



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.12.2011 Bulletin 2011/50

(51) Int Cl.:
B30B 15/30 (2006.01) B28B 13/02 (2006.01)

(21) Application number: **11168900.6**

(22) Date of filing: **07.06.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: **Emar S.R.L.**
41049 Sassuolo (MO) (IT)

(72) Inventor: **Martinelli, Paola**
I-41049 Sassuolo (MO) (IT)

(74) Representative: **Lampis, Marco**
Dragotti & Associati
Via Marina, 6
20121 Milano (IT)

(30) Priority: **10.06.2010 IT MI20101049**
06.04.2011 IT MI20110559

(54) **Sliding plate for a station for pressing powder materials for manufacturing of tiles and the like, pressing station using said plate and a method for replacement of the sliding surface of said plate**

(57) A pressing station (10) for pressing powders for manufacturing ceramic products comprises a press (11) for operating a mould (12) for the powders and a device (13) for loading the powders into the mould. The loading device (13) comprises in turn a sliding plate (15) slidably supporting a frame-like carriage (16) which transports the powders from a loading zone to the mould. The sliding plate (15) comprises a base plate part (17, 117), which is

designed to withstand the flexural stresses which are produced during operation of the station, and thin covering sheets (18, 118) which are arranged on the top surface of the base part and removably connected to the base part (17, 117) by connection means (19, 123). As a result, it is possible to remove and replace the sheets (18, 118) by control of the connection means without removing the heavier base plate part from the station.

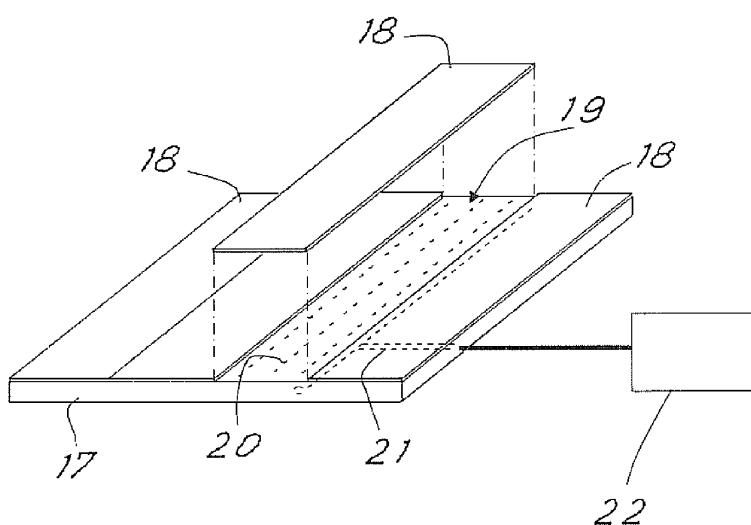


Fig.2

Description

[0001] The present invention relates to a pressing station for manufacturing ceramic products such as tiles and the like.

[0002] Pressing stations which comprise a press provided with a mould having one or more mould cavities for receiving, via a suitable sliding carriage (more commonly called "grille"), the powders (for example clay) to be pressed, are known.

[0003] The carriage usually has a frame-like form and travels on a fixing sliding plate which closes the bottom of the carriage until unloading into the mould is performed.

[0004] The sliding plate is a device of fundamental importance in loading benches for presses. In the prior art, the plate is composed of a substantially monolithic structure of relatively large thickness, often stratified with a top glued coating (which may consist of stainless steel, Teflon, etc.) in order to assist the flowing movement of any type of clay in pulverized or other forms.

[0005] The plate (which may have dimensions of up to 2x3 metres) has a large size and weight in order to ensure the necessary rigidity during use and cannot be moved by one person alone. However, it is subject to wear owing to the continuous sliding movement of the carriage transporting the powders and must be periodically replaced.

[0006] Each replacement requires the equivalent of a working day and the presence of several persons in order to change the plate using special raising and handling equipment. Moreover, acquisition or regeneration of the plate has a high cost.

[0007] The main object of the present invention is to provide a pressing plant which allows easier and less costly maintenance of the sliding surface of the loading carriage.

[0008] In the light of the above object the idea according to the invention is to provide a sliding plate for the carriage of a loading device in a pressing station for pressing powders for manufacturing ceramic products, characterized in that it comprises a base plate part, which is designed to withstand the flexural stresses which are produced during operation of the station, and thin covering sheets arranged on the top surface of the base part and connected to the base part by removable-connection means, thereby allowing the removal and replacement of the sheets by control of the connection means without removing the base plate part from the station.

[0009] Another idea according to the invention is to provide a pressing station for pressing powders for manufacturing ceramic products, comprising a press operating a mould for the powders and a device for loading the powders in the mould, the loading device comprising in turn a sliding plate slidably supporting a frame-like carriage which transports the powders from a loading zone to the mould, characterized in that the sliding plate comprises a base plate part, which is designed to withstand the flexural stresses which are produced during operation

of the station, and thin covering sheets arranged on the top surface of the base part and connected to the base part by removable-connection means, thereby allowing the removal and replacement of the sheets by control of the connection means without removing the base plate from the station.

[0010] A further idea is to provide a method for rapid replacement of the sliding surface of a sliding plate of a carriage for transporting the powders in a loading device of a pressing station for pressing powders for manufacturing ceramic products, comprising the steps of designing the plate with a heavy base plate part and thin top sheets arranged thereon and connected thereto by removable-connection means so as to be easily removable upon operation, the thin top sheets forming the sliding surface of the carriage and the heavy base plate providing these sheets with the necessary rigidity during the sliding movement of the carriage, and, where necessary, removing and replacing only the thin sheets by releasing the connection means and keeping the heavy base part in position within the station.

[0011] In order to illustrate more clearly the innovative principles of the present invention and its advantages compared to the prior art, an example of embodiment applying these principles will be described below, with the aid of the accompanying drawings. In the drawings:

- Figure 1 shows a partially cross-sectioned, schematic, side elevation view of a pressing station according to the invention;
- Figure 2 shows a schematic perspective view of a part of the station according to Figure 1, in a first embodiment;
- Figure 3 shows a schematic perspective view of a part of the station according to Figure 1, in a second embodiment;
- Figures 4 and 5 show an enlarged partial schematic views of a zone of the station part according to Figure 3 during different operating stages;

[0012] With reference to the figures, Figure 1 shows a pressing station denoted overall by 10 and designed according to the invention.

[0013] The station 10 comprises a press 11 which operates a mould for powders 12, which is loaded by means of a special loading device 13. The loading device 13 comprises a loading bench 14 provided with a sliding plate 15 slidably supporting a loading carriage 16 with a generally frame-like form. The frame-like carriage 16 transports the powders, from a loading zone (shown in Figure 1) alongside the press, into the mould.

[0014] The structure of the press, the mould and the loading carriage are substantially known per se and therefore will not be further shown or described here, being able to be easily imagined by the person skilled in the art.

[0015] A first possible embodiment of the carriage sliding plate 15, which generally closes the bottom of the

carriage as far as the mould, is shown in greater detail in Figure 2.

[0016] This plate is composed of a fixed base structure or plate 17, of relatively large thickness, on which removable covering sheets 18 are mounted, these sheets being retained on the base structure 17 in a removable manner by means of releasable retaining means 19. These removable sheets 18 are made using (or lined on top with) a material having a low friction and high abrasion resistance. Here "low friction" and "high abrasion resistance" are understood as meaning a sliding friction and abrasion resistance which are sufficient for the specific use. In particular, the low friction and high abrasion resistance may be in relation to those of the underlying base plate. The chosen material may consist, for example, of stainless steel, Teflon, etc. The sheets may consist advantageously of metal plates lined with such appropriate material.

[0017] The sheets have a suitable thickness sufficient for ensuring a certain rigidity when disassembled, but it is not necessary for them to withstand flexing owing to the forces acting on them during operation of the station. An advantageous thickness may be between 1 mm and 5 mm. The necessary flexural strength during operation of the station is instead provided by the base structure 17 which is made with a suitable thickness and of a suitable material. The base structure 17 may be, for example, a steel plate with a thickness of at least 10 mm and, advantageously, ranging between 10 mm and 50 mm. The base plate is therefore much heavier and more difficult to manage than the covering sheets.

[0018] The sheets are advantageously formed as rectangular strips which are arranged alongside each other so as to cover the surface of the base plate. In this way, they can be handled more easily when removed from the base plate.

[0019] The releasable retaining means 19 may be realized using various systems. Advantageously, these means may keep the sheets 18 fixed to the structure by means of a vacuum, magnetic force, mechanical locking means, and other systems.

[0020] Preferably, these means 19 may comprise suction holes or nozzles 20 arranged on the surface intended to receive the sheets. These nozzles are connected to a vacuum source 22 via ducts 21 in the base plate. In this way, by deactivating the vacuum source, the sheets may be easily removed, while during use of the plant, the vacuum keeps the sheets firmly in place. Alternatively, if the sheets are at least partially made of ferromagnetic material, it may be advantageous to use a magnetic (preferably electromagnetic) system inserted in the base 17 so as to act on the top surface and retain the sheets when operated.

[0021] According to an advantageous alternative embodiment of the plate 15, shown in Figure 3, the releasable retaining means are formed by means of a magnetic retention system, with an advantageous pressure-release system. For greater clarity, in the drawings of this

alternative embodiment, some parts similar to those of the previous embodiment are indicated by the same number, multiplied by 100.

[0022] In particular, as can be seen more clearly in Figures 4 and 5, each sheet 118 comprises at the bottom magnetic elements in the form of a magnetic underlayer 123, advantageously extending over the entire width of the sheet. This underlayer may be glued onto the sheet 118. Since the base 117 is made of ferromagnetic material, the sheet 118 adheres perfectly thereto.

[0023] In order to allow separation of the sheets 118 from the base 117 when required, the top surface of the base 117 is provided with blowing holes or nozzles 120 arranged on the surface intended to receive the sheets. These nozzles are connected to a pressurised-air source 122 via unions and ducts 121 in the base plate. In this way, by sending pressurised air from the source 112, the sheets 118 are raised from the base surface against the magnetic force. This results in the formation of an air cushion which allows the operator to slide the sheets so that they may be completely removed.

[0024] Advantageously, as can be clearly seen in Figures 4 and 5, each blowing nozzle 120 comprises a valve 124 provided with a closing member 124 (advantageously a ball) which, when pushed upwards, closes the respective nozzle 120. As can be seen in Figure 4, the sheets 118 in the operating position on the base 117 push the closing member downwards, ensuring opening of the valve. In this way, when pressurised air is sent, the air cushion is formed and raises the sheets.

[0025] As can be seen in Figure 5, also when the sheet 118 is raised from the air cushion, raising is such as not to cause closing of the valves. In this way the air cushion is maintained underneath the sliding sheets. The ball-shaped form of the closing member assists sliding of the sheets.

[0026] As can be seen in the left-hand part of Figure 5, when there is no sheet above the valve, then the closing member 124 may be raised sufficiently to assume the closed position, projecting further from the top surface of the base 117, and the valve closes. In this way, when a sheet 117 is not present, there is no unnecessary out-flow of air.

[0027] Although the closing thrust may be provided by a spring arranged underneath the closing member, it has been found to be advantageous to make use of the pressure itself of the blowing air. In this way, when pressurised air is supplied inside the ducts 121, the valves close where there is no sheet present, while the other valves remain open. When the pressurised air supply is deactivated, all the valves assume the open condition since the closing members fall onto the bottom of the respective seats.

[0028] At this point it is clear how the predefined objects have been achieved. The provision of a sliding plate which is no longer formed as a single body, or in any case as stably fastened layers, but is instead formed by a base plate, suitable for providing the sliding surface of

the loading carriage with the necessary structural rigidity, and by thin sheets, which can be easily removed and are suitable for providing the sliding surface with only the necessary sliding capacity and wear resistance, results in a lower cost of material for replacement of the device (since only the sheets, advantageously consisting of lined sheet metal, and no longer the entire plate as before, must be replaced), a smaller number of staff needed for replacement of the lining layer (only one person is required, and no longer 2 or 3 people and special means for raising the considerable weight of the entire plate) and less time for replacement of the lined sheets (about half an hour and no longer a working day). According to the method of the invention, the replacement of the wearing parts of a sliding plate in a pressing station therefore becomes a rapid and low-cost operation.

[0029] Obviously, the above description of an embodiment applying the innovative principles of the present invention is provided by way of example of these innovative principles and must therefore not be regarded as limiting the scope of the rights claimed herein. For example, the mould may have one or more mould cavities and be provided with any known means for pressing (for example, an isostatic mould) and discharging of the pressed product. Moreover, the loading system may comprise different structures for the carriage and for loading the powders in the carriage, designed in accordance with that known to the person skilled in the art. Known guiding means for precise relative positioning may also be provided between base plate and covering sheets.

[0030] Although constructionally more complex, the magnetic elements could be provided on the base plate instead of on the sheets. The magnetic elements may also be formed by a plurality of magnets instead of a magnetic underlayer, although this latter solution is preferred since it constitutes a reliable system for uniform fixing of the sheets. The pressurised-air source may also be connected to the base plate only for the time required for removal of the sheets. The air connectors which are present on the plate may be one in number for each series of holes associated with a sheet, so as to be able to supply with air only the relevant area occupied by a sheet which is to be removed, as is also clear from Figure 3.

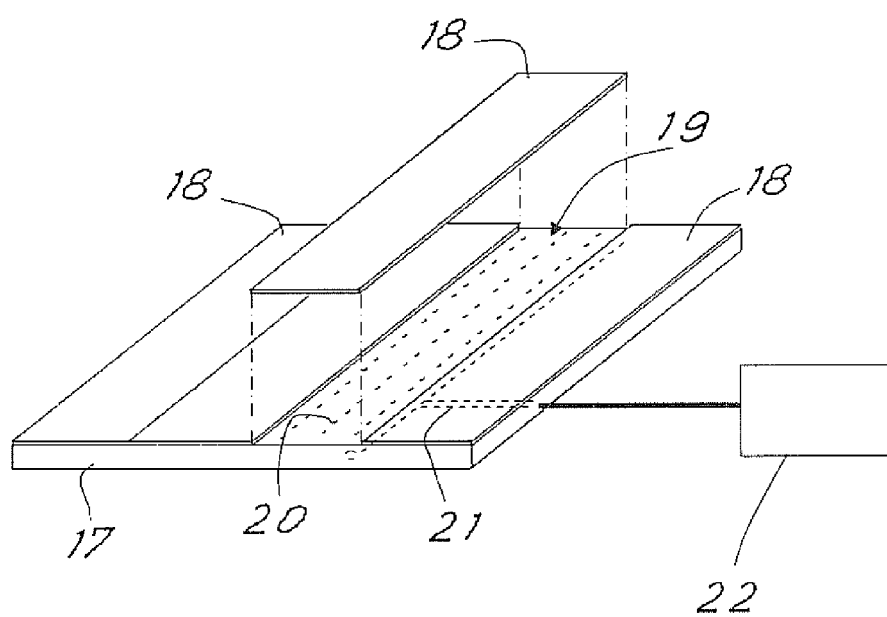
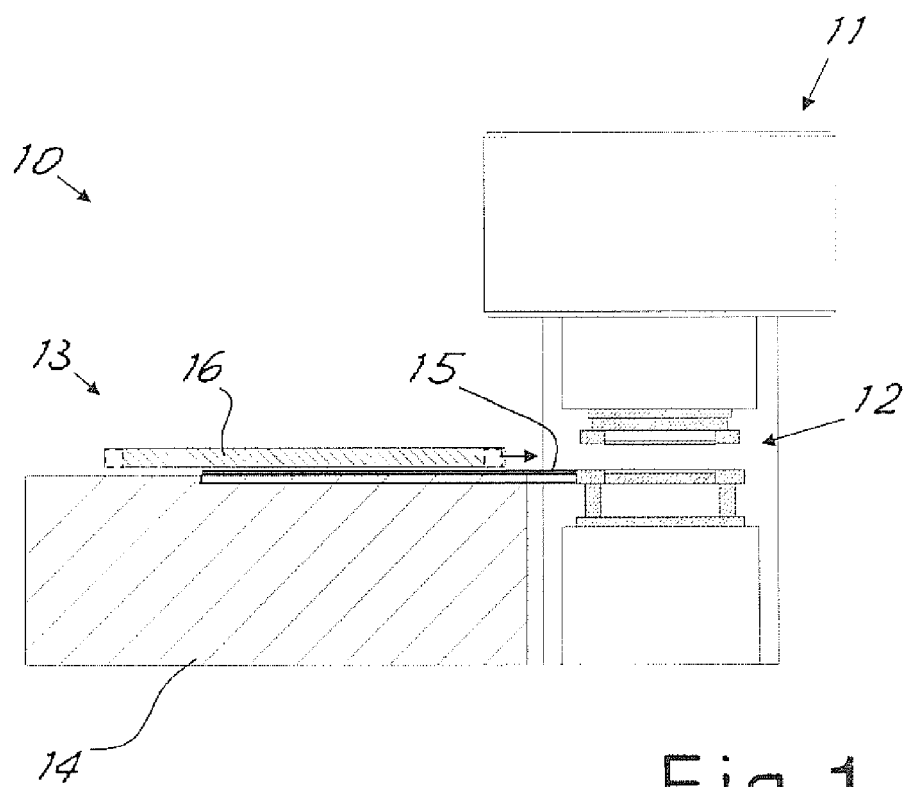
Claims

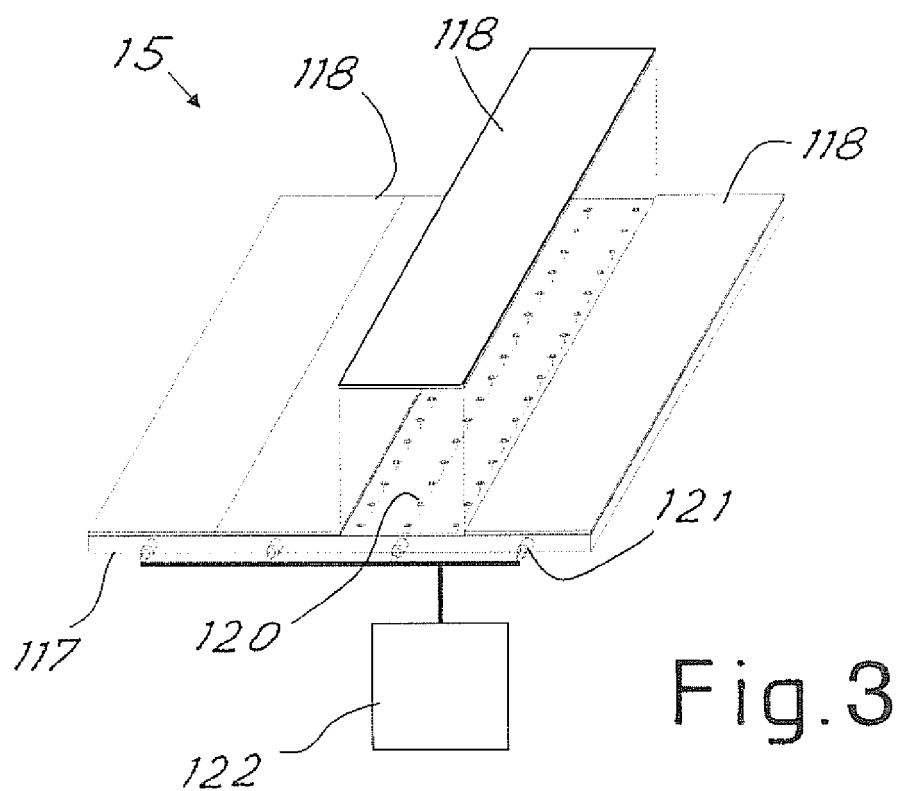
1. Sliding plate (15) for the carriage of a loading device in a pressing station (10) for pressing powders for manufacturing ceramic products, **characterized in that** it comprises a base plate part (17, 117), which is designed to withstand the flexural stresses which are produced during operation of the station, and thin covering sheets (18, 118) arranged on the top surface of the base part and connected to the base part (17, 117) by removable-connection means (19, 123), thereby allowing the removal and replacement of the sheets (18, 118) by control of the connection

means without removing the base plate part from the station.

2. Plate according to Claim 1, **characterized in that** the sheets are made of material, or lined with material, having a low friction and high abrasion resistance.
3. Plate according to Claim 1, **characterized in that** the sheets consist of a plurality of parallel rectangular strips.
4. Plate according to Claim 1, **characterized in that** the sheets consist of metal plates which are at least lined on top.
5. Plate according to Claim 1, **characterized in that** the removable-connection means (19) comprise vacuum means comprising suction holes (20) on the surface of the base plate part (17) and connected to a vacuum source (22) via ducts in the base plate.
6. Plate according to Claim 1, **characterized in that** the removable connection means (19) comprise electromagnet means.
7. Plate according to Claim 1, **characterized in that** the removable connection means comprise magnetic elements (123) for attracting together sheets and base plate and blowing nozzles (120) formed in the top surface of the base plate and connected to a controlled pressurised-air source for controlled raising of the sheets from the plate against the action of the magnetic elements, thereby allowing the removal and replacement of the sheets (118).
8. Plate according to Claim 7, **characterized in that** the magnetic elements comprise a magnetic underlayer arranged on the bottom side of the sheets.
9. Plate according to Claim 7, **characterized in that** the blowing nozzles (120) comprise valves (124) with a closing member (125) which is pushed into the open position by the presence of a sheet above them.
10. Plate according to Claim 9, **characterized in that** the closing member is pushed into the closing position by the pressure of the air supplied to the corresponding blowing nozzle.
11. Plate according to Claim 9, **characterized in that** the closing member (125) is formed by a ball which projects from the surface of the base plate when the valve is in the closed position.
12. Plate according to Claim 1, **characterized in that** the removable-connection means can be selectively controlled for each sheet.

13. Pressing station (10) for pressing powders for manufacturing ceramic products, comprising a press (11) for operating a mould (12) for the powders and a device (13) for loading the powders in the mould, the loading device (13) comprising in turn a sliding plate (15) slidably supporting a frame-like carriage (16) which transports the powders from a loading zone to the mould, **characterized in that** the sliding plate (15) is formed according to any one of Claims 1 to 12.
14. Method for rapid replacement of the sliding surface of a sliding plate of a carriage for transporting the powders in a loading device of a pressing station for pressing powders for manufacturing ceramic products, comprising the steps of designing the plate with a heavy base plate part and thin top sheets arranged thereon and connected thereto by removable-connection means so as to be easily removed upon operation, the thin top sheets forming the sliding surface of the carriage and the heavy base plate providing these sheets with the necessary rigidity during the sliding movement of the carriage, and, where necessary, removing and replacing only the thin sheets by releasing the connection means and keeping the heavy base part in position within the station.
15. Method according to Claim 14, wherein the thin top sheets are connected to the base plate by means of magnetic elements and, where necessary, air is blown between the base plate and the sheet so as to raise the thin sheets to allow removal thereof.





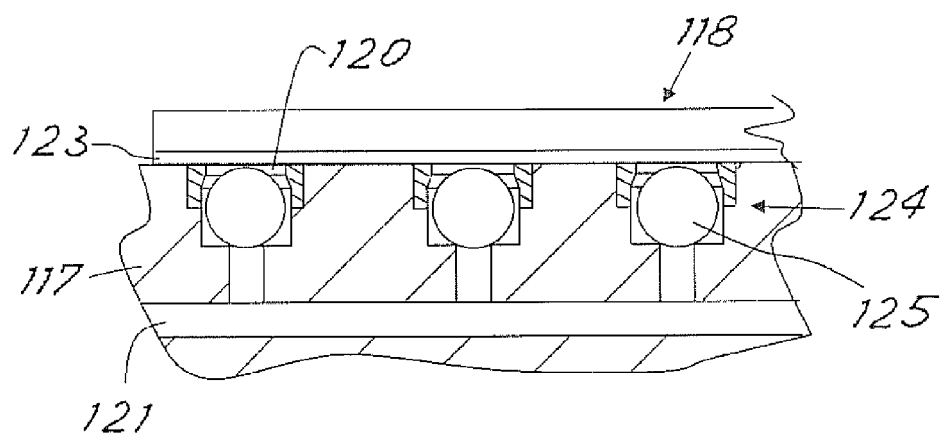


Fig.4

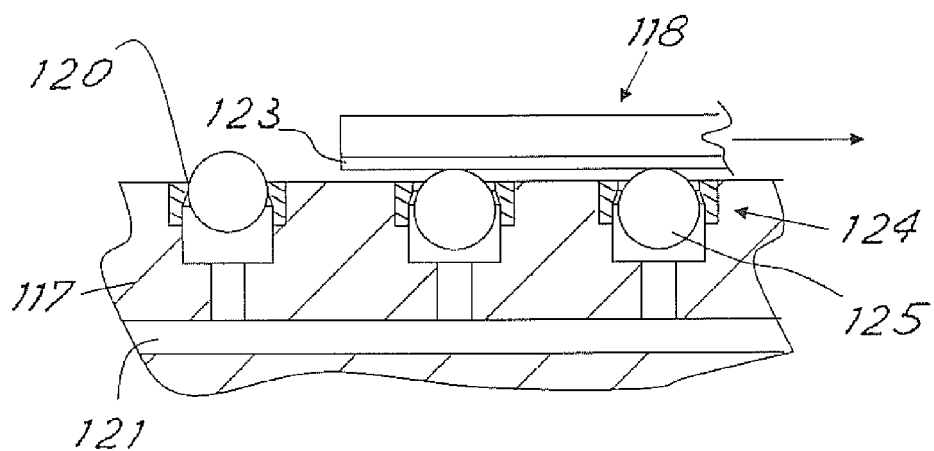


Fig.5



EUROPEAN SEARCH REPORT

Application Number
EP 11 16 8900

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 19 September 2011	Examiner Petrucchi, Luigi
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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19-09-2011

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