

(19)



(11)

EP 3 061 503 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
31.08.2016 Bulletin 2016/35

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

(21) Application number: **15460006.8**

(22) Date of filing: **27.02.2015**

(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

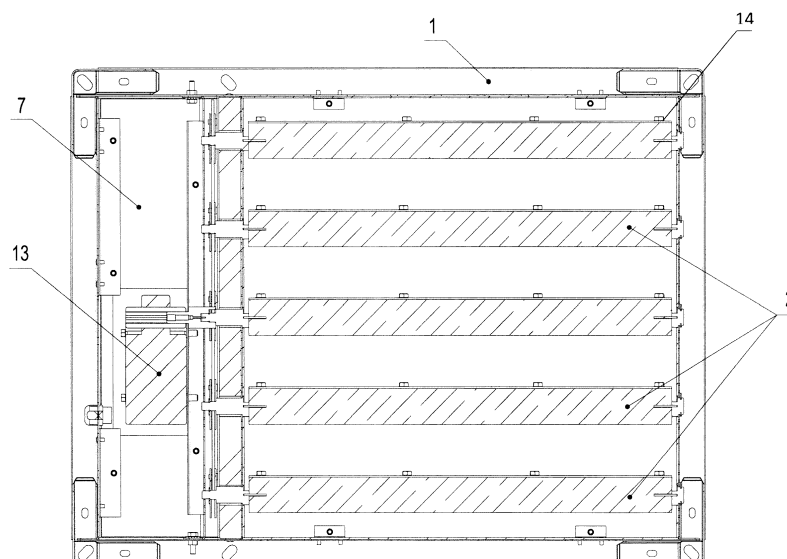
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(54) FIRE DAMPER

(57) The fire damper comprising a body (1) constituted by a steel frame and lamellas (2) of a fire-resistant material, provided with gaskets, wherein the lamellas (2) have two operating surfaces (2a), two leading edges (2b) and two side edges (2c), and along the operating surfaces (2a) rotational axes of lamellas extend seated in lamellas by means of connectors (15) mounted with bolts, wherein the lamellas are connected to each other by means of a string, characterized in that reinforcing elements (12) are fixed on both operating surfaces (2a) of the lamellas (2), said reinforcing elements being made of a shaped section one arm of which is seated in a groove arranged in the operating surface (2a) of the lamellas (2) along its length and mounted to the lamella (2) where the

reinforcing elements (12) and the connectors (14) are fixed to the lamellas (12) by means of adapter sleeves (11) seated therein and bolts (10) screwed into the adapter sleeves (11), arranged in a blind opening provided in the lamellas (2), and the lamellas are connected to each other on one side by means of two strings (8) coupled to each other at one side by means of rotational levers (9) which enables transmission of a driving force between the individual lamellas (2) from a driving mechanism (13) connected to one of the lamellas (2), wherein the driving mechanism (13) and the strings (8) are accommodated in a separate thermally insulated chamber (7) within the body of the fire damper.

**Fig. 3****EP 3 061 503 A1**

Description

[0001] The invention provides a damper which is a multi-blade damper used in ventilation or air-conditioning installations, as a transfer damper or a damper for fire ventilation, as well as a fire damper.

[0002] Diverse kinds of fire dampers are known for the above indicated applications, with movable lamellas (so called deflectors) for closing ventilation openings, that prevent transfer of fire and smoke from rooms being on fire into other rooms and to enable exchange of gases between the two sides of the wall they are mounted in.

[0003] Such dampers should show a specific fire resistance and smoke leakage properties. These parameters are indicated as EIS tt where E - Integrity, I - Insulation, S - Smoke leakage, tt - time, respectively, while all the mentioned parameters are met.

[0004] Automatic activation of the dampers occurs by means of an activating mechanism with a thermal fuse element release or an electric thermoactivator or in the case of the use as a fire ventilation damper, by a driving mechanism remotely controlled by an electric signal. In order to meet E and I parameters, fire-resistant materials are used in the construction of the damper. In order to obtain smoke leakage properties, rubber or silicon sealing is used as well as intumescent scaling to ensure leak tightness of the construction during a fire when a conventional scaling loses its properties.

[0005] The essential parameters of such a damper are defined in relative technical requirements as presented below.

1. FIRE DAMPERS (PRODUCT STANDARD PN-EN 15650:2010)

[0006] The classification should be presented according to the following template:

E	I		t	t		(	ve		ho		i	↔	o	)		S

[0007] The classes shall be expressed as follows:

- EI tt (...) tt being the classification period during which the integrity and insulation criteria are satisfied;
- E tt (...) tt being the classification period during which the integrity criterion is satisfied;
- EI tt (...) S tt being the classification period during which the integrity, insulation and smoke leakage criteria are satisfied;
- E tt (...) S tt being the classification period during which the integrity and smoke leakage criteria are satisfied.

[0008] All times in minutes: 15, 20, 30, 45, 60, 90, 120, 180 or 240.

E - Integrity

[0009] Integrity shall be assessed during the test as the time at which leakage through the damper after 5 min from the start of the fire test exceeds $360\text{m}^3/(\text{m}^2\text{h})$, cracks or openings exceed given dimensions and there occurs ignition of a cotton pad and sustained flaming on the non-exposed side at the perimeter of the damper junction with the wall or floor. Ignition of the cotton pad shall be disregarded for dampers classified E only.

I - Insulation

[0010] The performance level used to define insulation shall be the mean temperature rise on the unexposed face, limited to 140°C above the initial mean temperature, with the maximum temperature rise at any point limited to 180°C above the initial mean temperature.

S - Smoke leakage

[0011] For dampers for which the S class is relevant the leakage through the fire damper shall not exceed $200\text{m}^3/(\text{m}^2\text{h})$, corrected to 20°C at ambient temperature prior to the fire test, and shall not exceed $200\text{m}^3/(\text{m}^2\text{h})$ corrected to 20°C after the first 5 minutes of the fire test.

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[0012] The classification shall indicate if the performance criteria are satisfied by fire from inside or fire from outside or both, and whether it applies to vertical or horizontal orientations or both. The additions "i → o", "o → i" or "i ↔ o" shall be used respectively together with "vc" and/or "ho" to indicate orientation (vertical and horizontal).

ve - vertical

ho - horizontal

2. MULTI COMPARTMENT FIRE RESISTING SMOKE CONTROL DAMPERS FOR SMOKE VENTILATION DUCTS AND GENERAL VENTILATION (PRODUCT STANDARD PN-EN 12101-8:2011)

[0013] The classification shall be presented according to the following template:

E	I	t	t	(	**v _{od}	-	**h _{od}	-	i	***	o	)	S	*	****C _{yy}	HOT 400/30	AA lub MA	multi
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Description E, I, S, tt as in point 1

Additionally :

[0014]

- "ved", "vew" or "vedw" and/or "hod", "how" or "hodw" indicate the suitability for vertical and/or horizontal use, including mounting in a duct or in a wall or both respectively.
- "i→o", "i←o" and "i↔o", indicates that the performance criteria are satisfied from inside to outside (fire inside), outside to inside (fire outside) or both, respectively.
- "S" indicates a leakage rate of less than 200m³/(m³h) as an additional leakage restriction to the defined performance requirement. "500", "1 000" or "1 500" indicates that when the damper is tested at these negative pressures the damper is suitable for use over the range from the tested negative pressure up to a positive pressure of 500 Pa.
- "C300", "C1000C" or "Cmod" indicates the suitability of the damper for use in smoke control only systems, combined smoke control and general ventilation systems, and as modulating dampers used in combined smoke control and general ventilation systems. It indicates the number of the open/close cycles performed by a damper before the fire test, 3000, 10200 and 20000 respectively.
- "HOT 400/30" (High Operational Temperature) indicates that the damper has the ability to be opened or closed during a period of 30 minutes under temperature conditions below 400°C.
- "AA" or "MA" indicates automatic activation or manual intervention.
- The classification is completed by the suffix 'multi' to indicate suitability for multi compartment use.

[0015] A fire damper is known from the European patent application EP 2366435. The fire damper, according to this invention, comprises a body constituted by a steel frame and lamellas made of fire resistant materials provided with gaskets. The damper is characterized in that rotational axis is arranged in each lamella, the axes being seated in two bearings accommodated at the opposite vertical sides of the body, and the lamellas are connected to each other by means of a string through a metal sheet with a hole which enables transmission of the driving force between individual baffles, wherein the spring is mounted at one side to the of the spring bracket, at the other side to the baffle.

[0016] A fire damper is known from an American patent description US 6019679. The fire damper comprises a spring actuator rotating the blades of the lamellas between the position 'open' and 'closed', when a fire or smoke state occurs. The damper may comprise one or more blades which are opened or closed by means of a connector in order to ensure simultaneous functioning of each of them. The flat coil springs remain under the tension of an operating element (such as a fuse element) and maintain the blades in the 'open' position. After releasing the spring, the rotation system accommodated between the spring and the blades moves the blades to the 'closed' position and thereby blocks the flow of smoke and fire. The blades can be provided with gaskets to ensure their leak tightness.

[0017] A damper of the invention comprises a body constituted by a steel frame and lamellas of a fire resistant material

provided with gaskets. Lamellas have two parallel operating surfaces, two leading edges and two side edges. Along the operating surfaces, rotational axes of the lamellas extend, said axes being fixed in lamellas by means of connectors mounted with bolts, and the lamellas are connected to each other by means of a string. On both operating surfaces of the lamellas reinforcing elements are fixed, said reinforcing elements being made of a shaped section one arm of which is seated in a groove arranged in the operating surface of the lamella along its length and mounted to the lamella. The reinforcing elements and connectors are fixed to lamellas by means of adapter sleeves seated therein and bolts screwed into the adapter sleeves, arranged in blind openings provided in lamellas. Lamellas are connected to each other at one side by means of two strings with each other coupled at one side by means of rotational levers which enables transmission of the driving force between the individual lamellas from a driving mechanism connected to one of the lamellas. The driving mechanism and the strings are accommodated in a separate thermally insulated chamber within the body of the damper.

[0018] Preferably, a shaped section reinforcing element is an angle section.

[0019] Preferably, a shaped section reinforcing element is a T-bar.

[0020] Preferably, a reinforcing element is made of steel.

[0021] Preferably, a reinforcing element is made of fiber glass.

[0022] Preferably, a reinforcing element is made of carbon fiber.

[0023] Preferably, strings are made of a material resistant to thermal length changes.

[0024] Preferably, strings are made of carbon fiber.

[0025] Preferably, strings are made of fiber glass.

[0026] Preferably, strings are made of steel.

[0027] Preferably the damper has sealings constituted by a silicone gasket of a hollow O-profile (O-ring type), and allow the tightness between the lamellas as well as between the lamellas and the body, and includes the first gasket arranged at one of the side edges of each lamella, the second gasket arranged on the inner surface of the body on the side of the string and the third gasket arranged on the inner surface of the body on the upper and lower surface of the body and on the inner surface of the body on the opposite side of the string.

[0028] Preferably, gaskets are intumescent.

[0029] Preferably, lamellas are connected to the driving mechanism.

[0030] Preferably, the driving mechanism is constituted by an electric actuator.

[0031] Preferably, lamellas in the open position are arranged within the outline of the body.

[0032] In case of fire, upon closing the lamellas the damper obtains a fire resistance

[0033] EI 120 ($v_{edw}-h_{odw}-i \leftrightarrow o$) S 1500Pa C₁₀₀₀₀ AA and at the time of a normal operation of the installation when the lamellas are open they do not exceed the outline of the damper.

[0034] The reinforcement of the lamellas influences in a particular way the behavior of the fire damper during operation of high temperatures from one side. Preferably, both sides of lamellas are provided with reinforcing elements as the reinforcement accommodated at the side of the closed fire damper which is opposite to the room where fire occurs, or for other reason the temperature significantly increases is not subject to heating and maintains the shape of lamellas.

[0035] It is very significant that the reinforcing elements are seated in grooves in the operating surfaces of lamellas and also the connectors fixing the lamellas with their rotational axes, seated in special recesses are mounted to lamellas with bolts screwed into the sleeves arranged in the blind openings provided in lamellas. Such mounting of these elements prevents any loss of leak tightness caused by the arrangement of bolts in a way that it could happen in case of the through openings and enables, in case of damage to the lamellas during their operation, after fastening the damper to a wall, replacement of lamellas without any need to dismount the damper.

[0036] The body of the damper is disproportionally short in comparison to other dampers available on the market of the fire resistance EI 120 ($v_{edw}-h_{odw}-i \leftrightarrow o$) S 1500Pa C₁₀₀₀₀ AA multi and accounts only to 120 mm, which enables its easy installation in lamellas in construction industry of a fire resistance characteristics REI 120 or EI 120 in such a way that the body of the damper and its lamella when it is open do not exceed the outline of the damper's body.

[0037] A body of the damper made of preferably perforated steel sheet is used which enables fire insulation.

[0038] Despite a lot of potential leakages caused by a large number of lamellas and their contact surfaces, due to applying a sealing with a specially designed gasket, among others, and additionally an intumescent gasket, a tightness of the damper required for S smoke leakage properties has been obtained.

[0039] The driving mechanism is accommodated in a separate chamber within the body of the damper which effectively protects against high temperatures and also against the dirt arising during the installation of the damper, as it is accommodated within the body of the damper in a special thermally insulated chamber, therefore there is no possibility of contact with the mortar or plaster.

[0040] The lamellas are made in such a way that in the open position they do not exceed the outline of the body of the damper.

[0041] Mounting and bearing of lamellas enables their replacement in the installed damper, which has been built-in in a construction baffle without dismantling of the construction wall.

[0042] The construction of the damper enables mounting sheath grids (aluminum or steel) at one or both sides of the damper (depending on the thickness of the wall).

[0043] The invention provides a structure of high fire resistance and high smoke leakage properties while reducing the depth of the fire damper by using several rotary lamellas. At the same time, additional characteristics of the solution is providing a opportunity to replace the damaged lamellas without dismantling the damper built-in the a construction baffle and no protrusion of lamellas from the body of the damper. The possibility to dismantle is enabled by a specially designed axis of lamella which is slidingly inserted into a groove at short sides of lamellas and mounted to the lamella with bolts.

[0044] The object of the invention is presented in the embodiment in figures, where Fig. 1 presents a an open damper in a front view, Fig. 2 presents a damper in a cross-section along the line A-A of Fig. 1, Fig. 3 presents a damper in a cross-section along the line E-E of Fig. 6, Fig. 4 presents a lamella in a view from the side of the operating surface, Fig. 5 presents a lamella in a cross-section according to the line C-C of Fig. 4, fig. 6 presents a damper in a cross-section along the line B-B of Fig. 1, Fig. 7 presents a damper in a cross-section along the line D-D of Fig. 6, Fig. 8 presents a section of a part of the damper in the close position showing the details of sealing between the lamellas, Fig. 9 presents a cross-section of a part of the damper showing the lamellas at the side opposite to the actuator.

[0045] As shown in Fig. 1, the fire damper comprises a body 1 constituted by steel frame and lamellas 2 made of fire resistant material. The lamellas 2 are provided with gaskets and have two parallel operating surfaces 2a, two leading edges 2b and two side edges 2c. In each of the lamellas 2 two rotational axes are fixed which are seated in two bearings arranged at the opposite vertical sides of the body 4, which is shown in Fig. 3. The axes are fixed to the lamellas 2 by means of connectors 14 mounted to the lamellas with bolts 10. The lamellas 2 are connected to each other by means of strings 8 constituting the elements of actuating mechanism 13. The strings 8 make the lamellas 2 rotate which results in opening or closing of the fire damper.

[0046] On both operating surfaces 2a of the lamellas 2 the reinforcing elements 12 are made of an angle section seated in a groove provided in the operating surface 2a of lamellas 2 along the length thereof. Obviously, in other embodiments the angle section may be replaced by other profile, for example a T-bar, which is seated with its two arms in longitudinal, parallel grooves provided in a lamella 2 and fixed to it. The main task of the reinforcing element 12 is therefore reinforcement of a lamella 2 on a surface parallel to the operating surfaces 2a and extending through the center of a lamella 2.

[0047] The reinforcing element 12 in this embodiment is made of carbon fiber but it may be made of any other durable material having resistance to high temperatures, for example fiber glass or steel.

[0048] The reinforcing elements 12 and the connectors 14 are fixed to the lamellas 2 by means of adapter sleeves 11 fixed therein , and with bolts 10 screwed to the adapter sleeves 11, arranged in blind openings provided in lamellas 2 as shown in Fig. 2, Fig. 5, Fig. 8 and partially in Fig. 9. Such an embodiment of this combination contributes to improving the leak tightness properties of the closed tire damper as it eliminates transmission of gases and smoke through bolt connections, in particular in the fire conditions at high differences in pressure, which may occur in the prior art where bolts pass through a passage made in a lamella 2, while providing the opportunity to replace a lamella 2 in case of failure in a way that does not require dismantling of the built-in damper.

[0049] As shown in Fig. 3, Fig. 7 and partially in Fig. 6 the driving mechanism 13 is connected with two strings 8 coupled with rotational levers 9 accommodated on the leading edges 2b of a lamella 2. The driving mechanism 13 and the strings 8 are accommodated in a separate thermally insulated chamber 7 within the body of the fire damper.

[0050] In this embodiment the strings 8 are made of carbon fiber but they may be made of any heat resistant material with regard to changes in length, such as fiber glass or steel. The strings 8 made in this embodiment of carbon fiber prevent the situation when as result of thermal expansion of strings 8 made of other material unsealing of the fire damper upon elongation of the strings 8 could occur.

[0051] On individual lamellas 2 at their both short sides constituting the leading edges 2b and one long side constituting a side edge 2c with means of staples a sealing 3 made of silicone gaskets of an hollow O profile is mounted, having the task of ensuring the leak tightness between the lamellas 2, and between the lamellas 2 and the body 1 under normal operating conditions when not on fire and in the initial phase of fire protection against the leakage of gases and smoke when they are cold. Of course, in other embodiments the sealing 3 can be made of other materials resistant to high temperatures.

[0052] As shown in Fig. 2, Fig. 4, Fig. 8 and Fig. 9, additionally intumescent gaskets are used, the first gasket 4, the second gasket 5 and the third gasket 6 having a task of ensuring the leak tightness between the lamellas 2, and between the lamellas and the body 1, during a fire. The intumescent gaskets 4, 5 and 6 differ in width (30, 40 and 60 mm respectively). The first gasket 4 is mounted at the longer side of each lamella 2 with staples. The second gasket 5 is adhered to the inner surface of the body 1 of the damper on the side of strings 10. The third gasket 6 is adhered to the inner surface of the body 1 of the damper at the other sides thereof.

[0053] In each lamella 2 two rotational axes have been fixed which are in turn fixed in two bearings arranged at opposite vertical sides of the body 1 of the damper. A possibility to dismantle is ensured by a specially designed axis of a lamella

2 which is slidably inserted into the groove at short sides of a lamella 2 and fixed to the lamella 2 by means of a connector 14. The lamellas 2 have been connected to each other by means of strings 8 fixed to the lever 9, fixed on the rotational axis of a lamella 2, which was shown in Fig. 7.

[0054] The central lever 9 is connected by means of a shaft with an electric actuator constituting a driving mechanism 13 in this embodiment, accommodated in an insulation chamber 7. Of course, any other lever 9 can be connected with the driving mechanism 13.

[0055] Movement (rotation) of any lamella 2 causes the same movement of other lamellas 2.

[0056] In case of fire damper shown in Fig. 1, its opening can be performed automatically by means of a driving mechanism 13 by rotation of lamellas 2 by 90°. Upon opening, a lamella 2 is locked in an open position and then closed in case of need (fire alarm, periodical test of installation) by a driving mechanism 13 with an electric actuator as a result of transmitting a power signal to the actuator. In the transition of the damper from the open to the closed position the lamellas at no time exceed the outline of the body 1 of the damper.

[0057] The method of installation and connection to the ventilation ducts

[0058] The damper according to the invention can be mounted:

- In brick, concrete, plasterboard walls as a part of ventilation tube (the damper is installed in a wall or ceiling surface (and attached to them) and the ventilation ducts are connected on both sides of the damper),
- In brick, concrete, plasterboard walls as a final element of the ventilation duct (the damper is installed in a wall or ceiling surface and the ventilation ducts are connected only to one side of the damper, while on the other side generally there is a sheath grid),
- Directly on fire ventilation ducts,
- At a distance to the construction baffle, as a single damper or a bank of dampers (the damper is accommodated outside the construction wall and the ventilation ducts are connected on both sides to the damper),
- In the walls, as a transfer element (the damper is mounted in the surface of the wall without any ventilation ducts connected to it, the damper is secured at both sides by sheath grid which determines obtaining the fire resistance class EI 120 - in the case of such an application the damper is evaluated by other standards applicable to doors and windows, i.e. PN-EN 1634-1:2014-03. The tests of fire resistance smoke leakage properties of door, window shutter units, openable windows and window hardware elements - Part 1: Fire resistance tests for door units, shutter or openable windows, therefore the indication of the fire resistance there lacks in letter 'S' denoting smoke leakage properties which in this case are not assessed.

[0059] Additionally, the mounting of the damper can take place in a vertical or horizontal position:

- With a drive located at the side of the damper (standard position - lamellas arranged horizontally),
- With a drive located on the base of the damper (nonstandard position - lamellas arranged vertically).

[0060] The damper according to the invention is adapted for connection to:

- Rectangular ventilation ducts with a flange connector
- Circular or rectangular ventilation ducts with a sleeve connector.

[0061] The damper, according to the invention, is used in a ventilation or smoke installation as:

- Fire damper used in areas crossed by ventilation ducts through construction walls, constituting a separation from a fire zone. During normal operation of the facility all the fire dampers remain open, i.e. in a waiting position. In case of a fire, in response to a control signal, automatic or remote closing of the dampers arranged at the border with the area covered by fire occurs. In this case the damper has to be additionally equipped with a thermal release which may trigger closing of the damper due to a temperature elevated up to an operation threshold independently of the automatic functioning. The damper in this embodiment meets a fire resistance class EI 120 (ve-ho-i ↔ o) S (500 Pa).
- Transfer damper used in the fire separation walls without ducts. It enables the flow of the air between rooms until the temperature near the damper exceeds a predetermined value.

- Fire damper is used in places of passage of ventilation ducts through the construction baffles constituting a separation of the fire zone of for which fire resistance requirements have been determined or is mounted on fire ventilation ducts. During the fire, it enables evacuation of hot gases from a selected zone - in case the damper remains open or allows to keep an appropriate fire resistance when the damper is closed.

[0062] The damper, according to the invention, meets a fire resistance class EI 120 ($v_{edw}-h_{odw-i \leftrightarrow o}$) S 1500Pa C₁₀₀₀₀ AA multi or in case of using a thermal release EI 120 (ve-ho-i $\leftrightarrow$ o) S (500 Pa) and EI 120 in case of a transfer damper with a sheath grid.

Claims

1. A fire damper comprising a body (1), constituted by a steel frame and lamellas (2) of a fire resistant material, provided with gaskets, wherein the lamellas have two parallel operating surfaces (2a), two leading edges (2b) and two side edges (2c) and along the operating surfaces (2a) rotational axes of lamellas extend seated in lamellas by means of connectors (15) mounted with bolts, wherein the lamellas are connected to each other by means of a string, **characterized in that** reinforcing elements (12) are fixed on both operating surfaces (2a) of the lamellas (2), said reinforcing elements being made of a shaped section one arm of which is seated in a groove arranged in the operating surface (2a) of the lamella (2) along its length and mounted to the lamella (2) where the reinforcing elements (12) and the connectors (14) are fixed to the lamellas (2) by means of adapter sleeves (11) seated therein and bolts (10) screwed into the adapter sleeves (11) arranged in a blind opening provided in the lamella (2), and the lamellas (2) are connected to each other at one side by means of two strings (8) coupled with each other at one side by means of rotational levers (9) which enables transmission of a driving force between the individual lamellas (2) from a driving mechanism (13) connected to one of the lamellas (2), wherein the driving mechanism (13) and the strings (8) are accommodated in a separate thermally insulated chamber (7) within the body (1) of the damper.
2. The damper according to Claim 1 **characterized in that** the shaped section reinforcing element (12) is an angle section.
3. The damper according to Claim 1 **characterized in that** the shaped section reinforcing element (12) is a T-bar.
4. The damper according to Claim 1 **characterized in that** the reinforcing element (12) is made of steel.
5. The damper according to Claim 1 **characterized in that** the reinforcing element (12) is made of fiber glass.
6. The damper according to Claim 1 **characterized in that** the reinforcing element (12) is made of carbon fiber.
7. The damper according to Claim 1 **characterized in that** the strings (8) are made of a material resistant to thermal length changes.
8. The damper according to Claim 7 **characterized in that** the strings (8) are made of carbon fiber.
9. The damper according to Claim 7 **characterized in that** the strings (8) are made of fiber glass.
10. The damper according to Claim 7 **characterized in that** the strings (8) are made of steel.
11. The damper according to Claim 1 **characterized in that** it has sealings (3) which constitute silicone gaskets of a hollow O-profile (O-ring type), and allow the tightness between the lamellas (2), as well as between the lamellas (2) and the body (1), and includes the first gasket (4) arranged at one of the side edges (2c) of each lamella (2), the second gasket (5) arranged on the inner surface of the body (1) on the side of the string (8) and the third gasket (6) arranged on the inner surface of the body (1) on the upper and lower surface of the body (1) and on the inner surface of the body (1) on the side opposite to the string (8).
12. The damper according to Claim 11 **characterized in that** the gaskets (4, 5, 6) constitute intumescent gaskets.
13. The damper according to Claim 1 **characterized in that** the lamellas (2) are connected to the driving mechanism (13)
14. The damper according to Claim 12 **characterized in that** the driving mechanism (13) constitutes an electric actuator

15. The damper according to Claim 1 **characterized in that** the lamellas (2) in the open position fit inside the outline of the body (1).

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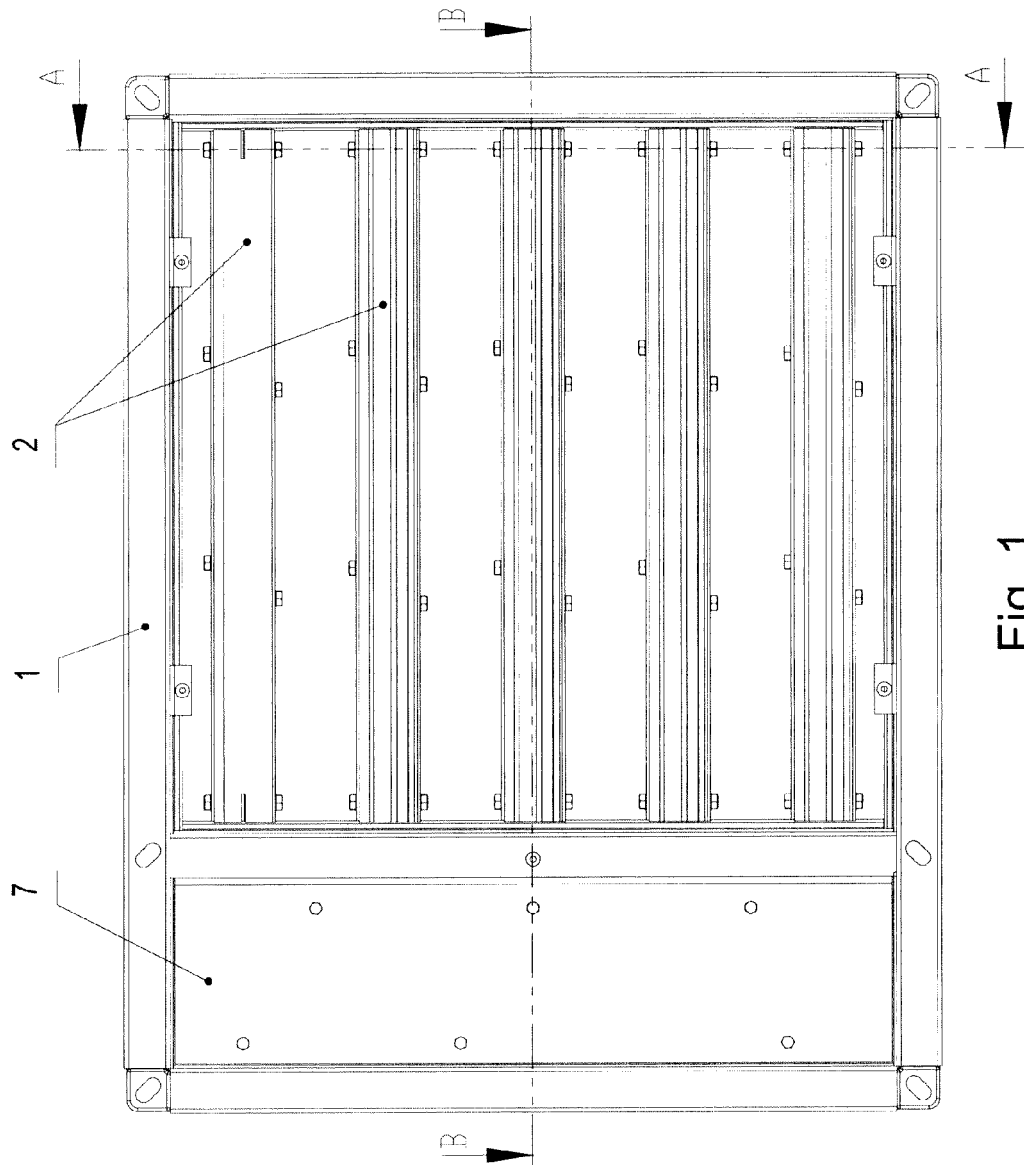


Fig. 1

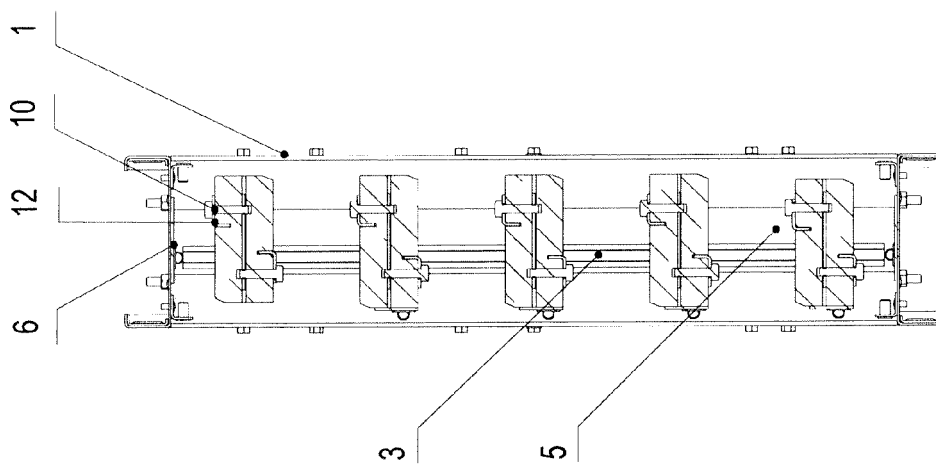


Fig. 2

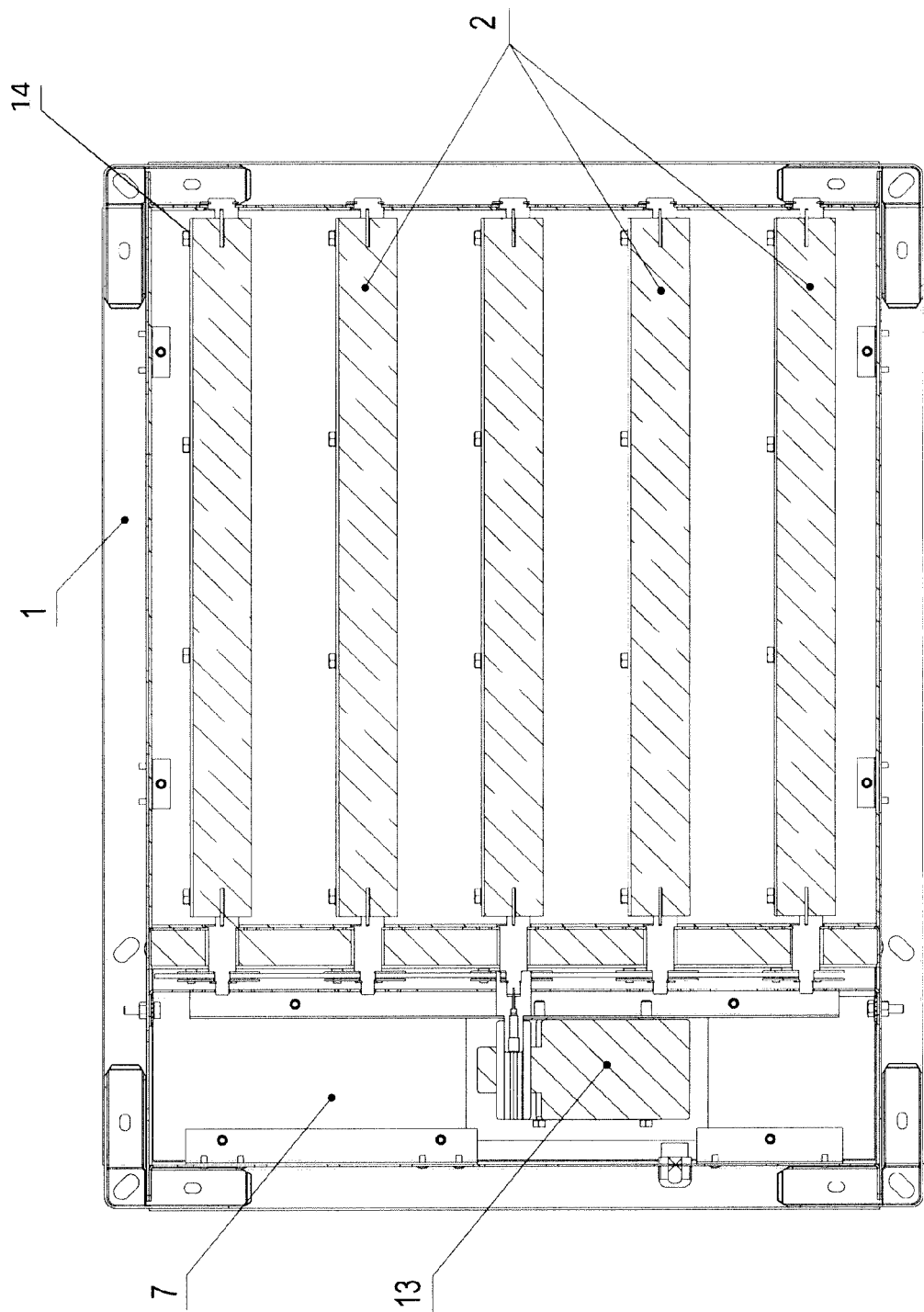


Fig. 3

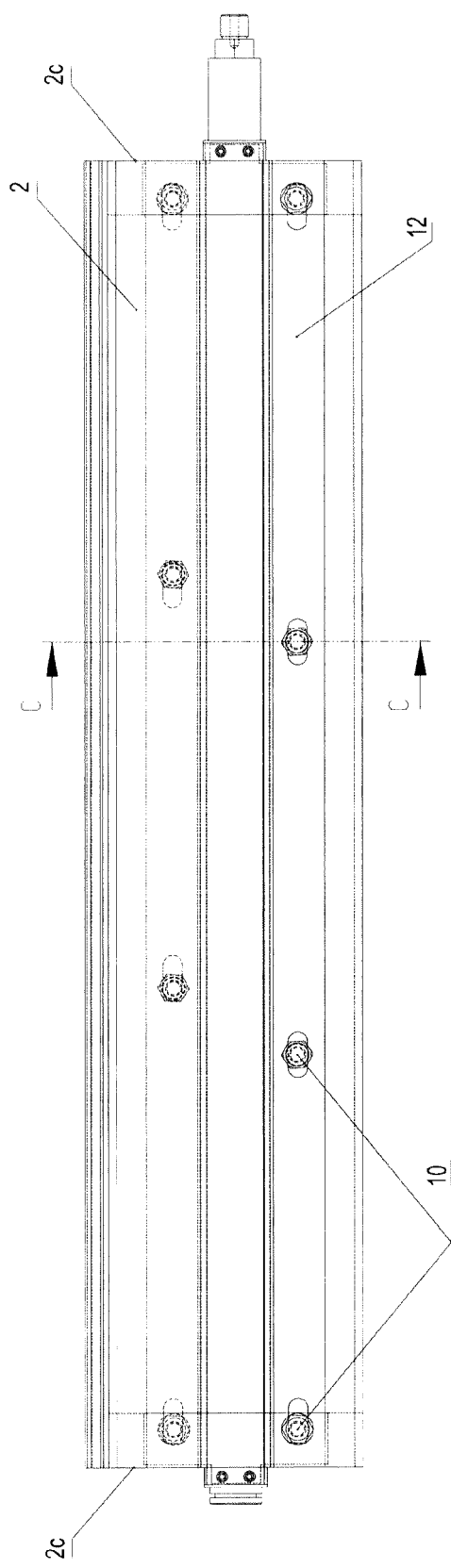


Fig. 4

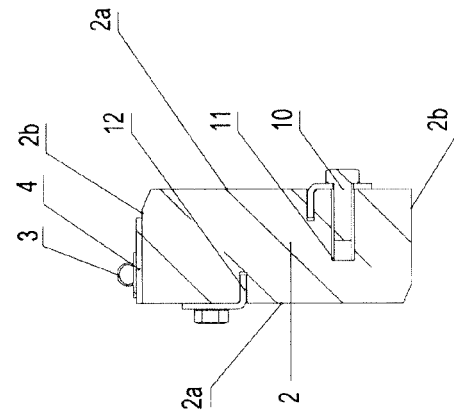


Fig. 5

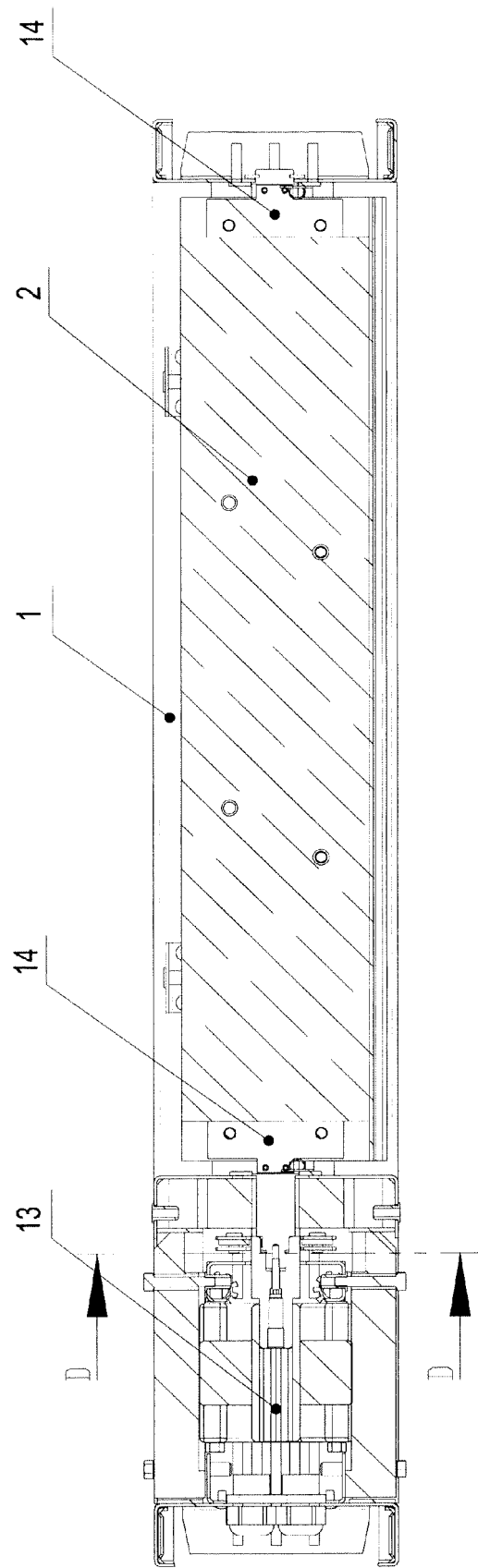


Fig. 6

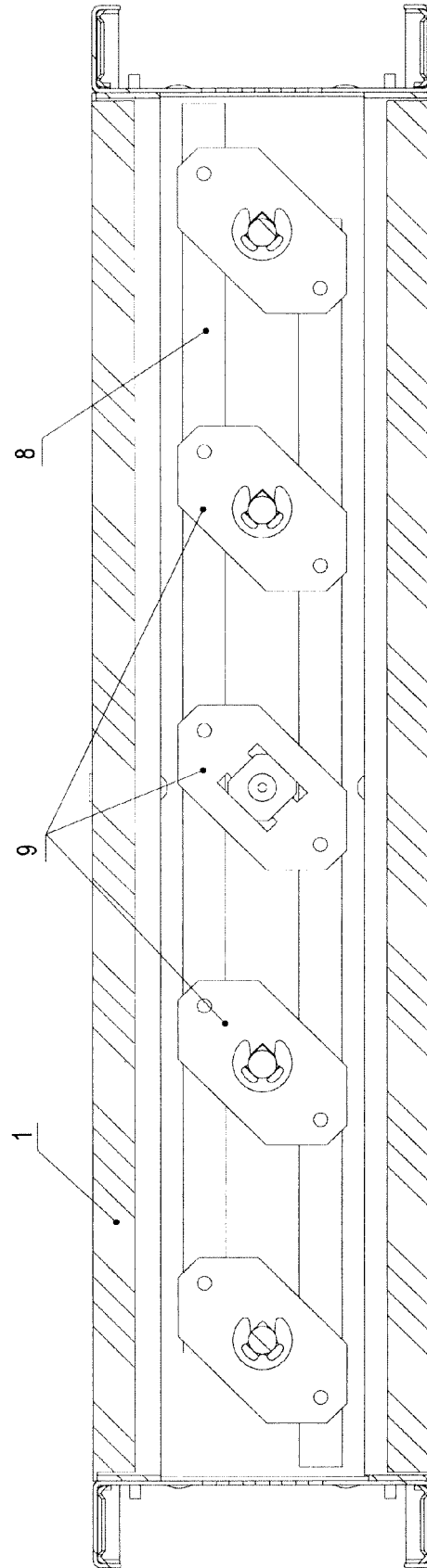


Fig. 7

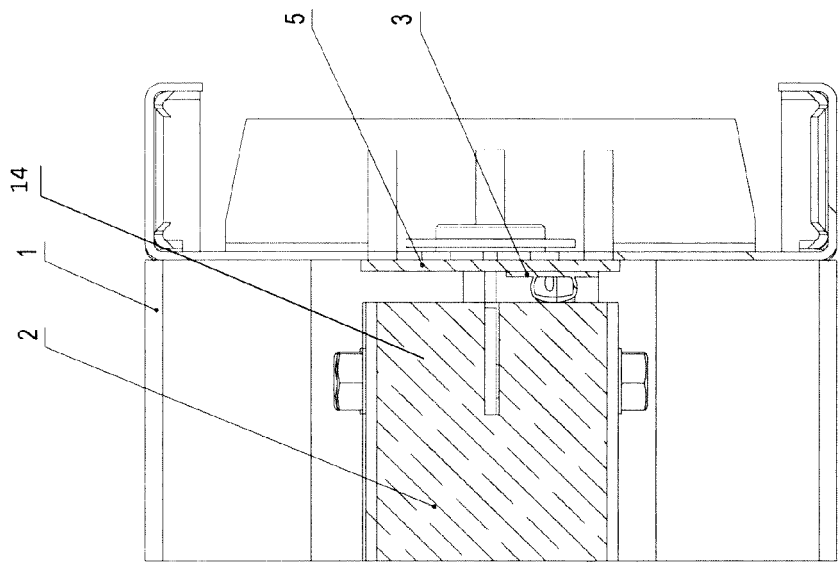


Fig. 9

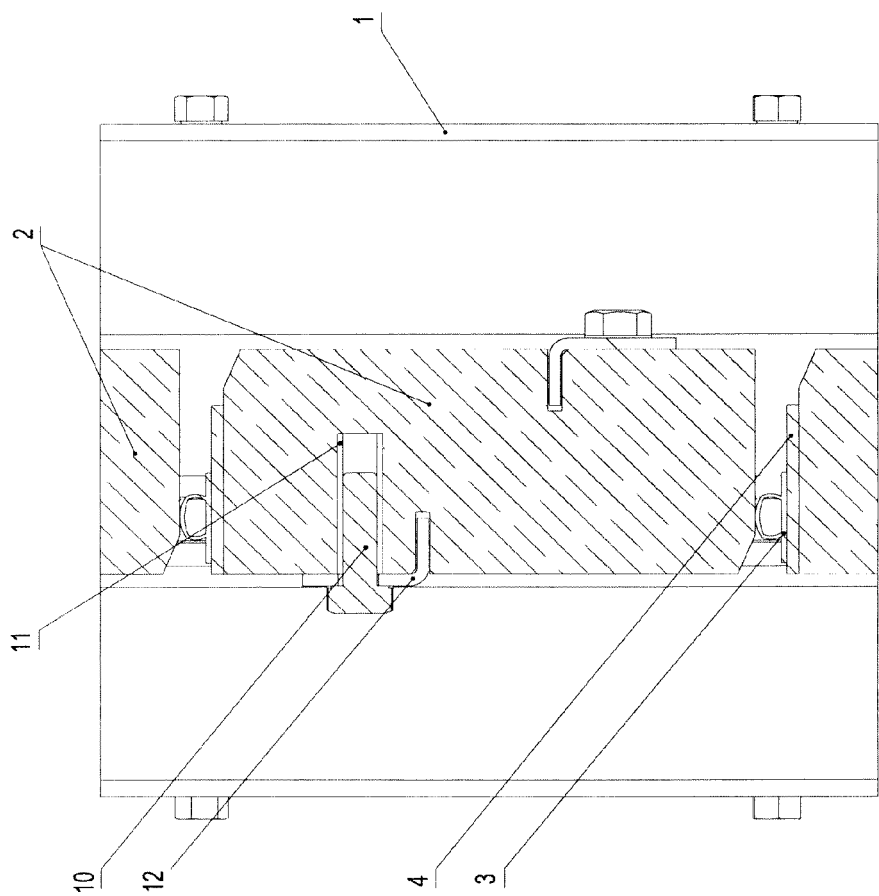


Fig. 8



EUROPEAN SEARCH REPORT

Application Number
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