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(71) Applicant: **Prototipo S.r.l.**
38068 Rovereto (TN) (IT)

(72) Inventor: **SCOFANO, Antonio**
Rovereto (TN) (IT)

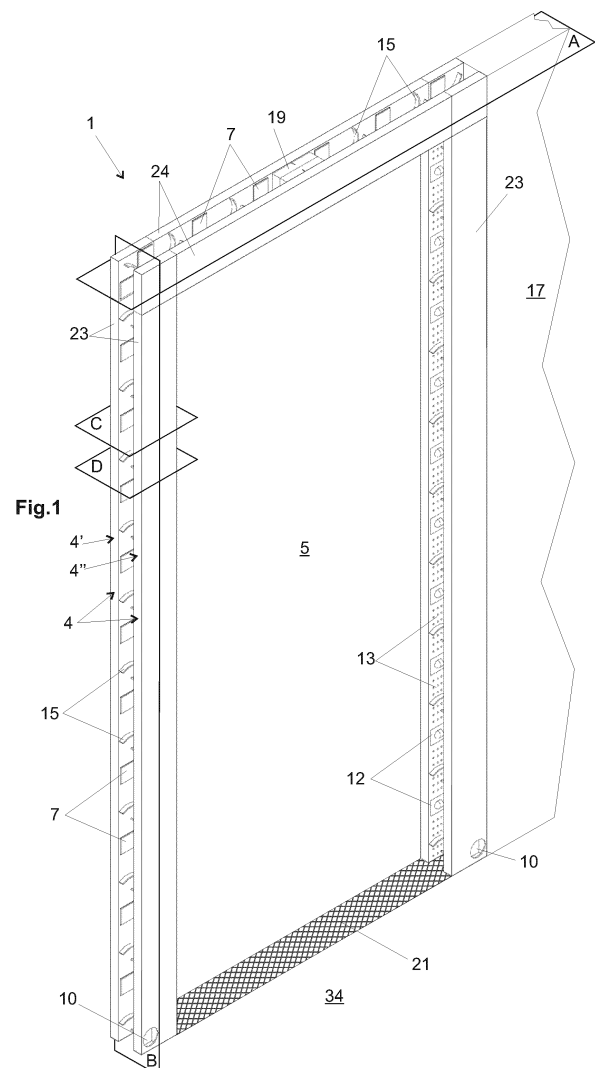
(74) Representative: **Leganza, Alessandro**
Via Sottopasso, 14
36040 Torri di Quartesolo (VI) (IT)

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(54) **FRAME ASSEMBLY FOR DOORS OR WINDOWS AND RELATIVE FRAME**

(57) Frame assembly (1) for supporting a movable door (2) comprising a frame (4) attachable to a wall (17) of an room (3), said frame (4) being provided with an opening (5) that is closed by said door (2) when said door (2) is in a closed position and that is open when said door (2) is in an open position; said frame (4) being shaped so as to overlap at least in part with said door (2) when said door (2) is in said closed position so to realize a gap (6) between the frame (4) and the door (2) enabling a flow of air from one front to another of the frame (4); wherein said frame (4) comprises one or more thermo-electric devices (7) configured to heat/cool the air flowing in said gap (6) between the frame (4) and the door (2).

Fixture (20) comprising a frame assembly (1) according to present invention and a door (2).



Description

TECHNICAL FIELD

[0001] The present invention relates to a frame for windows or doors for buildings. In particular, it concerns frames for fixtures capable of enabling an exchange of air with the outside. The present invention also relates to a fixture for the controlled exchange of air in a room.

BACKGROUND ART

[0002] Many types of frames for doors and windows are known in the state of the art. Some of these allow, through passage channels on the frame, the transit of air from the outside to the inside of an environment/room. Some of these frames equipped with air passage channels are used in environments with forced suction to prevent the rooms from going into depression.

[0003] In this type of fixtures, the air is free to flow from or to outside. Through these channels, in addition to entering air, also noise enters. In addition, cold air in winter and hot air in summer enters through these channels, negatively contributing to the energy efficiency of the environment.

[0004] It is also known from the document WO2019230988 a window frame in which the frame is equipped with a hot air ventilation system. In the solution presented in this document, the air is blown from the frame to touch the glass of the fixture, that is towards its face visible from the environment. This frame heats the glass and consequently the environment, but not the air that leaks between the glass and the frame.

[0005] In normal windows, the air that leaks into the space between the window/door and its frame is blocked or limited by one or more gaskets. Normal windows try to target the least possible leakage of air from the outside.

[0006] This aspect creates, in environments without forced ventilation, an almost hermetic seal of the room. Since each person breathes about a litre of water per day, in the form of water vapour, in an environment equipped with high thermal performance fixtures, a lot of humidity is created, which can stain the masonry and create other inconveniences.

[0007] To eliminate this humidity, forced air suction systems are added which, in addition to being expensive, can compromise the energy efficiency of the environment/room.

[0008] These systems also require specific ducts that need periodic cleaning to avoid hygienic, allergic and bacterial problems. Furthermore, these systems equipped with known forced suction systems are centralized and therefore do not discriminate the environments where windows or doors are open, consuming electricity unnecessarily.

[0009] As an alternative to the aforementioned forced air suction systems, solutions are known in which openings are made in the masonry that allow the passage of

air between the environment and the outside. This type of solution can include fans and enthalpy recuperators to reduce the loss in terms of thermal efficiency of the environment. These systems are expensive, bulky and above all increase the entry of noise from the external environment.

[0010] It is also known from document EP3372908 an air circulation system from the outside to the inside of an environment and vice versa which, in addition to allowing the exchange of air, allows not to vary the temperature of the environment. This solution is essentially a traditional type frame to which an enthalpy exchanger such as the one mentioned in the previous paragraph has been attached. This solution is not compact, thus capable of supplanting the current existing fixtures. Furthermore, this solution is expensive, since to a traditional type frame is added an air recirculation device, thus including gaskets and shaped in a complex way.

[0011] There are no compact size frames and fixtures that allow the entry of air from the outside without compromising the thermal efficiency of an environment in the state of the art. There are also no solutions available that achieve the previous advantage without worsening the sound insulation of an environment. Finally, there are no frames and fixtures available that allow to obtain the aforementioned advantages by using doors with extremely simple shapes, thus allowing the fixture to have a competitive cost compared to traditional ones.

SUMMARY

[0012] A first scope of the present invention is to provide a frame assembly capable of supporting a door in order to close a room. Said frame assembly comprises a frame which can be anchored to a wall of a room. Said frame is provided with an opening that is closed by said door when said door is in a closed position and which is open when said door is in an open position. Said frame is shaped so to overlap at least in part with said door when said door is in said closed position so to realize an interspace, i.e. a gap or open space, between the frame and the door configured to allow an air passage from one front of the frame to the other. Said frame comprises one or more thermoelectric devices configured to heat/cool the air flowing in said gap between the frame and the door. The room is therefore in constant fluid communication with the external environment and a flow of air can enter the room from the outside, allowing a continuous exchange of air. This flow is heated or cooled, depending on the season, in order to not reduce the thermal efficiency of the room. The cavity also has a tortuous shape to limit and dampen the sound waves coming from the external environment.

[0013] Preferably said frame can comprise at least one channel configured to allow the transit of exhausted air present in the room to the external environment. Said at least one channel can be shaped to cross the frame from one side to the other. In this way, a further fluid exchange

can take place between the room and the external environment to eliminate the exhausted air of the room. This second flow is opposite to the previous one as it allows the passage of air from the room to the external environment.

[0014] In particular, said one or more thermoelectric devices can be arranged along said channel in order to transfer heat between the air passing through said channel and the air flowing in said gap present between the frame and the door. This heat exchange between the channel and the gap, or vice versa, allows to considerably reduce the temperature difference across the thermoelectric devices and therefore the work performed by said devices.

[0015] Preferably said at least one channel can comprise an inlet on one front of the frame that faces the room and an outlet on the opposite front of the frame, thus towards the external environment. In particular, said at least one channel may comprise ventilation means to force the passage of air inside the channel, from the inside to the outside of the room. In this way, the expulsion of exhausted air to the external environment is achieved.

[0016] Advantageously, said frame can comprise one or more air pumps configured to pump the air flowing in said gap between the frame and the door. In this way, the air pumping from the external environment into the room is facilitated. In particular, this effect is obtained when the air pumps push the air towards the room.

[0017] Preferably said frame comprises a plurality of holes configured to put in fluid communication said gap between the frame and the door with at least one chamber arranged in the frame. These access holes to said chamber/s allow to trap the sound and to provide an inlet for the air pumped by said air pumps.

[0018] In particular, filters can be arranged in correspondence with said holes to filter the air that enters the chamber through said holes.

[0019] In particular, said frame can comprise one or more deflectors configured to direct the passage of air in the gap between the frame and the door. In this way, the air is directed as needed. In addition, the shape of the deflectors itself contributes to the absorption of noise from the external environment.

[0020] Said frame can also comprise means for moving said door with respect to said frame, to allow its opening/closing.

[0021] A second object of the present invention is to provide a fixture comprising a frame according to the first object of the present invention and a door. In this way, a fixture completely similar to the traditional ones is obtained.

[0022] The term fixture means a door or window complete with a sliding or hinged door, connected to a frame assembly having its own frame.

[0023] These and other advantages will become clearer in more detail from the description, given below, of an example of embodiment given by way of non-limiting example with reference to the attached drawings.

DESCRIPTION OF THE DRAWINGS

[0024] In the drawings:

- 5 Fig. 1 shows an axonometric view of a frame assembly according to a first embodiment of the present invention;
- Fig. 2 shows a side view of a section, according to a plane B, of the frame assembly of Fig. 1 comprising a door;
- 10 Fig. 3A shows a top view of a section, according to a plane A, of a crosspiece of the frame assembly of Fig. 1 comprising a door in the closed position;
- Fig. 3B shows a top view of a section, according to a plane A, of a crosspiece of the frame assembly of Fig. 1 comprising a door in the open position;
- 15 Fig. 4A shows a top view of a section, according to a plane C, of the frame assembly of Fig. 1 comprising a door, during the hot season;
- 20 Fig. 4B shows a top view of a section, according to a plane D, of the frame assembly of Fig. 1 comprising a door, during the cold season;
- 25 Fig. 5 shows a top view of a section, according to a plane C, of the frame assembly of Fig. 1 comprising a door, with particular emphasis on its noise absorption devices;
- Fig. 6A shows a sectional view from above of an upright according to an alternative embodiment to that of Fig. 4A comprising a door in the closed position, during the hot season;
- 30 Fig. 6B shows a sectional view from above of an upright according to an alternative embodiment to that of Fig. 4B comprising a door in the closed position, during the cold season;
- 35 Fig. 7 shows a schematic view from above of a room equipped with a fixture according to the present invention;
- Fig. 8A shows a sectional view from above of a fixture according to a second embodiment of the present invention, when the door is in the closed position, during the cold season;
- 40 Fig. 8B shows a sectional view from above of a fixture according to a second embodiment of the present invention, when the door is in the closed position, during the hot season;
- 45 Fig. 9 shows a sectional view from above of a fixture according to a second embodiment of the present invention, when the door is in the open position;
- 50 Fig. 10 shows a sectional view from above of a fixture according to a second embodiment of the present invention, when the door is in the closed position, with particular emphasis on its noise absorption devices.

DETAILED DESCRIPTION

[0025] The following description of one or more embodiments of the invention refers to the attached draw-

ings. The same numerical references in the drawings identify identical or similar elements. The object of the invention is defined by the attached claims. The technical details, structures or characteristics of the solutions described below can be combined with each other in any way.

[0026] With reference to Figs. 1-5, a first embodiment of a frame assembly 1 and fixture 20 according to the present invention is illustrated, in Fig. 6 a variant of the frame 4 of the frame assembly 1 according to the first embodiment is illustrated. Fig. 7 shows a schematic installation of a frame assembly 1 and a fixture 20 according to the present invention in a room 3 delimited by walls 17. Figs. 8-10 shows a second embodiment of a frame assembly 1 and fixture 20 in according to the present invention. The frame according to the present invention can be a door or a window and, as will become apparent later, it can be a sliding (Figs. 1-7) or hinged (Figs. 8-10) window/door.

[0027] With reference to Fig. 1, a frame assembly 1 of a fixture 20 is shown, in which only a frame 4 of the frame assembly 1 is visible. The frame is made up of two right and left uprights 23 and a crosspiece 24. Specifically, the frame 4 of Fig. 1 is double as will be described in detail later on. The frame 4 is shaped in such a way as to create an opening 5 through which the room 3 is put in communication with the external environment 31. As in all the fixtures 20, a door 2 (not shown in Fig. 1) is configured for move between two operating positions, one in which the door 2 blocks the opening 5 of the frame 4 and one in which the opening 5 is set free, at least in part, for the passage between the external environment 31 and the room 3 and vice versa.

[0028] The frame 4 has an internal front facing towards the opening 5 and an external front opposite to the internal one. When the door 2 is in the closed position, the frame 4 and the door 2 overlap when viewed from the front, as better illustrated in Figs.2-5.

[0029] The frame 4 shown in Figs. 1-5 has a single upper crosspiece 24 and two lateral uprights 23. Nevertheless, it is also possible that the frame 4 has an upper and a lower crosspieces and two lateral uprights, or only a crosspiece or upright, with the characteristics illustrated below. Basically, the technical characteristics of the frame according to the present invention are not limited to what is illustrated, but can concern one, two, three or four sides of the frame of a window or door.

[0030] As illustrated in Fig. 1, the frame 4 comprises two semi-frames 4', 4" that form together the frame 4. The two semi-frames 4', 4" are substantially identical and face towards each other. Each of the two semi-frames 4', 4" comprises a plurality of thermoelectric devices 7 arranged along the perimeter. These thermoelectric devices 7 are preferably Peltier cells, thus heat pumps, but alternatively they can be other type of thermoelectric devices capable of transferring and/or absorbing heat.

[0031] The semi-frames 4', 4" also comprise a plurality of air pumps 12, a plurality of holes 13 and deflectors 15,

as better illustrated below. The two semi-frames 4', 4" are arranged so that said elements 7,12,13,15 of a half-frame 4' face towards those of the other half-frame 4'.

[0032] The two semi-frames 4', 4" are connected to each other via at least one connection channel 19 and other connection means (not shown). Furthermore, each half-frame 4', 4" comprises at least one inlet/outlet hole 10, 11, to allow the passage of air from one front of the frame to the other 4. Said inlet/outlet holes 10, 11 are arranged in the lower part of the frame 4, next to the floor 34. Said inlet/outlet holes 10, 11 are preferably arranged on the front of the frame 4, but alternatively they can be arranged on the side thereof.

[0033] The frame of Fig. 4 also comprises a drain grate 21 for the water that by gravity can fall from the door 2 (not shown). In practice, when the fixture 20 separates the room 3 from the external environment 31, the rain can fall on the external side of the fixture 20 itself. In this case, the rain flows by gravity on the door 2 until it falls into the drain grate 21 to be then disposed of or recovered for other uses.

[0034] With reference to Fig. 2, the frame 4 of Fig. 1 is shown sectioned along the plane B, thus according to a vertical longitudinal plane. In this way, the internal structure of a part of the frame 4 is visible. In particular, in Fig. 2 the channel 8 of the two semi-frames 4', 4" is visible. Said channel 8 is a hollow body delimited by the same structure of the frame 4 within which air can flow. The air in question enters through an inlet 10 present in the half-frame 4", passes along the channel 8 of the upright 23 and the crosspiece 24 of the half-frame 4", until it reaches the connection channel 19, which in fact it represents a continuation of the channel 8. The air passes through the connection channel 19 and descends into the channel 8 of the other half-frame 4', passing first through the crosspiece 24 and then into the upright 23, until it exits through the outlet 11. In this way a fluid connection is realized between the room 3 and the external environment 31. Preferably the airflow is a flow of exhausted air 29 which flows from the room 3 towards the external environment 31. To facilitate the circulation of the air in one direction along the channel 8 it is possible that the frame 4 comprises ventilation means 9.

[0035] Between the frame 4 and the door 2 there is an gap 6, that is an empty space, through which the air can draw from the external environment 31 to the room 3. This empty space is not comparable to the space that normally is present between a door and its frame, because in this space there are seals that prevent leakages and these seals are such as to block the passage of air from the outside to the inside.

[0036] The door 2 can slide with respect to the frame 4 of the frame assembly 1 thanks to moving means 16. These moving means 16 can be hidden wheels positioned in the lower part of the door 2, as illustrated in Fig. 2, or a track (not shown) which supports the door 2 from above. Both solutions are of the type known in the state of the art.

[0037] Deflectors 15 protrude in a cantilever way from the internal surface of the semi-frames 4', 4". The deflectors 15 can have a wavy shape as shown in Fig. 1 and be arranged so as to develop along a transverse direction (right-left direction), so as to direct the flow of air inside the gap 6.

[0038] In an alternative version, not shown, the deflectors 15 can be arranged so as to develop along a substantially vertical direction, so as to block more the entry of sound waves. In this version, the deflectors are substantially orthogonal to those illustrated in Figs. 1-2.

[0039] Said deflectors 15 can be made of rubber or a sound-absorbing material. Furthermore, their shape can be such as to increase the absorbent surface on which the sound waves can impact.

[0040] In the section of the frame 4 of Fig. 2 a plurality of thermoelectric devices 7 are also visible and behind them, in the background, a plurality of air pumps 12.

[0041] As illustrated in Fig. 4, the thermoelectric devices 7 transfer heat between the air present in the channel 8 and the air present in the gap 6. The thermoelectric devices 7 are Peltier-type heat pumps, capable of pumping heat from one side of the device to the other.

[0042] Said thermoelectric devices 7 are arranged so that one side of the device 7 faces the channel 8 and the opposite side of the device 7 faces the gap 6.

[0043] Fig. 3A shows a fixture 20 in which a door 2 is in the closed position inside the frame 4 of a frame assembly 1. The frame assembly 1 comprises, in addition to the frame 4, a box 28 in which the door 2 is housed when is in the open position, as illustrated in Fig. 3B.

[0044] Door 2 slides on moving means 16 (visible in Fig. 2) inside the gap 6 made between the two semi-frames 4', 4". When the door 2 is in the closed position (Fig. 3A), the gap 6 is reduced to the space between the semi-frames 4', 4" and door 2.

[0045] Since the gap 6 puts the room 3 in direct fluid communication with the external environment 31, the air is free to flow through the slack (gap 6) present between the door 2 and the frame 4. In this way an air flow from external environment 27 is possible.

[0046] In this gap 6 there are no gaskets since the purpose of the present invention is to allow the passage of air between door 2 and frame assembly 1 and not to limit it.

[0047] To prevent the air coming from the external environment to cool or heat the room 3, said thermoelectric devices 7 transfer or absorb heat to the air present in said cavity 6 so as not to compromise the thermal efficiency of the room 3 itself. The air entering room 3 is therefore at a temperature equal to or similar to that of room 3 itself.

[0048] Temperature sensors arranged on the frame assembly 1 or in the room 3 (not shown) allow to detect the temperature difference between the external environment 31 and the room 3 and therefore to regulate the thermal flow 25 across the thermoelectric devices 7 as a function of said temperature difference.

[0049] The door 2 can comprise a head shell 18, shaped so as to come into contact with the sides of said semi-frames 4', 4" when said door 2 is in the closed position and separate the gap 6 from the box 28. In this way, the air flowing from external environment 27 does not disperse in the box 28, but flows towards the room 3.

[0050] As illustrated in detailed figures 4A and 4B, the thermoelectric devices 7 are Peltier cells, capable of absorbing and releasing heat in one direction rather than the other depending on the polarization of the cells themselves.

[0051] Fig. 4A illustrates the operation of the frame assembly 1 according to the present invention during the summer season, where in the external environment 31 is hot and hot air enters the gap 6, following the flow 27. In this condition, the thermoelectric devices 7 absorb heat from the hot air passing through the gap 6 and transfer the heat to the exhausted air flow 29 that comes from the room 3. The hot airflow from the external environment 27 is therefore cooled by passing over the thermoelectric devices 7 and its heat transferred to the exhaust air flow 29 that flows towards the external environment 31.

[0052] In a completely analogous but inverse way, during the cold season, the flow of air flow from external environment 27 that passes through the gap 6 would tend to cool the room 3. To avoid this, the thermoelectric devices 7 release heat to this cold air flow 27 and heat it, absorbing part of the heat of the exhausted airflow 29 that passes through the channel 8. In this way, the temperature difference across the Peltier cells is lower and the energy consumption is reduced.

[0053] To force the circulation of the air inside the gap 6, the air pumps 12 are oriented to pump the air in a direction that from the external environment 31 goes towards the room 3, in a "C" shape around door 2, as illustrated in Figs. 4A, 4B.

[0054] In an alternative embodiment, not shown, some or all of the air pumps 12 are oriented in the opposite direction, thus so as to pump the air from the room 3 to the external environment 31 and provide an air curtain suitable to limit the entry of air from the external environment 31.

[0055] The air pumps 12 are air blowers configured to suck air from a chamber 14 and push the air in a specific direction. The chamber 14 is a compartment obtained inside the structure of the frame 4 itself. In Figs. 4A, 4B, the air is blown according to the arrow in white, thus so as to lap the door 2 and circulate around it. The air is pumped in a direction normal to the internal surface of the semi-frame 4', 4" and through a conveyor 32 redirected tangentially to said internal surface.

[0056] In an alternative form not shown, the air pump 12 is devoid of said conveyor 32 and the air is pumped orthogonally. In this particular form, the deflectors 15 are shaped in such a way as to divert the air pumped by the air pumps 12 and make the airflow tangential to the internal surface of said semi-frame 4', 4".

[0057] Each air pump 12 draws air from chamber 14

and pumps it in the gap 6. Holes 13 allow air to enter in said chamber 14.

[0058] As shown in Fig. 5, said holes 13 put the gap 6 in fluid communication with the chamber 14. These holes 13 allow the entry of air into the chamber 14 but also the entry of sound waves. The sound waves 26 coming from the external environment 31 enter the gap 6 and are captured in the holes 13 of the frame 4. The holes 13 and the chambers 14 act as sound traps within which the sound is absorbed and damped.

[0059] The air entered in the chamber 14 and is then expelled by the air pumps 12.

[0060] As illustrated in Figs. 6A, 6B, the holes 13 can also be arranged upstream of the air pump 12, so that the air sucked in through the holes 13 is immediately expelled by the air pump 12.

[0061] As illustrated in Figs. 6A, 6B, the air entering in the chamber 14, through the holes 13, can be filtered through one or more filters 30 positioned in correspondence with said holes 13. The air thus blown by the air pumps 12 is therefore external air but suitably filtered. Said filters 30 can be arranged inside the chamber 14 or outside it for simplifying the maintenance. Said filters 30 can be made of sound-absorbing material to further improve the acoustic absorption of sound waves 26.

[0062] , The deflectors 15 protrude inside the gap 6, which contribute to the absorption of sound waves 26 thanks to their conformation and the material of which they are made.

[0063] The gap 6 surrounds the door 2 and is therefore shaped to form a kind of "C" around it. This shape allows to create a labyrinth seal that limits the air flow from external environment 27 and significantly contributes to the abatement of sound waves 26.

[0064] Thanks to the holes 13, the filters 30, the shape of the gap 6 and the deflectors 15, the sound absorption of the sound waves 26 coming from the external environment 31 is almost total. In any case, a high sound absorption can be achieved by using one or more of the aforementioned elements, without using all four of them.

[0065] In a particular embodiment, said deflectors 15 are made of rubber so as to flex if the door 2 comes into contact with them. Said deflectors 15 can also contribute to avoid swinging of door 2.

[0066] As illustrated in Fig. 7, the frame assembly 1 can be connected to a wall 17 of an room 3 in a traditional way, so as to block an opening present in said wall 17.

[0067] In a second embodiment illustrated in Figs. 8-10, the door 2 is hinged, thus the door 2 rotates around said moving means 16, which in the specific case are hinges, and can move between an opening position in which passage through the opening 5 of the frame 4 is allowed and a closing position in which the door 2 comes into contact with an end-of-stroke element (not visible) of the frame assembly 1.

[0068] Similarly to the previous embodiment, the frame 4 of the frame assembly 1 comprises two distinct ducts separated from each other by a septum. The first channel

8 enables a flow of exhausted air flow 29 from the room 3 to the external environment 31, while a second chamber 14 allows to collect an air flow from external environment 27 which is then pumped into the room 3 by means of air pumps 12.

[0069] Fig. 8A illustrates the functioning of the fixture 20 during the cold season, in which the thermoelectric devices 7 generate a thermal flow 25 which moves from the channel 8 towards the air present in the gap 6, overheating the airflow from external environment 27.

[0070] Fig. 8B illustrates the operation of the fixture 20 during the hot season, in which the thermoelectric devices 7 generate a thermal flow 25 which moves from the gap 6 towards the air present in the channel 8, cooling the airflow from the external environment 27.

[0071] When the door 2 is opened the exhaust air flow 29 stops as well as the operation of the thermoelectric devices 7 and the air pumps 12, as shown in Fig. 9.

[0072] The holes 13 of the frame 4 also allow to capture the sound waves 26, as illustrated in Fig. 10, behaving like a sound trap.

[0073] In the embodiment of Figs. 8-10 the deflectors 15 can be absent.

[0074] The frame 4 of the frame assembly 1 can be realized through pre-shaped profiles that fit together by means of corners to form the frame 4. The air pumps 12 and/or the thermoelectric devices 7 can also comprise quick coupling means to easily connect and disconnect to said frame 4.

[0075] The door 2 can comprise a handle 22 to allow its opening/closing both if it is a sliding (Figs. 1-6) or swing (Figs. 8-10) door.

[0076] Since some of the technical elements of the frame assembly 1 according to the present invention are electrically powered, the frame assembly 1 comprises a switch 33, or a sensor, able to detect if the door 2 is in said closed or open position. In the event that door 2 is in the open position, all electrical devices are immediately turned off in order to save electricity when the door or window is open for other needs. In this way, the exchange of air with the external environment is guaranteed when the frame is closed and there is no waste of energy when the frame is open, as shown in Figs. 3B and 9.

[0077] In buildings with a high or maximum energy class, the tightness of the rooms prevents an adequate air exchange between the room 3 and the external environment 31. Thanks to the conformation of the frame assembly 1, the fixture 20 does not need gaskets and the air is, contrary to traditional fixtures, free to flow in the gap present between the door and the frame, allowing said air exchange. An exhausted air flow 29, taken from the room 3 in proximity to the floor, makes it possible to create a second flow, opposite to the previous one, that from the room 3 expels the air to the external environment 31. In this way, the humidity within room 3 it is considerably reduced.

[0078] Since the fixture 20 according to the present invention does not require gaskets, the shape of the door

2 can be very simple and does not require special moldings along its sides. For example, door 2 can be a glass, thus having a parallelepiped shape. The fixture 20 according to the present invention is therefore realized with a more complex frame assembly 1 than the traditional ones, because it is active and not passive, but vice versa the door 2 is a lot simpler. Overall, the fixture 20 according to the present invention is economically competitive with respect to the frames available on the market.

[0079] In conclusion, it is clear that the invention thus conceived is susceptible to numerous modifications or variations, all falling within the invention; furthermore, all the details can be replaced by technically equivalent elements. In practice, the quantities can be varied according to the technical requirements.

[0080] Legend of reference signs for figures:

- 1 frame assembly
- 2 door
- 3 room
- 4 frame
- 5 opening
- 6 gap
- 7 thermoelectric device
- 8 channel
- 9 ventilation means
- 10 channel inlet
- 11 channel outlet
- 12 air pump
- 13 holes
- 14 chamber
- 15 deflector
- 16 door moving means
- 17 wall
- 18 head shell
- 19 connection channel
- 20 fixture
- 21 drain grate
- 22 handle
- 23 upright
- 24 crosspiece
- 25 thermal flow
- 26 sound waves
- 27 air flow from the external environment
- 28 box
- 29 exhaust air flow
- 30 filter
- 31 external environment
- 32 conveyor
- 33 switch
- 34 floor

Claims

1. Frame assembly (1) for supporting a movable door (2) comprising:

- a frame (4) attachable to a wall (17) of a room (3), said frame (4) being provided with an opening (5) that is closed by said door (2) when said door (2) is in a closed position and that is open when said door (2) is in an open position;

said frame (4) being shaped so as to overlap at least in part with said door (2) when said door (2) is in said closed position so to realize a gap (6) between the frame (4) and the door (2) enabling a flow of air from one front to another of the frame (4); wherein said frame (4) comprises one or more thermoelectric devices (7) configured to heat/cool the air flowing in said gap (6) between the frame (4) and the door (2).

2. Frame assembly (1) according to claim 1, wherein said frame (4) comprises at least one channel (8) configured to enable a passage of exhaust air coming from the room (3), said at least one channel (8) being shaped to cross the frame (4) from side to side.

3. Frame assembly (1) according to claim 2, wherein said one or more thermoelectric devices (7) are arranged along said channel (8) so to transfer heat between the air passing through said channel (8) and the air flowing in said gap (6) between the frame (4) and the door (2).

4. Frame assembly (1) according to claim 2 or 3, wherein said at least one channel (8) comprises an inlet (10) arranged on the front of the frame (4) facing the room (3) and an outlet (11) arranged on the front of the frame (4) facing toward the external environment (31), preferably said at least one channel (8) comprises ventilation means (9) to force the passage of air inside the channel (8).

5. Frame assembly (1) according to any one of the preceding claims, wherein said frame (4) comprises one or more air pumps (12) configured to push the air flowing in said gap (6) between the frame (4) and the door (2), preferably to push the air towards the room (3).

6. Frame assembly (1) according to any one of the preceding claims, wherein said frame (4) comprises a plurality of holes (13) configured to put said gap (6) between the frame (4) and the door (2) in fluid communication with at least one chamber (14) arranged in the frame (4).

7. Frame assembly (1) according to claim 6, wherein said frame (4) comprises one or more filters (30) arranged in correspondence of said plurality of holes (13).

8. Frame assembly (1) according to any one of the pre-

ceding claims, wherein said frame (4) comprises one or more deflectors (15) configured to direct the passage of air in the gap (6) between the frame (4) and the door (2).

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9. Frame assembly (1) according to any one of the preceding claims, comprising moving means (16) for moving said door (2) with respect to said frame (4).

10. Fixture (20) comprising a frame assembly (1) according to claim 9 and a door (2).

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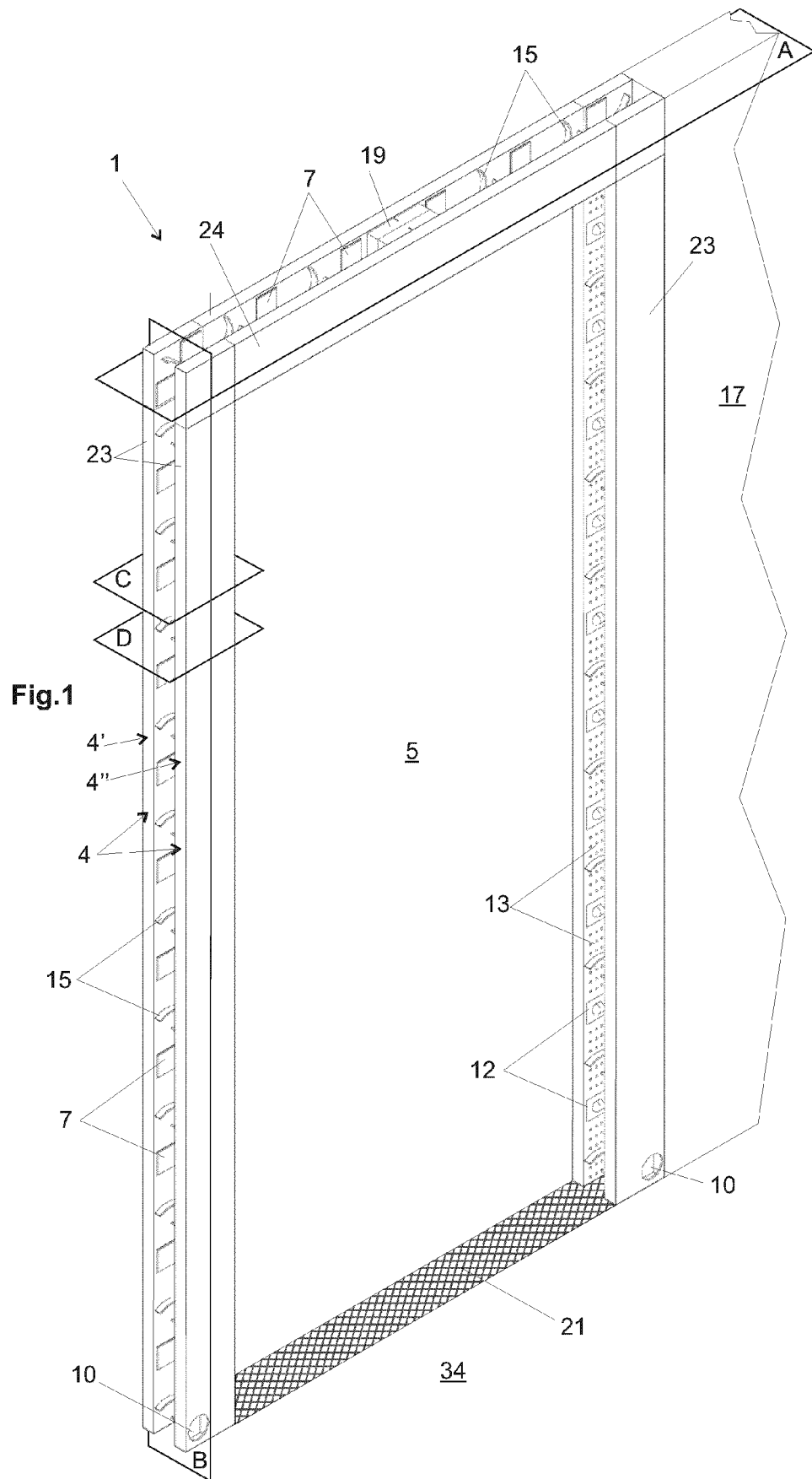
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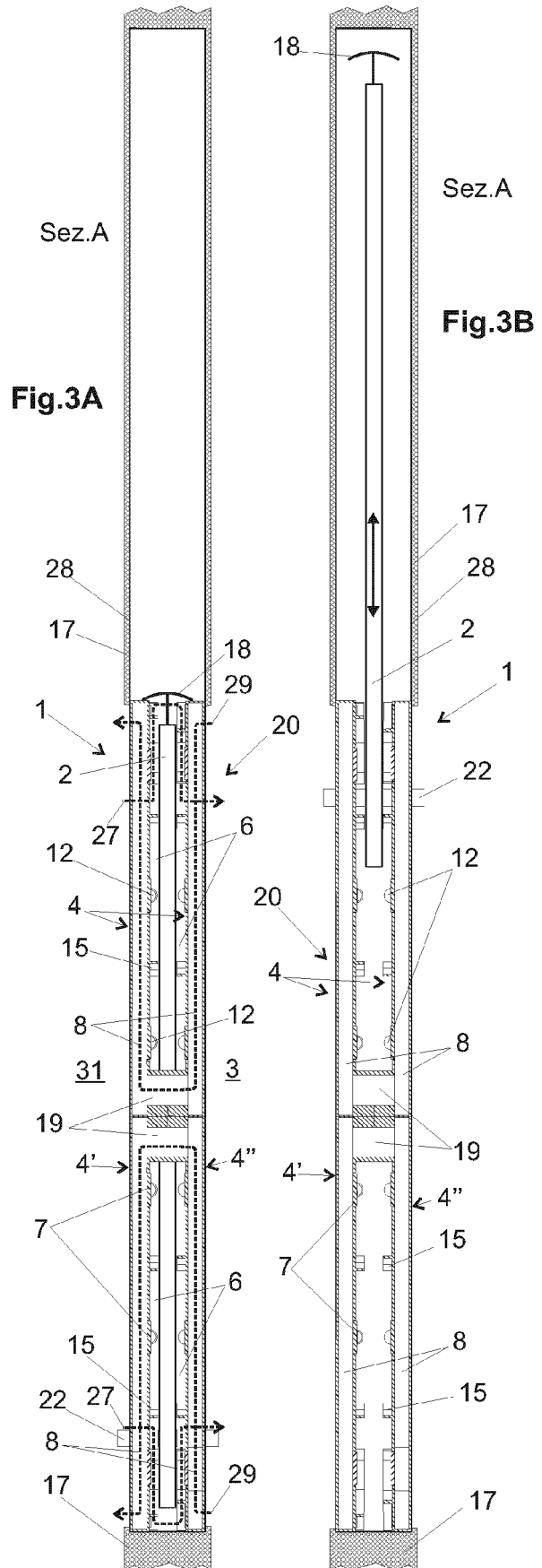
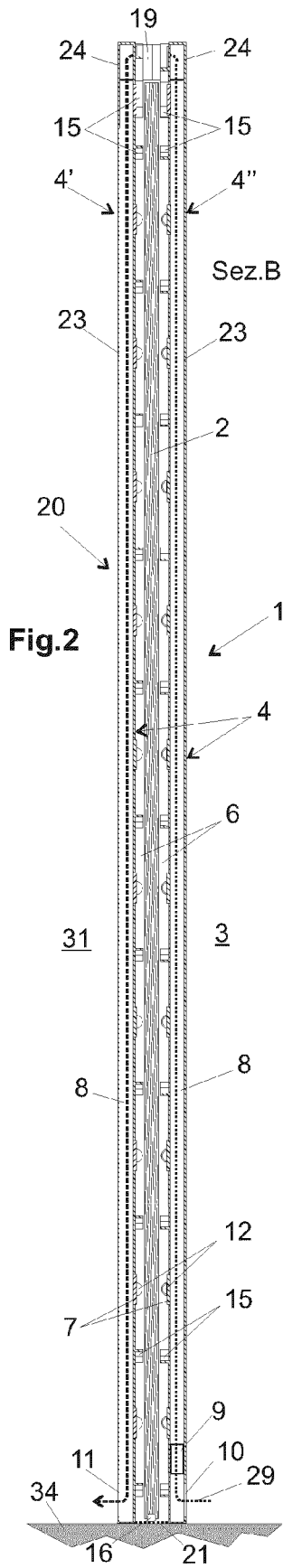
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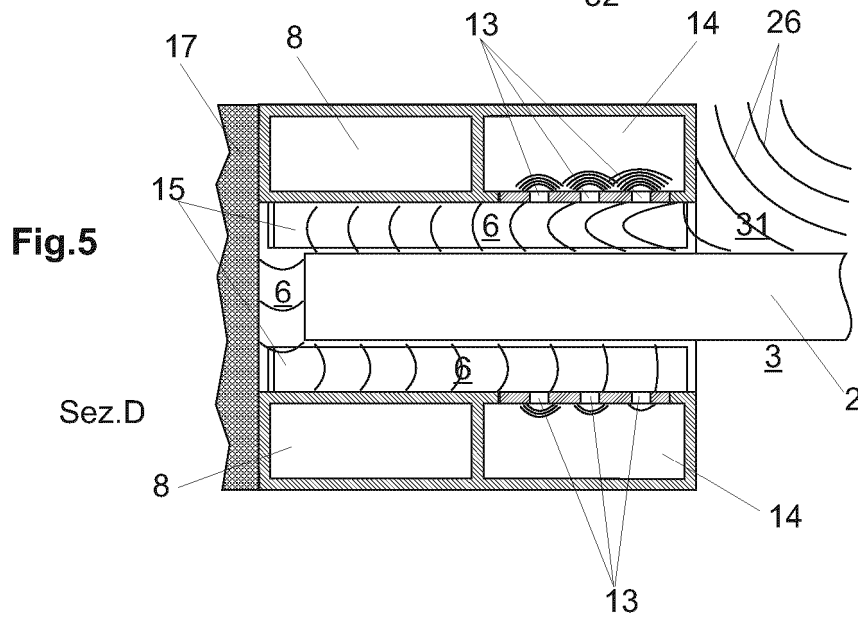
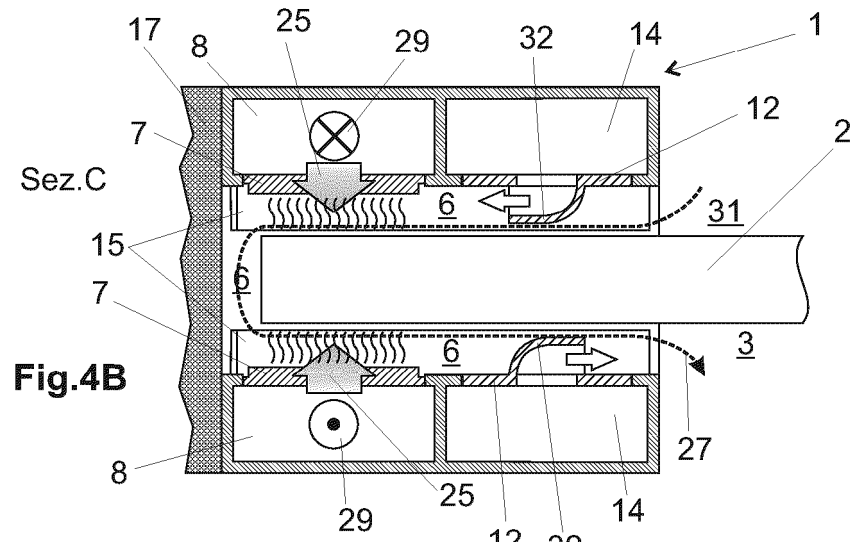
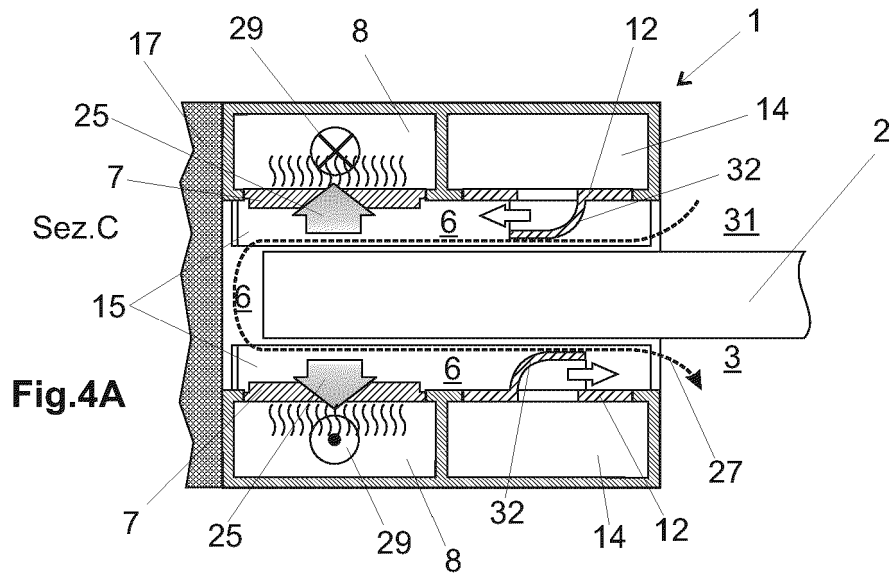
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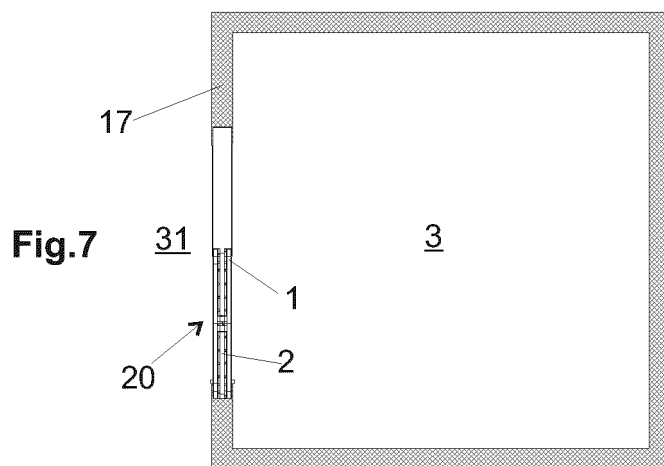
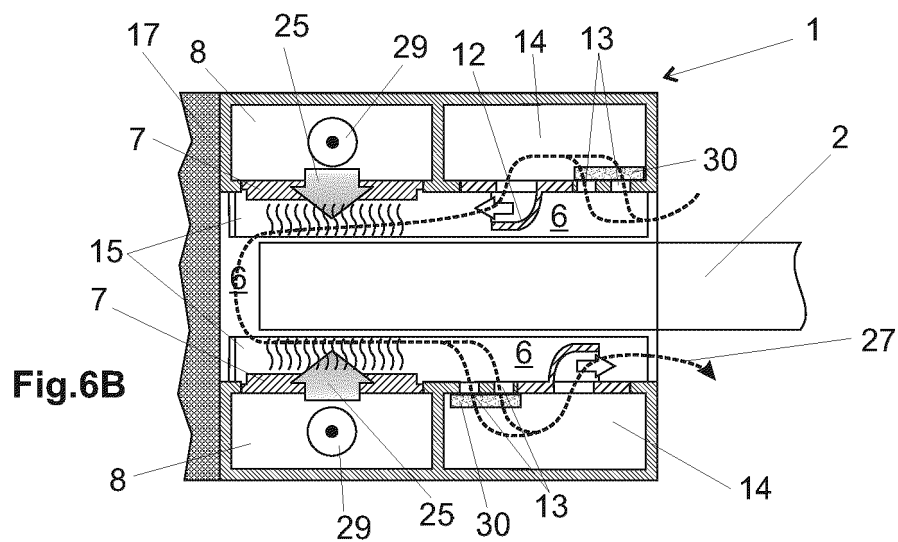
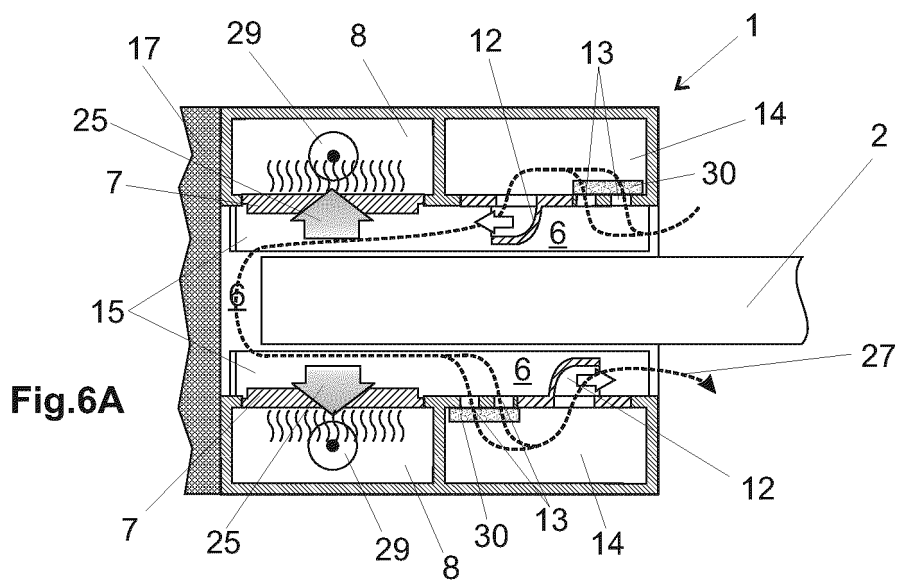
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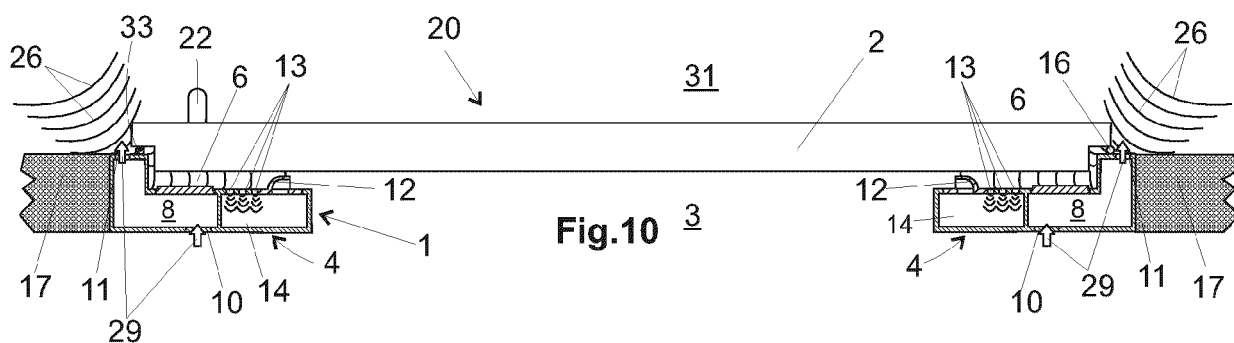
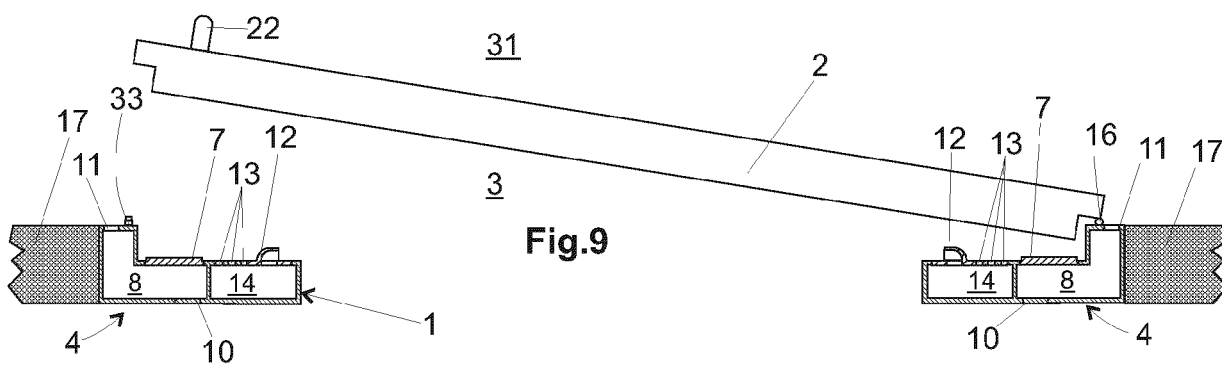
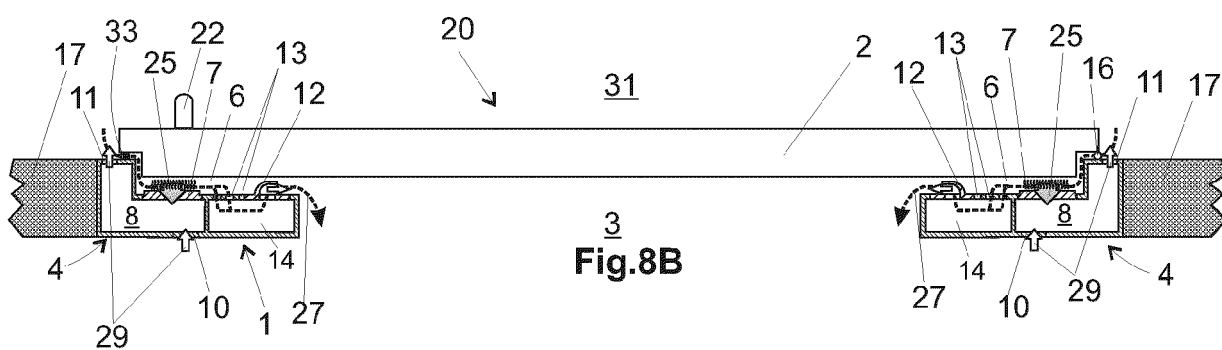
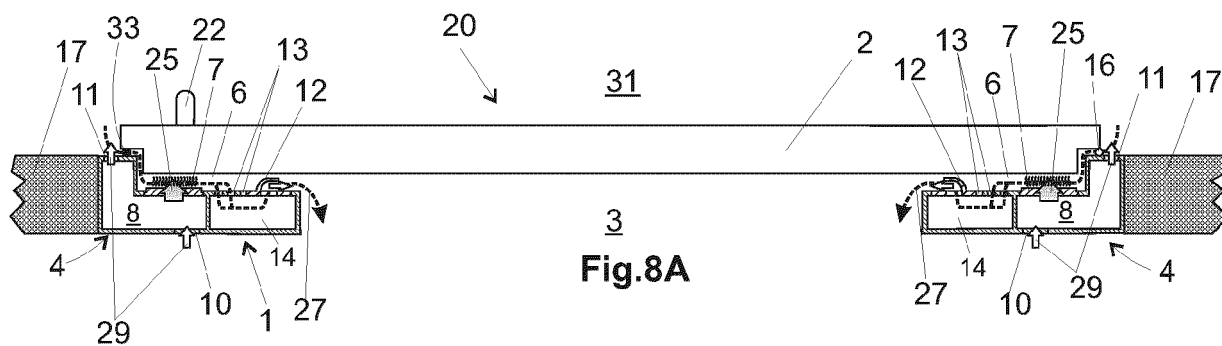
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 18 October 2021	Examiner Boufidou, Maria
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