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(54) **PRESS PROVIDED WITH A DEAERATION SYSTEM**

(57) A press for granular or powdered material, comprising: an upper pad (11) and a lower pad (12), movable towards and away from each other between a loading position, in which the two pads are located at a greater distance, and a pressing position, in which the two pads are located at a shorter distance; a conveyor belt (13), movable along a path that has at least one active stretch (14) parallel to a longitudinal direction (X) and arranged

between the two pads (11,12); two lateral walls (21,22) arranged parallel to the longitudinal direction (X) so as to laterally delimit a pressing compartment (V) together with the two pads (11,12).

At least one lateral wall (21) has a plurality of through openings (210) that place the pressing compartment (V) in communication with the external environment.

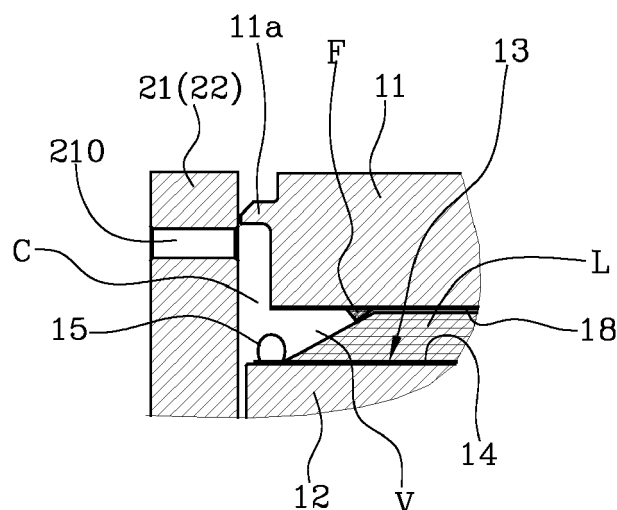


Fig.1

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Description

[0001] The present invention relates to a press for granular or powdered materials. In particular, the present invention relates to a press for realising ceramic tiles or slabs.

[0002] For some time a press has been available on the market, designed by the Applicant, which is particularly effective for pressing large ceramic slabs, up to formats of 1800x3600 mm.

[0003] The press comprises an upper pad and a lower pad, movable towards each other for pressing a layer of ceramic material, in granular or powdered form. The ceramic material is fed into the pressing space, comprised between two pads, by means of a conveyor belt that performs a path provided with at least one active stretch arranged between the two pads. The press further comprises two lateral walls, arranged parallel to the advancement direction of the conveyor belt, which laterally close the pressing space.

[0004] The ceramic material is deposited in a layer on the conveyor belt, and is taken by the latter into the pressing space comprised between the two pads. Once the layer of ceramic material has reached an established position with respect to the two pads, the conveyor belt stops and the pads move towards each other for pressing the layer.

[0005] The pressing of the layer is substantially a gradual compression of the ceramic material, which reduces the space comprised between the granules or particles and crushes the granules themselves, in the event in which the latter are in the form of hollow particles, obtained by atomisation. It is absolutely important that the air, largely diffused in the ceramic material, finds the possibility to flow outside the material itself, so as to prevent it collecting and forming empty spaces inside the pressed slab. In fact, such empty spaces can expand once the pressure exerted by the pads has stopped, and lead to the breaking of the pressed slab. In the event in which they remain trapped in the pressed slab, without causing the breakage thereof, they can expand during the firing step, and however lead to the breaking of the slab.

[0006] Currently, to enable the evacuation of the air from the pressed material, the pressing cycle, and in particular the compression step of the layer and the release step of the pads, are performed relatively slowly, in a gradual way. Obviously, this leads to an increase in production times.

[0007] The object of the present invention is to provide a press which enables the characteristics of the currently available presses to be improved.

[0008] The main advantage of the press according to the present invention is that it enables the effective evacuation of air during the pressing of the material, much more quickly than currently required.

[0009] Additional features and advantages of the present invention will become more apparent from the following detailed description of one embodiment of the

invention, illustrated by way of non-limiting example in the appended figures in which:

- figure 1 shows a schematic and partial view of a first embodiment of the press according to the present invention, in a section taken on a plane perpendicular to a horizontal longitudinal direction (X);
- figure 2 shows a schematic and partial view of a second embodiment of the press according to the present invention, in a section taken on a plane perpendicular to a horizontal longitudinal direction (X);
- figure 3 shows a schematic and partial view of a third embodiment of the press according to the present invention, in a section taken on a plane perpendicular to a horizontal longitudinal direction (X);
- figures 4, 5 and 6 show views from above of the embodiments of figures 1, 2 and 3, respectively.

[0010] The pressing device of the present invention comprises a lower pad (12), provided with a pressing surface facing upwards, and an upper pad (11) provided with a pressing surface facing downwards. The two pressing surfaces have, on the plan view, a rectangular outline with the sides arranged parallel to a longitudinal direction (X) and to a transverse direction (Y).

[0011] The two pads are activated to reciprocally near and distance so as to carry out the pressing of a deposited layer (L) in the form of a layer of ceramic material.

[0012] The upper pad (11) can be provided at the bottom with a forming element (F), directly or indirectly associated with the pressing surface, which is structured to delimit, on the layer (L), a containment outline. The presence of the forming element (F) is not however essential.

[0013] The device further comprises a conveyor belt (13), which has an active stretch (14) provided with a bearing surface facing upwards. The active stretch (14) is at least partially arranged between the upper pad (11) and the lower pad (12). The conveyor belt (13) is thus arranged with the active stretch (14) thereof above the lower pad (12) and below the upper pad (11). The active portion (14) of the conveyor belt (13) is movable along the longitudinal direction (X) for feeding the layers (L) of material to be pressed into the space comprised between the two pads (11,12). The layers (L) to be pressed are deposited on the conveyor belt (13) upstream of the two pads, using known means to the person skilled in the art and not illustrated in detail. The conveyor belt (13) is activated by means of rollers arranged in relation to the path to be followed, in a known way in the art.

[0014] The pressing device may be equipped with an upper belt (18) provided with an active stretch arranged at least partially between the conveyor belt (13) and the upper pad (11). In this case, the forming element (F) is applied to the upper belt (18). The active portion of the upper belt is movable along the longitudinal direction (X) in accordance with the active stretch (14) of the conveyor belt (13). At least for a stretch arranged at the pads

(11,12), and partially upstream and downstream thereof, the two active portions are both parallel to the longitudinal direction (X). The upper belt is also activated by means of rollers, arranged in relation to the path to be followed, in a known way in the art.

[0015] The lower pad (12) and the upper pad (11) delimit overall a pressing compartment (V) within which the pressing of the load (L) takes place.

[0016] The upper pad (11) and the lower pad (12) are movable towards and away from each other between a loading position, in which the two pads are located at a greater distance, and a pressing position, in which the two pads are located at a shorter distance.

[0017] When the pads (11,12) are in the loading position it is possible to feed a layer (L) to the pressing compartment (V), by means of the conveyor belt (13). If present, the upper belt moves in synchrony with the conveyor belt (13), bringing any forming element (F) into a centred position for pressing. For pressing the load (L), the pads move towards the pressing position and perform the gradual compression of the layer (L). Preferably, but not necessarily, the upper pad (11) remains stationary, whereas the lower pad (12) is movable.

[0018] Two lateral walls (21,22) are arranged parallel to the longitudinal direction (X) so as to laterally delimit the pressing compartment (V) together with the two pads (11,12). The pressing compartment is therefore delimited at the top and at the bottom by the two pads (11,12), laterally by the two lateral walls (21,22). The latter are arranged substantially vertical and are adjacent to the lateral flanks of the pads (11,12).

[0019] The lateral walls (21,22) have a stabilisation and/or consolidation function for the structure of the press. For example, in a preferred embodiment, the press comprises a plurality of ribs, i.e. flat annular shaped elements, arranged parallel to one another on vertical planes. The ribs are aligned along the longitudinal direction (X), so that the respective openings are likewise aligned along the longitudinal direction (X) for defining overall a tubular space inside which the pads (11,12) are housed. In this way, the ribs support the pressing force exercised by the pads (11,12). In this embodiment of the press, the lateral walls (21,22) are connected to the ribs and contribute to supporting and/or constraining the ribs to one another.

[0020] The lateral walls (21,22) are proximal to the lateral surfaces of the pads (11,12), limiting or in fact preventing a sufficient flow of air at the outlet from the pressing compartment (V) in the transverse direction, in practice enabling the exit of the air flow exclusively through the inlet and outlet areas of the press. For example, each lateral wall is in the form of a plate that has a height, measured along a vertical direction, greater than the distance that separates the pressing surfaces of the pads (11,12) in the loading position, and a length, measured along a horizontal direction parallel to the longitudinal direction (X), greater than or equal to the length of the pressing compartment (V).

[0021] In the embodiments illustrated in figures 1, 2 and 3, preferred but not exclusive, the upper pad (11) is provided with a projecting profile (11a) on each flank. The lateral walls (21,22) are alongside the projecting profiles (11a) of the upper pad and remain distanced from the pad (11) by a certain distance, so that a lateral space (C) is defined, substantially comprised between the pressing compartment (V) and each lateral wall (21,22). However, the presence of the projecting profile (11a) is not necessary, as it would be possible to arrange an upper pad (11) with substantially smooth flanks adjacent to the lateral walls (21,22). Advantageously, at least one lateral wall (21) has a plurality of through openings (210) that place the pressing compartment (V) in communication with the external environment. Thanks to the presence of through openings (210), the air ejected from the material during the compression step does not saturate the pressing compartment (V), i.e. it does not increase the pressure inside the compartment (V), but can exit towards the external environment. This implies the substantial absence of empty spaces or air pockets inside the pressed slab.

[0022] In the embodiment shown, the through openings (210) face the lateral space (C) which, in turn, is in communication with the pressing compartment (V).

[0023] The through openings (210) can be provided with a projecting mouth (211), which projects from a respective lateral wall (21,22) towards the pressing compartment (V). Preferably, but not necessarily, the mouth (211) opens in proximity to or at least partly inside the pressing compartment (V). For example, in the embodiment shown, the mouth (211) projects towards the pressing compartment (V) above and beyond a lateral edge (15), associated with the conveyor belt (13), which will be described in more detail below.

[0024] Preferably, but not necessarily, the through openings (210) can be connected to a collection manifold, e.g. a single conduit that also enables the particles and/or granules dragged by the air leaving the pressing compartment (V) to be collected, through respective connection conduits (212). Furthermore, the through openings (210) or a possible manifold can be connected to a suction circuit, to further promote the discharge of the air ejected from the layer of ceramic material during the compression step. In the embodiment represented, the conveyor belt (13) comprises two lateral edges (15), parallel to the longitudinal direction (X) and projecting from the conveyor belt (13) for a predefined height. Such lateral edges are described in publication WO2017149484. Preferably, the lateral edges are made of an elastically deformable material.

[0025] The lateral edges (15) have the function of preventing the particles or parts of the layers (L) from escaping from the pressing compartment (V), depositing in undesired areas. In the active stretch (14) of the conveyor belt (13), the lateral edges (15) project upwards, to the sides of the pressing compartment (V). The lateral edges (15) may be arranged for example in lateral areas of the

conveyor belt (13). During the pressing step, the lateral edges (15) are compressed between the pads, elastically deforming and laterally closing the pressing compartment (V).

[0026] To facilitate the ejection of air, the lateral edges (15) are provided with a plurality of through openings (150). Such through openings (150), also in the pressing position of the pads (11,12) in which the lateral edges (15) are in contact with the upper pad (11), maintain a communication passage between the pressing compartment (V) and the outside, to enable the ejection of air.

[0027] In the embodiment shown, the through openings (150) maintain a communication passage between the pressing compartment (V), the lateral space (C) and the through openings (210). Preferably, the advancement cycle of the conveyor belt (13) is controlled so that the conveyor belt (13) stops for the pressing step in a position in which the through openings (150) of the lateral edges (15) are aligned with the through openings (210) of the lateral walls (21,22). Such alignment position promotes the outflow of air from the pressing compartment (V).

the projecting profiles (11a) of the upper pad and remain distanced from the pad (11) by a certain distance, so that a lateral space (C) is defined, comprised between the pressing compartment (V) and each lateral wall (21,22).

6. The press according to claim 1, wherein the conveyor belt (13) comprises two lateral edges (15), parallel to the longitudinal direction (X) and projecting from the conveyor belt (13) by a predefined height, and wherein the lateral edges (15) are provided with a plurality of through openings (150).

7. The press according to claim 6, wherein the conveyor belt (13) advances according to an advancement cycle that envisages a stopping step, during pressing, in a position in which the through openings (150) of the lateral edges (15) are aligned with the through openings (210) of the lateral walls (21,22) of the pressing compartment (V).

Claims

1. A press for granular or powdered material, comprising: an upper pad (11) and a lower pad (12), movable towards and away from each other between a loading position, in which the two pads are located at a greater distance, and a pressing position, in which the two pads are located at a shorter distance; a conveyor belt (13), movable along a path that has at least one active stretch (14) parallel to a longitudinal direction (X) and arranged between the two pads (11,12); the two lateral walls (21,22) arranged parallel to the longitudinal direction (X) so as to laterally delimit a pressing compartment (V) together with the two pads (11,12): **characterised in that** at least a lateral wall (21) has a plurality of through openings (210) which place the pressing compartment (V) in communication with the external environment.
2. The press according to claim 1, wherein the through openings (210) are connected to a collection manifold.
3. The press according to claim 1, wherein the through openings (210) are connected to a suction circuit.
4. The press according to claim 1, wherein the through openings (210) are provided with a projecting mouth (211), which projects from a respective lateral wall (21,22) towards the pressing compartment (V).
5. The press according to claim 1, wherein: the upper pad (11) is provided with a projecting profile (11a) on each flank; the lateral walls (21,22) are alongside

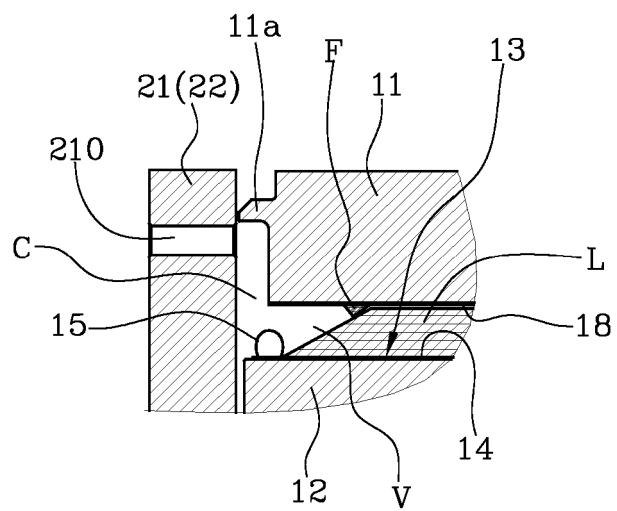


Fig.1

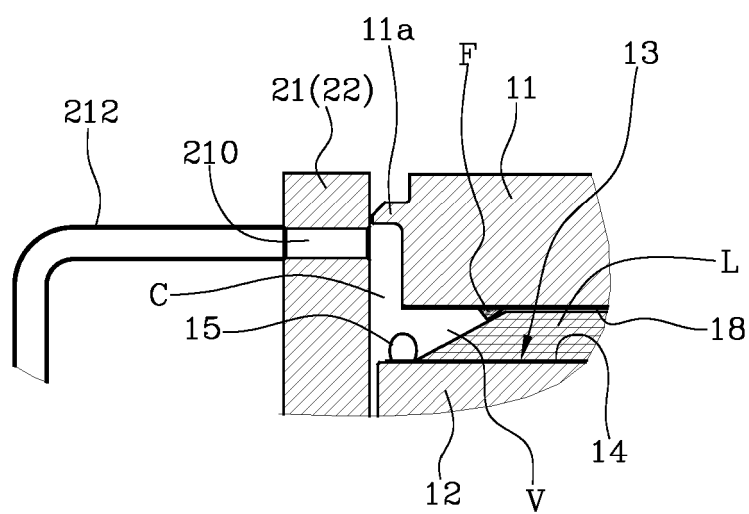


Fig.2

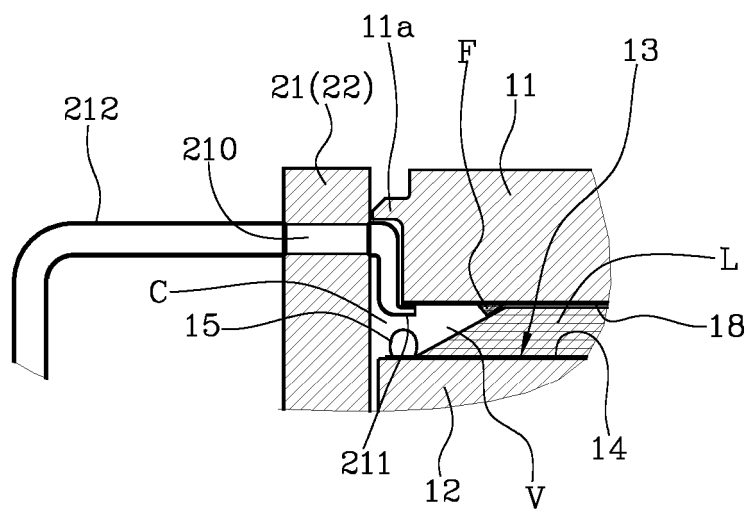
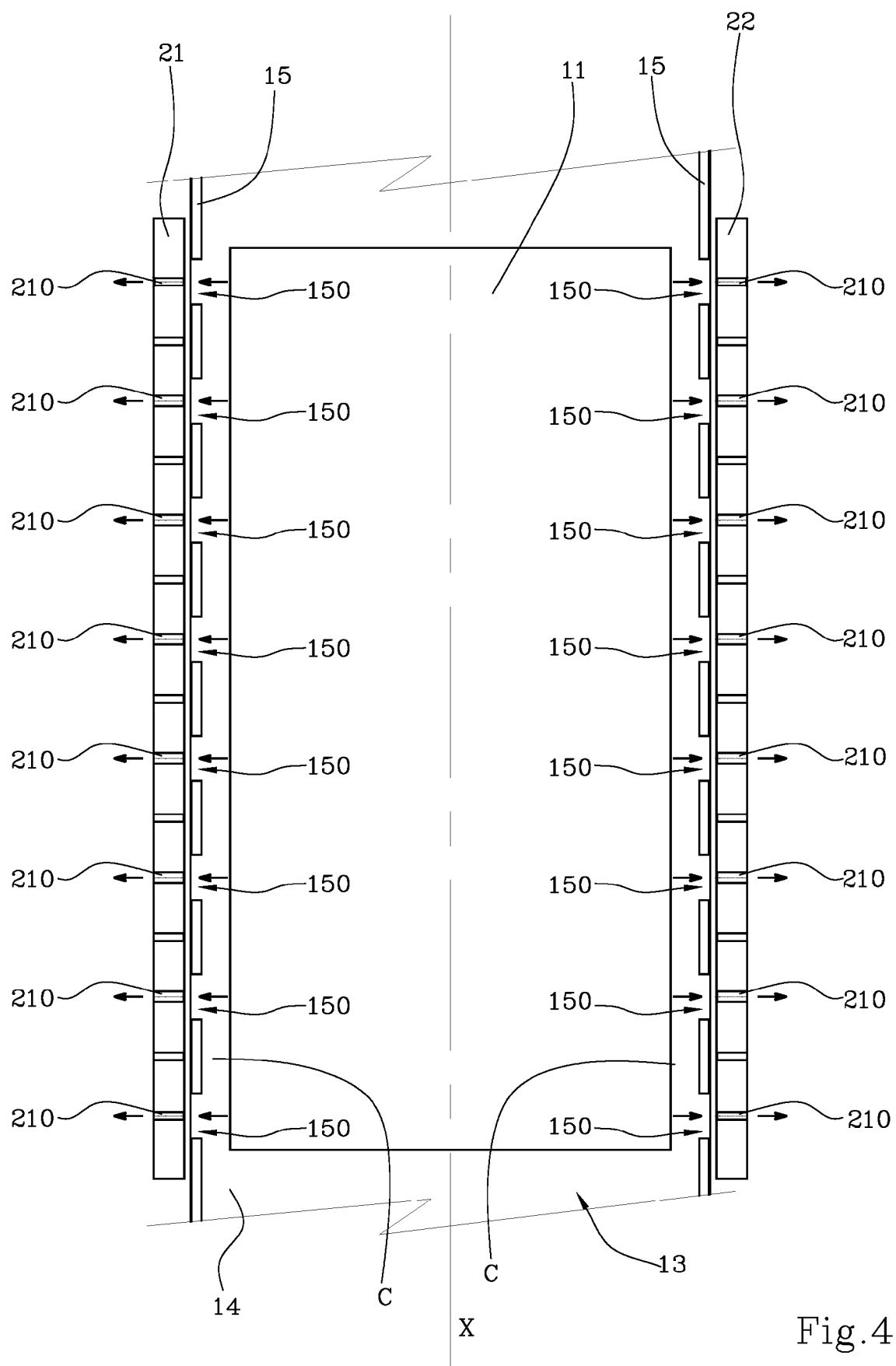


Fig.3



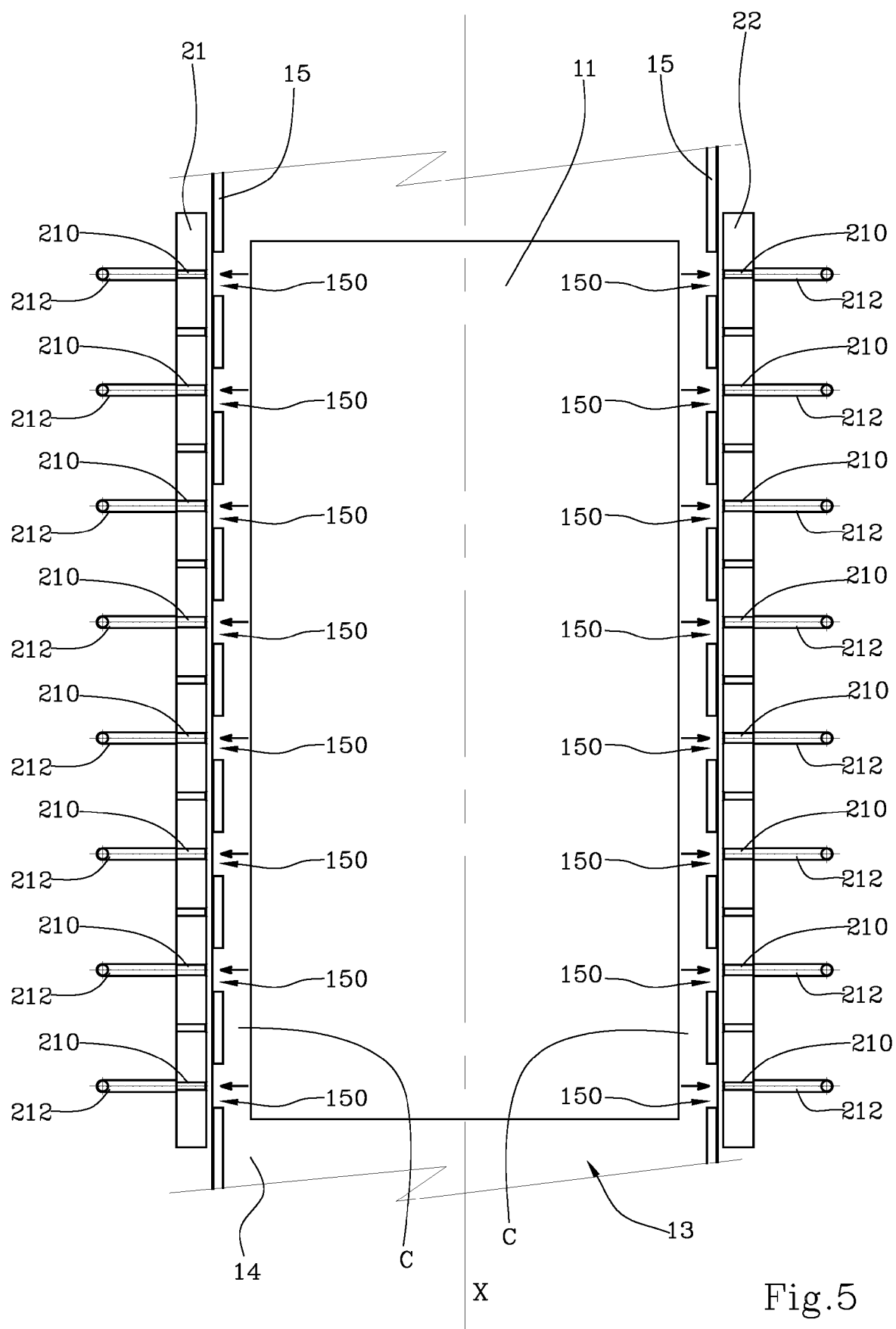


Fig.5

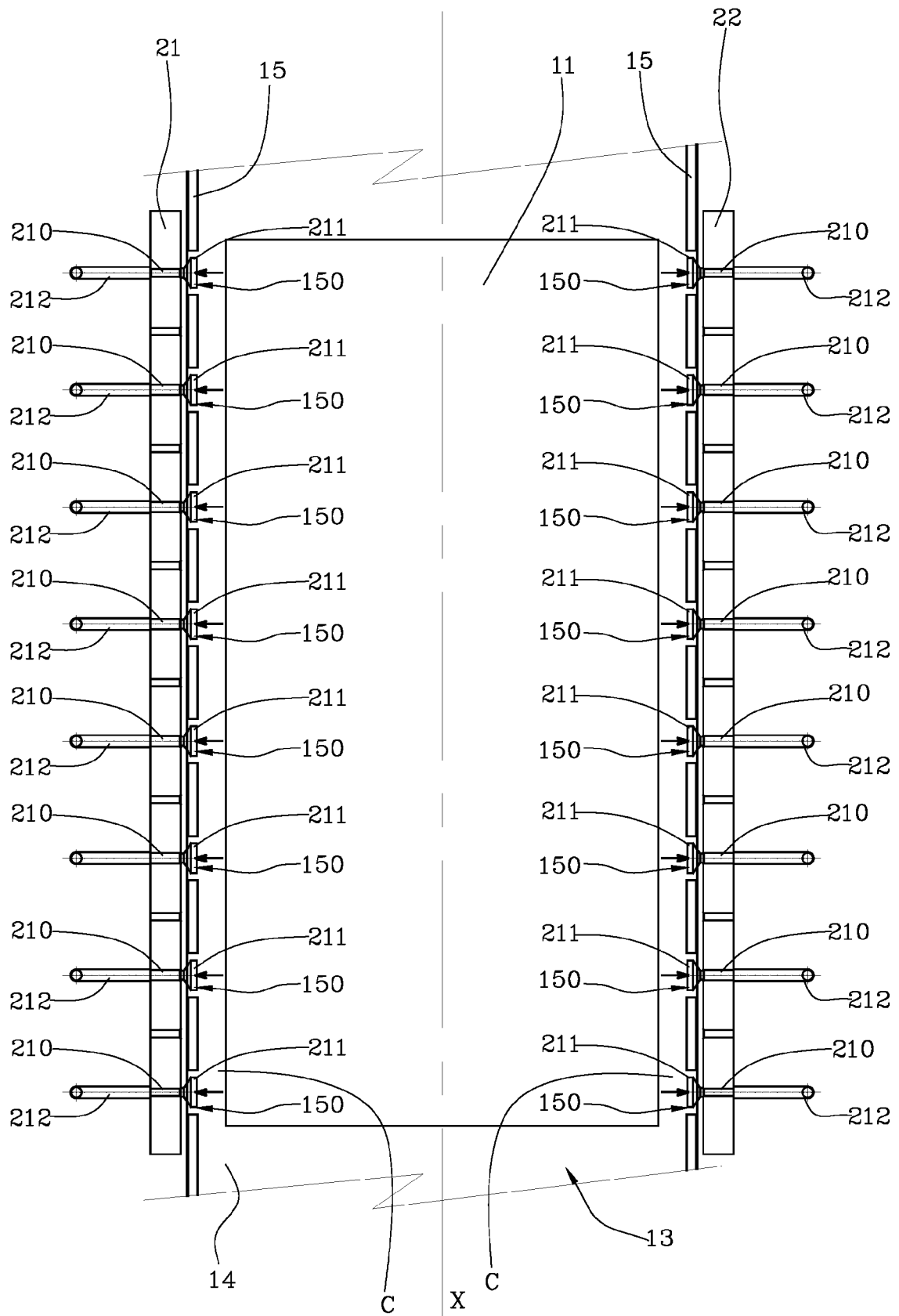


Fig.6



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Place of search The Hague		Date of completion of the search 6 September 2021	Examiner Papakostas, Ioannis
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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