



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 557 619 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
27.07.2005 Bulletin 2005/30

(51) Int Cl.7: **F24F 13/10**

(21) Application number: **05250201.0**

(22) Date of filing: **14.01.2005**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL BA HR LV MK YU

(72) Inventor: **Rideout, Neil Murray**
Uckfield East Sussex TN22 4LF (GB)

(74) Representative: **Wilson Gunn M'Caw**
5th Floor,
Blackfriars House,
The Parsonage
Manchester M3 2JA (GB)

(30) Priority: **16.01.2004 GB 0400897**

(71) Applicant: **Building Product Design Limited**
Sale, Cheshire M33 3SS (GB)

(54) **Valve device**

(57) A ventilation system has a valve device for controlling fluid flow through an opening (1). The valve has a support (2) and a closure structure mounted relative to the support (2), the closure structure being operable by a driving force. The closure structure comprises a deformable body (3) with at least one slot (10) bounded by edges, the edges being able to move relative to one another,

so the closure structure is movable across the opening to different extents, to effect different degrees of restriction on the flow of fluid, by small movements of the body (3) effected by low operating forces. Helical slots (10) may be provided in a sheet or panel (3) and the driving force may be applied, e.g. by a humidity sensitive device (16), at an angle to cause the sheet or panel (3) to twist.

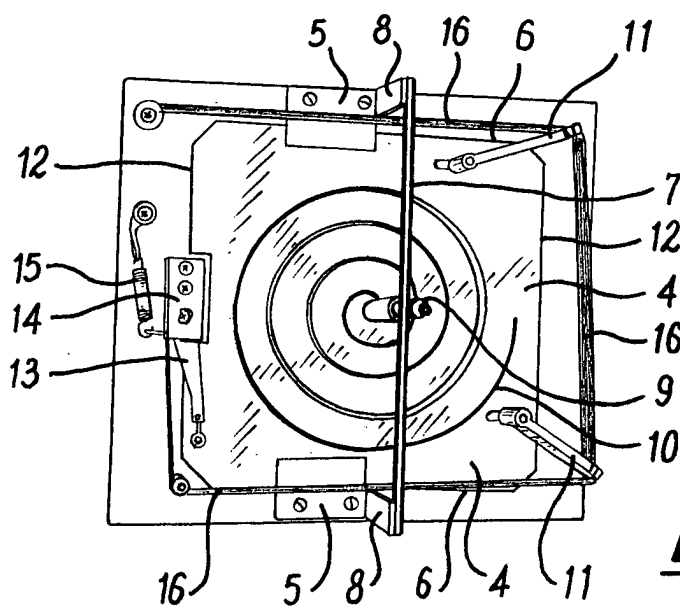


Fig. 2

EP 1 557 619 A1

Description

[0001] This invention relates to a valve device for controlling fluid flow through an opening, particularly although not exclusively for a ventilation opening for exhausting moist air from a room or other space within a building.

[0002] It is known to provide a building ventilation system with a vent which opens and closes with change in humidity.

[0003] Typically the vent comprises a shutter or louvre arrangement mounted across an outlet leading to a duct. A humidity-sensitive mechanical drive such as a tensioned absorbent fibrous cord or ribbon connected to a linkage is used to adjust fluid flow through the outlet by opening and closing the shutter or louvre arrangement.

[0004] With this arrangement it can be difficult to achieve efficient and effective air flow adjustment having regard to the relatively low force produced by the mechanical drive and the relatively massive nature of the shutter or louvre arrangement.

[0005] An object of the present invention is to provide a valve device which can be operated to adjust fluid flow through an opening in an efficient and effective manner with a relatively low operating force.

[0006] According to the invention therefore there is provided a valve device for controlling fluid flow through an opening, said device comprising a support having therein the said opening, and a closure structure mounted relative to the support so as to be movable across the opening between different positions in which the closure structure differently restricts the opening, characterised in that the closure structure comprises a body containing at least one slot bounded by edges, the body being deformable so as to cause the edges to move relative to each other.

[0007] With this arrangement, relatively large changes in overall separation of the slot edges, and consequent relatively wide adjustment of the extent to which the slot is opened out to permit fluid flow therethrough can be achieved with relatively small deformation movements of the body which need not require appreciable operating forces.

[0008] The slot may be of any desired configuration. However, in a particularly preferred embodiment a curved slot is used especially a spirally curved slot.

[0009] There may be a single slot or multiple slots as desired in the same said body. Such multiple slots may be wholly separate or they may be joined as desired. For strength purposes, i.e. to prevent collapse of the body along the slot lines, multiple slots having different angular and/or directional characteristics may be desirable. In one embodiment inner and outer concentric helices of opposite hand are used.

[0010] There may be two or more like said bodies disposed in superimposed relationship each with its respective said slot (or slots) which may be aligned or

staggered as desired.

[0011] The (or each) slot is preferably formed as a slit in a sheet or panel which preferably is otherwise solid, i.e. substantially imperforate.

[0012] This sheet or panel is preferably substantially planar in a first closure said condition and is twisted or buckled or otherwise distorted into a non-planar configuration in the (or each) other open said condition. In the closure condition the slot preferably has its edges parallel to each other.

[0013] In the said closure condition, the body may alternatively be non-planar e.g. curved or otherwise shaped.

[0014] The arrangement may be such that the opening is substantially sealed in one said condition of the closure structure e.g. the aforesaid closure condition, i.e. the (or each) slot is closed up with the edges touching or closely juxtaposed and the body is formed from a solid imperforate material. It is, however, also possible for the (or each) slot to allow fluid flow therethrough in all conditions, such flow being more restricted in one said condition, e.g. the aforesaid closure condition, than in the (or each) other condition.

[0015] The arrangement may be such that the body is biased to one of said conditions whereby an operating force is required only to change the (or each) slot to the (or each) other said condition. This biasing may be effected resilient properties of the body and/or by use of a spring or other biasing means in conjunction therewith.

[0016] In one embodiment the body is preferably biased to an open most condition of the (or each) slot.

[0017] Alternatively, no biasing may be used whereby an operating force is required for movement to all conditions.

[0018] With regard to the deformation of the body preferably this involves twisting or buckling such that the edges bounding the (or each) slot move relative to each other transverse to a plane containing the slot.

[0019] This may be achieved by application of a drive force to the body at an angle to the longitudinal extent of at least a portion of the (or each) slot whilst the body is retained against bodily movement, the force thereby causing the body to twist or buckle by distortion at the (or each) slot.

[0020] In one embodiment where the (or each) slot is curved, e.g. of spiral configuration, the body may be retained in position centrally relative to the slot curvature, provision being made for application of the drive force substantially in the plane of the body.

[0021] Thus, for example, a bridge member may be fixed to the support so as to extend over the body with a suspension member such as a rod or bar rigidly by joining central region of the bridge member and the body, guide means being provided to guide movement of the body in a direction transversely to the suspension member in the plane of the body.

[0022] With regard to the drive force, this may be de-

rived from a humidity sensitive mechanical drive which comprises a structure, such as a fibrous cord or ribbon which changes dimensions e.g. by contraction or expansion with changes in moisture level. A structure of this kind may be used in conjunction with a biasing means

[0023] In one embodiment movement of a spring linked to the body is opposed by a tensioned fibrous cord or ribbon where increased humidity causes the cord or ribbon to extend and permit movement (extension or contraction of the spring) which moves the body.

[0024] Other arrangements involving different kinds of movement of the body and different kinds of drive devices are also possible. For example, instead of using a body held captive at the centre of a curved slot, the body may be held captive differently with the drive force being operative to move a central region of the body.

[0025] Also, the drive force may be applied linearly and/or rotationally in the plane of the body and/or at an angle to such plane, or otherwise.

[0026] It is visualised that the valve device of the invention will find particular application in the context of a ventilation system for a building whereby the said opening is a vent outlet leading to a vent duct through which moist air is exhausted.

[0027] However, the invention is not restricted to this field of application and the valve device may be used for any suitable purpose in any suitable context.

[0028] The invention will now be described further by way of example only and with reference to the accompanying drawings in which:

Figure 1 is a plan view from below of one form of a valve device according to the invention in a closed condition;

Figure 2 is a plan view from above of the valve device of Figure 1, and

Figure 3 is a side perspective of the device in an open condition.

[0029] Referring to the drawings, Figures 1-3, these show a valve device for controlling fluid flow through a ventilation duct of a building ventilation system.

[0030] The ventilation duct which may comprise a flexible pipe runs between an opening e.g. in a ceiling of a room and an outlet of the building.

[0031] The opening is a circular opening 1 cut in a rigid solid board 2 mounted in the room ceiling. The board 2 may be formed from MDF or other material.

[0032] The circular opening 1 is covered with a substantially square sheet or panel 3 formed from a readily deformable solid i.e. imperforate plastics material such as ABS.

[0033] This panel 3 lies on top of the board 2 and is larger than the opening 1 such that a peripheral edge region 4 of the panel 3 overlies the solid part of the board 2 around the opening 1.

[0034] The panel 3 is held in position by a mounting arrangement comprising two flanges 5 which are fixed to the board 2 at opposite sides 6 of the panel 3 at fixing positions beyond the panel edges. The flanges 5 project from their fixing positions inwardly over the adjacent edge regions 4 of the panel 3 with a slight gap therebetween.

[0035] The mounting arrangement also comprises a ridged elongate bridging element 7 which extends over the panel 3 being attached at opposite ends to vertically upstanding arms 8 attached to the flanges 5 at ends thereof beyond the panel 3.

[0036] The bridging element 7 runs parallel to and spaced from the panel surface perpendicularly to the two opposite sides 6 located by the flanges 5.

[0037] A rigid rod 9 is fixed between the centre of the panel 3 and the centre of the bridging element 7 so as to run perpendicularly to the panel face and the bridging element 7.

[0038] The panel 3 contains a spiral cut 10 which runs substantially from the centre of the panel 3 to an outer position adjacent to the centre of one side edge of the panel 3. The outermost turn of the spiral 10 is substantially coincident with the circular rim of the opening 1.

[0039] The valve device further includes a drive device which comprises two arms 11 each of which is slidably located at one end within a short slot in the panel 3 which extends generally parallel to the located sides 6 of the panel 3 and which projects beyond one transverse side 12 of the panel 3 at its opposite end. The two arms 11 are located respectively close to the two sides 6.

[0040] There is also a pivot arm 13 which is pivotally mounted at one end within a block 14 fixed to the board 2 adjacent the transverse side 12 opposite to the arms 11. The opposite end of this pivot arm 13 is pivotally mounted on the panel 3.

[0041] A spring 15 is fixed in compression between a mid position of the pivot arm 13 and a fixed position on the board 2.

[0042] A humidity sensitive fibrous cord 16, e.g. formed from Nylon runs alongside the two sides 6 of the panel 3 and between and connected to the arms 11. This cord 16 is anchored at opposite ends respectively to the block 14 and to a fixed point on the board 2.

[0043] In dry atmospheric conditions the cord 16 contracts and is in tension so as to bear against the arms 11 and hold the arms 11, the panel 3 and the pivot arm 13 against the spring force.

[0044] In this condition the panel 3 is substantially planar and the edges of the slot are in close parallel contact whereby the panel 3 acts to seal the opening 1 such as substantially to prevent flow of air therethrough.

[0045] In moist conditions the cord 16 extends which release tension. The spring 15 can now extend which causes the pivot arm 13 and hence the panel 3 to be pushed away from the spring 15.

[0046] The centre of the panel 3 is restrained by the

rod 9 whereby such movement of the panel 3 causes the panel 3 to distort by twisting or buckling so that the edges of the spiral slot 10 are moved away from each other, the slot 10 opens up and sections of the panel 3 between the slot turns are deflected both upwardly and downwardly out of the plane of the board 2.

[0047] This causes the opening 1 in the board 2 to be uncovered to a substantial extent thereby to allow moist air to flow freely through the opening 1 into the ventilation duct.

[0048] As and when humidity again falls the cord 16 contracts returning the panel 3 to its planar, sealed condition.

[0049] With this arrangement it will be appreciated that wide ranging movement causing opening and closing of the slot 10 can be achieved with only a small driving force. Control of fluid flow can therefore be achieved in a particularly efficient and effective manner.

[0050] It is of course to be understood that the invention is not intended to be restricted to the details of the above embodiments which are described by way of example only.

Claims

1. A valve device for controlling fluid flow through an opening (1), said device comprising a support (2) having therein the said opening (1), and a closure structure mounted relative to the support (2) so as to be movable across the opening (1) between different positions in which the closure structure differently restricts the opening (1), **characterised in that** the closure structure comprises a body (3) containing at least one slot (10) bounded by edges, the body (3) being deformable so as to cause the edges to move relative to each other.
2. A valve device as claimed in claim 1 **characterised in that** the slot (10) has a curved configuration.
3. A valve device as claimed in claim 2 **characterised in that** the slot (10) is spirally curved.
4. A valve device as claimed in any of the claims 1 to 3 **characterised in that** there is a single slot (10) in the same said body.
5. A valve device as claimed in any of the claims 1 to 3 **characterised in that** there are multiple slots in the same said body.
6. A valve device as claimed in claim 5 **characterised in that** the multiple slots are wholly separate.
7. A valve device as claimed in claim 5 **characterised in that** the multiple slots are joined.
8. A valve device as claimed in claims 5 to 7 **characterised in that** the multiple slots have inner and outer concentric helices of opposite hand.
9. A valve device as claimed in any one of claims 1 to 8 **characterised in that** there are at least two like said bodies disposed in superimposed relationship each with its respective said slot (10) (or slots).
10. A valve device as claimed in claim 9 **characterised in that** the bodies are aligned.
11. A valve device as claimed in claim 9 **characterised in that** the bodies are staggered.
12. A valve device as claimed in any of claims 1 to 11 **characterised in that** each slot (10) is formed as a slit in a sheet or panel (3) which is substantially imperforate.
13. A valve device as claimed in claim 12 **characterised in that** the sheet or panel (3) is substantially planar in a first closure said position and is deformed into a non-planar configuration in another open said position.
14. A valve device as claimed in claim 13 **characterised in that** in the closure position the slot (10) preferably has its edges parallel to each other.
15. A valve device as claimed in claims 13 and 14 **characterised in that** the arrangement of the body (3) is such that the opening is substantially sealed in one said closure position of the closure structure.
16. A valve device as claimed in claims 13 and 14 **characterised in that** the arrangement is such that the body (3) is biased to one of said positions whereby an operating force is required only to change the (or each) slot (10) to the (or each) other said position.
17. A valve device according to any one of claims 1 to 16 **characterised in that** the deformation of the body (3) involves movement of the edges bounding the (or each) slot (10) relative to each other transverse to a plane containing the slot (10).
18. A valve device as claimed in claim 17 **characterised in that** the deformation of the body (3) is achieved by application of a drive force to the body (3) at an angle to the longitudinal extent of at least a portion of the (or each) slot (10) whilst the body (3) is retained against bodily movement.
19. A valve device as claimed in claim 18 **characterised in that** the drive force is derived from a humidity sensitive mechanical drive which comprises a structure (16), which changes dimensions by con-

traction or expansion with changes in moisture level.

- 20.** A valve device as claimed in claim 18 or 19 **characterised in that** the body (3) is held captive with the drive force being operative to move a central region of the body (3). 5
- 21.** A valve device substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings. 10
- 22.** A valve device as claimed in any of the preceding claims which is used in a ventilation system for a building whereby the opening (1) is a vent outlet leading to a vent duct through which moist air is exhausted. 15

20

25

30

35

40

45

50

55

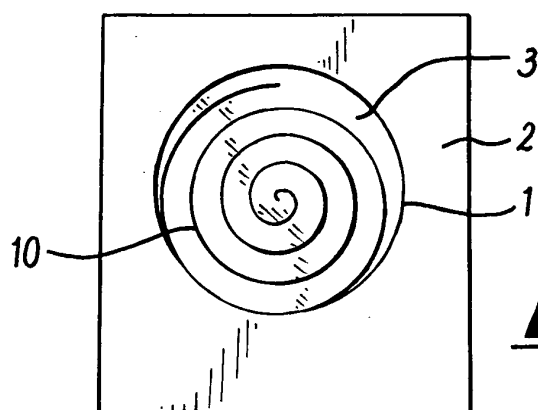


Fig. 1

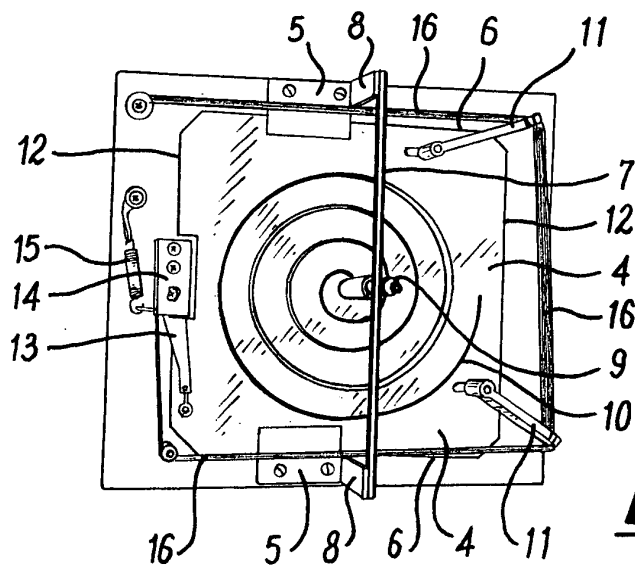


Fig. 2

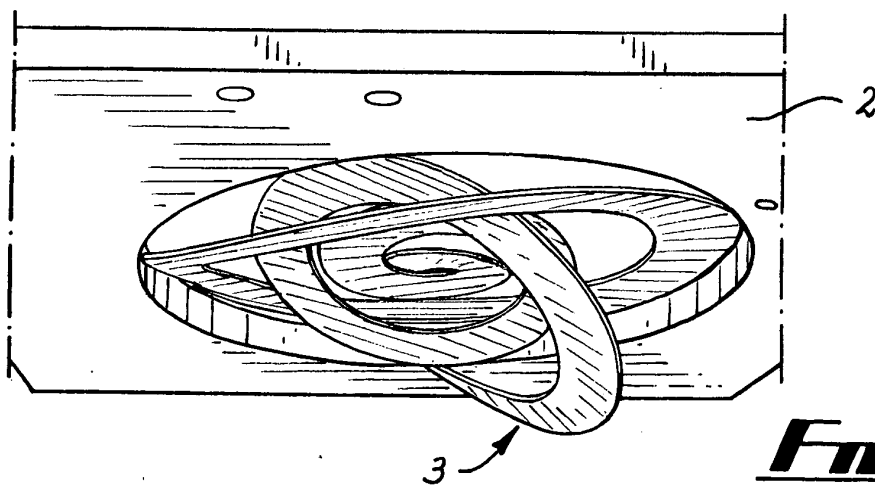


Fig. 3



European Patent
Office

PARTIAL EUROPEAN SEARCH REPORT

Application Number

which under Rule 45 of the European Patent Convention EP 05 25 0201 shall be considered, for the purposes of subsequent proceedings, as the European search report

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	DE 38 21 948 A1 (KUTZNER, LUITPOLD, DIPL.-ING., 8000 MUENCHEN, DE) 4 January 1990 (1990-01-04) * column 1, line 3 - column 6, line 27; figures 1,2 *	1-4, 12-18,20	F24F13/10
X	GB 391 324 A (WASSMUTH, KURTH & CO. AKT. GES) 27 April 1933 (1933-04-27) * page 2, line 48 - page 3, line 3; figures 1,4,5 *	1-4	
X	US 2 727 456 A (DAVIES CHARLES) 20 December 1955 (1955-12-20) * column 3, line 13 - column 4, line 61; figures 1,3,6 *	1-4,12	
A	WO 83/04298 A (V. KANN RASMUSSEN HOLDING A/S) 8 December 1983 (1983-12-08) * page 3, lines 7-36; figure 1 *	1,19,22	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			F24F G05D
INCOMPLETE SEARCH			
The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC to such an extent that a meaningful search into the state of the art cannot be carried out, or can only be carried out partially, for these claims. Claims searched completely : Claims searched incompletely : Claims not searched : Reason for the limitation of the search: see sheet C			
Place of search		Date of completion of the search	Examiner
Munich		17 May 2005	Lienhard, D
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

2

EPO FORM 1503 03/82 (P04C07)



European Patent
Office

**INCOMPLETE SEARCH
SHEET C**

Application Number
EP 05 25 0201

Claim(s) searched completely:
1-20,22

Claim(s) not searched:
21

Reason for the limitation of the search:

Claim 21 contains a reference to the drawings and is formulated in such a vague and unclear manner that no meaningful search can be carried out.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 25 0201

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-05-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 3821948 A1	04-01-1990	NONE	
GB 391324 A	27-04-1933	NONE	
US 2727456 A	20-12-1955	NONE	
WO 8304298 A	08-12-1983	DK 46984 A	02-02-1984
		WO 8304298 A1	08-12-1983
		EP 0111504 A1	27-06-1984