



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
21.09.2011 Bulletin 2011/38

(51) Int Cl.:
A62C 2/14 (2006.01) F24F 13/15 (2006.01)

(21) Application number: **11158318.3**

(22) Date of filing: **15.03.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: **Grempeco S.A.**
72-100 Goleniów (PL)

(72) Inventor: **Jedrzejewski, Roman**
71-450, Szczecin (PL)

(74) Representative: **Karcz, Katarzyna**
Patpol Sp. z o.o.
ul. Nowoursynowska 162J
02-776 Warszawa (PL)

(30) Priority: **15.03.2010 PL 39069310**

(54) **Fire damper**

(57) A fire damper comprising a body (4) consisting of a steel frame and at least two pivotally mounted blades (1) made of a fire protection material, the blades (1) and optionally the body (4) being provided with sealings (10) comprising seals, characterized in that each of the blades (1) is provided with two rotary axes (14) located in two

respective bearings (5) placed on the opposite vertical sides of the body (4) of the damper, the blades (1) being connected to each other via angle bars (18) and by a link (6) enabling drive transmission between the successive blades (1), and in that at least one spring (3) is attached by its one end to the body (4) of the damper, the other end of the spring (3) being connected with one blade (1).

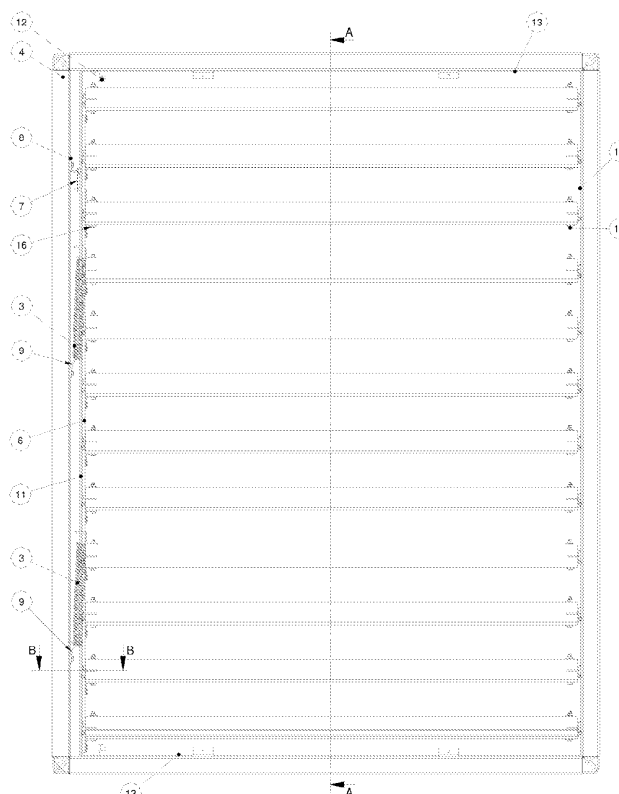


Fig. 1

Description

[0001] The object of the invention is a fire damper which is a multiblade damper used in ventilation or air conditioning systems as a transfer or a fire ventilation damper.

[0002] Different types of fire dampers are known in the art having movable blades (the so called deflectors), that are used to close ventilation openings. The fire dampers prevent fire and smoke to be transferred from the rooms on fire to other rooms. The fire dampers should have a specific fire resistance and smoke tightness. These parameters are designated as EIS tt respectively, where E stands for fire integrity, I - fire insulation, S - smoke tightness, tt - the time in which all the mentioned parameters are being maintained. The dampers are automatically released by means of an actuating mechanism with a thermal fuse trigger or an electric thermal trigger or, in case of the fire ventilation damper, a drive mechanism remotely controlled by an electric signal. In order to achieve the E and I parameters, fireproof materials are used for the damper construction. In order to achieve the smoke tightness, rubber or silicone sealings and swelling sealings are used, which ensure the tightness of the structure during a fire when ordinary sealings lose their fireproof characteristics.

[0003] A fire damper according to the invention comprises a body consisting of a steel frame, and at least two pivotally mounted blades made of a fire protection material, the blades being provided with sealings comprising seals.

[0004] The fire damper according to the invention is characterized in that each of the blades is provided with two rotary axes located in two respective bearings placed on the opposite vertical sides of the body of the damper, the blades being connected to each other via angle bars and by a link enabling drive transmission between the successive blades, and in that at least one spring is attached by its one end to the body of the damper, the other end of the spring being connected with one blade.

[0005] Alternatively, the fire damper according to the invention comprises a body consisting of a steel frame, and at least two pivotally mounted pivotally mounted blades made of a fire protection material, the body of the damper and the blades being provided with sealings comprising seals.

[0006] The fire damper according to this alternative version of the invention is characterized in that each of the blades is provided with two rotary axes located in two respective bearings placed on the opposite vertical sides of the body of the damper, the blades being connected to each other via angle bars and by a link enabling drive transmission between the successive blades, and in that at least one spring is attached by its one end to the body of the damper, the other end of the spring being connected with one blade.

[0007] Preferably, the at least one spring is attached

to the body of the damper by means of a support.

[0008] The sealings are preferably placed on both short sides and one long side of the blades.

[0009] Alternatively, the sealings are placed on one long side of each blade on the vertical sides of the body of the damper.

[0010] The sealings preferably also comprise at least one first seal made of an elastic material, having a hollow cross section so as to ensure the tightness between the blades as well as between the blades and the body.

[0011] Preferably, the first seals are silicone seals.

[0012] Preferably, the first seals are O-ring seals.

[0013] The sealings preferably comprise at least one second seal placed on one of the longer sides of each of the blades.

[0014] Preferably, a second seal is placed on the inner surface of the vertical side of the damper body, where the link is located.

[0015] Alternatively, a second seal is placed on the inner surface of the upper and lower sides the damper body as well as on its vertical side, the one that is opposite to the location of the link .

[0016] The second seal is preferably a swelling seal.

[0017] Preferably, at least one blade is connected to a fuse trigger the other side of which is mounted on a support attached to the body.

[0018] Preferably, at least one blade is connected to a drive actuator.

[0019] Preferably, the support has the form of an angle bar and is attached to the body so that it forms a blade movement stop.

[0020] The damper preferably comprises at least one protection grate.

[0021] In case of a fire, after the blades have been closed, the damper reaches a fire resistance of EIS 120. In the course of regular operation of the system, when the blades are opened, they do not extend beyond the damper outline.

[0022] The damper body is surprisingly short as compared to other commercially available dampers of the EIS 120 fire rating, as it is only 120 mm long. It allows easy installation of the fire damper in the construction barriers the fire resistance characteristics of which are REI 120 or EI 120, in such a way that the body of the damper and its blades do not extend beyond of the barrier outline while the damper remains open.

[0023] In an embodiment of the invention, the damper body was made of a steel sheet, preferably perforated, which allowed obtaining fire insulation.

[0024] Despite the potentially numerous possible leaks resulting from the large number of blades and their contact surfaces, the damper integrity required for the S-rate smoke tightness was achieved. It was possible thanks to the use of a swelling seal and the innovative sealing comprising a specially designed seal registered by the present applicant as an industrial design.

[0025] The drive of the damper (the drive mechanism) is located within the damper body. The drive mechanism

is efficiently protected against soiling that may arise during installation because it is located on the inner side of the damper body whereby no contact with mortar or gypsum is possible during installation. The pivotally mounted blades are made in such a way, that they do not extend beyond the damper body outline in their open position.

[0026] The installation and the bearing setting of the blades enable their replacement in a damper which is built into a construction barrier without the need of dismantling it from the construction barrier.

[0027] The design of the damper enables installation of the protection grates (of aluminium or steel) on one or two sides of the damper (depending on the wall thickness).

[0028] The invention provides a fire resistant and smoke tight fire damper, the length of which is shortened to the possible minimum thanks to the use of the several pivotally mounted blades. At the same time, the damper of the invention has the additional feature of enabling the replacement of the individual damaged blades without dismantling the damper that is built into a construction barrier. Moreover, the blades do not extend beyond the outline of the damper. The possibility of dismantling results from a specially designed blade axle which is inserted into a slot on the short sides of the barrier and fixed to the barrier by means of bolts.

[0029] The fire damper of the invention is shown on the accompanying drawing, in which: fig. 1 shows the front view of the open damper according to the invention, fig. 2 shows a cross section of the damper along the A-A line of fig. 1, fig. 3 shows a cross section of the damper along the B-B line of fig. 1, fig. 4 shows the front view of the closed damper according to the invention in the remote control version, fig. 5 shows the side view of the damper of fig. 4, fig. 6 shows the front view of the open damper of fig. 4, fig. 7 shows the side view of a part of the closed damper of fig. 7, fig. 8 shows the enlarged detail of fig. 7, fig. 9 shows the side view of the open damper according to the invention, comprising one protection grate, fig. 10 shows the side view of the open damper according to invention, comprising two protection grates, fig. 11 shows the enlarged detail of fig. 2, fig. 12 shows a part of the damper cross section in the second embodiment of the invention, similar to the cross section along the B-B line, but on the other side of the barrier.

[0030] The multiblade fire damper shown in fig. 1 comprises a body 4 consisting of a steel frame, and a multiplicity of blades 1 made of a fire protection material. On both short sides and on one long side of the blades 1, sealings 10 have been fixed by means of staples, the sealings 10 comprising the first elastic seals having a hollow cross section. Preferably, the first seals are made of silicone and have an O-shaped cross section as it is shown in fig. 11. The function of these seals is to ensure the tightness between the successive blades 1 as well as between the blades 1 and the body 4 at low temperatures. Furthermore, the second seals 2, 11 and 13, preferably swelling seals, have been used, their function be-

ing to ensure the tightness between the successive blades 1 as well as between the blades 1 and the body 4 during a fire. The second swelling seals 2, 11 and 13 differ in width from one another (respectively 30, 40 and 60mm). The seal 2 is fixed on one of the longer sides of each of the blades 1 by means of staples. The seal 11 is glued to the inner surface of the body 4 of the damper on the side of the link 6. The seals 13 are glued to the inner surface of the body 4 of the damper on the remaining sides.

[0031] Each blade 1 is provided with two rotary axles 14 that are mounted in the respective bearings 5 fixed on the opposite vertical sides of the body 4 of the damper. The possibility of dismantling the blades 1 is provided by a specially designed blade axle 14 which is inserted into a slot on the short sides of the blade 1 and fixed by bolts 16 to the blade 1.

[0032] The blades 1 are connected to each other by means of a link 6 in the form of, for example, an angle bar. On each blade 1 an angle bar 18 having an opening is mounted. The link 6 has openings spaced by 100 mm (same as the spacing between the blade axles). These two elements are connected with each other by pins and clips. The pins are freely rotatable in the openings of the link 6, so as to enable the drive transmission between individual blades 1. The movement (rotation) of any blade 1 causes identical movement of the remaining blades 1.

[0033] The self-acting damper shown in fig. 1 is opened by manually turning the blade 1 by a 90° angle. Once opened, the blade 1 is blocked in the open position by a fuse trigger 7, which is mounted between the blade 1 and the support 8 of the fuse trigger 7. The support 8 is fixed to the body 4 of the damper (by means of screws). The fuse trigger 7 is mounted on the support 8 by its one end and connected to the blade 1 by its other end. While opening the damper, at least one drive spring 3 becomes stretched. There may be more springs 3, depending on the damper type.

[0034] Each spring 3 is fixed by its one end to the blade 1 and by its other end to the body 4, preferably by means of the support 9. In the case of the damper version comprising the drive actuator 15 (fig. 4, 5 and 6), the damper is opened by powering of the actuator 15, the rotation of which causes simultaneous rotation of the blades 1 and stretching of the spring inside the actuator 15.

[0035] In the case of the self-acting damper version, its automatic closing is caused by the action of the fuse trigger 7 which, when the temperature of 72°C is reached, gets torn apart by the drive spring 3 forcing the damper to close at the same time. In the case of the damper version with the drive actuator 15, the system is released as a result of the action of an electric thermal trigger which activates the spring inside the actuator 15 forcing the damper to close. In the case of the fire ventilation dampers, only the dampers comprising the drive actuator 15 are used, the system being released by electric signal forcing the damper to open while in normal conditions it remains closed.

[0036] In order to ensure the correct position of the closed blades 1, a blade 1 movement stop has been used. It consists of a support 12 in the shape of an angle bar fixed to the body 4 of the damper. It ensures that the force generated while closing the blades 1 will not turn them over to the other side - i.e., if the their initial position (closed) is a 0 degree angle and their final position (open) is a 90 degrees angle, the stop makes the blade 1 return to the position of exactly 0 degrees instead of e.g. -5 degrees during closing.

[0037] The damper may comprise one (fig. 9) or two protection grates 17 (fig. 10).

[0038] Fig. 11 shows a detail of the sealing 10 consisting of the first seal and the second seal 2, the sealing 10 being placed on the blade.

[0039] Fig. 12 shows a part of the damper cross section in the second version of the invention, similar to the cross section along the B-B line but on the other side of the blade. The axle 14 and the bearing 5 have been omitted in fig. 12 for the sake of clarity. This damper differs from the above described first version in that both the body 4 and the blades 1 are provided with the sealings 10. In this example, the first seal having a hollow cross section is placed on both vertical sides of the body 4.

[0040] While the damper passes from its open position to its closed position, the blades 1 do not extend beyond of the outline of the body 4 of the damper at any time.

[0041] Method of installation of the fire damper according to the invention and of connecting it to ventilation ducts.

[0042] The damper according to invention can be mounted in:

- masonry, concrete, gypsum-cardboard construction barriers, as an element of ventilation ducting (the damper is installed within the thickness of the wall or ceiling (and fixed thereto), the ventilation ducts being connected to both sides of the damper);
- masonry, concrete, gypsum-cardboard construction barriers, as an ending element of ventilation ducting (the damper is installed within the thickness of the wall or ceiling, the ventilation ducts being connected only to one side of the damper whereas a protection grate is generally placed on the other side);
- spaced away from a construction barrier as a single damper or a set of dampers (the damper is placed beyond the construction barrier, the ventilation ducts being connected to both sides of the damper);
- construction barriers as a transfer element (the damper is installed within the thickness of the wall, no ventilation ducts being connected thereto, the damper being protected on both sides with protection grates imparting the fire resistance class EI 120).

[0043] It should also be noted that the damper is suitable for vertical and horizontal installation:

- with the drive mechanism situated on the side of the

damper (the standard position - deflectors in a horizontal arrangement),

- with the drive mechanism situated on the base of the damper (the non-standard position - deflectors in a vertical arrangement).

[0044] The damper according to the invention is suitable for:

- rectangular ventilation ducts with flange connection
- circular or rectangular ventilation ducts with band connection

[0045] The damper according to the invention may be used in ventilation or smoke extraction systems as:

- a fire damper, used in places where ventilation ducts pass through construction barriers constituting a fire zone division. During standard functioning of a building, all fire dampers remain open, in a so called stand-by position. In the case of a fire and in response to a control signal, an automatic or remote closing of the dampers located on the border of the fire zone take place.
- a transfer damper, used in fire division walls without ducts. It enables air flow between rooms until the temperature near the damper exceeds a predetermined value.
- a fire damper used in places where smoke extraction ducts pass through construction barriers constituting a fire zone division. During a fire it enables extraction of hot gases from a selected zone - the damper is remotely opened in case of a fire.

[0046] The damper according to the invention meets the fire resistance requirements of the class EIS 120 and of the EI 120 in the case of the transfer damper with a protection grate 17.

Claims

1. A fire damper comprising a body (4) consisting of a steel frame and at least two pivotally mounted blades (1) made of a fire protection material, the blades (1) being provided with sealings (10) comprising seals, **characterized in that** each of the blades (1) is provided with two rotary axles (14) located in two respective bearings (5) placed on the opposite vertical sides of the body (4) of the damper, the blades (1) being connected to each other via angle bars (18) and by a link (6) enabling drive transmission between the successive blades (1), and **in that** at least one spring (3) is attached by its one end to the body (4) of the damper, the other end of the spring (3) being connected with one blade (1).

2. A fire damper comprising a body (4) consisting of a

steel frame and at least two pivotally mounted blades (1) made of a fire protection material, the body (4) of the damper and the blades (1) being provided with sealings (10) comprising seals, **characterized in that** each of the blades (1) is provided with two rotary axles (14) located in two respective bearings (5) placed on the opposite vertical sides of the body (4) of the damper, the blades (1) being connected to each other via angle bars (18) and by a link (6) enabling drive transmission between the successive blades (1), and **in that** at least one spring (3) is attached by its one end to the body (4) of the damper, the other end of the spring (3) being connected with one blade (1).

3. The damper according to claim 1 or 2, **characterized in that** the at least one spring (3) is attached to the body of the damper by means of a support (9) .
4. The damper according to claim 1, **characterized in that** the sealings (10) are preferably placed on both short sides and one long side of the blades (1) .
5. The damper according to claim 2, **characterized in that** the sealings (10) are placed on one long side of each blade (1) on the vertical sides of the body (4) of the damper.
6. The damper according to claim 1 or 2 or 4 or 5, **characterized in that** the sealings (10) further comprise at least one first seal made of an elastic material, having a hollow cross section so as to ensure the tightness between the blades (1) as well as between the blades (1) and the body (4) .
7. The damper according to claim 6, **characterized in that** the first seals are silicone seals.
8. The damper according to claim 6 or 7, **characterized in that** the first seals are O-ring seals.
9. The damper according to claim 1 or 2 or 4 or 5, **characterized in that** the sealings (10) comprise at least one second seal (2) placed on one of the longer sides of each of the blades (1).
10. The damper according to claim 1 or 2, **characterized in that** a second seal (11) is placed on the inner surface of the vertical side of the damper body (4), where the link (6) is located.
11. The damper according to claim 1 or 2, **characterized in that** a second seal (13) is placed on the inner surface of the upper and lower sides the damper body (4) as well as on its vertical side, the one that is opposite to the location of the link (6).
12. The damper according to claim 9 or 10 or 11, **char-**

acterized in that the second seal (2, 11, 13) is a swelling seal.

13. The damper according to claim 1 or 2, **characterized in that** at least one blade (1) is connected to a fuse trigger (7) the other side of which is mounted on a support (8) attached to the body (4).
14. The damper according to claim 1 or 2, **characterized in that** at least one blade (1) is connected to a drive actuator (15).
15. The damper according to claim 1 or 2, **characterized in that** the support (12) has the form of an angle bar and is attached to the body (4) so that it forms a blade movement stop.
16. The damper according to claim 1 or 2, **characterized in that** it comprises at least one protection grate (17).

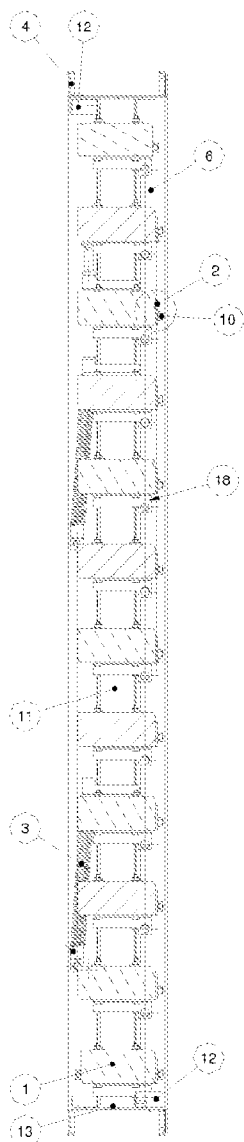


Fig. 2

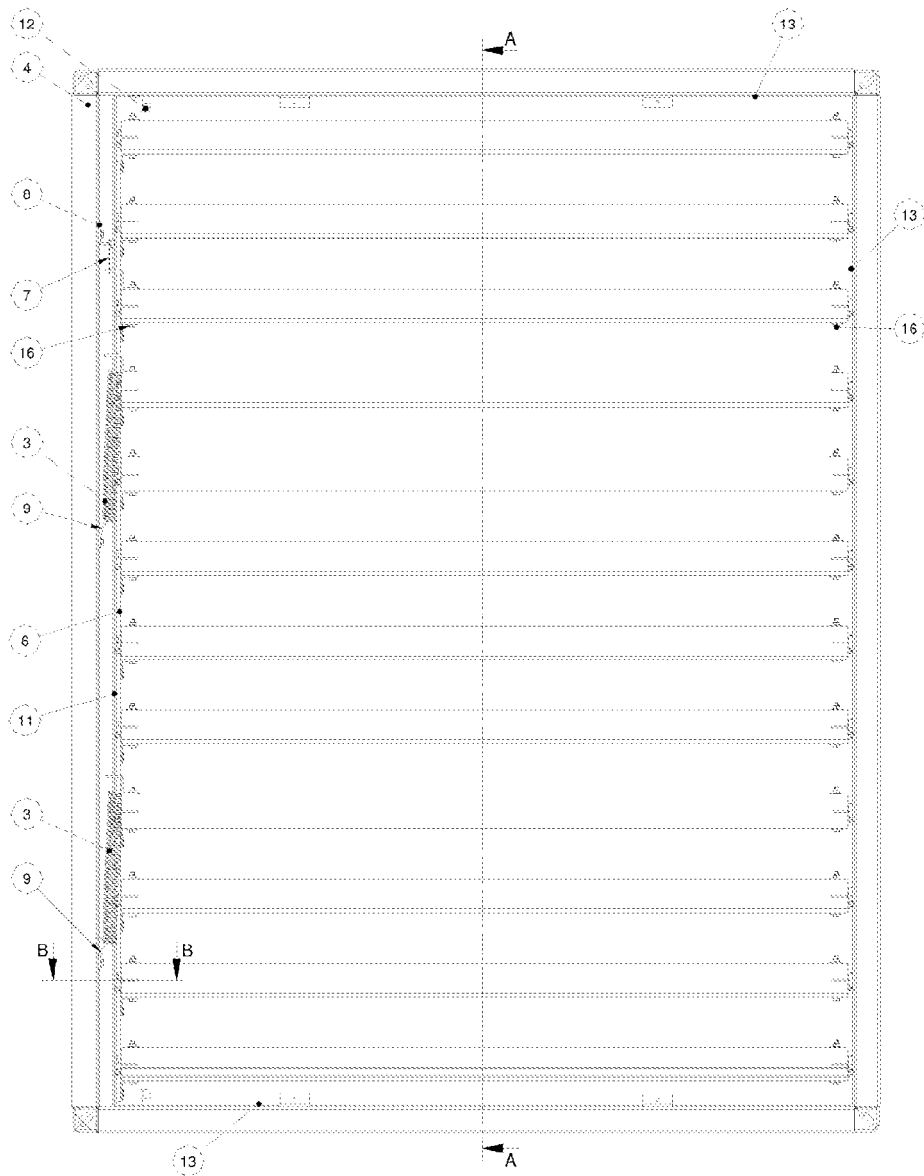


Fig. 1

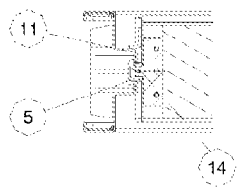


Fig. 3

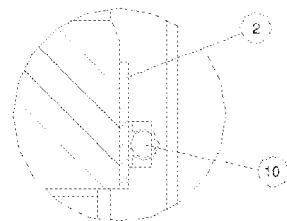


Fig. 11

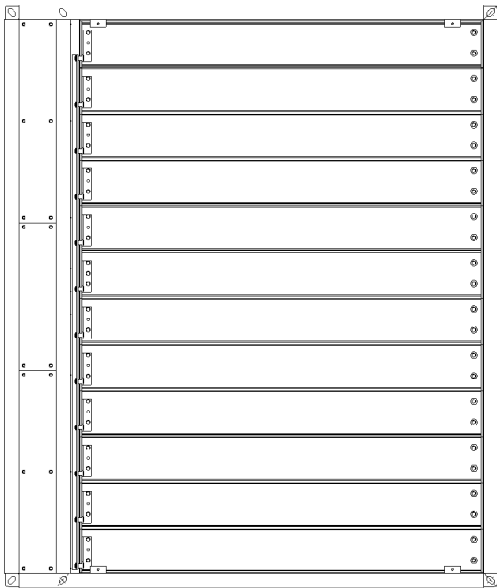


Fig. 4

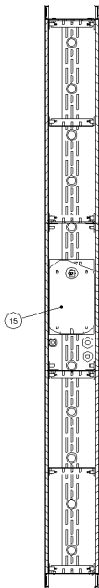


Fig. 5

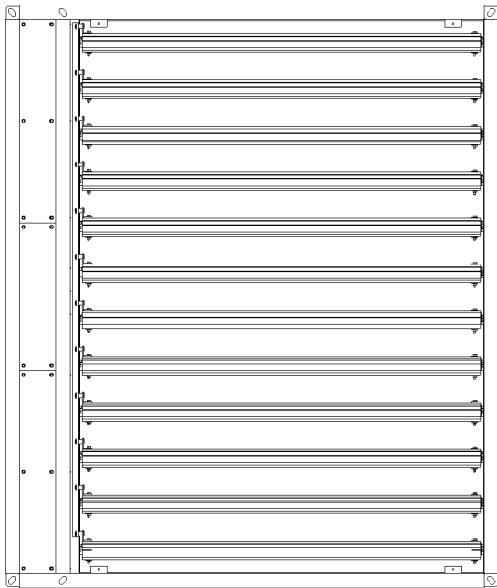


Fig. 6

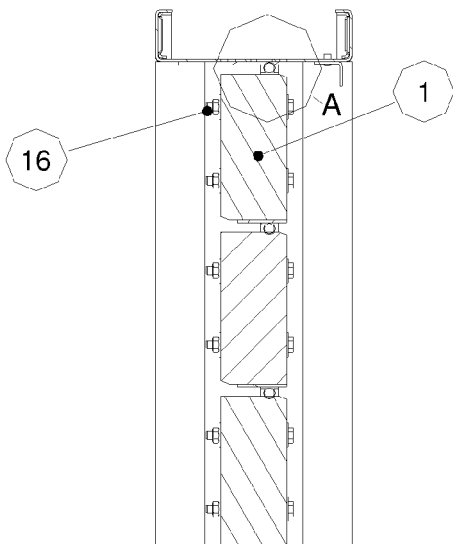


Fig. 7

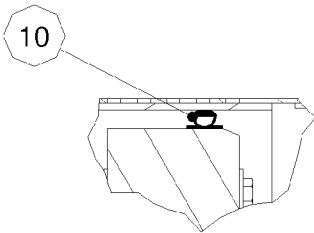


Fig. 8

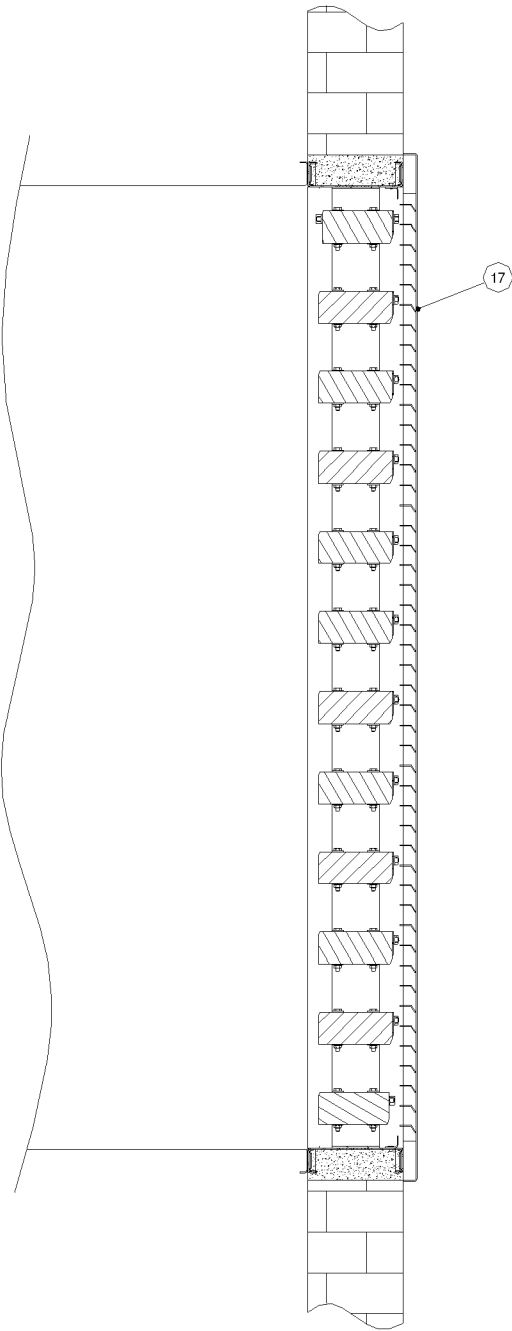


Fig. 9

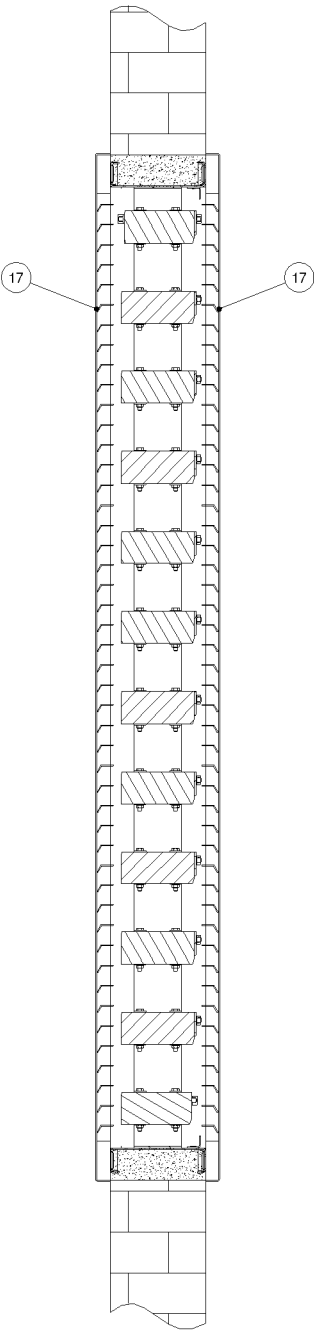


Fig. 10

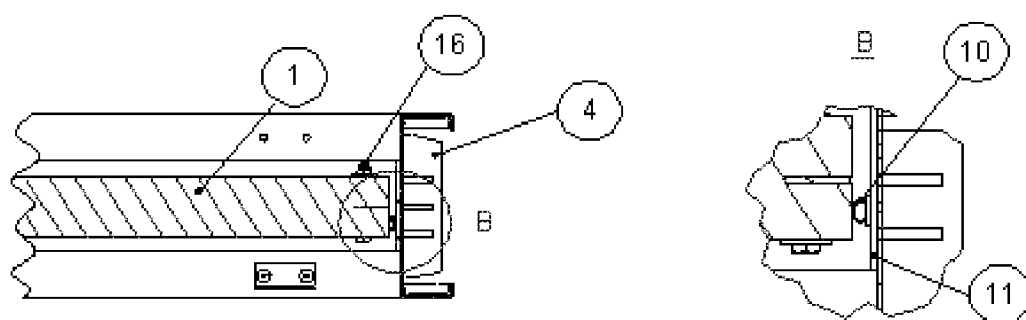


Fig 12



EUROPEAN SEARCH REPORT

Application Number
EP 11 15 8318

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 2 118 293 A (ACTIONAIR EQUIP) 26 October 1983 (1983-10-26) * abstract; figures * * page 2, line 126 - page 3, line 21 * * page 3, line 39 - line 58 * -----	1-6, 9-11,13, 14	INV. A62C2/14 F24F13/15
X	EP 0 396 785 A1 (KUHN GMBH) 14 November 1990 (1990-11-14) * abstract; figures * * column 1 - column 4 * -----	1-5,9, 12-14	
X	US 6 019 679 A (LLOYD) 1 February 2000 (2000-02-01) * abstract; figures * -----	1-3,9, 13-15	
X	GB 2 207 233 A (NUAIRE LTD) 25 January 1989 (1989-01-25) * abstract; figures * -----	1-3,5,9, 10,13-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			A62C F24F
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 July 2011	Examiner Vervenne, Koen
CATEGORY OF CITED DOCUMENTS 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		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	

2

EPO FORM 1503 03.82 (P04C01)

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

EP 11 15 8318

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.

28-07-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2118293	A	26-10-1983	NONE
EP 0396785	A1	14-11-1990	AT 139134 T 15-06-1996 DE 58909690 D1 18-07-1996 ES 2087856 T3 01-08-1996 GR 3020308 T3 30-09-1996
US 6019679	A	01-02-2000	CA 2288859 A1 09-05-2000
GB 2207233	A	25-01-1989	NONE