

## DESCRIPTION

### TITLE OF THE INVENTION: EASY-OPEN AND LOCKING FIRE-RESISTANT CEILING ACCESS PANEL

#### TECHNICAL FIELD

[0001] The present invention belongs to the field of building decoration technology, specifically relating to a detachable access panel installed at a certain position in an indoor ceiling, particularly concerning an easy-open and locking fire-resistant ceiling access panel.

#### BACKGROUND OF THE INVENTION

[0002] Modern constructions often install various mechanical, electrical, piping, and fire-fighting equipment beneath the floor slabs, which are then covered with fire-resistant ceilings to comply with legal and regulatory requirements. The function of the fire-resistant ceiling is to prevent the spread of fire to the interior of the ceiling during a fire incident, ensuring that the equipment hidden within the ceiling continues to function normally, thereby reducing casualties and property loss. For the convenience of maintenance and inspection of the aforementioned facilities, ceilings typically require the installation of access panels. These access panels also need to meet fire protection standards (such as BS 476-22 and EN 1364-1, etc.), and their design must consider fire resistance and insulation performance.

[0003] An existing type of fire-resistant access panel usually consists of several fire-resistant boards stacked and assembled together, fixed directly to the ceiling's framework with screws. However, this design is cumbersome to operate as it requires unscrewing when opening, and the fire-resistance access panel is usually quite heavy. Given the abundance of equipment concealed within modern ceilings and the corresponding frequent maintenance, the

repeated installation and removal of the panel present significant safety risks and often require two people to complete the task. Additionally, the continuous drilling and screwing of screws into the four sides of the fire-resistant access panel and the ceiling framework would damage the structure of the access panel and the framework, thereby affecting the strength and fire resistance of the framework as well as the overall decorative effect of the ceiling.

[0004] In view of the above problems, the present invention aims to provide an easy-open and locking fire-resistant ceiling access panel to address the many inconveniences and safety hazards present in existing technologies. By improving material selection, structural design, and installation methods, the invention aims to provide a lightweight and reliable access panel that allows maintenance personnel to easily enter the ceiling for inspection and repair work, while ensuring that the fire-resistance performance and overall decorative effect of the ceiling are not compromised.

#### BRIEF SUMMARY OF THE INVENTION

[0005] In response to the problems existing in the conventional fire-resistant ceiling access panels, the purpose of this invention is to provide an easy-to-use access panel with effective fire-resistant performance, which, when tested according to BS 476-22:1987, has at least one hour of fire resistance, as well as an aesthetically pleasing appearance that can be permanently fixed in the ceiling, and is coordinated with the overall ceiling design, namely a fire-resistant ceiling access panel. The fire-resistant ceiling access panel comprises a frame being rectangular in shape; an access door being rectangular in shape having four edges; a pair of hinges attaching to a pair of opposite edges of the access door, connecting the access door to the frame.

[0006] The frame comprises a frame shell being rectangular in shape, having a plurality of rectangular cavities, comprising a notch; a sealing gasket ring attaching to the periphery of the notch of the frame shell; a frame top plate

attaching on top of the frame shell having a notch aligning to and smaller in size than the notch of the frame shell; a frame bottom plate attaching underneath the frame shell having a notch aligning to and in the same shape of the notch of the frame shell.

[0007] The access door comprises a door shell having a plurality of rectangular cavities; a door top plate attaching on top of the door shell having the same periphery thereof; a door bottom plate attaching underneath the door shell having the periphery larger than the notch of the frame bottom plate.

[0008] Such a fire-resistant ceiling access panel must include certain components to provide the required fire-resistant performance. The access panel must not have any gaps when closed, and there should be no gaps where it connects to the ceiling. This reduces the ability for flames or heat to pass through these gaps. Therefore, these gaps must be filled with a sealing material with a suitable high melting point to provide the required level of protection.

[0009] As mentioned above, this fire-resistant ceiling access panel must be sealed to the ceiling, and during a fire, it should not allow any significant heat and/or flames to pass through the opening of the ceiling cut-out section. To that end, the frame top plate contacts the door top plate, the frame bottom plate contacts the door bottom plate, the sealing gasket ring contacts the door top plate, the frame shell enfolds rock mineral wool material, the door shell enfolds rock mineral wool material, the access door enfolds rock mineral wool material. The construction of the fire-resistant ceiling access panel is sealed to the ceiling, and it has fire resistance when tested according to BS 476-22:1987.

[0010] The fire-resistant ceiling access panel should be made of materials that can withstand the high temperatures associated with residence fires (e.g. 1000 degrees Celsius) caused by a fire. Preferably, the frame shell and the door shell should be made of steel. The frame top plate, the frame bottom plate, the

door top plate, the door bottom plate should be made of calcium silicate. The insulating material wrapped around the frame, door shell, access door should be made of mineral wool. The sealing gasket ring should be made of rubber and graphite.

[0011] The access door comprises a lock locking the access door to the frame.

[0012] Essentially, the inventive fire-resistant ceiling access provides effective fire resistance at every vulnerable point for heat and flame could potentially pass. The materials, components and design play a crucial role in fulfilling all these required characteristics. In particular, it is able to offer convenience in use and fire-resistant performance in a fire-resistant ceiling access panel.

[0013] Compared with traditional fire-resistant ceiling access panel, this invention has the following advantages:

[0014] Aesthetic appearance: The frame and access door can be designed and manufactured according to needs, making them coordinate with the overall ceiling and not affecting the overall decorative effect.

[0015] Effective fireproofing: The access door comprises calcium silicate board and rock mineral wool material, which has good fire-resistant performance and can effectively prevent the spread of fire.

[0016] Convenient maintenance: The fire-resistant ceiling access panel is permanently installed and fixed on the ceiling, comprising a frame and an access door, and uses a concealed lock mechanism, allowing the access door to be easily opened and reliably locked. No tools are needed, making it simple to operate.

[0017] Safety and reliability: The frame is made of rectangular steel tubing, providing a stable structure and good load-bearing capacity. Stainless steel

hinges and the concealed lock mechanism ensure the stability and safety of the access door.

[0018] This invention of a concealed hinge & lock fire-resistant ceiling access panel is suitable for various building locations, such as commercial buildings, office building, hotels, hospitals, schools, etc. It can be conveniently installed on suspended ceilings and provides reliable fire protection and easy maintenance functionality, meeting the requirements for fire protection in buildings.

#### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0019] FIG. 1 is a front elevation view of a fire-resistant ceiling access panel;

[0020] FIG. 2 is a rear elevation view thereof;

[0021] FIG. 3 is a fragmentary cross-sectional view taken along lines 3-3 in FIG. 1;

[0022] FIG. 4 is a fragmentary cross-sectional view taken along lines 4-4 in FIG. 1 in the access door closed position;

[0023] FIG. 5 is a fragmentary cross-sectional view taken along lines 4-4 in FIG. 1 in the access door open position;

[0024] FIG. 6 is a fragmentary view thereof installed with a ceiling in the access door closed position;

[0025] FIG. 7 is a fragmentary view thereof installed with a ceiling in the access door open position;

[0026] FIG. 8 is an enlarged view of an area circumscribed in FIG. 3;

[0027] FIG. 9 is an enlarged view of an area circumscribed in FIG. 4; and

[0028] FIG. 10 is an enlarge view of an area circumscribed in FIG. 6.

#### DETAILED DESCRIPTION OF THE INVENTION

[0029] As shown in FIG. 1 and FIG. 2, the fire-resistant ceiling access panel 100 comprises a frame 110 being rectangular in shape; an access door 120 being rectangular in shape having four edges; a pair of hinges 130 attaching to a pair of opposite edges of the access door 120 connecting the access door 120 to the frame 110.

[0030] As shown in FIG. 3, and FIG. 8, the said frame 110 comprises a frame shell 111 being rectangular in shape, having a plurality of rectangular cavities, comprising a notch; a sealing gasket ring 116 attaching to the periphery of the notch of the frame shell 111; a frame top plate 112 attaching by screws on top of the frame shell 111 having a notch 115 aligning to and smaller in size than the notch of the frame shell 111; a frame bottom plate 113 attaching by screws underneath the frame shell 111 having a notch aligning to and in the same shape of the notch of the frame shell 111.

[0031] The said access door 120 comprises a door shell 121 having a plurality of rectangular cavities; a door top plate 122 attaching by screws on top of the door shell 121 having the same periphery thereof 121; a door bottom plate 123 attaching by screws underneath the door shell 121 having the periphery larger than the notch of the frame bottom plate 113.

[0032] As shown in FIG. 4 and FIG. 9, The frame top plate 112 contacts the door top plate 122, the frame bottom plate 113 contacts the door bottom plate 123, the sealing gasket ring 116 contacts the door top plate 122, the frame shell 111 enfolds rock mineral wool material 114, the door shell 121 enfolds rock

mineral wool material 124, the access door 120 enfolds rock mineral wool material 125 when the access door 120 is in closed position. The configuration of the fire-resistant ceiling access panel 100 seals against the ceiling and achieve the fire resistance ability when tested under BS 476-22:1987.

[0033] The fire-resistant ceiling access panel 100 should be made from materials that can withstand the high temperatures associated with residence fires (e.g. 1000 degrees C.). Preferably, the frame shell 111 and the door shell 121 should be made of steel. The frame top plate 112, the frame bottom plate 113, the door top plate 122, the door bottom plate 123 should be made of calcium silicate. The sealing gasket ring 116 should be made of rubber and graphite.

[0034] As shown in FIG. 2, FIG. 5, FIG. 7, the access door 120 comprises a lock 140 locking the access door 120 to the frame 110. The hinges 130 allow the opening and closing of the access door 120.

[0035] FIG. 6, FIG. 7, FIG. 10 depict a way of installation of the fire-resistant ceiling access panel 100 to a ceiling by screws.

[0036] The invention is not intended to be limited to the preferred versions of the invention described above, but rather is intended to be limited only by the claims set out below. Thus, the invention encompasses all different versions that fall literally or equivalently within the scope of these claims.

## CLAIMS

What is claimed is:

1. A fire-resistant ceiling access panel comprising:
    - a frame being rectangular in shape;
    - an access door being rectangular in shape having four edges;
    - a pair of hinges attaching to a pair of opposite edges of the access door connecting the access door to the frame;
    - the frame comprising:
      - a frame shell being rectangular in shape, having a plurality of rectangular cavities, comprising a notch;
      - a sealing gasket ring attaching to the periphery of the notch of the frame shell;
      - a frame top plate attaching on top of the frame shell having a notch aligning to and smaller in size than the notch of the frame shell;
      - a frame bottom plate attaching underneath the frame shell having a notch aligning to and in the same shape of the notch of the frame shell;
    - the access door comprising:
      - a door shell having a plurality of rectangular cavities;
      - a door top plate attaching on top of the door shell having the same periphery thereof;
      - a door bottom plate attaching underneath the door shell having the periphery larger than the notch of the frame bottom plate;
- wherein,
- the frame top plate contacts the door top plate,
  - the frame bottom plate contacts the door bottom plate,
  - the sealing gasket ring contacts the door top plate,
  - the frame shell enfolds rock mineral wool material,
  - the door shell enfolds rock mineral wool material,
  - the access door enfolds rock mineral wool material,



the fire-resistant ceiling access panel exhibits at least one hour of fire resistance when tested under BS 476-22:1987.

2. The fire-resistant ceiling access panel of claim 1, wherein the access door further comprises a lock locking the access door to the frame.
3. The fire-resistant ceiling access panel of claim 1, wherein the frame shell is made of steel.
4. The fire-resistant ceiling access panel of claim 1, wherein the frame top plate is made of calcium silicate.
5. The fire-resistant ceiling access panel of claim 1, wherein the frame bottom plate is made of calcium silicate.
6. The fire-resistant ceiling access panel of claim 1, wherein the sealing gasket ring is made of rubber and graphite.
7. The fire-resistant ceiling access panel of claim 1, wherein the door shell is made of steel.
8. The fire-resistant ceiling access panel of claim 1, wherein the door top plate is made of calcium silicate.
9. The fire-resistant ceiling access panel of claim 1, wherein the door bottom plate is made of calcium silicate.

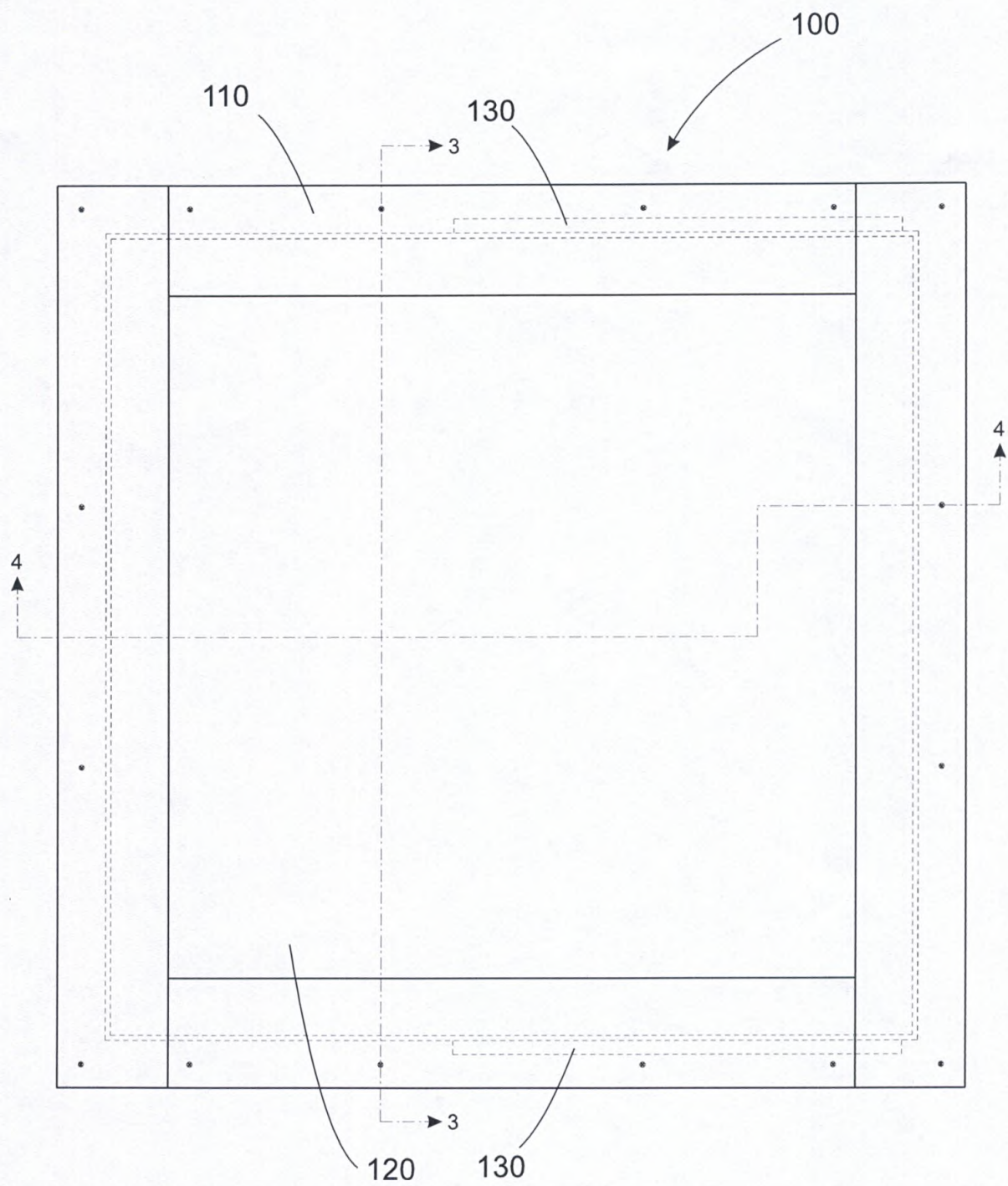


FIG. 1



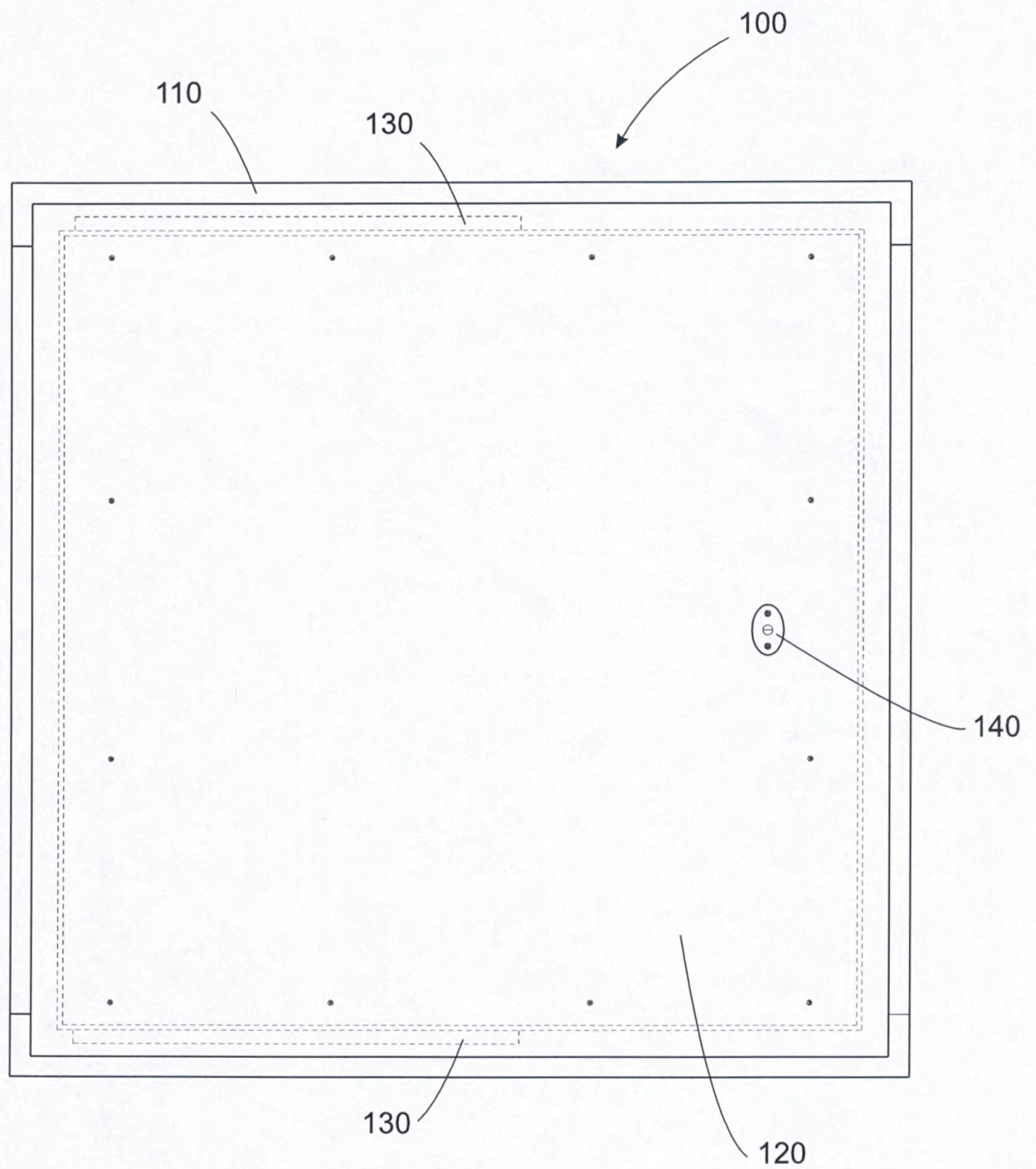


FIG. 2



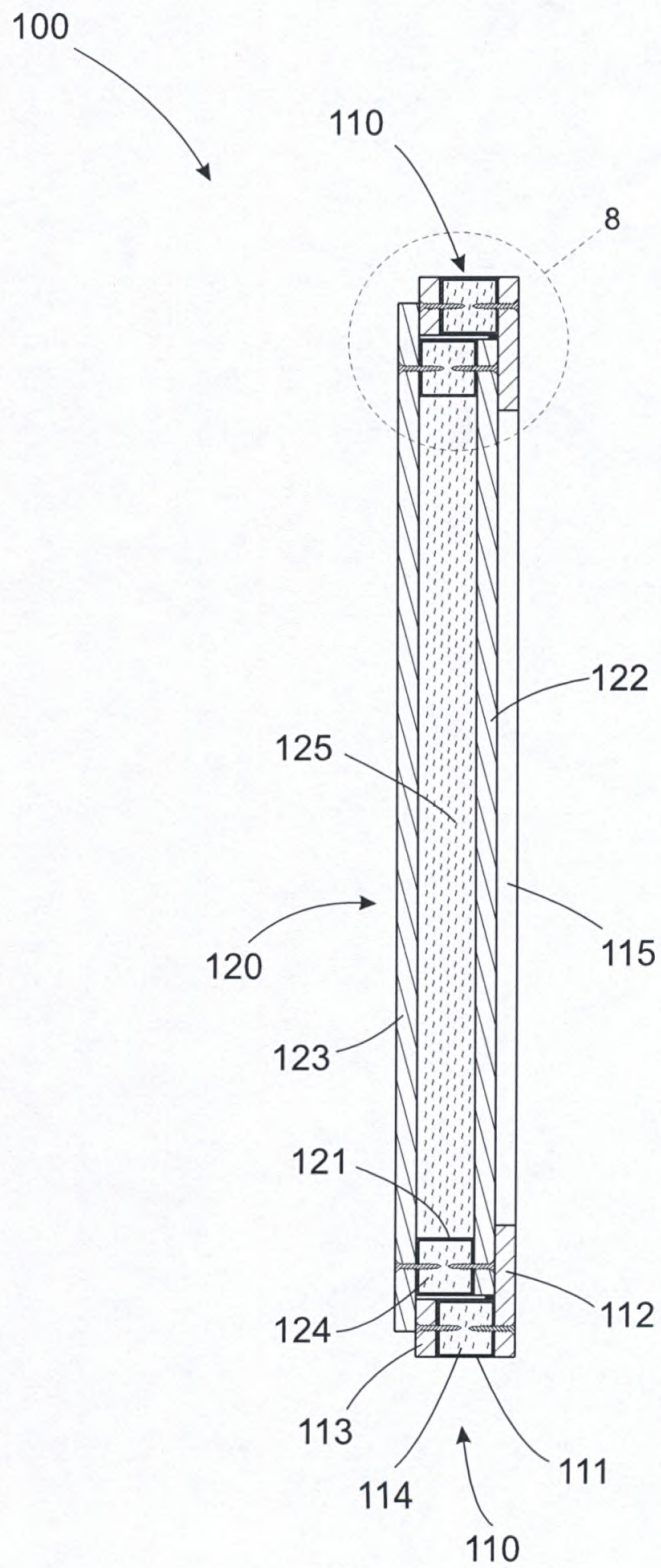


FIG. 3



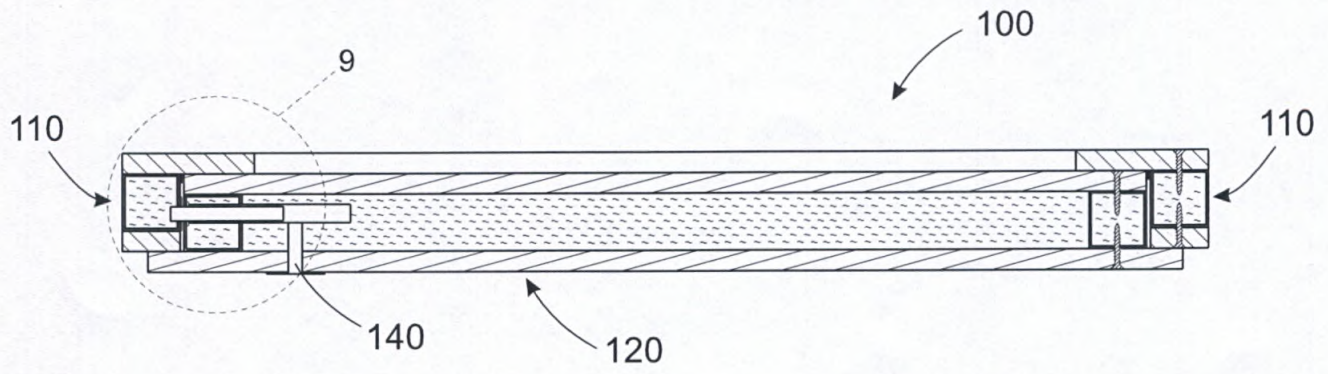


FIG. 4

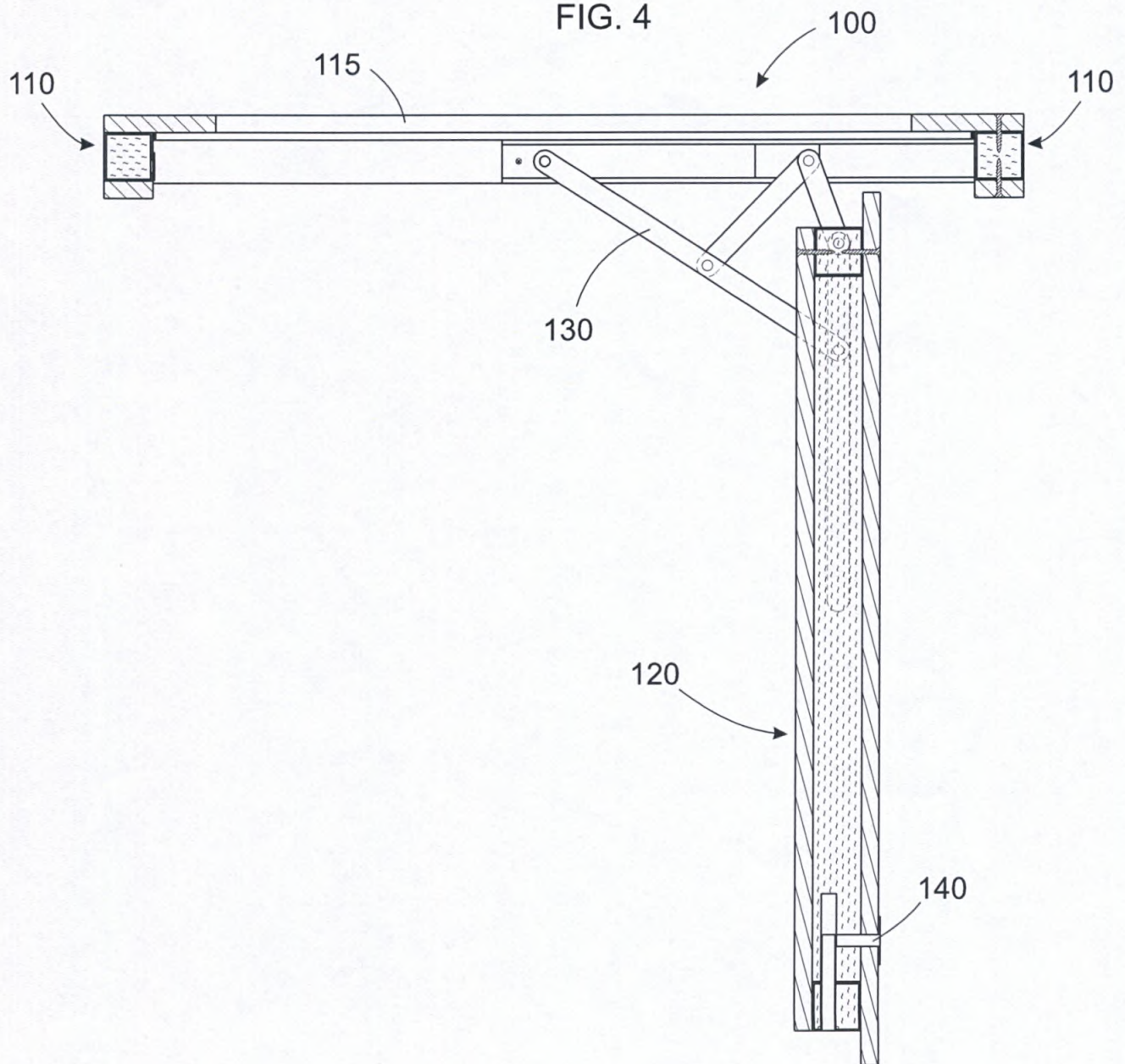


FIG. 5



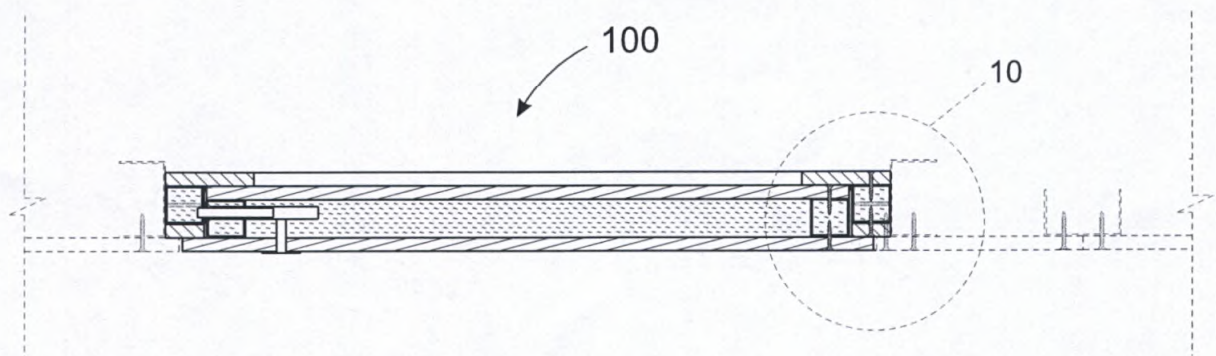


FIG. 6

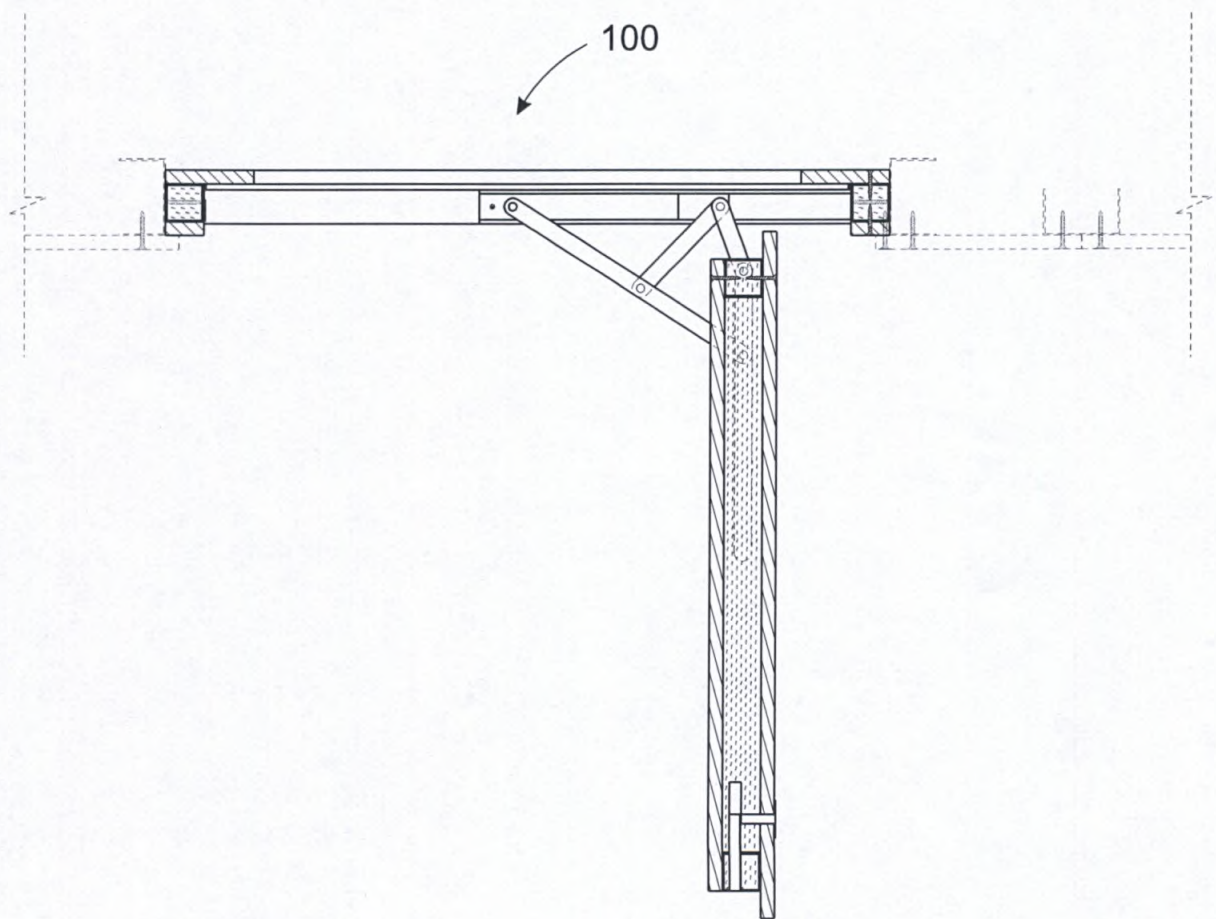


FIG. 7



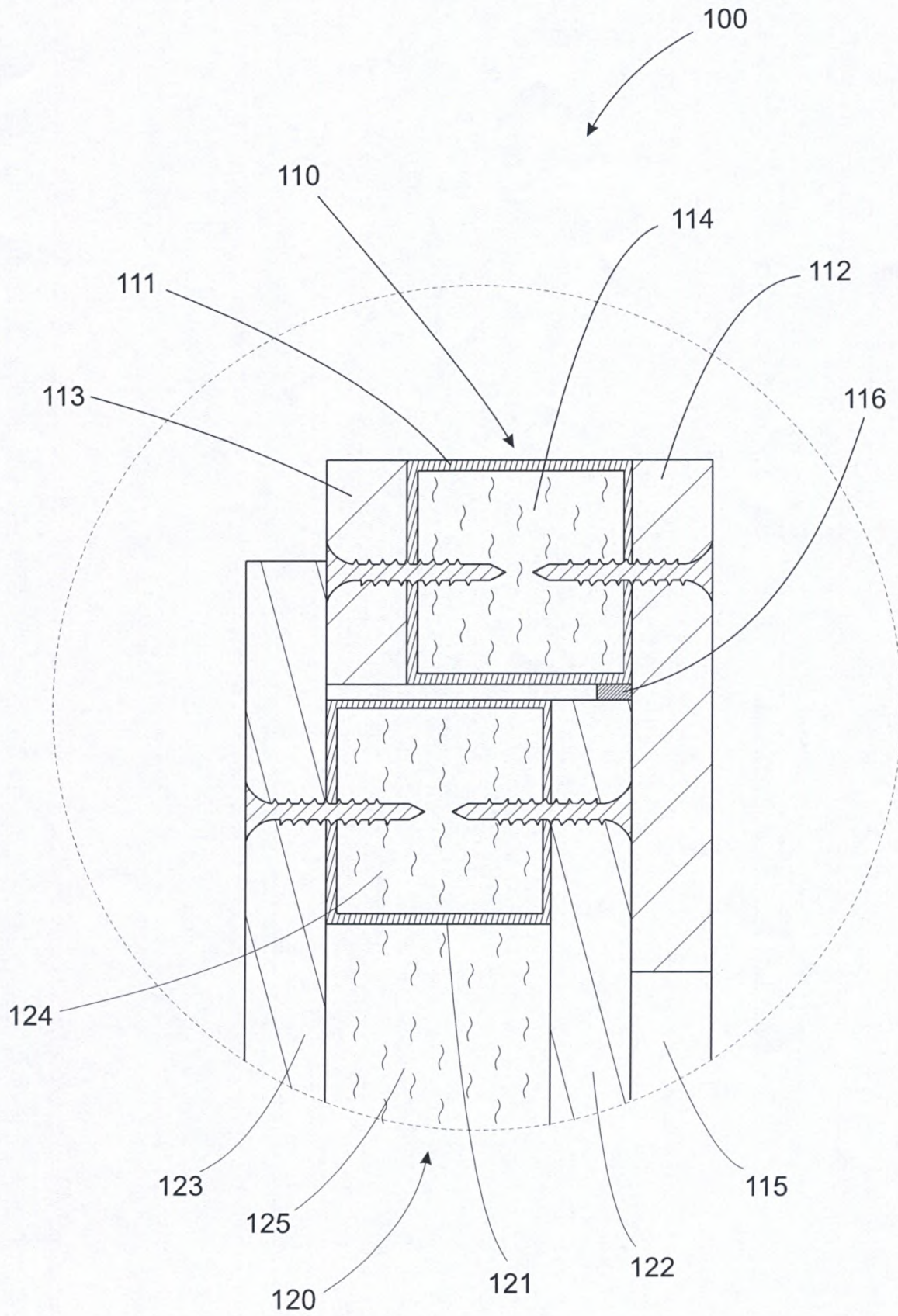


FIG. 8



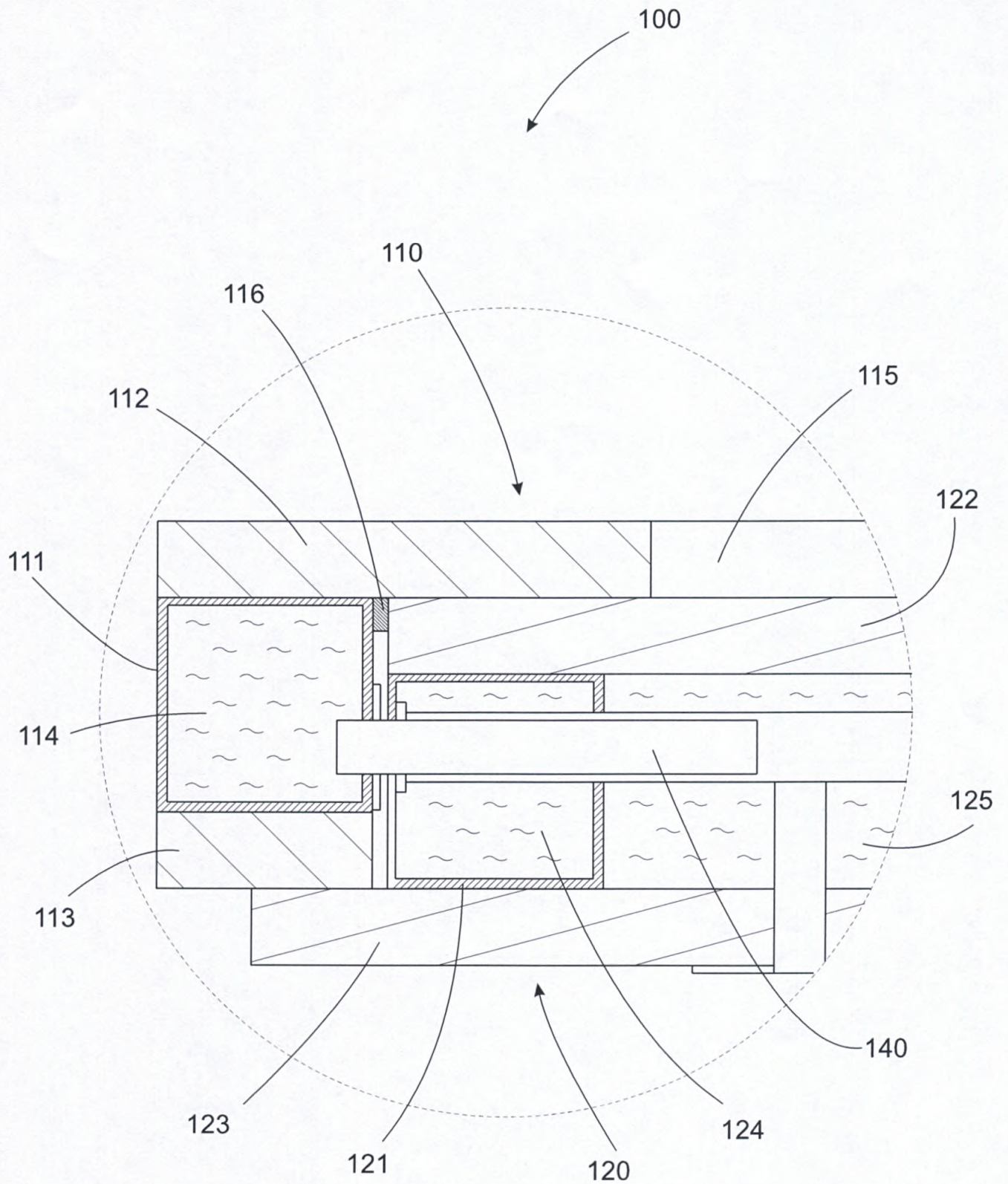


FIG. 9



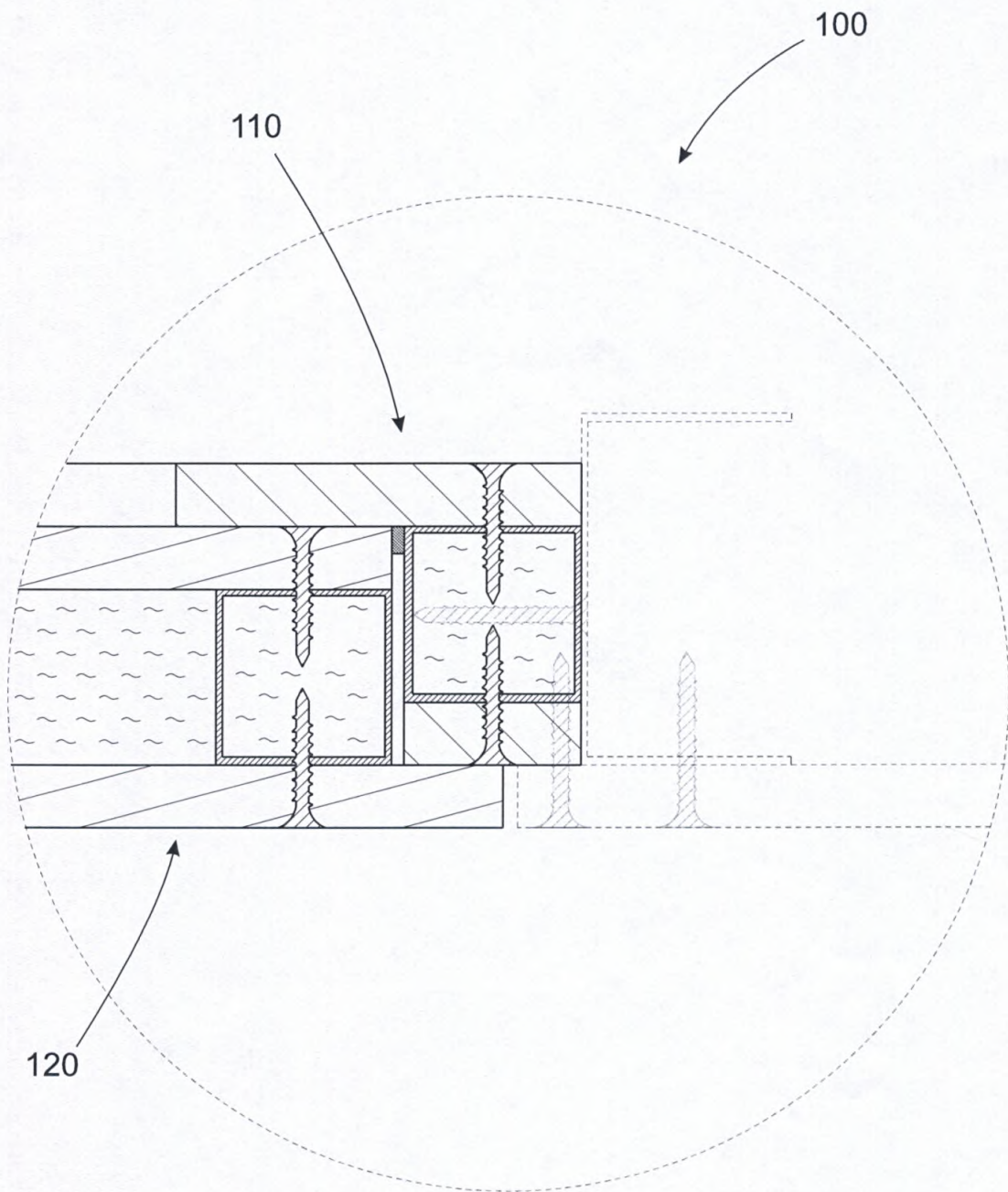


FIG. 10