



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
29.09.2021 Bulletin 2021/39

(51) Int Cl.:
B28B 3/04 (2006.01) **B28B 7/00 (2006.01)**
B28B 7/02 (2006.01) **B28B 7/34 (2006.01)**
B28B 7/36 (2006.01)

(21) Application number: **21165062.7**

(22) Date of filing: **25.03.2021**

(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
Designated Validation States:
KH MA MD TN

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(30) Priority: **26.03.2020 GB 202004376**

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(54) **A METHOD OF MANUFACTURING A BRICKWORK MEMBER**

(57) A method of manufacturing brickwork members is provided. The method includes: providing a mould defining a base and four upstanding walls extending from said base so as to define a receptacle for receiving a deformable building material, e.g. clay, therein; creating textured surface features on the base of the mould; c)

dispensing a deformable building material into the mould; and d) applying pressure to the deformable building material within the mould. The step of applying pressure to the deformable building material imprints the textured surface features of the base onto a surface of the deformable building material.

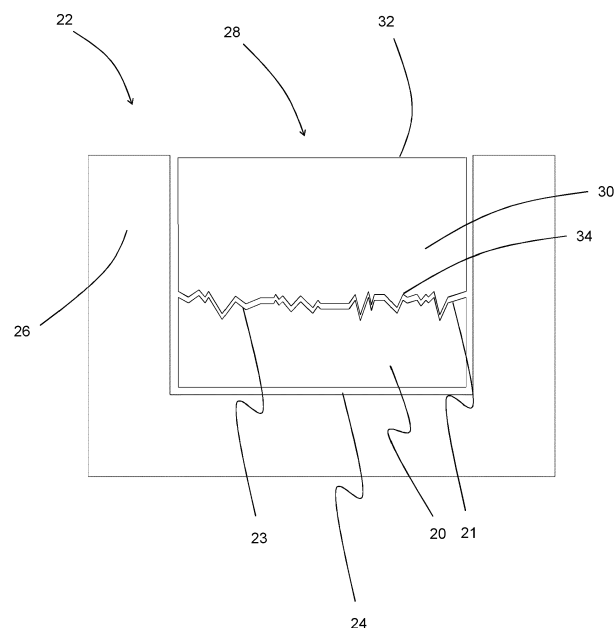


FIG. 2

Description

FIELD

[0001] The present teachings relate to a method of manufacturing a brickwork member, a method of manufacturing a textured surface for a mould, and an apparatus for manufacturing a brickwork member.

BACKGROUND

[0002] Brickwork members, often referred to as brick slips, are thin sections of brick that are provided on external (or internal) surfaces of a building structure (i.e. a wall) to replicate the appearance of a conventional brick. An array of brick slips are typically mounted onto the surface in order to cover said surface, and provide a quick, and cost-effective route to providing a traditional 'brick' surface finish. In addition to being mounted to a building structure for aesthetic purposes, brick slips are also often used as they are durable and require low maintenance.

[0003] Brick slips may be manufactured via an extrusion process. However, in order to produce a brick slip that has a visual appearance similar to a traditionally manufactured brick, the brick slip is typically cut off from a traditionally manufactured brick, after the brick has been dried and fired, with the remaining part of the brick being discarded. This traditional method of producing brick slips can be time intensive. Moreover, this method of manufacturing brick slips results in large amounts of waste material and large amounts of wasted energy.

[0004] The present teachings seek to overcome or at least mitigate one or more problems associated with the prior art.

SUMMARY

[0005] A first aspect of the teachings provides a method of manufacturing brickwork members, the method comprising the steps of: a) creating a textured surface; b) providing a mould defining a base comprising the textured surface and four walls extending around said base so as to define a receptacle for receiving a building material, e.g. clay, therein; c) dispensing a building material into the mould; and d) applying pressure to the building material within the mould to form a brickwork member, wherein the applying pressure to the building material within the mould imprints the textured surface of the base onto a surface of the brickwork member.

[0006] Traditionally manufactured bricks may be provided with one or more textured surfaces. Brickwork members or brick slips may be manufactured using moulds, but this results in brick slips having a substantially smooth, uniform appearance. Often, in order to manufacture a brick slip with the appearance of a traditionally manufactured brick, a full brick is manufactured and a slip is cut-off from said brick. This can be a very time intensive process and results in large amounts of

waste material.

[0007] Through the present method of manufacture outlined above, a brickwork member (i.e. a brick slip) is able to be produced quickly by compressing a building material such as clay into a mould having a textured lower surface. During compression of the building material, the textured features are imparted/imprinted onto the building material, such that a surface of the manufactured brick slip has a textured surface similar to that of the mould. This textured surface advantageously enables the brick slip to appear as if it has been made using traditional methods.

[0008] In contrast to the traditional methods of manufacturing house bricks, the above method of manufacturing a brick slip enables the amount of building material deposited into the mould to be customised to just fill the volume of the mould, which helps to reduce waste material and energy.

[0009] Creating the textured surface may comprise replicating or duplicating a textured brick surface.

[0010] Through this process, the textured surface features of the mould/insert are a replica of a surface of an existing, e.g. traditionally manufactured, house brick. This in turn enables a brick slip to be manufactured, using the mould, to have a textured surface that is a replica of a traditional brick. This advantageously improves the ability of the brick slip to appear as if it has been made using traditional methods.

[0011] Replicating or duplicating a textured brick surface may comprise imparting a textured brick surface onto the base of the mould.

[0012] Through this process, the textured surface features of the mould/insert are a replica of a surface of an existing, e.g. traditionally manufactured, house brick. This in turn enables a brick slip to be manufactured, using the mould, to have a textured surface that is a replica of a traditional brick. This advantageously improves the ability of the brick slip to appear as if it has been made using traditional methods.

[0013] The textured brick surface may be imparted onto a deformable material.

[0014] The deformable material may comprise a plastics material. The deformable material may comprise a resin material. The deformable material may comprise a polyurethane resin material.

[0015] The base wall (i.e. the surface having the textured features thereon) is formed from a plastics material. These materials have been found to have the desired viscosity to enable it to produce an accurate cast of the traditionally manufactured brick surface, whilst also having sufficient structural strength to withstand the brickwork member manufacturing process.

[0016] The deformable material may comprise a filler material for increasing the structural strength thereof.

[0017] This increased structural strength helps the mould insert to withstand the brickwork member manufacturing process.

[0018] Creating the textured surface may comprises

applying a deformable material to a textured brick surface and hardening/curing said deformable material.

[0019] Creating the textured surface on the base may comprises producing a cast of a textured brick surface.

[0020] This provides an effective way to replicate the surface features of a traditionally manufactured house brick.

[0021] The textured surface may be created on a removable mould insert. The method may comprise positioning the mould insert in the mould such that the textured surface of the mould insert forms the base of the mould.

[0022] Providing the textured surface features on a removable insert enables the textured surface to be changed (i.e. by changing the insert) without requiring the entire mould to be replaced. Thus, the provision of a removable insert having textured surface features facilitates the manufacture of brickwork members having a range of surface textures.

[0023] The mould insert may define a height in a direction parallel with the side walls of the mould. The method may comprise the step of selecting a height of the mould insert.

[0024] Allowing an operator to select a thickness of a mould insert to be used enables the thickness of the manufactured brick slip to be predetermined. Moreover, this arrangement enables the thickness of a brick slip to be varied between production runs by simply changing the mould insert.

[0025] The method may comprise the step of inverting the mould and removing the brickwork member from said mould.

[0026] Removing the brickwork member from the mould may comprise the step of vibrating the mould and/or using pressurised air to remove the brickwork member from the mould.

[0027] The step of vibrating the mould may comprise vibrating the mould with high frequency and low amplitude vibrations.

[0028] Such vibration attributes have been found to be particularly effective for facilitating easy removal of the brickwork member from the mould.

[0029] The method may comprise providing a volume of building material that is substantially equal to the volume of the receptacle.

[0030] Providing a volume of deformable building material that is substantially equal to the volume of the mould receptacle (i.e. equal to the volume of the mould that remains vacant after the mould insert is placed therein) enables the amount of building material deposited into the mould to be customised to just fill the volume of the mould, which helps to reduce waste material.

[0031] The method may comprise the step of depositing sand onto the textured surface.

[0032] This aids in the removal of the brickwork member from the mould.

[0033] The brickwork member may be a brick slip, for example having a thickness in the range 10mm to 50mm,

optionally 15mm to 30mm.

[0034] The building material may be a clay material.

[0035] The clay material may have a water content in the range 15% to 30%. The clay material may have a water content in the range 18% to 24%.

[0036] Clay material having this water content has been found to be particularly suitable for shaping, imparting and retaining a texture on a brickwork member.

[0037] It will be understood that if the clay material has a water content that is too high, the clay material would be too viscous for the shape of the mould to be imparted and retained on the brickwork member (e.g. the clay material may not maintain its shape after removal from the mould). Furthermore, higher water content in the clay requires more energy when firing the brickwork member in a kiln or similar apparatus. It will also be understood that if the clay material has a water content that is too low, the clay material may not be sufficiently deformable for the shape of the mould to be imparted on the brickwork member (e.g. the clay material may not conform to the shape of the mould even under the application of pressure).

[0038] In exemplary embodiments, step d) occurs immediately after step c).

[0039] In exemplary embodiments, step d) occurs within 2 seconds of step c).

[0040] The application of pressure occurring immediately after (e.g. less than 5 seconds after, for example approximately 2 seconds after) filling the mould allows an optimal amount of brickwork members to be produced by a given apparatus.

[0041] For example, in an apparatus consisting of a plurality of moulds which move sequentially through the filling apparatus, application of pressure occurring within 2 seconds of filling the mould allows around twenty mould movements per minute.

[0042] Furthermore, application of pressure occurring immediately after filling the mould ensures that the clay material maintains an optimal water content throughout the manufacturing process (i.e. the clay material does not begin to harden prior to compression in the mould).

[0043] The base may be moveable with respect to the four walls surrounding the base in a direction parallel to said walls (e.g. in a vertical direction when said walls are arranged vertically).

[0044] Having a base which is movable with respect to said walls provides a means of varying the height of brickwork members produced in the mould, without having to replace a mould insert.

[0045] Furthermore, having a base which is movable with respect to said walls facilitates removal of a brickwork member from the mould by moving the base upwards to a distal end of the mould, such that the brickwork member is at least partially ejected from the mould.

[0046] The method may further comprise moving the base to a predetermined position with respect to said walls (e.g. in order to alter the volume of the receptacle that is empty after the mould insert is positioned in the

mould).

[0047] The base may be coupled to an actuation mechanism and the method may further comprise moving the base with the actuation mechanism to a predetermined position with respect to said walls.

[0048] Having an actuation mechanism provides a simple means of varying the position of the base relative to the upstanding walls (e.g. for altering brickwork member thickness and/or ejecting a brickwork member from the mould).

[0049] The actuation mechanism may comprise one or more linear actuators, winches, linear gear arrangements or an inflatable actuation mechanism.

[0050] The actuation mechanism may be configured to automatically move the base to a predetermined position (e.g. a volume-defining position or an ejecting position) and the method may comprise automatically moving the base with the actuation mechanism to a predetermined position.

[0051] Automatically moving the base with the actuation mechanism to a predetermined position offers a simple and accurate means for setting a desired thickness of brickwork members produced in the mould and/or for ejecting a brickwork member from the mould.

[0052] The actuation mechanism may comprise a position determining means to determine the position of the base relative to the upstanding walls and the method may further comprise: comparing a position of the base determined by the position determining means with a desired position; and moving the base towards the desired position if the determined position is different to the desired position.

[0053] Having a position determining means facilitates setting the base to a desired position.

[0054] The position determining means may comprise: a visual scale for visually determining a position of the base; a position sensor such as an encoder or potentiometer; and/or an open-loop determination means based on driving signals of the actuation mechanism.

[0055] The method may comprise receiving a desired position of the base from a user input and moving the base to the desired position with the actuation mechanism.

[0056] The method may comprise receiving a desired thickness from a user input, determining a desired position of the base from the desired thickness and moving the base to the desired position with the actuation mechanism, so as to produce a brickwork member with the desired thickness.

[0057] The actuation mechanism may be manually operated (e.g. by operation of a button, switch, lever, crank handle or the like), and the method may comprise manually moving the base with the actuation mechanism to a predetermined position.

[0058] Manually operating the actuation mechanism provides a simple means of moving the base to a desired position.

[0059] In exemplary embodiments, the base defines

one or more openings.

[0060] The base may comprise one or more openings and/or the base is shaped to define one or more openings between the base and one or more of the four walls extending around the base.

[0061] Such openings allow air in the mould to be pushed out when building material fills the mould, and allow air to enter the mould when the brickwork member is removed from the mould. This helps to retain a good shape of the brickwork members and facilitates easier removal of brickwork members from the mould.

[0062] In exemplary embodiments, the one or more openings defined by the base comprise one or more slots each running along a length or width of the base.

[0063] In exemplary embodiments, said one or more slots each have a width in the range of 0.1mm to 1mm, preferably 0.25mm to 0.75mm, more preferably 0.5mm.

[0064] In exemplary embodiments, said one or more slots comprise four slots, each slot being provided between the base and one of the four upstanding walls.

[0065] Put another way, in exemplary embodiments, said one or more slots comprise four slots and the trough comprises four side walls, wherein a slot is provided between the base wall and each of the four side walls.

[0066] Such an arrangement of slots has been found to be particularly effective for facilitating easy removal of brickwork members from the mould, since it provides openings for inflow/outflow of air around a majority of a perimeter of the base of the mould.

[0067] In exemplary embodiments, said one or more slots comprise a plurality of slots (e.g. four slots) arranged around a perimeter of the base, wherein adjacent slots are spaced apart. Optionally, wherein adjacent slots are spaced apart by a distance in the range 10mm to 20mm.

[0068] Having the first and second ends of the slots spaced apart from the respective corners (i.e. having corner regions where the walls and base meet which do not have a slot therein) allows the base to stay connected to the upstanding walls, while providing openings for inflow/outflow of air around a majority of a perimeter of the base of the mould.

[0069] According to a second aspect there is provided a method of creating a textured surface for a mould for manufacturing brickwork members, the method comprising the steps of: a) providing a deformable material; and b) creating a textured surface on the deformable material, wherein creating the textured surface comprises replicating or duplicating a textured brick surface.

[0070] This enables the surface texture imparted onto the brickwork member to be a replica of a traditionally made house brick. This advantageously improves the ability of the brick slip to appear as if it has been made using traditional methods. Moreover, this provides an effective way to provide an insert having substantially the same features as a traditionally manufactured house brick.

[0071] Replicating or duplicating a textured brick surface may comprise imparting the textured brick surface

onto the deformable material.

[0072] Creating the textured surface may comprise applying the deformable material to a textured brick surface and hardening/curing said deformable material.

[0073] Creating the textured surface may comprise producing a cast of a textured brick surface.

[0074] This provides an effective way to replicate the surface features of a traditionally manufactured house brick.

[0075] The deformable material may comprise a plastics material. The deformable material may comprise a resin material. The deformable material may comprise a polyurethane resin material. The deformable material may comprise a filler material for increasing the structural strength of the deformable material.

[0076] These materials have been found to have the desired viscosity to enable it to produce an accurate cast of the traditionally manufactured brick surface, whilst also having sufficient structural strength to withstand the brickwork member manufacturing process.

[0077] This increased structural strength helps the textured surface to withstand the brickwork member manufacturing process.

[0078] According to a third aspect there is provided a mould for use in manufacturing brickwork members, the mould comprising: a base and four upstanding walls extending around said base so as to define a receptacle for receiving a deformable building material, e.g. clay, therein.

[0079] In exemplary embodiments, the base comprises a textured surface thereon.

[0080] The textured surface may be a replica or duplicate of a textured brick surface.

[0081] The textured surface may be a cast of textured brick surface.

[0082] This provides an effective way to provide an insert having substantially the same features as a traditionally manufactured house brick.

[0083] The mould may comprise a removable mould insert positioned in the receptacle such that the removable mould insert defines the base having the textured surface thereon.

[0084] The base may be moveable with respect to the four upstanding walls in a direction parallel to said upstanding walls (e.g. in a vertical direction when said walls are arranged vertically).

[0085] Having a base which is movable with respect to said walls provides a means of varying the height of brickwork members produced in the mould, without having to replace a mould insert.

[0086] In exemplary embodiments, the base defines one or more openings.

[0087] The base may comprise one or more openings and/or the base is shaped to define one or more openings between the base and one or more of the four walls extending around the base.

[0088] Such openings allow air in the mould to be pushed out when building material fills the mould, and

allow air to enter the mould when the brickwork member is removed from the mould. This helps to retain a good shape of the brickwork members and facilitates easier removal of brickwork members from the mould.

[0089] In exemplary embodiments, the one or more openings defined by the base comprise one or more slots each running along a length or width of the base.

[0090] In exemplary embodiments, said one or more slots each have a width in the range of 0.1mm to 1mm, preferably 0.25mm to 0.75mm, more preferably 0.5mm.

[0091] In exemplary embodiments, said one or more slots comprise four slots, each slot being provided between the base and one of the four upstanding walls.

[0092] Put another way, in exemplary embodiments, said one or more slots comprise four slots and the trough comprises four side walls, wherein a slot is provided between the base wall and each of the four side walls.

[0093] Such an arrangement of slots has been found to be particularly effective for facilitating easy removal of brickwork members from the mould, since it provides openings for inflow/outflow of air around a majority of a perimeter of the base of the mould.

[0094] In exemplary embodiments, said one or more slots comprise a plurality of slots (e.g. four slots) arranged around a perimeter of the base, wherein adjacent slots are spaced apart. Optionally, wherein adjacent slots are spaced apart by a distance in the range 10mm to 20mm.

[0095] Having the first and second ends of the slots spaced apart from the respective corners (i.e. having corner regions where the walls and base meet which do not have a slot therein) allows the base to stay connected to the upstanding walls, while providing openings for inflow/outflow of air around a majority of a perimeter of the base of the mould.

[0096] According to a fourth aspect there is provided an apparatus for manufacturing brickwork members from a building material, the apparatus comprising: a mould comprising a base and four upstanding walls extending around said base so as to define a receptacle for receiving a building material, e.g. clay, therein; a dispenser for dispensing a building material into the mould; and a compressor for applying pressure to building material within the mould for forming a brickwork member, wherein the base comprises a textured surface such that said textured surface is imprinted onto the building material when the compressor applies pressure to building material within the mould.

[0097] The apparatus may comprise a plurality of moulds, wherein two or more of the plurality of moulds comprise a different textured surface.

[0098] The textured surface may be a replica or duplicate of a textured brick surface.

[0099] The textured surface may be a cast of a textured brick surface.

[0100] This provides an effective way to provide an insert having substantially the same features as a traditionally manufactured house brick.

[0101] The base may be movable with respect to the

four upstanding walls in a direction parallel to said upstanding walls (e.g. in a vertical direction when said walls are arranged vertically).

[0102] Having a base which is movable with respect to said walls provides a means of varying the height of brickwork members produced in the mould, without having to replace a mould insert.

[0103] Furthermore, having a base which is movable with respect to said walls facilitates removal of a brickwork member from the mould by moving the base upwards to a distal end of the mould, such that the brickwork member is at least partially ejected from the mould.

[0104] The apparatus may further comprise an actuation mechanism coupled to the base for moving the base with respect to the upstanding walls.

[0105] Having an actuation mechanism provides a simple means of varying the position of the base relative to the upstanding walls (e.g. for altering brickwork member thickness and/or ejecting a brickwork member from the mould).

[0106] The actuation mechanism may comprise one or more linear actuators, winches, linear gear arrangements or an inflatable actuation mechanism.

[0107] The actuation mechanism may be configured to automatically move the base to a desired position.

[0108] Automatically moving the base with the actuation mechanism to a predetermined position offers a simple and accurate means for setting a desired thickness of brickwork members produced in the mould and/or for ejecting a brickwork member from the mould.

[0109] The actuation mechanism may comprise position determining means to determine the position of the base relative to the upstanding walls.

[0110] Having a position determining means facilitates setting the base to a desired position.

[0111] The position determining means may comprise: a visual scale for visually determining a position of the base; a position sensor such as an encoder or potentiometer; and/or an open-loop determination means based on driving signals of the actuation mechanism.

[0112] The actuation mechanism may be configured to be manually operated.

[0113] Manually operating the actuation mechanism provides a simple means of moving the base to a desired position.

[0114] In exemplary embodiments, the base defines one or more openings.

[0115] The base may comprise one or more openings and/or the base is shaped to define one or more openings between the base and one or more of the four walls extending around the base.

[0116] Such openings allow air in the mould to be pushed out when building material fills the mould, and allow air to enter the mould when the brickwork member is removed from the mould. This helps to retain a good shape of the brickwork members and facilitates easier removal of brickwork members from the mould.

[0117] In exemplary embodiments, the one or more

openings defined by the base comprise one or more slots each running along a length or width of the base.

[0118] In exemplary embodiments, said one or more slots each have a width in the range of 0.1mm to 1mm, preferably 0.25mm to 0.75mm, more preferably 0.5mm.

[0119] In exemplary embodiments, said one or more slots comprise four slots, each slot being provided between the base and one of the four upstanding walls.

[0120] Put another way, in exemplary embodiments, said one or more slots comprise four slots and the trough comprises four side walls, wherein a slot is provided between the base wall and each of the four side walls.

[0121] Such an arrangement of slots has been found to be particularly effective for facilitating easy removal of brickwork members from the mould, since it provides openings for inflow/outflow of air around a majority of a perimeter of the base of the mould.

[0122] In exemplary embodiments, said one or more slots comprise a plurality of slots (e.g. four slots) arranged around a perimeter of the base, wherein adjacent slots are spaced apart. Optionally, wherein adjacent slots are spaced apart by a distance in the range 10mm to 20mm.

[0123] Having the first and second ends of the slots spaced apart from the respective corners (i.e. having corner regions where the walls and base meet which do not have a slot therein) allows the base to stay connected to the upstanding walls, while providing openings for inflow/outflow of air around a majority of a perimeter of the base of the mould.

BRIEF DESCRIPTION OF THE DRAWINGS

[0124] Embodiments will now be described with reference to the accompanying drawings, in which:

Figure 1 is a schematic cross-sectional view of a mould for forming a mould insert;

Figure 2 is a schematic cross-sectional view of a mould for forming a brickwork member according to an embodiment;

Figure 3 is a schematic cross-sectional view of a mould having a moveable base for forming a brickwork member according to an embodiment;

Figure 4 is a schematic cross-sectional view of the mould of Figure 3 with a brickwork member ejected therefrom;

Figure 5 is a schematic cross-sectional view of a mould for forming a brickwork member according to an embodiment; and

Figure 6 is a plan view of the mould of Figure 5.

DETAILED DESCRIPTION OF EMBODIMENT(S)

[0125] The present teachings relate to a method of producing a textured surface for a mould. Put another way, the present teachings relate to a method of producing a textured surface on a base of a brickwork mould for manufacturing brickwork members.

[0126] Referring now to Figure 1, a mould 10 for producing a textured surface for a mould is illustrated. The mould 10 is used in the production of a textured surface for use in a brickwork mould for manufacturing brickwork members.

[0127] In the exemplary embodiment, the mould 10 is used to produce a textured surface on a removable insert that is positionable in a brickwork mould for manufacturing brickwork members. In the exemplary embodiment, the mould 10 may be considered to be an insert mould. It will be appreciated that in alternative arrangements the textured surface may be formed as an integral, e.g. fixed, part of a brickwork mould.

[0128] The insert mould 10 includes a body defining a base 12 and four upstanding walls 14 extending from said base 12 so as to define a receptacle 16. The receptacle 16 of the insert mould 10 is configured and arranged for receiving a brick 18 (e.g. a traditionally manufactured brick) therein. The brick 18 is positioned in the insert mould 10 such that a textured surface 19 of the brick 18 arranged to be uppermost in the insert mould 10.

[0129] In order to produce a textured surface that resembles a textured surface 19 of a brick 18, a deformable material is applied to the textured surface 19 of the brick 18. Put another way, in order to produce a textured surface that has a visual appearance similar to a textured surface 19 of a brick 18, a deformable material is applied to the textured surface 19 of the brick 18.

[0130] It will be appreciated that whilst the method of producing a textured surface has been described in terms of applying a deformable material to a textured surface 19 of a brick 18 whilst in a mould, it will be appreciated that in alternative arrangements the deformable material may be applied to a brick 18 and then cut to desired dimensions (i.e. without a mould 10 being used).

[0131] The deformable material defines a body 20. The deformable material substantially covers the textured surface 19 of the brick 18. Put another way, the body 20 defines a surface 21 that substantially covers the textured surface 19 of the brick 18. In this way, a textured surface is formed on the surface 21 of the body 20.

[0132] The step of forming a textured surface on the surface 21 of the body 20 is carried out by imparting/imprinting the features of the textured surface 19 of the brick 18 onto the deformable material (i.e. onto the surface 21 of the body 20). In this way, a textured surface 21 is able to be produced having a textured surface features similar or substantially the same as the textured surface 19 of the brick 18.

[0133] In the exemplary embodiment, the process of forming the textured features on the surface 21 of the

body 20 is done by producing a cast of the textured surface 19 of the brick 18. Put another way, a cast of the textured surface 19 of the brick 18 is produced by applying the deformable material onto the textured surface 19 of the brick 18.

[0134] In the exemplary arrangement, the brick 18 is positioned within the receptacle 16 of the insert mould 10 with the textured surface 19 uppermost. The deformable material is then poured in to the mould 10 to partially or completely fill the receptacle 16 (i.e. to partially or completely fill the remaining empty volume of the receptacle 16). The deformable material is then left on the textured surface 19 of the brick 18 so as to harden/cure. In alternative arrangements, the method may require the body 20 of the deformable material to be pressed onto the textured surface 19 of the brick 18 so as to form the textured surface on the body 20.

[0135] Following this hardening/curing process, the body 20 is separated from the brick 18 to form the mould insert. Put another way, following this hardening/curing process, the body 20 is removed from the mould 10 so as to separate said body 20 from the brick 18. The resulting body 20 incorporating the textured surface 21 may then be used to form a base of a brickwork mould (as is discussed in more detail below).

[0136] In the exemplary embodiment, the deformable material includes a plastics material, optionally a resin material, for example a polyurethane resin material. It will be appreciated that a large number of plastics materials may be used to form a cast of the brick surface, and that any suitable material may be used. It will be appreciated that the deformable material may include two or more different of said plastics materials.

[0137] In some arrangements, the deformable material may also include filler material so as to increase the structural strength of the body 20. An example of a filler material that may be used is aluminium oxide, but it will be appreciated that a large number of possible filler materials may be used, and that the filler material may be selected to suit the plastics material.

[0138] The present teachings also relate to a method of manufacturing a brickwork member using a brickwork mould.

[0139] Referring now to Figure 2, a mould 22, i.e. a brickwork mould 22, for use in the manufacture of brickwork members is illustrated.

[0140] The mould 22 includes a body defining a base 24 and four upstanding walls 26 extending around said base 24 so as to define a receptacle 28. The base 24 of the mould 22 is provided with a textured surface 23. The textured surface 23 is configured to resemble the appearance of a traditionally manufactured brick. Put another way, the textured surface 23 is configured to have a visual appearance that is similar to or substantially the same as a traditionally manufactured brick.

[0141] The textured surface 23 of the mould 22 is formed on the surface 21 of a body 20. In the exemplary embodiment, the body is provided as a removable insert

20 for positioning in the brickwork mould 22 so as to provide the base 24 with a textured surface 23. Put another way, in the exemplary arrangement, the receptacle 28 of the brickwork mould 22 is configured and arranged for receiving a removable mould insert 20 therein so as to provide the base with a textures surface 23. The provision of the textured surface 23 on a removable insert 20 enables the textured surface 23 on the base 24 of the mould 22 to be easily changed without having to change the entire mould 22. However, in alternative arrangements, it will be appreciated that the body 20 may be an integral (i.e. permanently fixed) part of the brickwork mould 22. Put another way, in alternative arrangements, the textured surface 23 may be provided directly on the base 24 of the mould 22, e.g. the textured features 23 on the base may be integrally formed with the mould 22.

[0142] As has been discussed above, the textured surface 21 is provided on the body 20 (i.e. the mould insert 20). The removable mould insert 20 is positioned in the mould 22 such that the textured surface 21 (i.e. the upper surface) of the mould insert 20 defines the base 24 of the mould 22.

[0143] A second process is a method relating to the manufacture of brickwork members, also known as brick slips, which will now be discussed.

[0144] The method includes providing the brickwork mould 22 with a base 24 having a textured surface 23. In the exemplary arrangement, the method includes positioning the removable mould insert 20 in the mould 22 such that the textured surface 21 is positioned uppermost in the mould 22. In this way, the textured surface 21 of the body 20 defines the textured surface 23 of the base 24 of the brickwork mould 22.

[0145] A building material, for example clay, is dispensed or placed into the brickwork mould 22 so as to fill the remaining empty volume of the receptacle 28. In exemplary embodiments, the building material is a clay material having a water content in the range of 15% to 30%, for example in the range 18% to 24%. It will be appreciated that the volume of building material dispensed into the mould 22 may be such that the remaining empty volume of the receptacle 28 is just filled, e.g. such that there is no/little waste material.

[0146] In some arrangements, the textured surface 23 of the base (and the rest of the internal surfaces of the brickwork mould 22) may be coated with water or oil, or another suitable liquid. Sand is then deposited onto the surface(s) and cling/adheres to the liquid on the surface(s) of the brickwork mould 22. In this way, sand may be deposited so as to substantially cover the textured surface 23. This helps to aid in the removal of the resulting brickwork member from the brickwork mould 22. In some alternative arrangements, it will be appreciated that alternative materials such as lubricating oils may be deposited onto the brickwork mould 22 so as to aid the removal of a brickwork member from the brickwork mould 22. In such arrangements, it will be appreciated that the material used to form the textured surface 23, and also

possibly the other internal surfaces of the brickwork mould 22, may be selected to have a suitable surface texture so as to retain a thin layer of liquid, e.g. water, on the surface thereof so as to be capable of holding the sand thereon.

[0147] Once the brickwork mould 22 has been filled with a building material, pressure is applied to said building material within the mould 22. The pressure is applied to an upper surface 32 of the building material (i.e. to a surface that is remote from the base 24 of the mould 22). Through the application of pressure to the building material, the features of the textured surface 23 of the mould 22 are imprinted onto the building material (i.e. onto a lower surface of the building material).

[0148] It will be appreciated that the pressure applied to the building material may be done so using any suitable means such as a pressure plate.

[0149] In exemplary embodiments, the application of pressure to the building material occurs immediately after the building material is dispensed or placed in the mould 22. For example, the application of pressure to the building material occurs within 2 seconds of the building material being dispensed or placed in the mould.

[0150] The application of pressure occurring immediately after (e.g. less than 5 seconds after, for example approximately 2 seconds after) filling the mould 22 allows an optimal amount of brickwork members to be produced by a given apparatus. For example, in an apparatus consisting of a plurality of moulds 22 which move sequentially through the filling apparatus, application of pressure occurring within 2 seconds of filling the mould 22 allows around twenty mould movements per minute.

[0151] The application of pressure occurring immediately after filling the mould 22 ensures that the clay material maintains an optimal water content throughout the manufacturing process (i.e. the clay material does not begin to harden prior to compression in the mould 22).

[0152] The method may include the step of removing any small excesses of building material, e.g. using a cutting tool. It will be appreciated that this removal of excess material may occur whilst the building material is in the mould 22.

[0153] Following this manufacturing process (i.e. the filling the mould 20 and the application of pressure), the building material is formed into a brickwork member 30, e.g. a brick slip, which is removed from the mould 22. In order to remove the brickwork member from the mould 22, the mould may be inverted. In some arrangements, the process may include applying a vibration to the mould when it is in the inverted state in order to aid removal of the brickwork member from the mould 22. In some arrangements, applying a vibration to the mould 22 may include applying high frequency and low amplitude vibrations to the mould 22. In some arrangements, the process may incorporate the use of pressurised air to in the removal of the brickwork member 30 from the mould 22.

[0154] Following removal of the brickwork member 30 from the mould 22, said brickwork member it is put into

a dryer to reduce its moisture content. It will be appreciated that the drying process may be varied to suit the building material used and the use of the brickwork member. As an example, the brickwork member may be dried for approximately 24 hours at a temperature at or above 100°C. Once the brickwork member has been sufficiently dried, it will be placed in a kiln to be fired.

[0155] Through the above described method, a brickwork member 30 (i.e. a brick slip) is produced having a textured surface 34 with a visual appearance that is similar or substantially the same as the textured surface 19 of the brick 18. Put another way, through the above described method, a brickwork member 30 is able to be manufactured having a textured surface that resembles a brick 18 manufactured using traditional methods.

[0156] It will be appreciated from Figure 2 that the size of the brickwork member that is produced is dependent on the volume of the receptacle that is empty after the mould insert 20 is positioned in the mould 22. Thus, the method of manufacturing the brick slip may include the selection (or the manufacture) of a mould insert having a specific height and/or the selection (or manufacture) of a mould 22 with upstanding walls 26 having a specific height, so as to produce a brickwork member with a predetermined thickness.

[0157] Referring now to Figures 3 and 4, a mould 122, i.e. a brickwork mould 122, for use in the manufacture of brickwork members is illustrated. Common features with the mould of Figure 2 are given the prefix "1", and only differences are discussed.

[0158] The base 124 is movable with respect to the upstanding walls 126. The base 124 is moveable in a direction parallel to the upstanding walls 126. The moveable base 124 enables the volume of the receptacle 128 to be adjusted. This enables the height of brickwork members produced in the mould 122 to be varied, without having to replace the mould insert 120.

[0159] In the illustrated arrangement, the base 124 is in contact with the side walls 126 so that there are no significant gaps therebetween. However, in alternative embodiments, the base 124 may be spaced apart from at least one of the side walls 126 so as to define a spacing (i.e. an air gap) therebetween. This may be useful for expelling air from the mould 122 as it is filled with building material, and also for air to flow into the mould 122 to aid in removal of the brickwork member 130 from the mould 122.

[0160] The method of manufacturing the brick slip according to this embodiment may include movement of the base 124 to a predetermined position (i.e. height) with respect to the upstanding walls 126, so as to produce a brickwork member with a predetermined thickness.

[0161] The method of manufacturing the brick slip according to this embodiment may include movement of the base 124 to facilitate removal of a brickwork member from the mould 122 by moving the base 124 upwards. In this way, the brickwork member may be at least partially ejected from the mould 122 (e.g. as illustrated in Figure

4). In some arrangements, the method of manufacturing the brick slip may include movement of the base 124 to a distal end of the mould 122 (e.g. a distal end of the upstanding walls 126) to eject the brickwork member from the mould 122.

[0162] In the illustrated embodiment, the base 124 is coupled to an actuation mechanism 136 for moving the base 124 with respect to the upstanding walls 126. Having an actuation mechanism 136 provides a simple means of varying the position of the base 124 relative to the upstanding walls 126.

[0163] The actuation mechanism 136 of Figure 3 is in the form of one or more linear actuators (e.g. hydraulic/pneumatic cylinders, or electric linear actuators). However, it will be understood that any suitable actuation mechanism may be provided. For example, the actuation mechanism 136 may include a winch, a linear gear arrangement (e.g. rack and pinion) or an inflatable actuation mechanism.

[0164] In some embodiments, the actuation mechanism 136 is configured to automatically move the base 124 to a desired position (e.g. a volume-defining position, or an ejecting position). Thus, the method of manufacturing the brick slip according to this embodiment includes automatically moving the base 124 to a predetermined position.

[0165] Having an actuation mechanism 136 configured to automatically move the base 124 to a desired position offers a simple and accurate means for setting a desired thickness of brickwork members produced in the mould 122 and/or for ejecting a brickwork member from the mould 122.

[0166] In some embodiments, the actuation mechanism 136 includes a position determining means to determine the position of the base 124 relative to the upstanding walls 126. For example, the position determining means may be a visual scale, a position sensor such as an encoder or potentiometer, and/or an open-loop determination means based on driving signals of the actuation mechanism. Thus, the method of manufacturing the brick slip according to this embodiment includes comparing a position of the base determined by the position determining means with a desired position, and moving the base towards the desired position if the determined position is different to the desired position.

[0167] In embodiments where the actuation mechanism 136 is automated, the method of manufacturing the brick slip may include receiving a desired position of the base 124 from a user input and moving the base 124 to the desired position with the actuation mechanism 136.

[0168] Similarly, the method of manufacturing the brick slip may include receiving a desired thickness from a user input, determining a desired position of the base 124 from the desired thickness and moving the base 124 to the desired position with the actuation mechanism 136, so as to produce a brickwork member with the desired thickness.

[0169] In some embodiments, the actuation mecha-

nism 136 is manually operated (e.g. by operation of a button, switch, lever, crank handle or the like). In such embodiments, a scale may be provided on the upstanding walls 126 to allow a visual determination of the position of the base, and thus the thickness of brickwork member that would be produced for a given position of the base 124. Thus, the method of manufacturing the brick slip may include moving the base 124 with the actuation mechanism 136, and comparing the position of the base 124 relative to the scale so as to set the position of the base 124 to produce a brickwork member with a desired thickness.

[0170] Having a manually operated actuation mechanism provides a simple means of moving the base 124 to a desired position.

[0171] Referring now to Figures 5 and 6, a mould 222, i.e. a brickwork mould 222, for use in the manufacture of brickwork members is illustrated. Common features with the mould of Figures 2 to 4 are given the prefix "2" and only differences are discussed.

[0172] The mould 222 includes a removable mould insert 220 with a textured surface 221. However, in alternative embodiments, a textured surface 223 may be provided directly on the base 224. In yet further embodiments, no textured surface is provided on the base 224 (e.g. the base 224 may define a substantially smooth surface).

[0173] The base 224 of the mould 222 defines one or more openings 238. In the illustrated embodiment, the one or more openings 238 are in the form of four slots 238 each running along the length or width of the base 224. In the illustrated embodiment, the slots 238 are each provided at a periphery of the base 224 so that they each form an opening between the base 224 and a respective side wall 226. Put another way, said one or more slots comprise four slots and the trough comprises four side walls, where an opening 238 is provided between the base 224 and each of the four side walls. In alternative embodiments, one or more slots 238 may be provided within an interior region of the base 224. In some embodiments, the slots 238 have a width in the range of 0.1mm to 1mm, e.g. in the range 0.25mm to 0.75mm.

[0174] In the illustrated embodiment, the openings 238 are arranged around a perimeter of the base 224. Adjacent openings or slots 238 are spaced apart. In some arrangements, adjacent openings 238 may be spaced apart by a distance in the range 10mm to 20mm. Put another way, each of the four slots 238 terminates at a first end 240 and a second end 242. Each of the first and second ends 240, 242 is spaced from a respective corner 244 where the base 224 meets two of the upstanding walls 226. In some embodiments, the first and second ends 240, 242 are spaced apart from a respective corner 244 by a spacing in the range 10mm to 20mm.

[0175] It will be appreciated that the brick slips manufactured using the methods described above may have a thickness in the range 10mm to 50mm, for example in the range 15mm to 30mm. Contrastingly, it will be under-

stood that a traditionally manufactured brick may have a thickness of around 100mm to 110mm. The brickwork member may define a body height of approximately 65mm along an axis extending between the first and second surfaces.

[0176] Although not illustrated, an apparatus for manufacturing brickwork members will be briefly discussed.

[0177] An apparatus for use in the manufacturing of brickwork members 30, 130 includes a brickwork mould 22, 122, 222 that may be supported on a frame. The brickwork mould 22, 122, 222 includes a base 24, 124, 224 that is provided with a textured surface, as has been described above.

[0178] The apparatus includes a dispenser for dispensing a building material into the brickwork mould 22, 122, 222. It will be appreciated that the dispenser may be positioned substantially above the brickwork mould 22, 122, 222.

[0179] In some embodiments, the dispenser includes a vertical tower having a rotating shaft with angled paddles. In this way, as building material is added to an upper end of the vertical tower the angled paddles push the clay down through the vertical tower to a die at a lower end of the tower. The die has an opening corresponding to a position of the mould 22, 122, 222 positioned below the dispenser. The opening of the die may be shaped to be slightly smaller than the base area of the mould 22, 122, 222, to ensure that building material entering the mould 22, 122, 222 does not get stuck on the upstanding walls 26, 126, 226 and/or scrape off any sand deposited on the upstanding walls 26, 126, 226 when the mould 22, 122, 222 is filled.

[0180] The apparatus is also provided with a compressor, e.g. a compressing plate, for applying pressure to deformable building material within the brickwork mould 22, 122. Through compression of the building material, the textured surface of the base is imprinted onto the building material. Furthermore, building material is pressed by the compressor into all four corners of the mould 22, 122, 222, and is compacted to reduce or eliminate voids, folds and/or faults in the brickwork member.

[0181] In some embodiments, the compressor is hydraulically driven. In other embodiments, the compressor is mechanically or electrically driven.

[0182] It will be appreciated that in arrangements where the textured surface of the brickwork mould 22, 122, 222 is provided on a removable insert 20, 120, 220, said insert 20, 120, 220 may be quickly and easily exchanged by an operator so as to change the appearance of the manufactured brickwork members. Alternatively, in arrangements where the textured surface is integrally formed with the brickwork mould 22, 122, 222, said brickwork mould 22, 122, 222 may be quickly and easily exchanged by an operator so as to change the appearance of the manufactured brickwork members. Moreover, it will be understood that the apparatus may include a plurality of brickwork moulds 22, 122, 222 such that the apparatus may contain brickwork moulds 22, 122, 222 each

having a different textured surface. This enables the apparatus to be capable of manufacturing brickwork members having a range of different surface features in a single manufacturing process.

[0183] The apparatus may include a cutting tool, such as a wire or a metal cutting tool so as to remove small excess material from the brick slip. It will be appreciated that this removal of excess material may occur whilst the building material is in the mould 22, 122, 222.

[0184] Although the teachings have been described above with reference to one or more preferred embodiments, it will be appreciated that various changes or modifications may be made without departing from the scope as defined in the appended claims.

Claims

1. A method of manufacturing brickwork members, the method comprising the steps of:

- a) creating a textured surface;
- b) providing a mould defining a base comprising the textured surface and four walls extending around said base so as to define a receptacle for receiving a building material, e.g. clay, therein;
- c) dispensing a building material into the mould; and
- d) applying pressure to the building material within the mould to form a brickwork member,

wherein the applying pressure to the building material within the mould imprints the textured surface of the base onto a surface of the brickwork member.

2. A method according to claim 1, wherein creating the textured surface comprises imparting a textured brick surface onto the base of the mould, wherein the textured brick surface is imparted onto a deformable material, optionally wherein the deformable material comprises a plastics material.
3. A method according to claim 2, wherein the deformable material comprises a resin material, for example a polyurethane resin material.
4. A method according to claim 2 or claim 3, wherein the deformable material comprises a filler material configured to increase the structural strength of the deformable material.
5. A method according to any preceding claim, wherein creating the textured surface comprises applying a deformable material to a textured brick surface and hardening/curing said deformable material and/or wherein creating the textured surface comprises producing a cast of a textured brick surface.

6. A method according to any preceding claim, wherein the base is configured to define one or more openings, e.g. slots, through the mould, optionally wherein the base is configured to define an opening between the base and each of the four walls extending around the base, optionally wherein adjacent openings are spaced apart.

7. A method according to any preceding claim, comprising the step of selecting a height of the textured surface within the mould.

8. A method according to any preceding claim, wherein the base is moveable with respect to the four walls in a direction parallel to said four walls such that the height of the textured surface in the mould is adjustable, optionally the method comprises the step of moving the textured surface to a predetermined position relative to the four walls surrounding the base.

9. A method according to claim 7 or claim 8, wherein the base is coupled to an actuation mechanism, and wherein the method comprises moving the base with the actuation mechanism so as to move the textured surface to a predetermined position relative to the four walls surrounding the base.

10. A method according to any preceding claim, wherein the brickwork member is a brick slip comprising a clay building material, optionally wherein the clay building material has a water content in the range 15% to 30%, optionally in the range 18% to 24%.

11. A method according to any preceding claim, comprising the step of inverting the mould and removing the brickwork member from said mould, wherein removing the brickwork member from the mould comprises the step of vibrating the mould and/or using pressurised air to remove the brickwork member from the mould.

12. A method according to any preceding claim, comprising the step, prior to step c), of depositing sand onto the textured surface and/or wherein step c) comprises providing a volume of building material that is substantially equal to the volume of the receptacle.

13. A method of creating a textured surface for a mould for manufacturing brickwork members, the method comprising the steps of:

- a) providing a deformable material; and
- b) creating a textured surface on the deformable material,

wherein creating the textured surface comprises replicating or duplicating a textured brick surface.

14. A mould for use in manufacturing brickwork members, the mould comprising:

a base and four upstanding walls extending
around said base so as to define a receptacle 5
for receiving a deformable building material, e.g.
clay, therein,
wherein the base comprises a textured surface
thereon.

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15. A mould according to claim 14, wherein the base is
configured to define one or more openings, e.g. slots,
through the mould, optionally wherein base is con-
figured to define an opening between the base and
each of the four walls extending around the base, 15
optionally wherein adjacent openings are spaced
apart.

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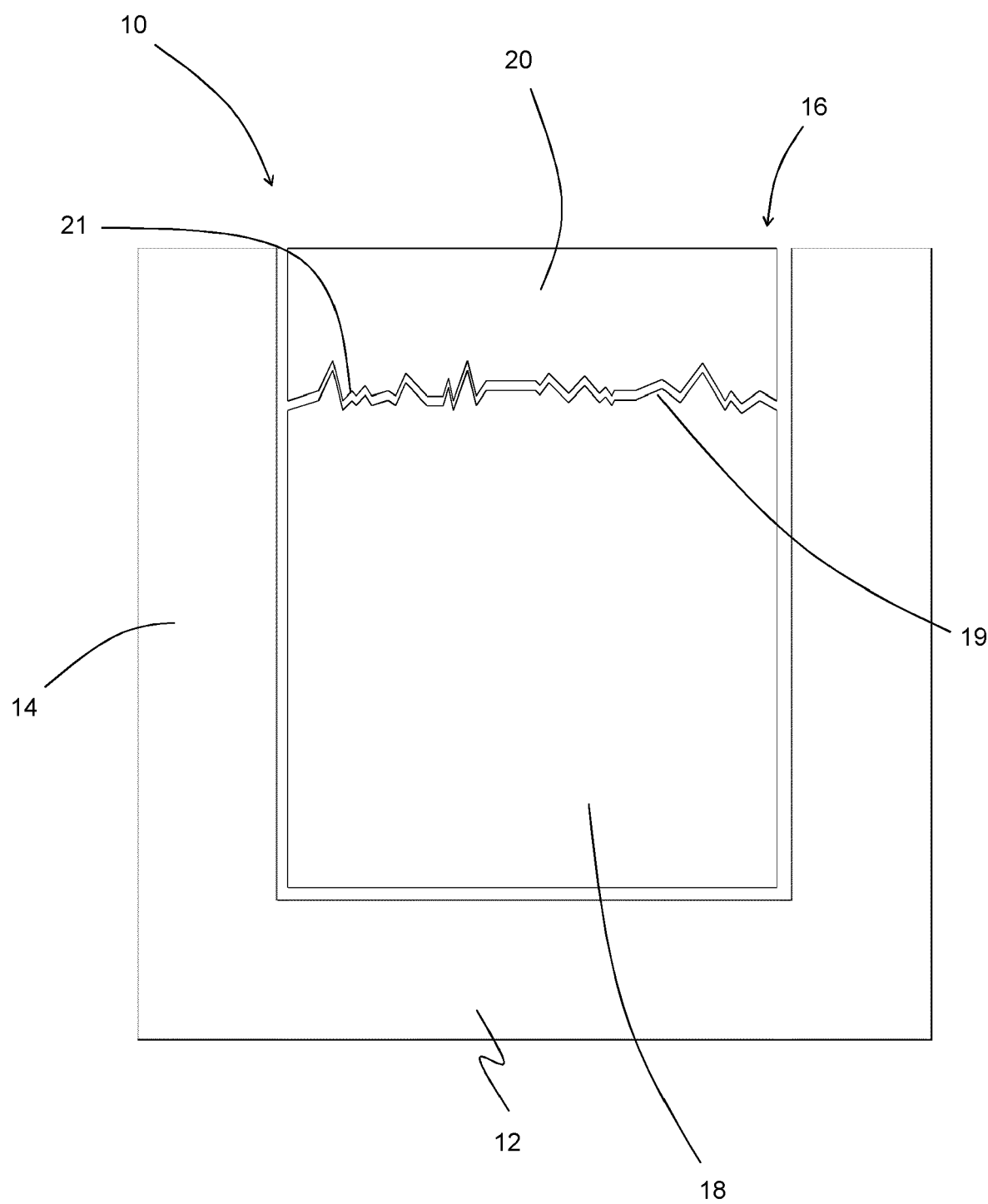


FIG. 1

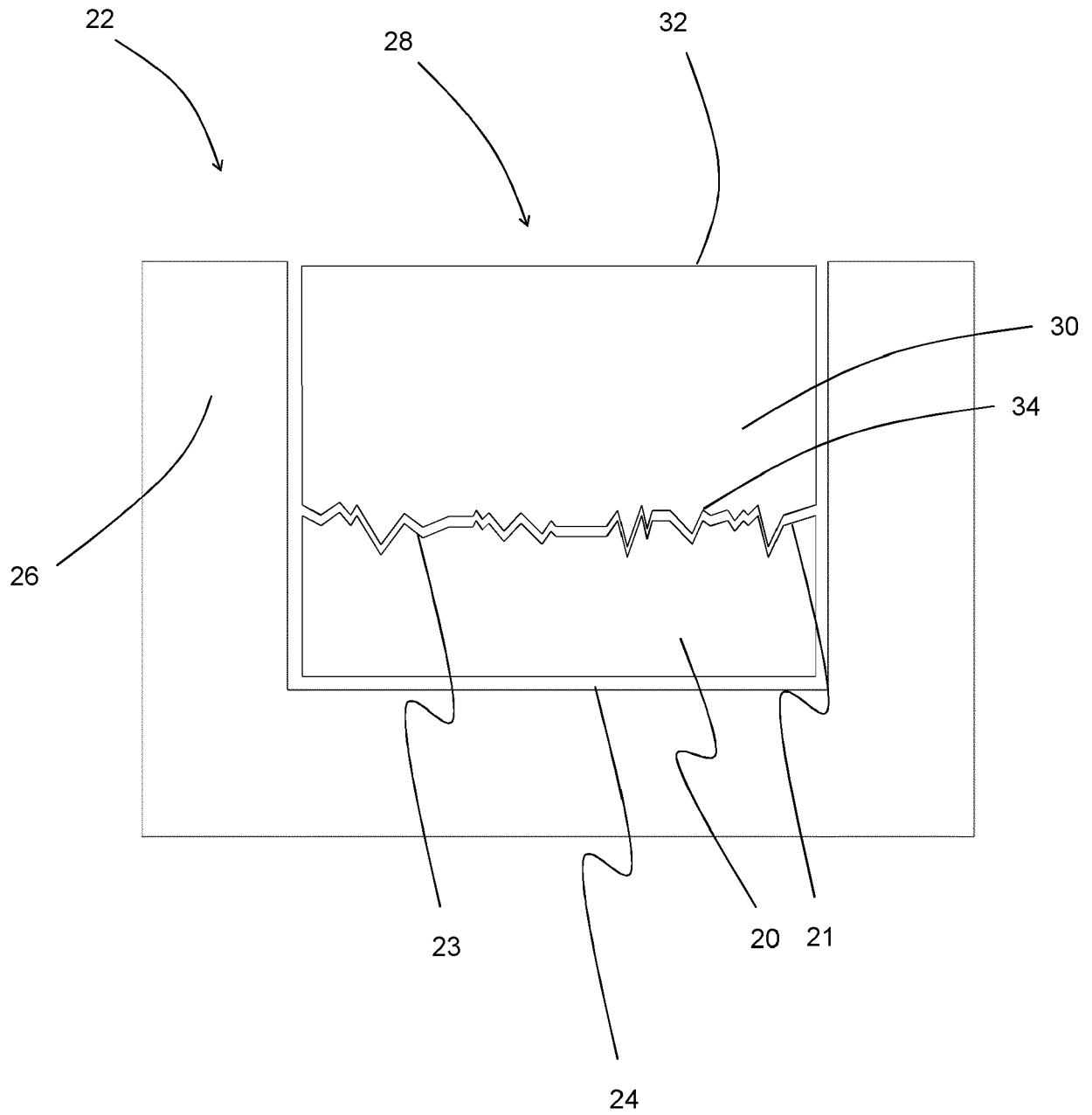


FIG. 2

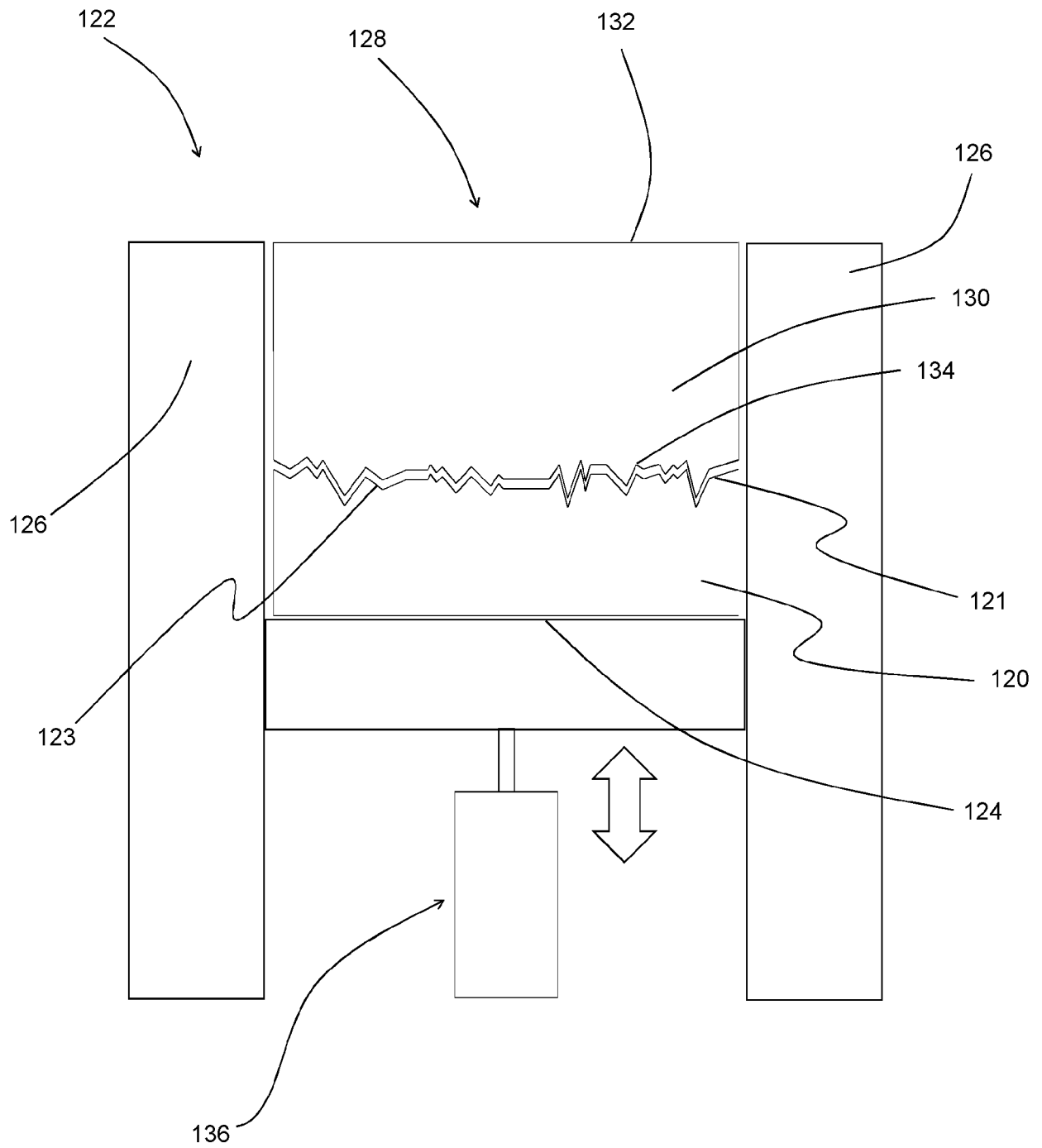
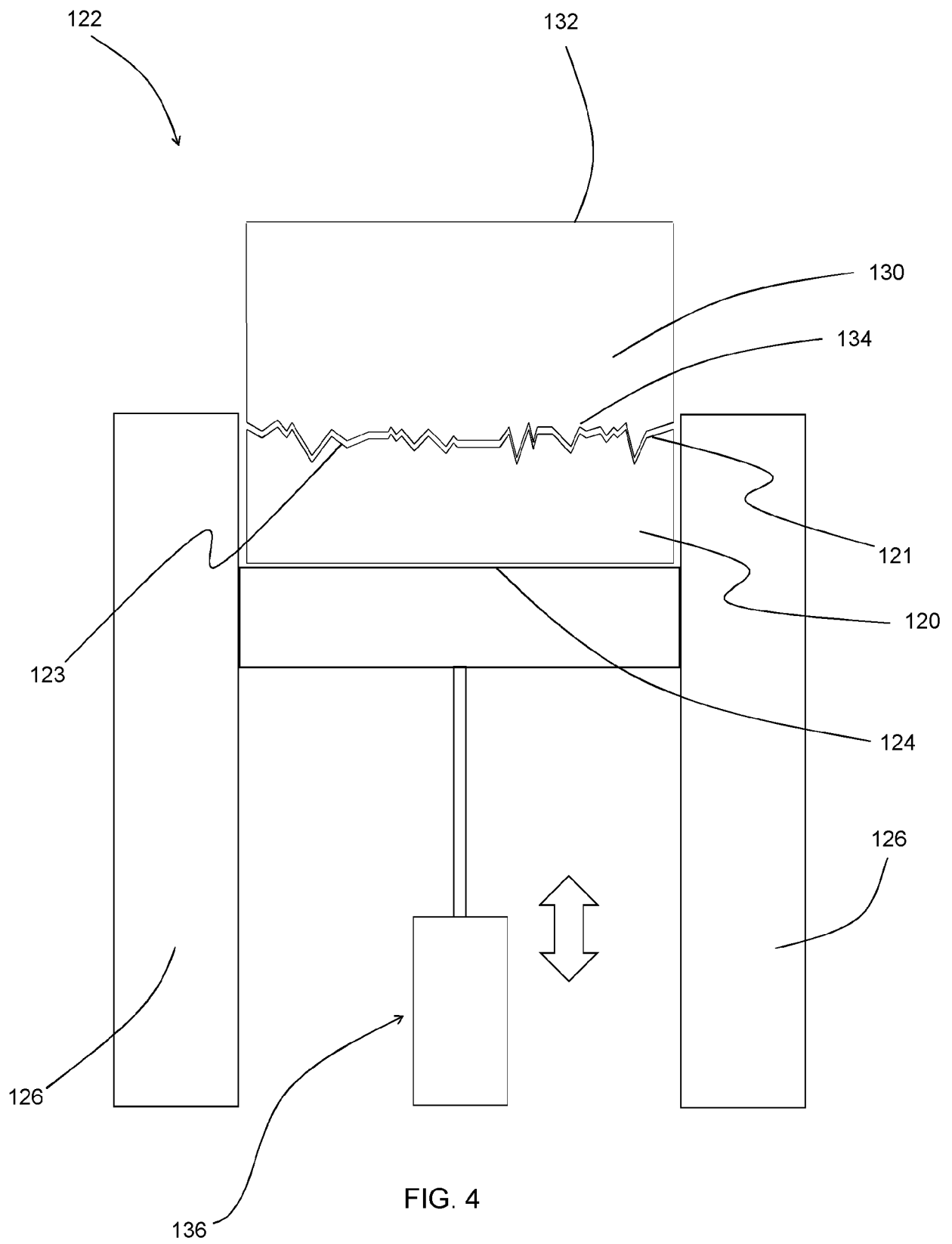


FIG. 3



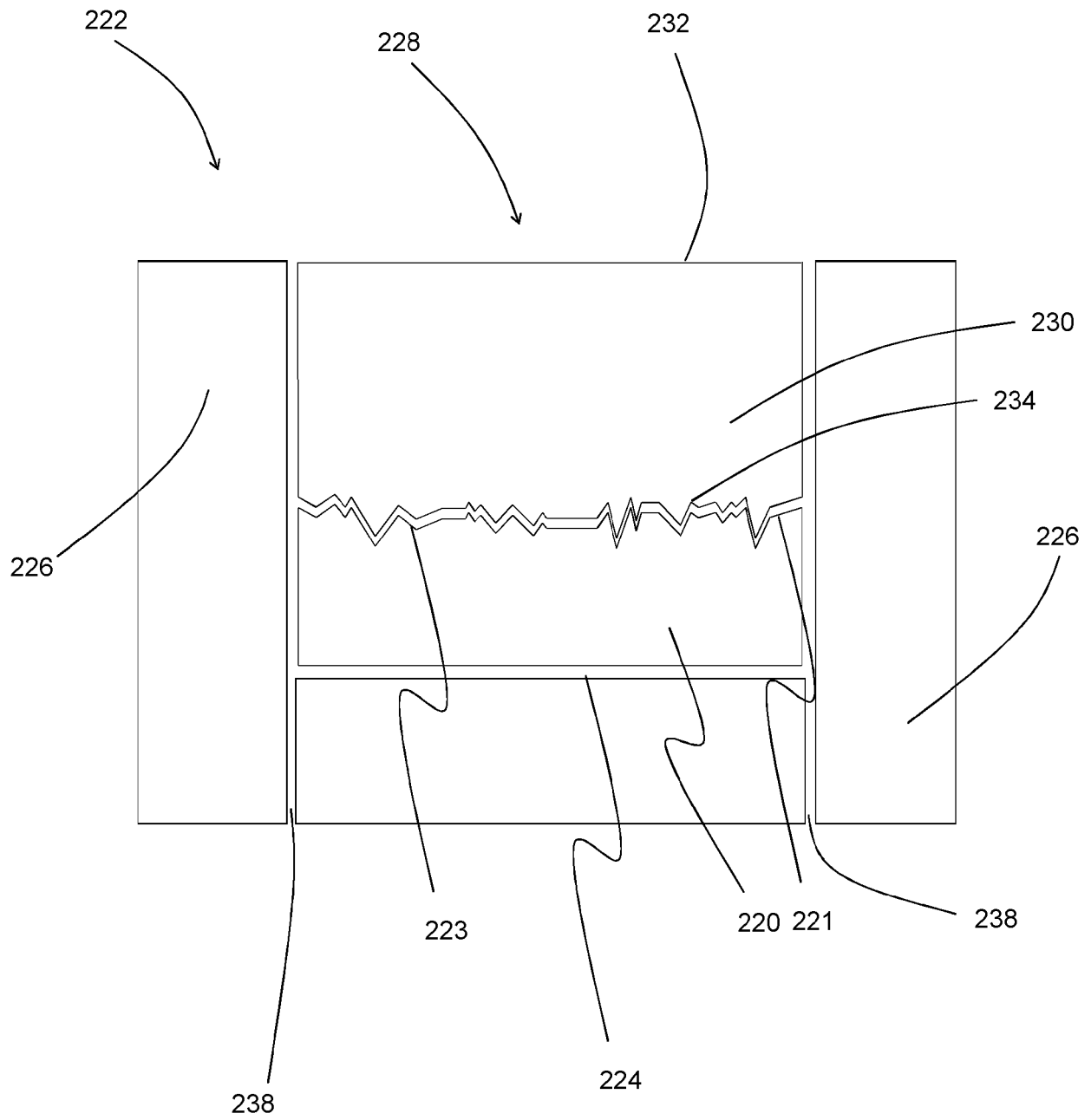


FIG. 5

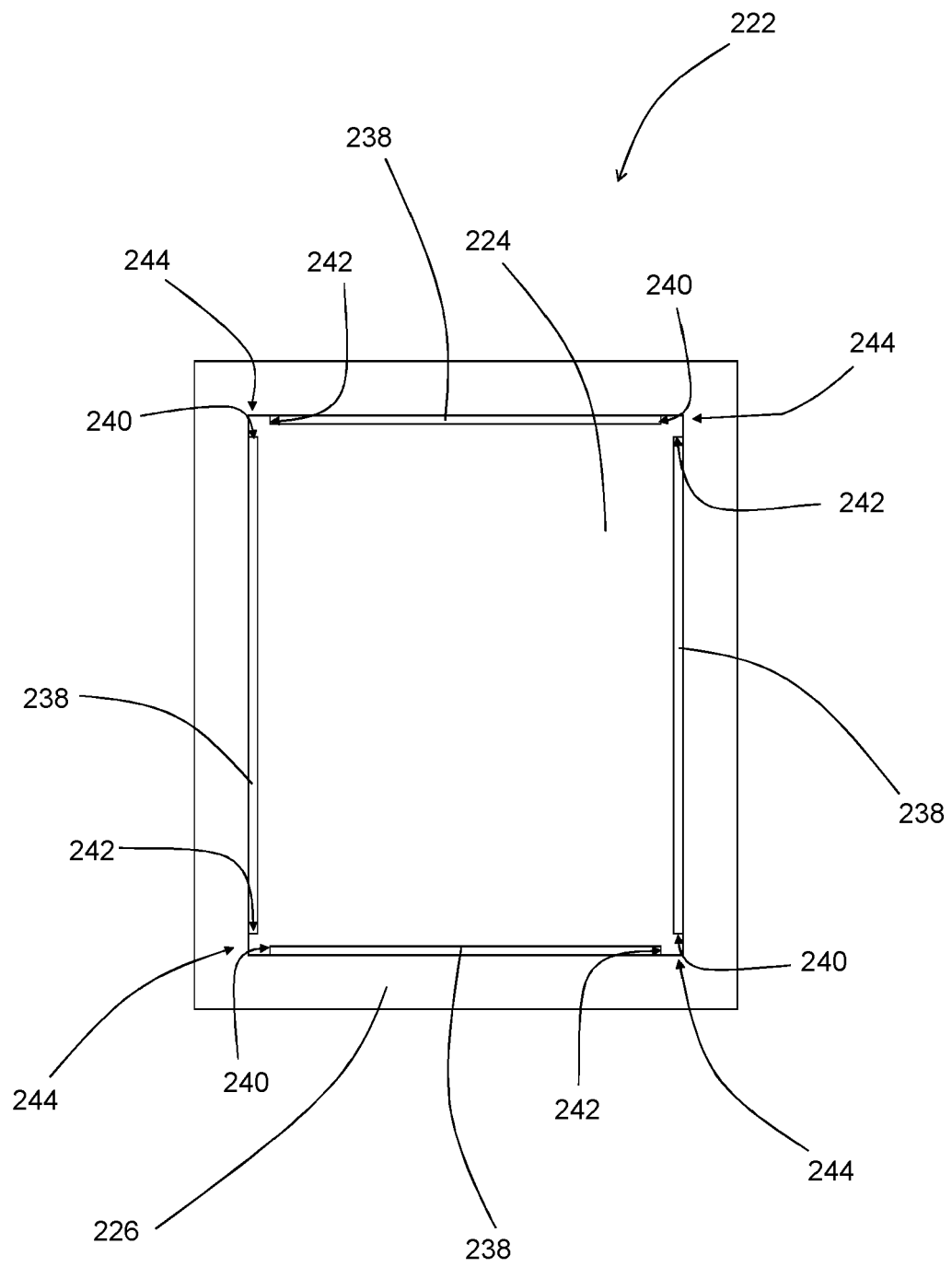


FIG. 6