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(54) **High productivity installation for floor tile moulding**

(57) The present invention relates to an installation for floor tile moulding, which comprises at least one loading station (A) of the mould (S) with cement mixture, at least one press-moulding and release station (B) of the tiles (M), at least one trolley (2) to support and move the mould (S) to and from the station (B), at least one un-

loading station (C) connected with the station (B), which comprises a tray (5) that slides according to alternate horizontal travels, moving from two end-of-travel positions, the first one being a forward position inside the station (B) and the second one being a backward position outside the station (B).

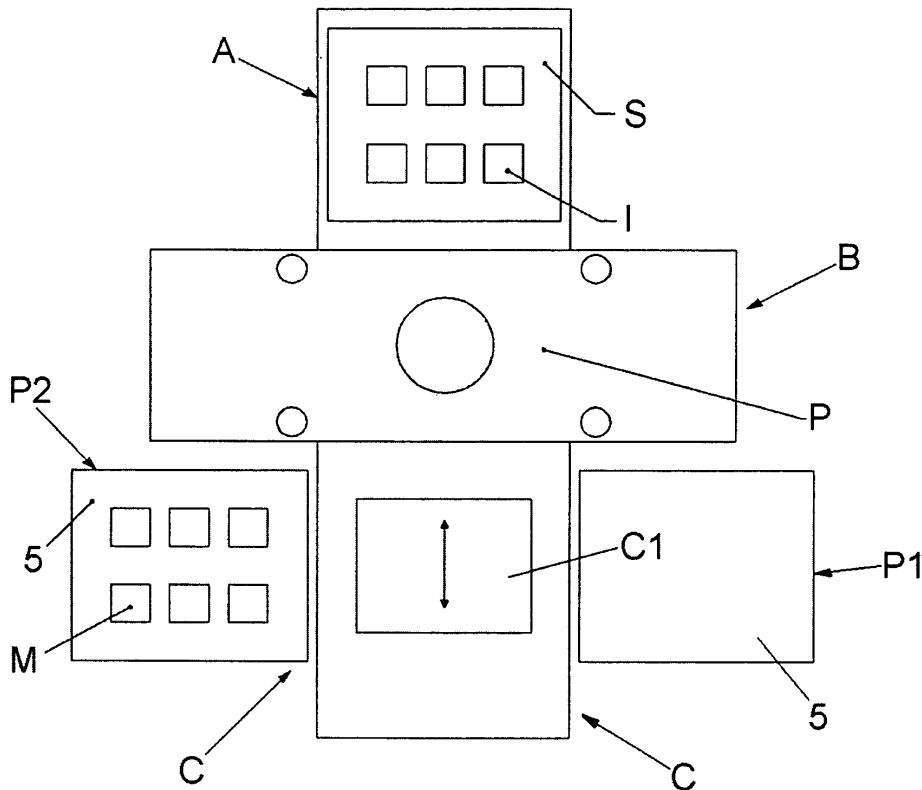


FIG. 1

Description

[0001] The present patent application relates to a high productivity installation for floor tile moulding.

[0002] The characteristics and advantages of the new installation will become evident after a short illustration of the prior technique.

[0003] Two different types of installations for floor tile press-moulding are currently known, starting from a suitable cement mixture in fluid state that is poured into suitable moulds.

[0004] In both cases, special moulds with composite structure are used, which are designed to cooperate with corresponding operating units to press the cement mixture and extract the moulded tiles.

[0005] A mould of this type is made of two parts, the first one being composed of a simple horizontal surface plate for a frame provided with a series of through openings and designed to make alternate vertical travels.

[0006] When the frame is engaged against the surface plate, impressions open on top to receive the cement mixture are formed.

[0007] Each impression is bordered on the bottom by the section of the surface plate that covers the corresponding opening obtained on the frame; it being evident that the same cavity is laterally bordered by the edges of the opening along its entire perimeter.

[0008] After filling the impressions with the cement mixture, a pressing buffer with vertical axis provided with lower heads designed to perfectly engage in the cavities is actuated to energetically compact the mixture contained in them.

[0009] Once the pressing operation is completed, the buffer returns in the upper end-of-travel position.

[0010] Immediately afterwards, the frame starts an ascending travel, separating from the surface plate and touching the buffer.

[0011] In this way, the buffer heads are engaged again into the openings of the frame, energetically interfering with the moulded tiles that are still contained in the openings.

[0012] Evidently, the interference between the buffer heads and the tiles contained in the openings of the vertically sliding frame allows for extracting the tiles.

[0013] In particular, the tiles fall back on the surface plate, and then the entire mould (surface plate + frames with openings) comes out of the press-moulding station and moves towards the station with operator for tile extraction.

[0014] According to the most typical configuration of this type of installations, the various moulds used for tile moulding are loaded with cement mixture in a first operating station, and are then transferred to a second operating station, where the cement mixture is pressed and consolidated, and the finished tiles are released from the corresponding moulds.

[0015] Once the tiles are moulded, the mould returns to the station where the cement mixture was initially load-

ed, in such a way that the tiles are extracted by the operator.

[0016] In spite of their popularity, this type of installations is impaired by a low productivity level, which is especially due to the long "dead time" caused by the complicated sequence of operations as described above.

[0017] In fact, in order to start a new operating cycle in the loading station where the cement mixture is loaded, the operator must completely unload the tiles that were moulded during the previous operating cycle, since the unloading operation is carried out in the same station that is also used to load the moulds.

[0018] In order to overcome the aforementioned drawback a second type of moulding installations for floor tiles has been devised, being characterised by automation and by the fact that they are provided with a "carousel" structure, in which each production phase is carried out in a specific "dedicated" station.

[0019] These installations are characterised by high productivity since the different operations (loading, press-moulding, release, unloading) that are necessary to produce the tiles are simultaneously carried out in a sequence.

[0020] It can be said that these installations are able to eliminate the "dead time" that used to impair the pre-existing installations.

[0021] However, this second type of installations is impaired by a drawback of different type.

[0022] In fact, they require a large number of moulds, since each station needs to be provided with its own mould, which must be changed when different tiles are produced.

[0023] In view of the above, it is easily understood that a similar "carousel" installation is characterised by high running costs (in view of the large number of moulds) and long management and maintenance time (in view of mould replacement and cleaning).

[0024] The specific purpose of the present invention is to devise an installation able to overcome the typical inconveniences of the prior technique as described above.

[0025] The installation of the present invention is characterised by high-productivity obtained by eliminating the "dead time" during the production cycle, and by a very lean structure that uses a very limited number of moulds.

[0026] The second characteristic guarantees low running costs and long maintenance and cleaning intervals.

[0027] A similar result has been obtained by providing that, in the installation of the invention, after leaving the press-moulding and release station, the moulded tiles are no longer conveyed towards the loading station of the moulds in the same mould where they were moulded.

[0028] On the contrary, as soon as they are released from the mould, the tiles are intercepted inside the press-moulding and release station by a special sliding tray that takes them towards an operating station that is exclusively dedicated to unloading the finished products, which are then taken to the storage and packaging phas-

es.

[0029] It must be noted that while the tray reaches the unloading station, the empty mould returns to the loading station in order to start a new cycle and fill the mould impressions again.

[0030] In view of the above, two operations can be carried out simultaneously without "dead time", that is to say: unloading of finished products in the unloading station and new filling of the mould in the traditional loading station in order to start a new production cycle immediately.

[0031] For purposes of clarity, the description of the invention continues with reference to the enclosed drawings, which are intended for purposes of illustration only and not in a limiting sense, wherein:

- Figure 1 is a diagrammatic view of the installation of the invention;
- Figures 2 to 7 are diagrammatic views of the different cycles of the installation of the invention;
- Figure 8 is the same as Figure 1, except for it refers to an alternative embodiment of the said installation;
- Figure 9 is the same as Figure 1, except for it refers to an additional alternative embodiment of the said installation;
- Figure 10 is the same as Figure 1, except for it refers to a last alternative embodiment of the said installation.

[0032] With reference to figure 1, the installation according to the present invention comprises:

- one loading station (A) where the impressions (I) of a traditional mould (S) are loaded, either manually or automatically, with cement mixture.
- one station (B) where the mould (S) is taken after loading and in which a hydraulic press (P) operates to move a pressing buffer (1) designed to make vertical alternate travels to press the cement mixture contained in the impressions of the mould (S) and release the moulded tiles (M);
- a third station (C) where the tiles that were previously released from the mould (S) are taken by a sliding tray in order for the operator to extract them.

[0033] To illustrate the operating modes of a similar installation, reference is made to figures 2 to 7, which show the different positions of the operating parts in the press-moulding and release station (B).

[0034] First of all, it must be noted that the operating station (B) is provided with a pressing buffer (1) driven in vertical alternate travels by the press (P), provided with lower protruding heads (1 a) that are technically defined as "pressing buffers".

[0035] The said operating station (B) is also provided with a horizontal trolley (2) that supports the mould (S) and is recessedly equipped with elevator means (2a), such as a series of pneumatic or hydraulic jacks with vertical axis.

[0036] The mould (S) is composed of a plate (3) and a frame (4) with a series of through openings (4a) with suitable shape and section to exactly receive the pressing heads (1 a) of the buffer (1).

5 **[0037]** The openings (4a) and the plate (3) form a series of cavities closed on the bottom, which coincide with the impressions (I) (shown in fig. 1) of the mould (S) .

[0038] Figure 2 illustrates the first operating phase of the station (B), in which the mould (S) maintains its closed position - that is to say with the parts (3, 4) mutually engaged - and rests above the trolley (2).

10 **[0039]** In this figure, which refers to the pressing operation, the pressing buffer (1) is shown at the end of the descending travel, in such a way that the heads (1 a) are energetically engaged into the impressions (I) of the mould (S), thus guaranteeing the pressing of the cement mixture contained in them.

[0040] With reference to figure 3, in the next operating phase of the station (B), the pressing buffer (1) is raised at the end of the ascending travel, while the mould (S) rests on the trolley (2).

20 **[0041]** Figure 4, which refers to the release phase, illustrates that the frame (4) of the mould (S) is taken upwards towards the pressing buffer (1) by the elevator means (2a), separately from the surface plate (3) that rests on the trolley (2).

25 **[0042]** The tiles (M), which have set inside the mould (S), remain engaged inside the openings (4a) of the frame, in such a way that they are raised together with the frame (4).

30 **[0043]** With reference to figure 5, it must be noted that before the ascending travel of the frame (4) against the pressing buffer (1) is completed, a horizontally sliding tray (5) is inserted transversally in the same station (B), and exactly arranged under the frame (4).

35 **[0044]** With reference to figure 6, when the ascending travel of the frame (4) reaches the upper end-of-travel position, an energetically interference is created between the heads (1 a) of the pressing buffer (1) and the tiles (M) contained inside the openings (4a) of the frame (4).

40 **[0045]** The interference guarantees that the tiles (M) are extracted from the frame (4) from up downwards and rest above the tray (5).

[0046] As shown in figure 7, the tray (5) takes the tiles (M) out of the press-moulding and release station (B) towards the unloading station (C).

[0047] Although the additional operating phases are not illustrated in the enclosed drawings, it must be noted that the empty frame (4) is taken downwards and engaged again against the surface plate (3); then, having closed the mould, the two parts (3, 4) are moved by the trolley (2) that slides on the tracks (7) to the loading station (A) in order to receive a new dosage of cement mixture.

55 **[0048]** Fig. 1 is a diagrammatic view of the unloading station (C) provided with:

- a trolley (C1) designed to move the trays (5), when necessary, to and from the press-moulding and re-

- lease station (B);
- a first lateral stack (P1) of empty unloading trays (5) situated on the side of the trolley (C1) and designed to be positioned in sequence on the said trolley (C1);
- a second lateral stack (P2) of unloading trays (5) loaded with tiles (M), in opposition to the first stack (P1) with respect to the trolley (C1), from which the tray (5) extracted from the station (B) is taken from time to time.

[0049] As mentioned above, figure 8 illustrates an alternative embodiment of the installation of the invention, which differs from the previous embodiment in that it is provided with two loading stations (A and A1), in which two different moulds (S and S1) operate, being designed to be alternatively inserted in the press-moulding and release station (B).

[0050] A similar embodiment of the installation of the invention is characterised by higher productivity because, while the mould (S) is filled with cement mixture in the first loading station (A), the second mould (S1) is subjected to press-moulding and release in the station (B), without slowing down the crucial phase of the production process, that is to say the one performed in the press-moulding and release station (B) of the tiles (M).

[0051] Figure 8 illustrates the tracks (7) on which the mould-holding trolleys (2) slide.

[0052] Figure 9 illustrates an alternative embodiment of the installation of the invention, which is **characterised in that** it comprises two press-moulding and release stations (B and B1) in which corresponding moulds (S and S1) travel and stop, connected with corresponding unloading trays (5) that feed corresponding loading stations (C and C2).

[0053] A loading station (A) is situated in intermediate position between the two press-moulding and release stations (B and B1), where a fixed automatic dosing device (8) operates, under which the moulds (S and S1) are stopped alternatively. The advantage of this solution consists in the fact that the dosing device is positioned at a height slightly higher than the moulds; consequently and differently from other solutions that involve the use of conveyors to accompany the material from higher heights, no additional applications (such as the aforementioned conveyors or, alternatively, the use of as many fixed dosing devices as the moulds) must be provided in this case.

[0054] The loading operation of the moulds is unquestionably simplified compared to the previous solutions.

[0055] Evidently, in the installation illustrated in fig. 9, the first mould (S) is loaded when the second mould (S1) is in the corresponding press-moulding and release station (B1), while the second mould (S1) is loaded when the first mould (S) is in the corresponding press-moulding and release station (B), with a reduction of dead time and a very high productivity level.

[0056] Fig. 10 illustrates a last alternative embodiment

of the installation of the invention, which differs from fig. 9 only in the different position of the unloading trays (5) with respect to the corresponding press-moulding and release stations (B and B1).

[0057] In the installation of fig. 10 the trays (5) are situated on the same side as the press-moulding and release stations (B and B1), while in the installation of fig. 9 the trays (5) are situated on opposite sides.

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Claims

1. High-productivity installation for floor tile moulding, of the type comprising:

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- at least one loading station (A) where the impressions (I) of a traditional mould (S) are loaded with cement mixture;

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- at least one press-moulding and release station (B), in which a press (P) is actuated to move a pressing buffer (1) along vertical alternate travels, which is designed both to press the cement mixture contained in the impressions (I) of the mould (S) and release the tiles (M);

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- at least one trolley (2) designed to support and move corresponding mould (S) to and from the station (B) along alternative rectilinear travels; installation **characterised in that** it comprises at least one unloading station (C) connected with the station (B), in which a tray (5) that slides according to horizontal alternate travels moves between two end-of-travel positions, the first one in forward position under the pressing buffer (1), and the second one in backward position outside the station (B) .

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2. Installation as claimed in the above claim, **characterised in that** it comprises a single press-moulding and release station (B) and two identical loading stations (A, A1), in which two different moulds (S, S1) operate, being alternatively transferred to the press-moulding and release station (B).

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3. Installation as claimed in claim 1, **characterised in that** it comprises:

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- two press-moulding and release stations (B and B1), in which corresponding moulds (S and S1) are transported and stopped, being connected with corresponding unloading trays (5) that feed corresponding unloading stations (C and C2).

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- a single loading station (A) in intermediate position between the two press-moulding and release stations (B and B1).

4. Installation as claimed in any of the above claims, **characterised in that** each station (B , B1) compris-

es the said pressing buffer (1) with lower protruding heads (1 a), and a trolley (2) that supports a corresponding mould with elevator means (2a).

5. Installation as claimed in any of the above claims, **characterised in that** each unloading station (C, C2) comprises a trolley (C1) designed to transport the trays (5) to and from the press-moulding and release station (B, B1) before the trolley (C1).

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6. Installation as claimed in one of the above claims, **characterised in that** each unloading station (C, C2) comprises:

- a first lateral stack (P1) of empty trays (5) situated on the side of the trolley (C1) and designed to be positioned in sequence on board the said trolley (C1);

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- a second lateral stack (P2) of trays (5) loaded with tiles (M), in opposition to the first stack (P1) with respect to the trolley (C1), from which the tray (5) extracted from the station (B) is taken from time to time.

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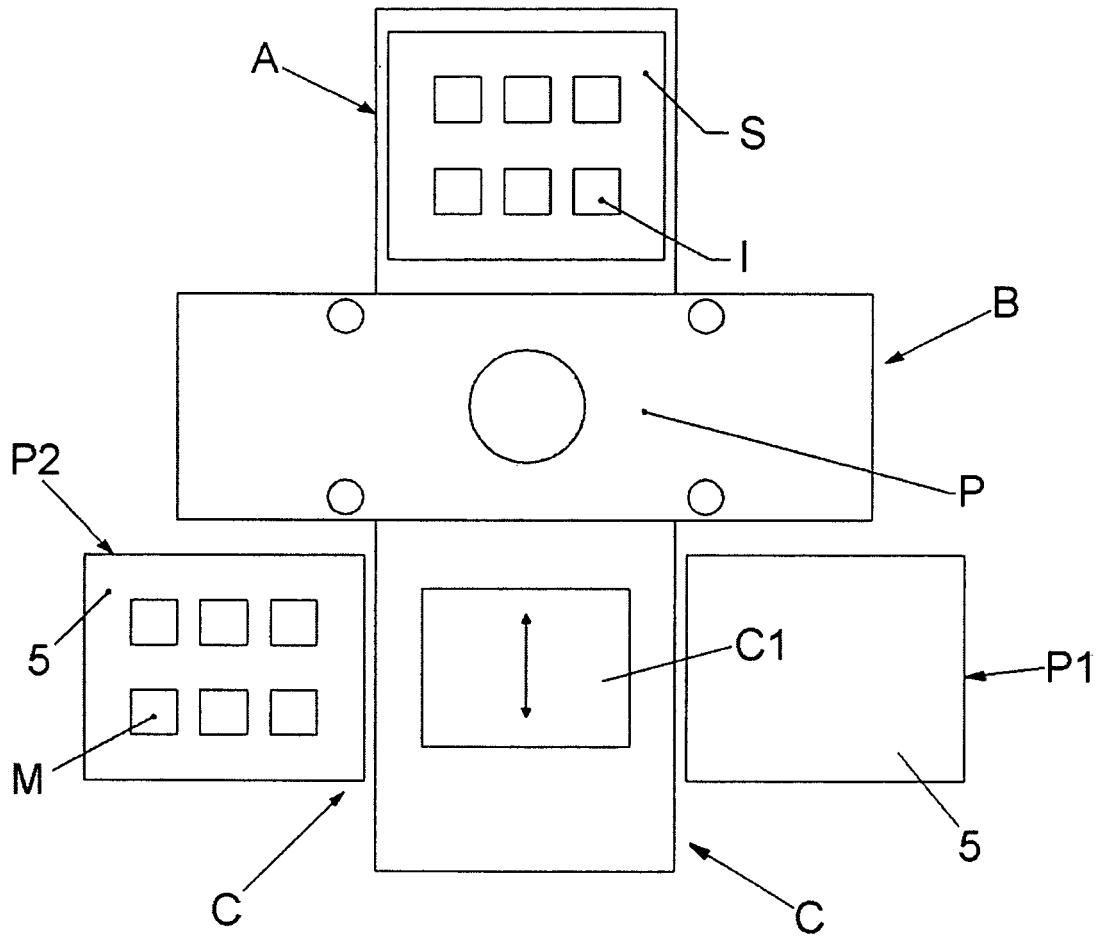


FIG. 1

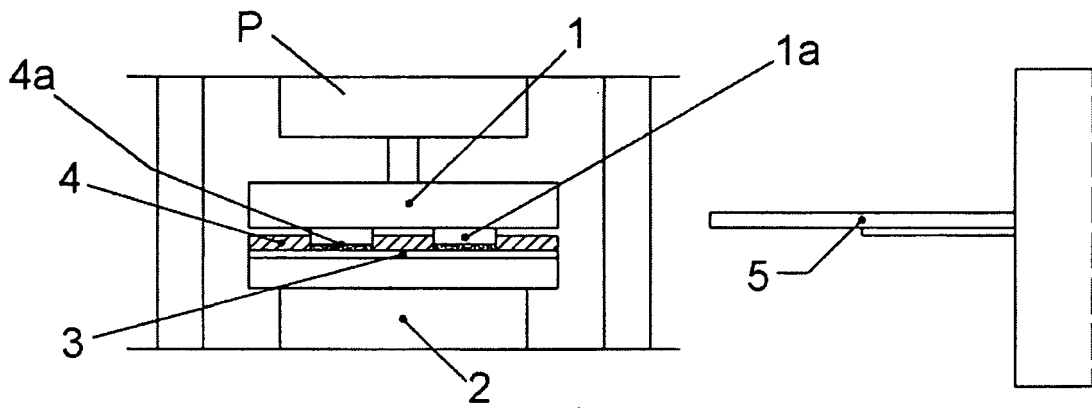


FIG. 2

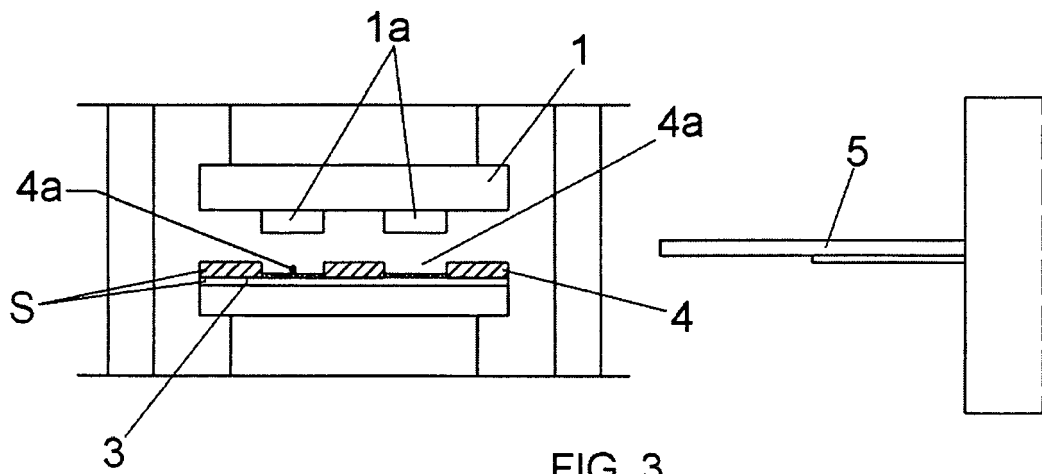


FIG. 3

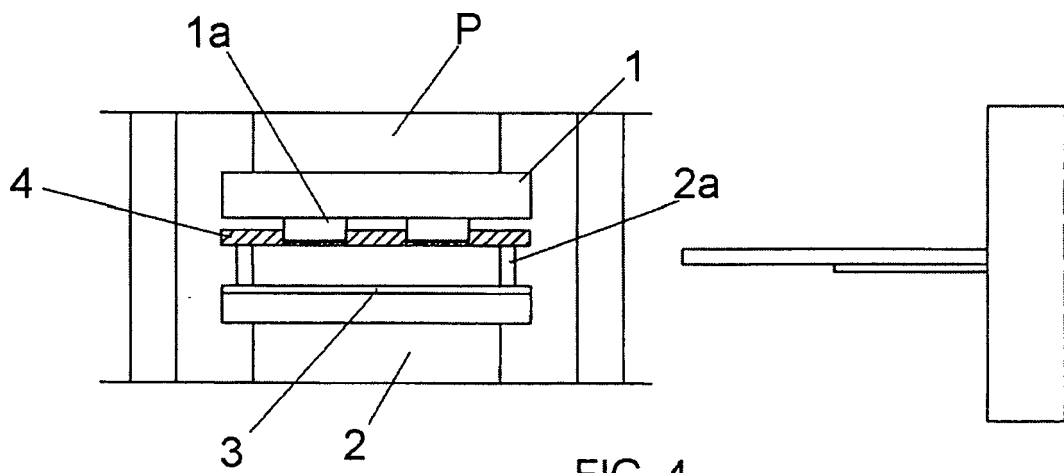


FIG. 4

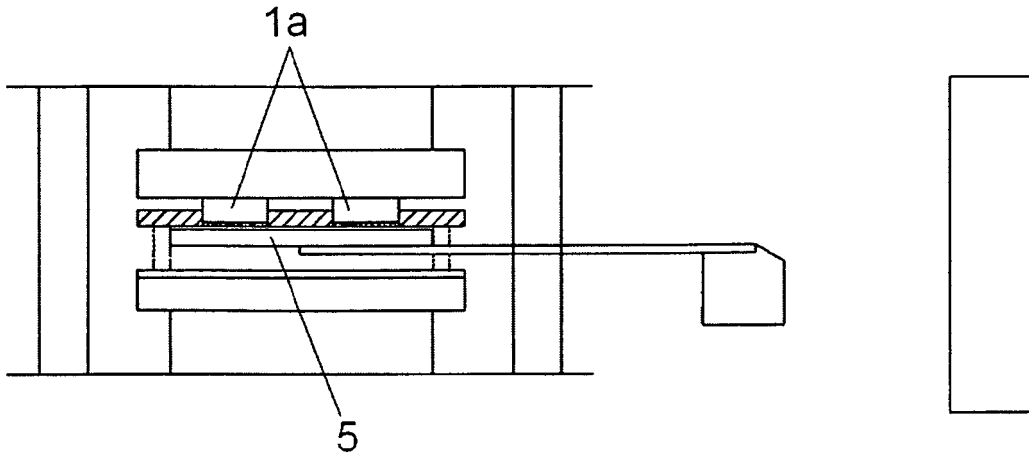


FIG. 5

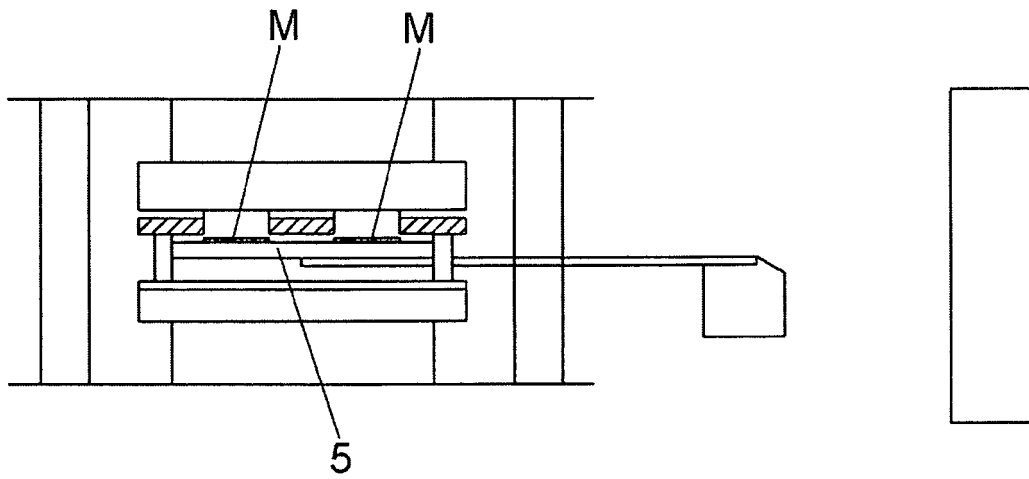


FIG. 6

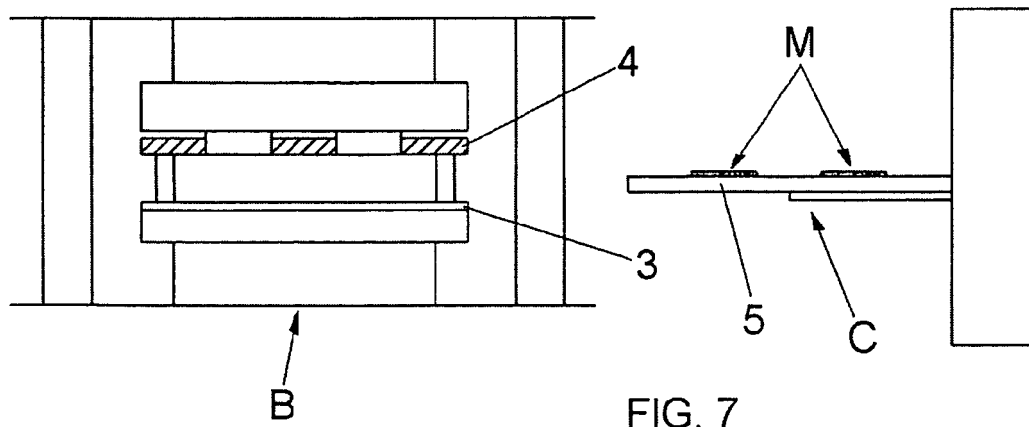
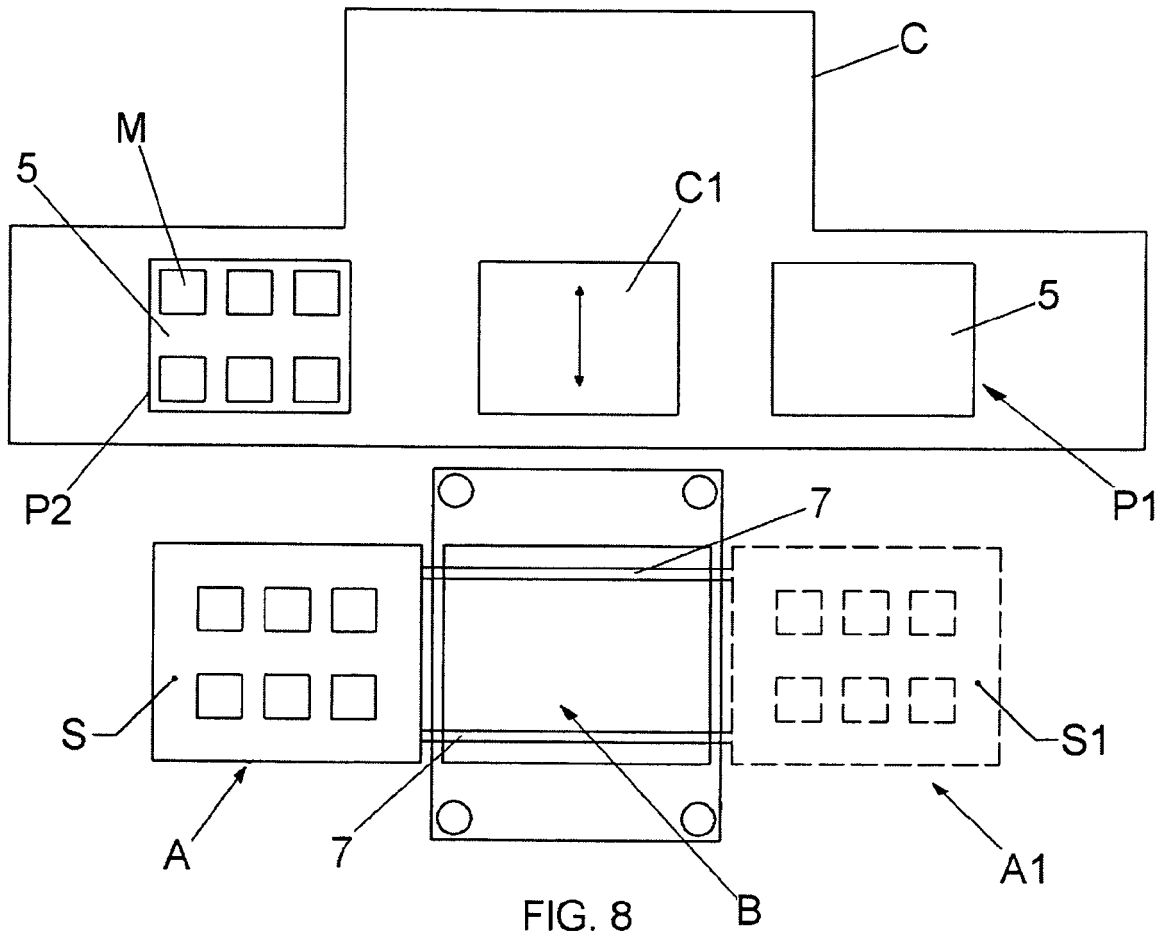


FIG. 7



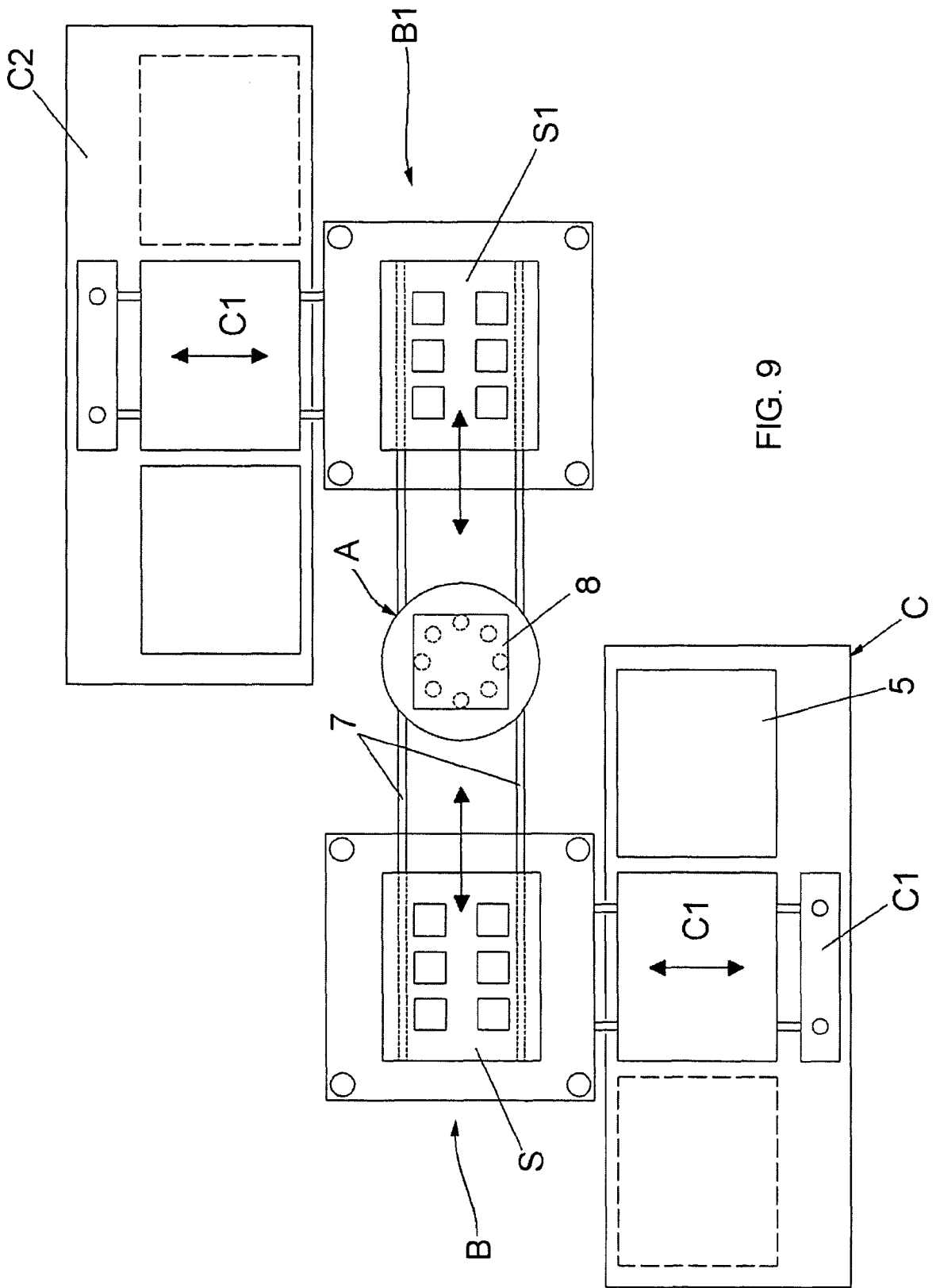


FIG. 9

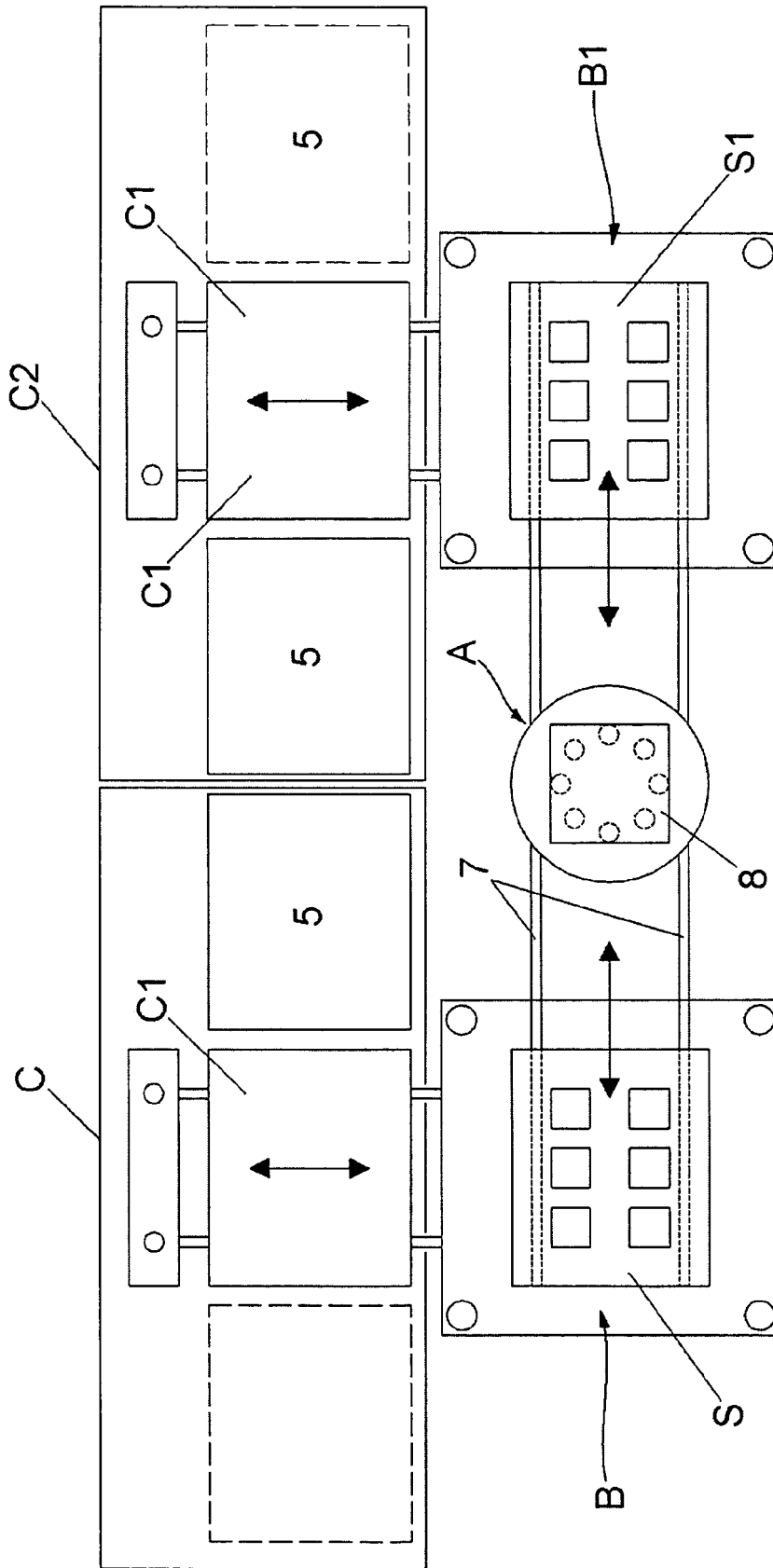


FIG. 10



EUROPEAN SEARCH REPORT

Application Number
EP 08 42 5706

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Place of search		Date of completion of the search	Examiner
The Hague		20 July 2009	Labre, Arnaud
CATEGORY OF CITED DOCUMENTS		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
ON EUROPEAN PATENT APPLICATION NO.

EP 08 42 5706

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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