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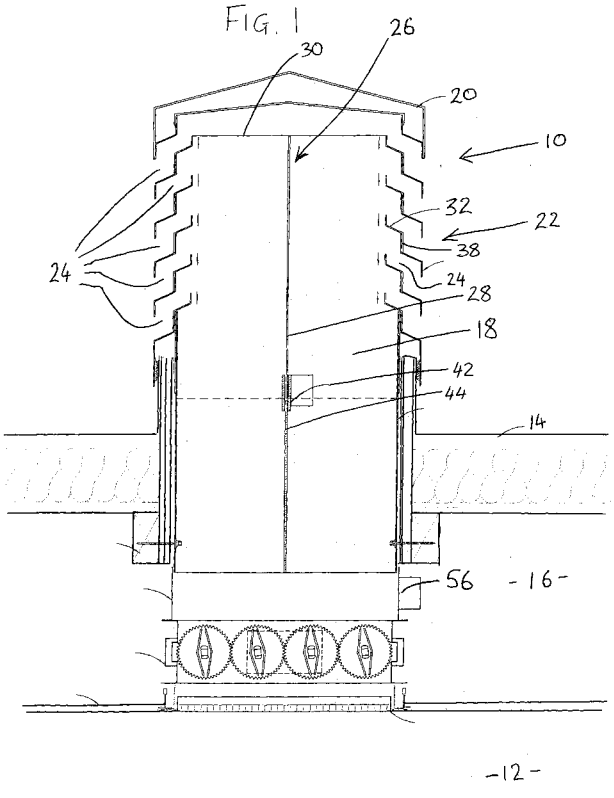
(54) Ventilation arrangements

(57) A ventilation arrangement 10 for ventilating the interior 12 of a building. The arrangement 10 includes a duct 18 extending to above the roof 14 of the building. The duct 18 is square in cross section and is divided into four quadrants by internal vertical divider plates. A louvre arrangement 22 is provided on each side of the upper part of the duct 18 to receive air into the building on a windward side of the duct 18, and to expel air from a leeward side of the duct 18. A closure arrangement 26 is provided for selectively partially or wholly closing the louvre arrangements 22, for instance in the event of bad weather.



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Description

[0001] The present invention relates to a ventilation arrangement for ventilating a building interior.

[0002] The provision of adequate ventilation is an important consideration in building design. The combination of heat gains generated within buildings by occupants and electrical equipment and solar heat gain can cause a significant build up of heat and, therefore overheating.

[0003] Air conditioning or other mechanical ventilation systems can be used to provide ventilation to buildings to address these difficulties. However, such systems consume electricity and can, therefore, be relatively expensive to operate.

[0004] One prior arrangement is to provide a duct extending from just above roof level into a building, with the upper end of the duct connecting to outwardly facing openings extending around the duct. During use air can enter the windward side of the duct through respective openings, with stale air exiting from the building through respective openings on the leeward side of the duct.

[0005] In such a configuration, the duct is divided by radial dividers, which could for instance divide the ducting into four quadrants, with the quadrant nearest the windward side receiving the most air to ventilate the building, whilst the majority of air extracted from the building exits through the opposite quadrant on the leeward side of the arrangement.

[0006] Such arrangements have operated successfully in providing ventilation with little or no power input. However, problems can be encountered in extreme weather with such arrangements, for example with very heavy rain and particularly snow, leading to ingress of precipitation into the apparatus.

[0007] According to the present invention there is provided a ventilation arrangement for ventilating a building interior, the ventilation arrangement comprising: an air duct which extends in use from roof level into an interior of the building to be ventilated to convey air between the exterior and interior of the building; ventilation openings which extend around an upper part of the air duct to direct moving air caused by wind movement into or out of the air duct; the ventilation openings having a louvre configuration defining a plurality of discrete openings, one above each other, and a closure arrangement selectively movable between a closed condition closing the ventilation openings, and an open condition substantially clear of the ventilation openings, the closure arrangement including a plurality of closure members, each selectively movable between a closed position substantially closing a respective discrete opening, and an open position leaving the respective discrete opening substantially open.

[0008] The closure arrangement may be configured to permit partial closure of the ventilation openings.

[0009] The ventilation arrangement may be substantially polygonal in plan view, with ventilation openings and a corresponding closure arrangement, for each side of the polygon.

[0010] Alternatively the ventilation arrangement may be substantially circular or oval in plan view.

[0011] The closure members may be connected to an actuator member such that the closure members are all simultaneously movable between the open and closed conditions.

[0012] The closure arrangement may be manually operable and/or operable by an electric motor, or actuator.

[0013] The closure arrangement may be operable from the building interior, and a control member may extend from the actuator member into the building.

[0014] Automatic control means may be provided for automatically moving the closure arrangement between the open and closed conditions as required. The automatic control means may be connected to a weather station or detectors so as to automatically move the closure arrangement to or towards a closed position when bad weather is forecast or detected.

[0015] The automatic control means may be connected to a timer so as to automatically move the closure arrangement between open and closed conditions for particular times or seasons of the year.

[0016] An embodiment of the present invention will now be described by way of example only and with reference to the accompanying drawings, in which:-

Fig. 1 is a diagrammatic cross sectional side view of a first ventilation arrangement according to the invention in an open condition;

Fig. 2 is a similar view to Fig. 1 but in a closed condition;

Fig. 3 is a diagrammatic detailed cross sectional view showing part of the arrangement of Fig. 1 in fully open and closed conditions;

Fig. 4 is a similar view to Fig. 3 but showing the arrangement in a partially open condition;

Fig. 5 is a diagrammatic cross sectional side view of a second ventilation arrangement according to the invention in an open condition;

Fig. 6 is a similar view to Fig. 5 but in a closed condition; and

Fig. 7 is a diagrammatic plan view of the arrangement of Fig. 5.

[0017] Figs. 1 to 4 of the drawings show a first ventilation arrangement 10 according to the invention for ventilating an interior 12 of a building. The ventilation arrangement 10 is mounted on a roof 14 of a building and extends through the roof space 16 to the building interior 12.

[0018] The arrangement 10 comprises a duct 18 which

extends vertically to above the roof 14. The duct 18 is divided into four quadrants by vertical divider plates (not shown). These plates divide the duct such that air on the windward quadrants will enter the arrangement 10, whilst air on the leeward side will exit from the interior 12 through the arrangement 10. In this arrangement 10 the duct 18 is of square cross section, but other cross sectional shapes such as circular could be used.

[0019] The top end of the duct 18 is closed by a turret 20. Beneath the turret 20 a louvre arrangement 22 is provided which defines five downwardly and outwardly extending openings 24 extending from the interior of the duct 18 to atmosphere.

[0020] A closure arrangement 26 is provided which comprises a central bar 28 extending upwardly through the duct 18 to an upper plate 30. The bar 28 may house the divider plates. Extending downwardly on each side from the plate 30 is an inner louvre arrangement 32. The inner louvre arrangement 32 is of a similar configuration to the outer louvre arrangement 22 but is set inwardly and comprises a first downwardly extending section 34 from which an outwardly and downwardly inclined second section 36 extends to a downwardly extending third outer section 38.

[0021] In a raised condition of the closure arrangement 26 as shown in Fig. 2 and in broken lines in Fig. 3, each third outer section 38 closes a respective one of the openings 24. In a lower open position as shown in Fig. 1, the third outer section 38 is clear of the respective openings 24, and lies parallel to the inner first section 44 of the louvre arrangement 22. Fig. 4 shows a partially open configuration, with the third outer sections 38 partially closing the respective openings 24.

[0022] The bar 28 extends within the duct 18 to a little below the outer louvre arrangement 22 and connects to an actuator 42 mounted on a further bar 44 which extends downwardly to a lower part of the duct 18. The actuator 42 can be mechanically operable by a connection to the further bar 44 extending into the building interior 12. In addition, the actuator 42 can be controlled by an electrical motor (not shown). A guide wheel or a geared rack can be used to provide vertical movement of the central bar 28.

[0023] Ductwork 46 extends beneath the duct 18 and leads to an airflow control arrangement 48 with dampers 50 for controlling the flow of air between the exterior and interior 12 of the building. Beneath the air flow arrangement 48 a grille 52 is provided in the ceiling 54.

[0024] A programmable automatic control box 56 is provided for automatic actuation of the closure arrangement 26. The control box 56 can be programmed by season allowing for instance a 25% opening in winter mode when lower external temperatures provide a greater driving force for natural ventilation. During spring and autumn modes the closure arrangement could be programmed to be 50% open, and during summer mode to provide maximum ventilation, the closure arrangement can be set to 100% open.

[0025] The control box 56 could also be linked to a weather station, which could be locally mounted. This could provide a control signal prior to or during very poor weather conditions. These conditions could be strong winds, heavy rain, snow or very low external temperatures. This can particularly prevent for instance snow being carried into the arrangement 10.

[0026] There is thus described a ventilation arrangement with additional control features. The amount of possible ventilation can be varied for different seasons and also particularly when bad weather is expected or occurring. The arrangement is however of mechanically straightforward configuration and can thus be inexpensively constructed for long term essentially maintenance free operation.

[0027] Figs. 5 to 7 of the drawings show a second ventilation arrangement 100 according to the invention which is similar in many respects to the arrangement 10, and only the differences will be described. In this instance a louvre arrangement 102 is provided which defines eight openings 104 on each side of the duct 106. The louvre arrangement 102 again comprises a fixed outer louvre arrangement 108 and a movable inner louvre arrangement 110.

[0028] The upper ends of the inner louvre arrangement 110 on each side are attached adjacent the corner of the square duct 106, to an end of the respective arm of a horizontally extending cruciform support 112. A downwardly extending bar 114 is provided at the centre of the support 112, and the bar 114 is operatively engageable with a linear actuator 116, for raising and lowering the support 112. The linear actuator 116 is mounted on a support plate 118 which extends across part of the top of the duct 106.

[0029] A solar panel 120 is provided on the top end of a turret 122 which closes the top end of the duct 106. The solar panel 120 may power the actuator 116, and any control or sensor equipment for the arrangement 100.

[0030] By vertical movement of the bar 114 by operation of the actuator 116, any required position of the inner louvre arrangement 110 can be chosen between the fully closed position shown in Fig. 6 and the fully open position shown in Fig. 5, to vary the amount of ventilation into and out of the duct 106.

[0031] Various other modifications may be made without departing from the scope of the invention. For instance, whilst some automatic operation has been described, other automatic operation could be possible for instance dependent on temperature or other conditions. Also controls could be provided for manual override of the automatic controls by a user of the building. Whilst a double louvre arrangement has been described, other ways could be provided of providing selective opening or closing of the openings. Also the openings may take a different form.

[0032] As indicated the duct may be other than of square cross section, and could be a different polygonal

shape, or circular or oval. A different number of openings could be provided by the louvre arrangement. The actuator could be provided at a different location, such as under the turret or any other capping provided for the arrangement.

[0033] Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed thereon.

Claims

1. A ventilation arrangement (10, 110) for ventilating a building interior (12), the ventilation arrangement comprising: an air duct (18, 106) which extends in use from roof level (14) into an interior of the building to be ventilated to convey air between the exterior and interior of the building; ventilation openings (24) which extend around an upper part of the air duct to direct moving air caused by wind movement into or out of the air duct; the ventilation openings having a louvre configuration defining a plurality of discrete openings (24, 104), one above each other, **characterised in that** the arrangement also includes a closure arrangement (26) selectively movable between a closed condition closing the ventilation openings, and an open condition substantially clear of the ventilation openings, the closure arrangement including a plurality of closure members (34), each selectively movable between a closed position substantially closing a respective discrete opening, and an open position leaving the respective discrete opening substantially open.

2. An arrangement according to claim 1, **characterised in that** the closure arrangement is configured to permit partial closure of the ventilation openings.

3. An arrangement according to claims 1 or 2, **characterised in that** the ventilation arrangement is substantially polygonal in plan view, with ventilation openings and a corresponding closure arrangement, for each side of the polygon.

4. An arrangement according to claims 1 or 2, **characterised in that** the ventilation arrangement is substantially circular or oval in plan view.

5. An arrangement according to any of the preceding claims, **characterised in that** the closure members are connected to an actuator member (28, 114) such that the closure members are all simultaneously movable between the open and closed conditions.

6. An arrangement according to any of the preceding claims, **characterised in that** the closure arrangement is manually operable.

7. An arrangement according to any of the preceding claims, **characterised in that** the closure arrangement is operable by an electric motor or actuator (42, 116).

8. An arrangement according to any of the preceding claims, **characterised in that** the closure arrangement is operable from the building interior.

9. An arrangement according to claim 8 when dependent on claim 5, **characterised in that** a control member (44) extends from the actuator member into the building.

10. An arrangement according to any of the preceding claims, **characterised in that** automatic control means (56) is provided for automatically moving the closure arrangement between the open and closed conditions as required.

11. An arrangement according to claim 10, **characterised in that** the automatic control means is connected to a weather station or detectors so as to automatically move the closure arrangement to or towards a closed position when bad weather is forecast or detected.

12. An arrangement according to claims 10 or 11, **characterised in that** the automatic control means is connected to a timer so as to automatically move the closure arrangement between open and closed conditions for particular times or seasons of the year.

FIG. 1

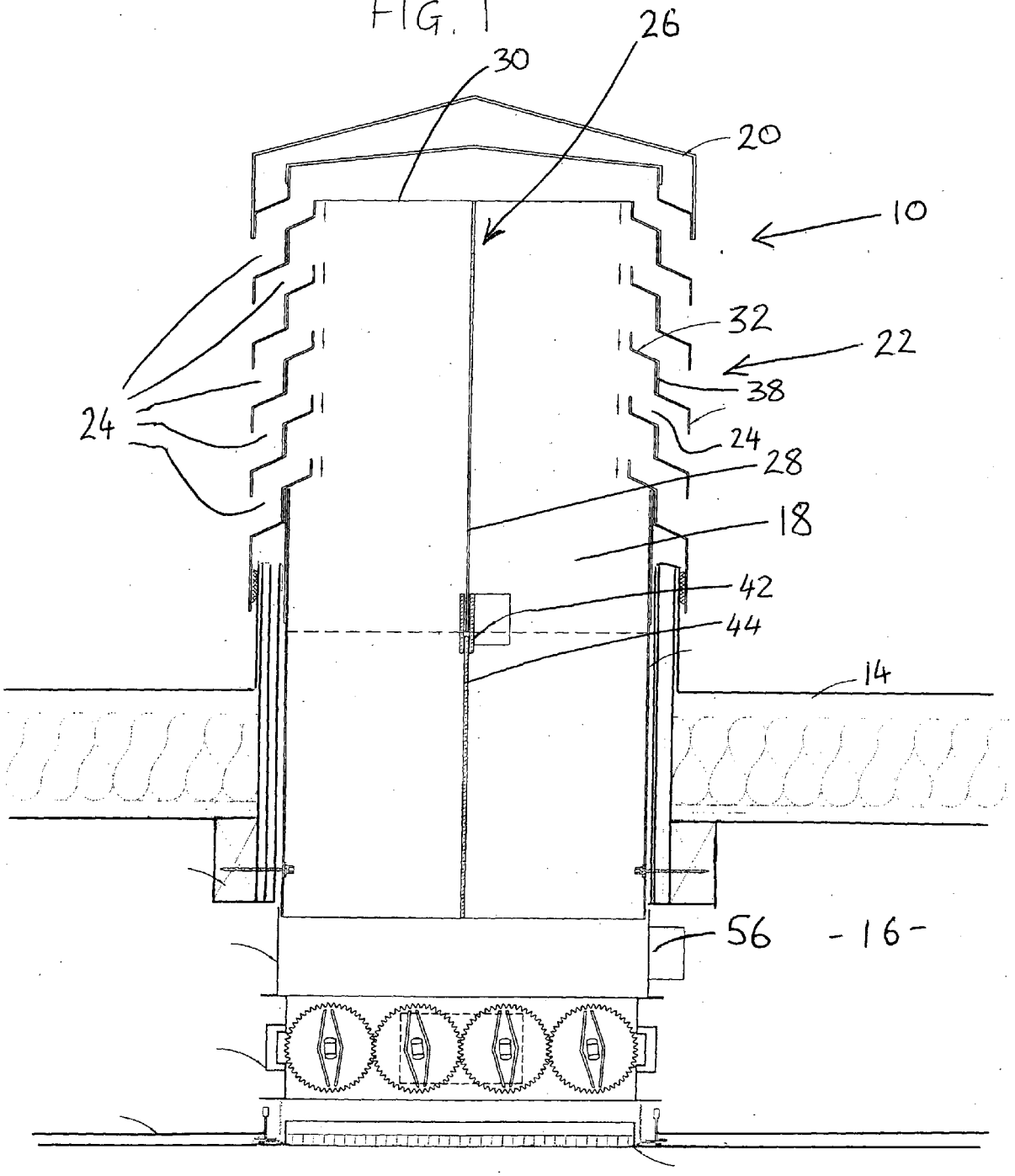
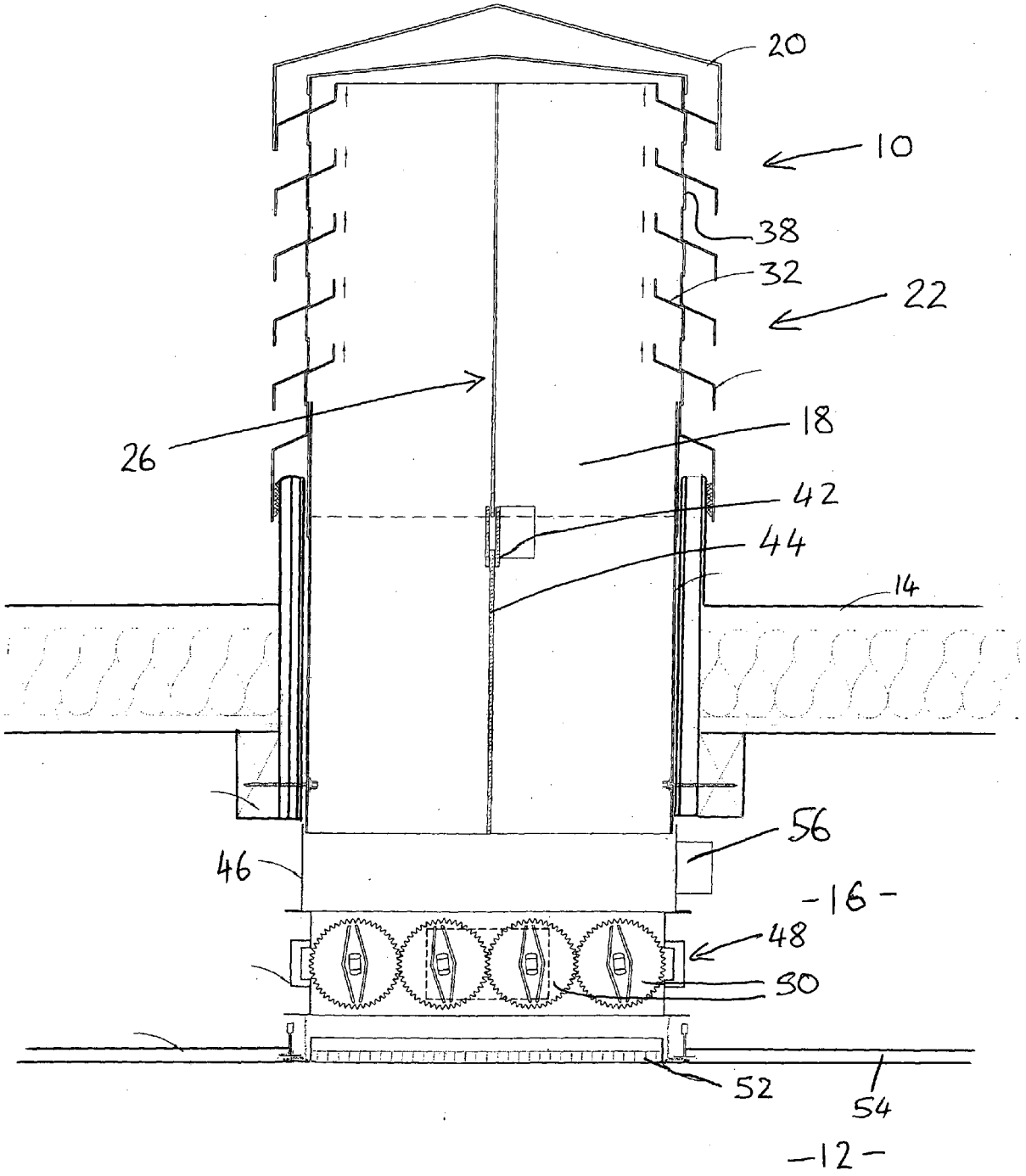


FIG. 2



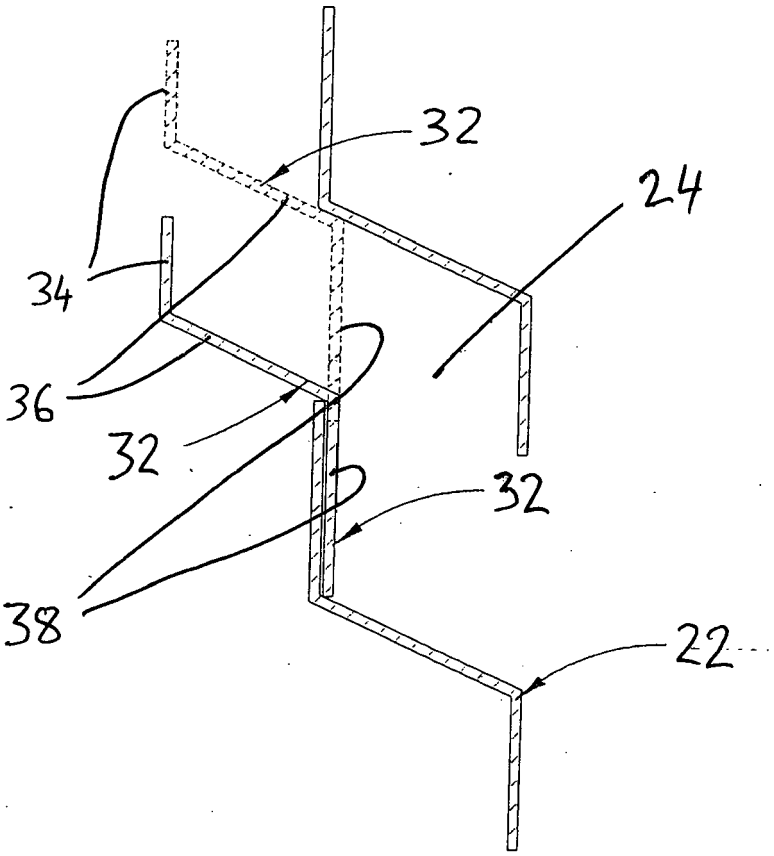


FIG. 3

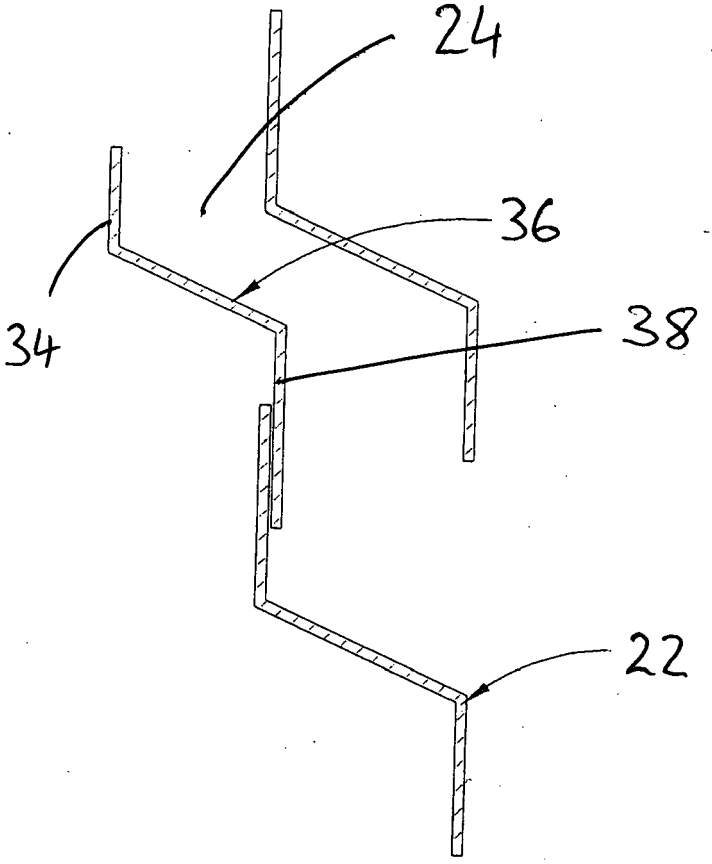


FIG. 4

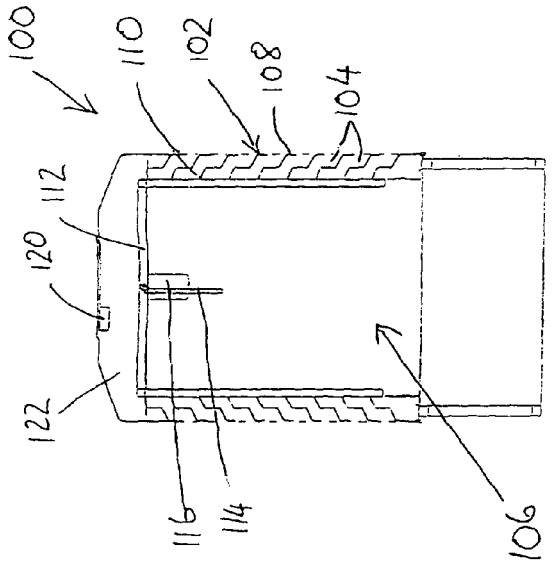


Fig. 5

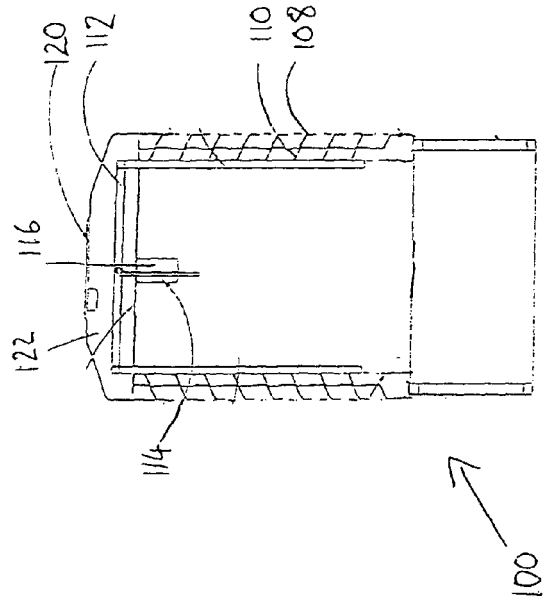


Fig. 6

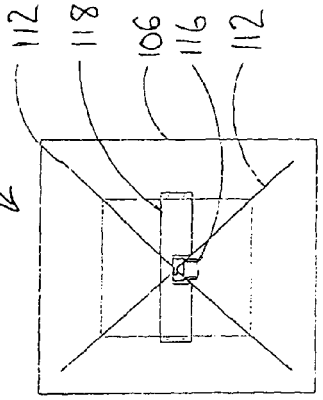


Fig. 7