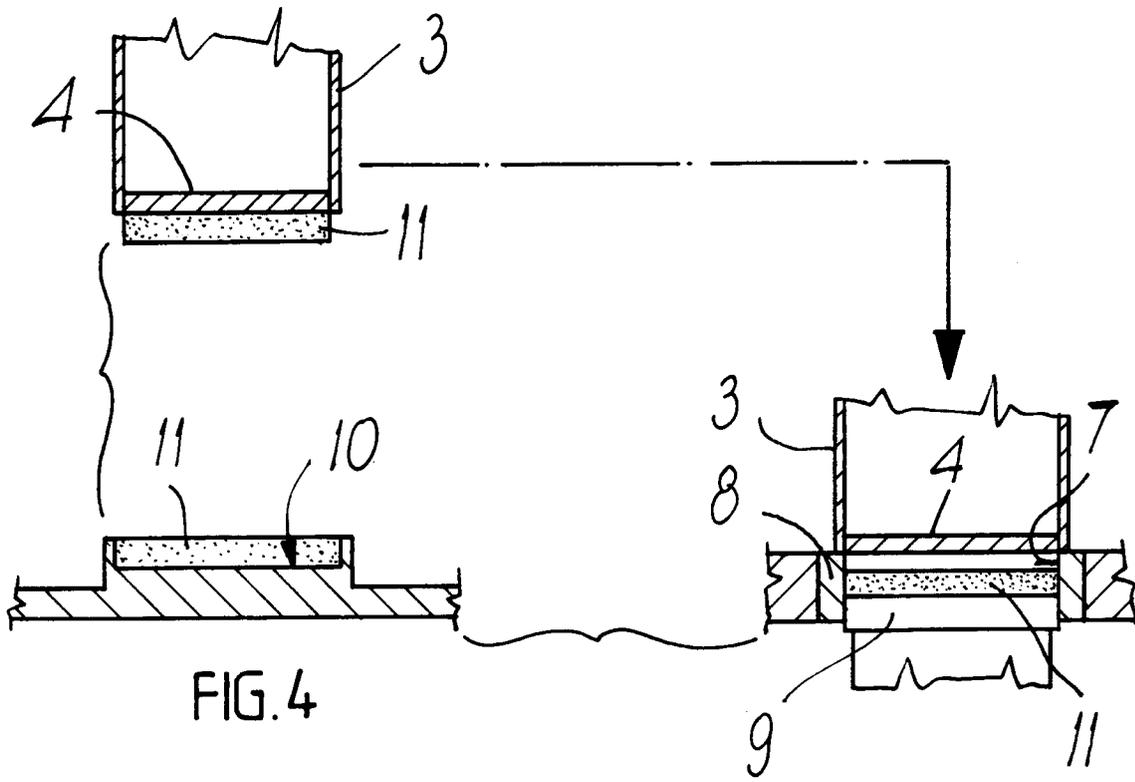


FIG. 3



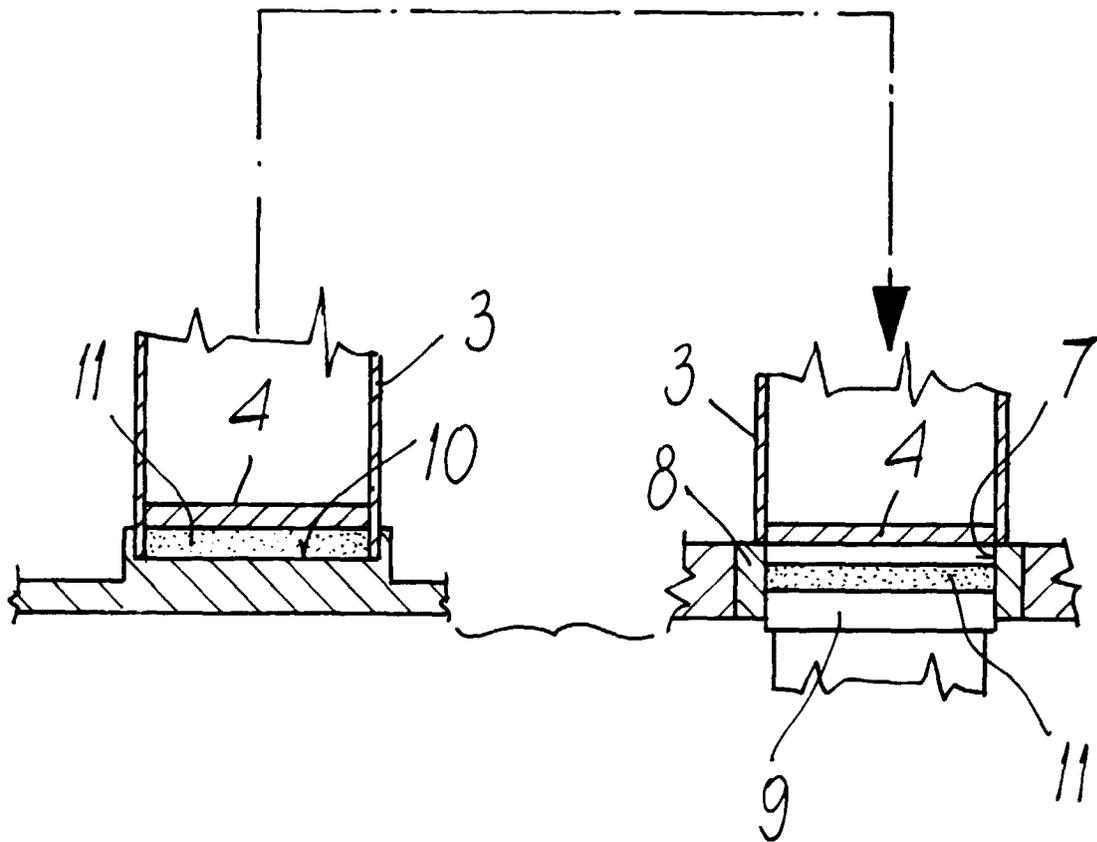


FIG. 7



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EUROPEAN SEARCH REPORT

Application Number  
EP 98 10 2126

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)
X	US 3 970 223 A (LONGINOTTI ENRICO) * the whole document *	1-5	B28B13/02
X	FR 2 444 543 A (LONGINOTTI SPA) * the whole document *	1-4	
A	DE 39 41 346 A (MURATA MANUFACTURING CO) * the whole document *	1-4	
A	WO 96 15888 A (CAMORANI CARLO ANTONIO ;ALGERI MARIS (IT)) * page 11, line 28 - page 12, line 16 * * page 13, line 12 - page 15, line 17 * * figures 1,9,28-30 *	1	
A	EP 0 693 352 A (L B ENGINEERING S R L) * the whole document *		
A	EP 0 444 730 A (LB OFFICINE MECCANICHE SPA) * the whole document *		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B28B
Place of search		Date of completion of the search	Examiner
THE HAGUE		14 May 1998	Gourier, P
CATEGORY OF CITED DOCUMENTS			
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