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(73) Proprietor: **Monodraught Limited
High Wycombe
Buckinghamshire HP12 3SE (GB)**

(72) Inventors:
• **Cull, Anthony Francis
High Wycombe
Buckinghamshire HP12 3SE (GB)**

• **Hopper, Nicholas John
High Wycombe
Buckinghamshire HP12 3SE (GB)**

(74) Representative: **Sales, Robert Reginald
Swindell & Pearson Limited
48 Friar Gate
Derby DE1 1GY (GB)**

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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 over-heating.

[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. Another arrangement is known from patent document US-A-1672291 which describes a ventilation arrangement comprising an air duct with ventilation openings extending around an upper part of the air duct, the ventilation openings having a louvre configuration defining a plurality of openings, one above each other, the arrangement including a closure 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 according to the subject-matter of claim 1.

[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 pos-

sible 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 as disclosed by the appended claims. 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.

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; the air duct being polygonal in plan view and being divided into a plurality of duct sections by divider plates extending between upper and lower ends of the ventilation arrangement, and being arranged to direct moving air caused by wind movement through one or more of the duct sections on a windward side of the air duct into the building interior, and to exhaust air from the interior of the building through one or more other of the duct sections on a leeward side of the air duct; ventilation openings (24) on each side of the polygon 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 comprising an outer louvre arrangement defining a plurality of discrete openings (24, 104), one above each other, wherein the arrangement also includes a closure arrangement (26) comprising an inner louvre arrangement, the inner and outer louvre arrangements being selectively slidable relative to each other 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 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.
4. An arrangement according to any of the preceding claims, **characterised in that** the closure arrangement is manually operable.
5. 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).
6. An arrangement according to any of the preceding claims, **characterised in that** the closure arrangement is operable from the building interior.

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7. An arrangement according to claim 6 when dependent on claim 3, **characterised in that** a control member (44) extends from the actuator member into the building.
8. 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.
9. An arrangement according to claim 8, **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.
10. An arrangement according to claims 8 or 9, **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.

Patentansprüche

1. Belüftungsanordnung (10, 110) zum Lüften eines Gebäudeinnenraums (12), wobei die Belüftungsanordnung umfasst: einen Luftkanal (18, 106), der sich im Gebrauch von einer Dachebene (14) in einen Innenraum des zu belüftenden Gebäudes erstreckt, um Luft zwischen einem Außen- und einem Innenbereich des Gebäudes zu transportieren; wobei der Luftkanal in einer Draufsicht polygonal ist und mittels sich zwischen einem oberen und unteren Ende der Belüftungsanordnung erstreckenden Trennplatten in eine Vielzahl von Kanalabschnitten unterteilt ist und angeordnet ist, um durch eine Windbewegung bewegte Luft durch einen oder mehrere der Kanalabschnitte an einer windzugewandten des Luftkanals in den Gebäudeinnenraum zu leiten und, um Luft aus dem Innenraum des Gebäudes durch einen oder mehrere andere Kanalabschnitte an einer windabgewandten Seite des Luftkanals abzulassen; Lüftungsöffnungen (24) auf jeder Seite des Polygons, die sich um einen oberen Teil des Luftkanals erstrecken, um die durch eine Windbewegung bewegte Luft in den Luftkanal hinein oder heraus zu leiten; wobei die Lüftungsöffnungen eine äußere Lamellenanordnung aufweist, die eine Vielzahl an übereinanderliegenden diskreten Öffnungen (24, 104) definiert, wobei die Anordnung auch eine eine innere Lamellenanordnung aufweisende Verschlussanordnung (26) umfasst, wobei die innere und die äußere Lamellenanordnung wahlweise relativ zueinander zwischen einem geschlossenen Zustand, der die Lüftungsöffnungen verschließt, und einem offenen

Zustand, der die Lüftungsöffnungen im Wesentlichen freigibt, bewegbar ist, wobei die Verschlussanordnung eine Vielzahl an Verschlusselementen (34) umfasst, jedes wahlweise zwischen einer geschlossenen Position, die im Wesentlichen eine jeweilige diskrete Öffnung schließt, und einer offenen Position, die im Wesentlichen die diskreten Öffnungen offen lässt, bewegbar.

2. Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Verschlussanordnung konfiguriert ist, um ein teilweises Schließen der Lüftungsöffnungen zu erlauben.
3. Anordnung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Verschlusselemente mit einem Stellglied (28, 114) verbunden sind, sodass die Verschlusselemente alle gleichzeitig zwischen dem offenen und geschlossenen Zustand bewegbar sind.
4. Anordnung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet** dass die Verschlussanordnung manuell betätigbar ist.
5. Anordnung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Verschlussanordnung durch einen Elektromotor oder einen Aktuator (42, 116) betätigbar ist.
6. Anordnung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Verschlussanordnung vom Gebäudeinneren aus betätigbar ist.
7. Anordnung nach Anspruch 6, in Abhängigkeit von Anspruch 3, **dadurch gekennzeichnet, dass** sich ein Steuerelement (44) vom Stellglied in das Gebäude erstreckt.
8. Anordnung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** automatische Steuermittel (56) vorgesehen sind, um die Verschlussanordnung nach Bedarf automatisch zwischen dem offenen und geschlossenen Zustand zu bewegen.
9. Anordnung nach Anspruch 8, **dadurch gekennzeichnet, dass** die automatischen Steuermittel mit einer Wetterstation oder Detektoren verbunden sind, um die Verschlussanordnung automatisch zu oder in Richtung einer geschlossenen Position zu bewegen, wenn schlechtes Wetter vorhergesagt oder detektiert wird.
10. Anordnung nach einem der Ansprüche 8 oder 9, **dadurch gekennzeichnet, dass** die automatischen Steuermittel mit einem Zeitgeber verbunden sind,

um die Verschlussanordnung automatisch zwischen offenen und geschlossenen Zuständen für bestimmte Zeiten oder Jahreszeiten zu bewegen.

Revendications

1. Agencement de ventilation (10, 110) pour ventiler un intérieur de bâtiment (12), l'agencement de ventilation comprenant : un conduit d'air (18, 106) qui s'étend en utilisation depuis le niveau du toit (14) jusqu'à un intérieur du bâtiment à ventiler pour acheminer l'air entre l'extérieur et l'intérieur du bâtiment ; le conduit d'air étant polygonal en vue de dessus et divisé en une pluralité de sections de conduit par des plaques de séparation s'étendant entre les extrémités supérieure et inférieure de l'agencement de ventilation, et étant agencé pour diriger l'air en mouvement provoqué par le mouvement du vent par l'intermédiaire d'une ou de plusieurs des sections de conduit situées sur un côté au vent du conduit d'air jusqu'à l'intérieur du bâtiment, et pour évacuer l'air de l'intérieur du bâtiment par l'intermédiaire d'une ou plusieurs autres sections de conduit situées sur le côté sous le vent du conduit d'air ; des ouvertures de ventilation (24) de chaque côté du polygone qui s'étendent autour d'une partie supérieure du conduit d'air pour diriger l'air en mouvement provoqué par le mouvement du vent dans ou hors du conduit d'air ; les ouvertures de ventilation comprenant un agencement de lamelles extérieur définissant une pluralité d'ouvertures discrètes (24, 104) les unes au-dessus des autres, l'agencement comprenant également un agencement de fermeture (26) comprenant un agencement de lamelles intérieur, les agencements de lamelles intérieur et extérieurs pouvant être coulissés de manière sélective l'un par rapport à l'autre entre une condition de fermeture fermant les ouvertures de ventilation, et une condition d'ouverture sensiblement dégagée des ouvertures de ventilation, l'agencement de fermeture comprenant une pluralité d'éléments de fermeture (34), chacun pouvant être déplacé de manière sélective entre une position fermée fermant sensiblement une ouverture discrète respective, et une position ouverte laissant l'ouverture discrète respective sensiblement ouverte.
2. Agencement selon la revendication 1, **caractérisé en ce que** l'agencement de fermeture est configuré pour permettre la fermeture partielle des ouvertures de ventilation.
3. Agencement selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les éléments de fermeture sont reliés à un élément d'actionnement (28, 114) de telle sorte que les éléments de fermeture peuvent tous être déplacés simultanément.

ment entre les conditions d'ouverture et de fermeture.

4. Agencement selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'agencement de fermeture peut être actionné manuellement. 5
5. Agencement selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'agencement de fermeture peut être actionné par un moteur électrique ou un actionneur (42, 116). 10
6. Agencement selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'agencement de fermeture peut être actionné depuis l'intérieur du bâtiment. 15
7. Agencement selon la revendication 6 lorsqu'elle est dépendante de la revendication 3, **caractérisé en ce qu'**un élément de commande (44) s'étend depuis l'élément d'actionnement jusqu'à l'intérieur du bâtiment. 20
8. Agencement selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**un moyen de commande automatique (56) est prévu pour déplacer automatiquement l'agencement de fermeture entre les conditions d'ouverture et de fermeture selon les besoins. 25
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9. Agencement selon la revendication 8, **caractérisé en ce que** le moyen de commande automatique est connecté à une station météorologique ou à des détecteurs afin de déplacer automatiquement l'agencement de fermeture jusqu'à ou en direction d'une position fermée lorsque du mauvais temps est prévu ou détecté. 35
10. Agencement selon les revendications 8 ou 9, **caractérisé en ce que** le moyen de commande automatique est connecté à une minuterie afin de déplacer automatiquement l'agencement de fermeture entre des conditions d'ouverture et de fermeture pour des périodes ou des saisons de l'année particulières. 40
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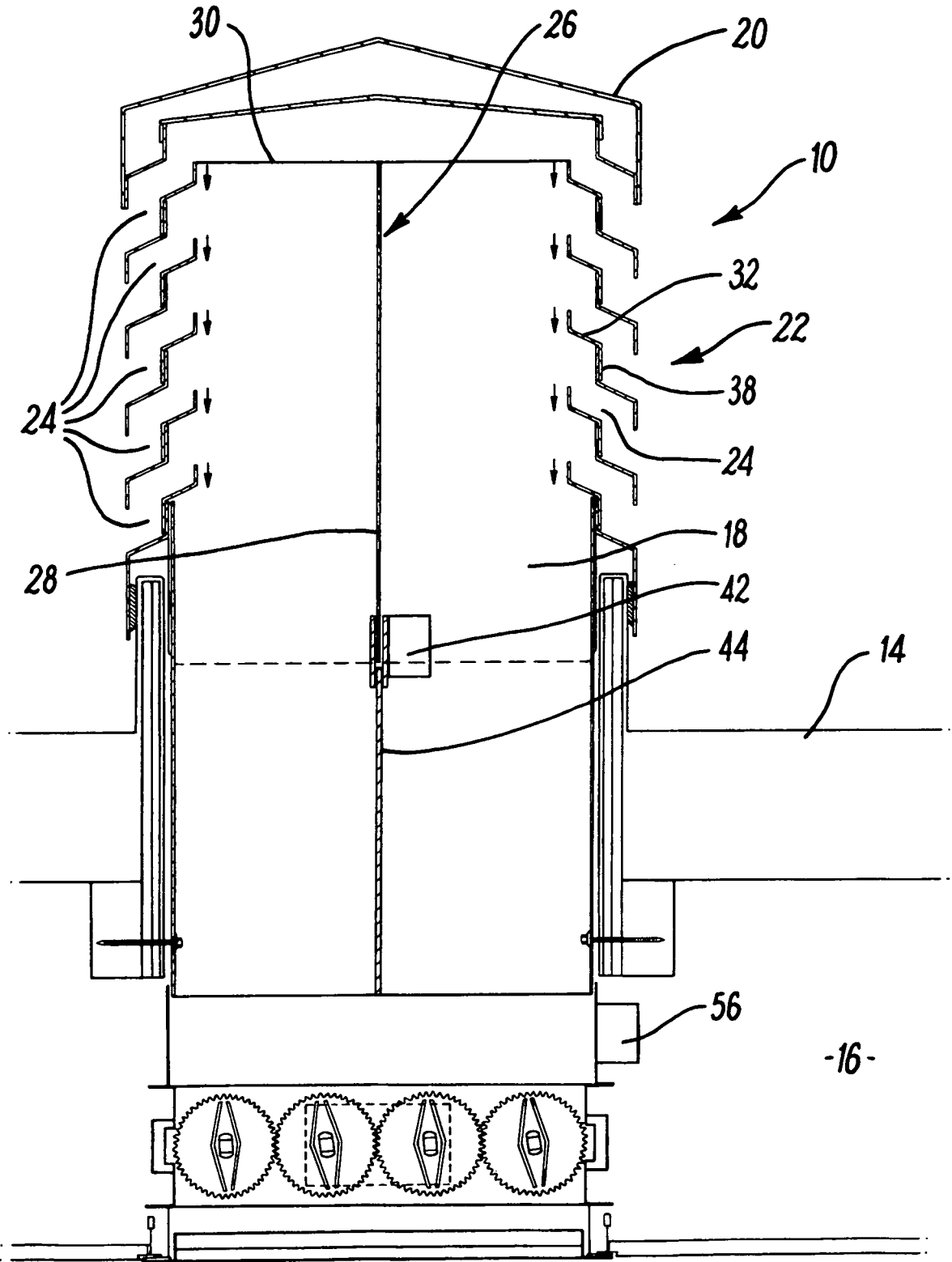


Fig. 1

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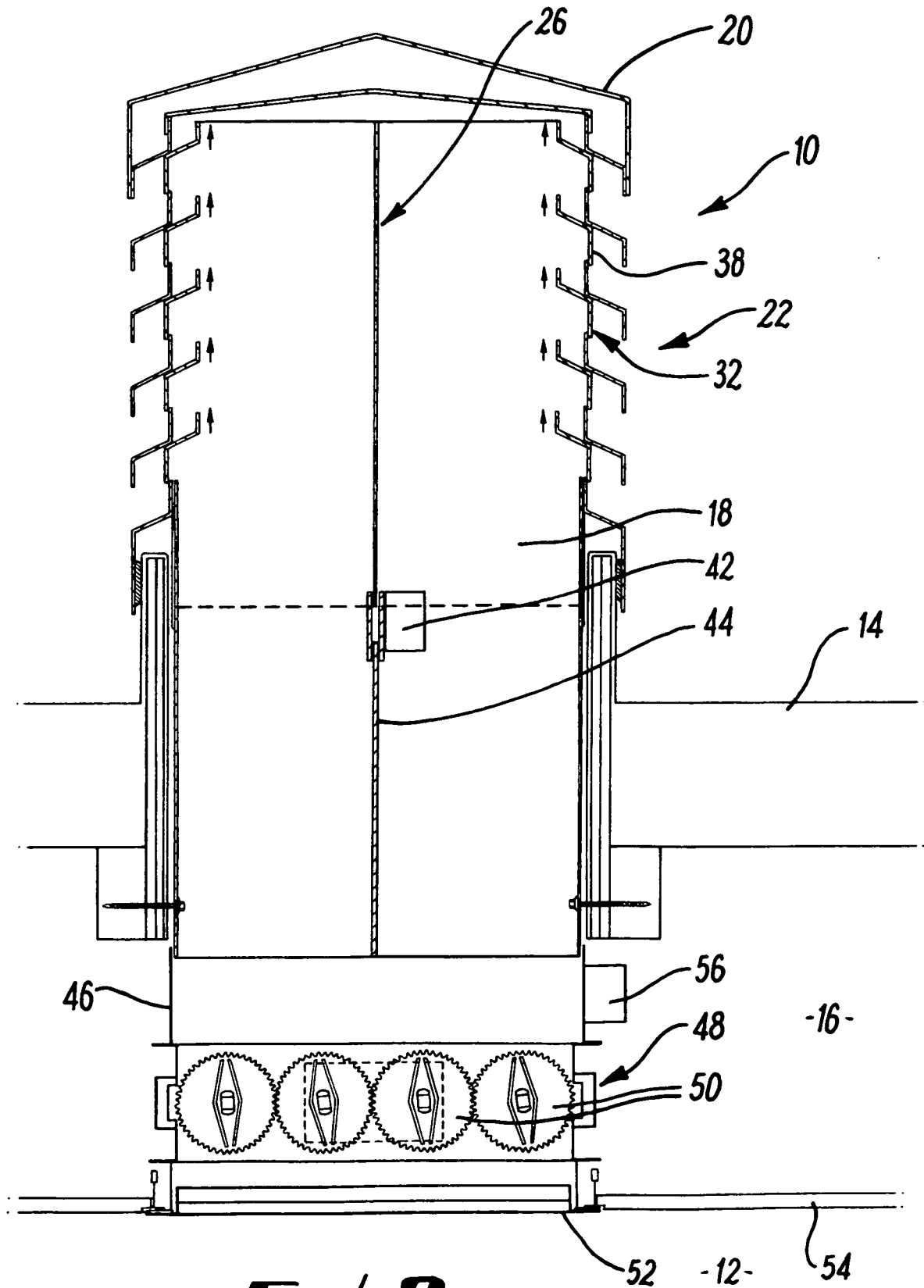


Fig. 2

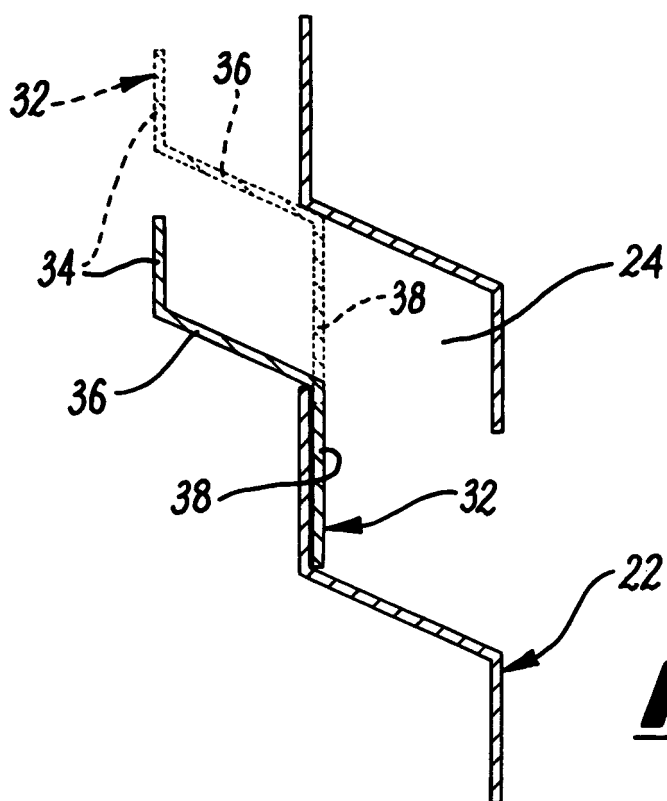


Fig. 3

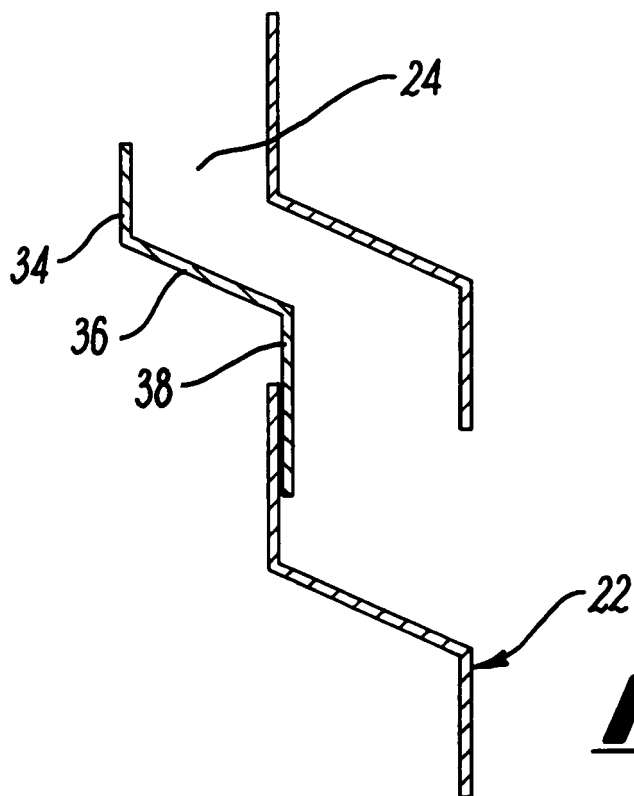


Fig. 4

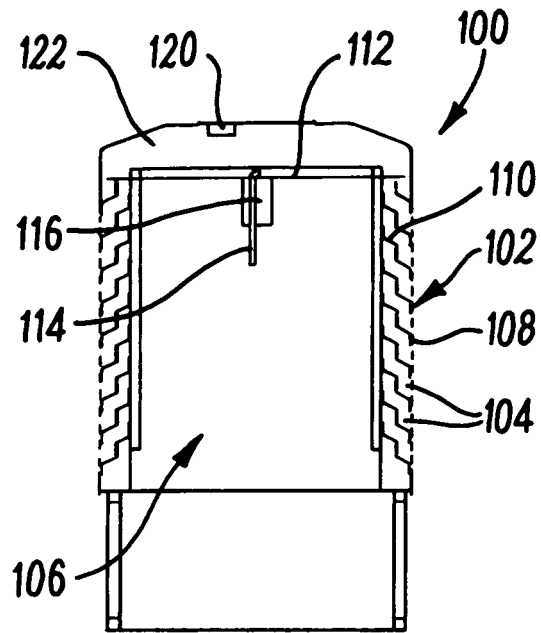


FIG. 5

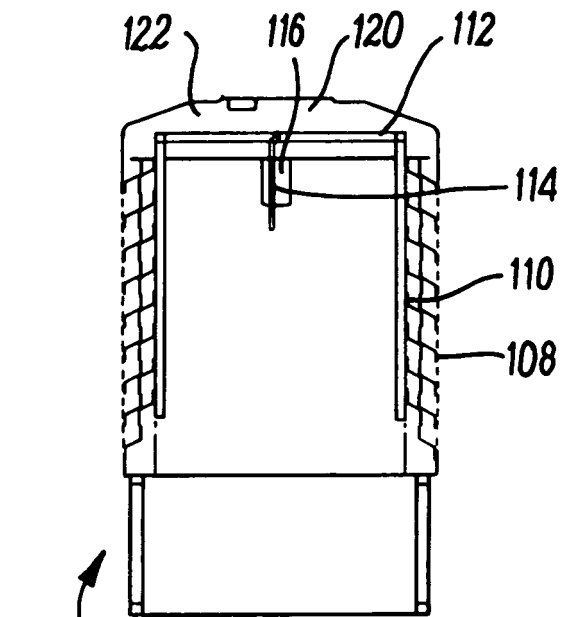


FIG. 6

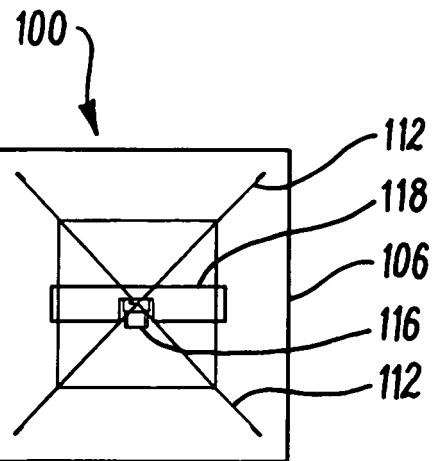


FIG. 7

REFERENCES CITED IN THE DESCRIPTION

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