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(54) **Fire damper**

Brandschutzklappe

Clapet coupe-feu

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## Description

**[0001]** The subject invention relates to a fire damper. One of the problems that need to be solved in the domain of ventilation and air-conditioning installations is fire protection of a vented or air-conditioned unit. Unprotected ventilation and air-conditioning ducts and pipes running through the elements of a fire division constitute a way along which the fire is spread through. Therefore they cause a decrease of fire protection level. The solution of this problem is to fit elements that cut off the zones in fire inside the ventilation and/or air-conditioning ducts and pipes and allow for walls, ceiling and floors to keep their fire protection integrity. This way other areas are protected against hot smoke and gas and may operate in nominal conditions. Those elements are fire cut off flap valves or fire dampers. They constitute the elements of fire protection installed in the ventilation and/or air-conditioning ducts and pipes passages through the walls, ceiling and floors.

**[0002]** Patent literature offers various cut off flap valves solutions working in auto and controlled mode. British patent claim nr GB 2 399 497 presents a cut off flap valve, placed outside a vent duct, equipped with a spring tightening device. The flap is kept in open position by the outer wall of the vent duct. The closure of the duct results from the fact that the heated vent duct loses its stiffness. The thrust of the flap on the wall of the vent duct, effected by a spring device results in progressing indenting of the wall of the vent duct until the flow is completely cut off.

**[0003]** European patent claim nr EP 0 829 689 presents a flap valve fitted axially in a narrowing inside the vent duct. The narrowing is constituted by a ring with a flap rotation axis fixed in a horizontal plane. Both the ring and the flap are formed in such a way that the flap when rotated by 90 deg., rests against a pitch /thread made in the ring. Additionally, flexible plates are fitted on the flap and the ring, sealing the flap in a closed position.

**[0004]** Another solution of the cut off flap valves construction is described in a Swedish patent SE 9003794. A flap placed inside a body is fixed on an axis that is bent at the right angle as soon as leaves the body. A bent end of the axis extending outside rests against a fuse-link element that melts at high temperature and releases it allowing a spiral spring, placed in the axis of flap rotation to act. This arrangement causes the flap to rotate and to close the gas flow.

**[0005]** WO00/20803 discloses a control device for controlling flow of air through an opening having a rectangular body and comprising a flow control member (division) which moves between open and closed positions, closure means (e.g. spring attached to the body of the device) which can be moved between rest condition, in which the control member can move, and active condition, in which the closure means force the control member to remain in closed position; and sensing means detecting the hazard conditions (e.g. made of material susceptible to rise of temperature) acting on the closure means

to move it from rest to active conditions. Said spring extends through the opening division and is attached to a bracket on the other side of the division with the help of said material susceptible to rise of temperature. The division is not provided with a flexible sealing ring nor any element providing smoke integrity. Furthermore the device does not contain a thermally expanding gasket. In general, this document describes a device which is regarded as static fire damper, i.e. device which operates in static conditions, i.e. in which the ventilation (air conditioning) system is turned off in whole building after the fire is detected so there is no air flow in ducts and there is no difference of pressure between isolated area where fire is detected and protected area of building.

**[0006]** US 4,858,517 discloses a dynamic fire damper having a cylindrical body comprising a self-closing division that is fixed inside the body and linked to the inside wall of the body by means of a closing spring device and is kept open by means of a releasing fuse link element. Both these elements are located inside the body and their planes of operation are perpendicular to the axis of the division.

**[0007]** Polish technical approval ITB-15-6622/2005 discloses dynamic fire damper, a device which operates in dynamic conditions, i.e. in which the ventilation (air conditioning) system is still running despite that there is a fire in certain areas of the building. The device described in said document contains a cylindrical body comprising a self-closing division that is fixed inside the body on an axis; closing spring device and a releasing fuse link element. The division is provided with a flexible sealing ring fixed in its circumference notch and cooperating with a thermally expanding gasket located on the inside wall of the body. The closing spring device includes a manual lever and a spring placed on a shaft being the axis of the division. The closing spring device is placed outside of the cylindrical body. The fuse link is located inside the body but its plane of operation is not perpendicular to the axis of the division, but parallel. The operation of the releasing mechanism used in discussed document is completely different than the operation of the invention. Instead of simple releasing of the spring device, the operation of the closest prior art is based on use of a sophisticated and multi-part interlock mechanism.

**[0008]** The fire damper according to the current invention is composed of a cylindrical body comprising a self-closing division that is fixed inside the body on an axis via bearings. The division is linked to the inside wall of the body by means of a closing spring device and is kept in an open position by means of a releasing fuse link element. The division is also provided with a flexible sealing ring fixed in its circumference notch and cooperating with a thermally expanding gasket located on the inside wall of the body in a lateral plane corresponding to the closed position of the division. The fire damper of the invention is further defined by the characterizing part of claim 1.

**[0009]** Preferably, at least two rows of lengthwise holes

protecting against heat conduction are provided on the body wall in the lateral plane corresponding to the closed position of the division.

**[0010]** Preferably, limit switches are placed inside the body for monitoring the position of the division.

**[0011]** The releasing fuse link device is preferably connected in series with an electromagnet providing a remote control for the division.

**[0012]** The body of the fire damper may be made in such a way that its diameter equals the diameter of vent duct.

**[0013]** The fire damper according to the invention is presented in an exemplary embodiment on the drawing, in which: fig. 1 presents a longitudinal semi-view and a semi-section of a nipple type fire damper according to the invention in a closed position; fig. 2 presents a longitudinal semi-view and a semi-section of a sleeve type cut off flap valve of the invention in a closed position open; fig. 3 presents a longitudinal view of the cut off flap valve with limit switches in a closed position. Fig. 4 presents a detail of the division in sectional view.

**[0014]** A division 6, made of a high temperature resistant metal is fixed diametrically on an axis 1 inside a circular body 5 via bearings 4. The division 6 is kept in an open position by a fuse-link releasing device 3. Additionally, the division 6 is linked to the body 5 with a spring closing device 2. The spring closing device 2 and the fuse-link releasing element 3 are fitted inside the body 5, their planes of operation being perpendicular to the axis 1 on which the division 6 has been fixed. The division 6 has a circumferential notch 10, in which a continuous flexible sealing ring 11 having a rectangular cross-section has been mounted that cooperates closely with a thermally expanding gasket 12 located inside the body on the body wall 5 in a lateral plane corresponding to the position of the division 6 in a closed position. Besides, at least two rows of lengthwise holes 13 are located on the body wall in a lateral plane corresponding to the position of the division 6 in order to prevent heat conduction along the body 5. The position of the division 6 may be monitored by limit switches 8, 9 placed inside the body 5. The switch limit 9 indicating the open position of the division 6 is installed on a bracket 7. The switch limit 8 indicates the closed position of the division 6.

**[0015]** The body 5 of the fire damper has a diameter similar to that of the vent duct which makes the installation fitting easier. The fire damper can be of two types. In the nipple version of the body 5, the vent duct endings enclose the body endings while in the sleeve type, the vent duct endings are inverted into the inside of the body 5. During regular operation of the vent installation, the fire damper is open. The area of a fire outbreak is being cut-off by the self-closure of the fire resisting division 6 due to temperature increase in the vent duct and the release of the fuse 3 that results in a release of the potential energy accumulated in the tensioned spring of the closing device 2. Optionally, an electromagnet may be connected in series to the release fuse device 3 that allows for

the division 6 position to be remote controlled.

## Claims

1. A fire damper, composed of a cylindrical body (5) comprising a self-closing division (6) that is fixed inside the body (5) on an axis (1) via bearings, the division (6) being linked to the inside wall of the body (5) by means of a closing spring device (2) and being kept in an open position by means of a releasing fuse link element (3), the division (6) being also provided with a flexible sealing ring (11) fixed in its circumference notch (10) and cooperating with a thermally expanding gasket (12) located on the inside wall of the body (5) in a lateral plane corresponding to the closed position of the division (6) **characterized in that** the flexible sealing ring (11) is continuous and has a rectangular cross-section, the closing spring device (2) and the releasing fuse link element (3) being located inside the body (5) connected to the same side of the body (5).
2. A fire damper according to claim 1, wherein at least two rows of lengthwise holes (13) protecting against heat conduction are provided on the body wall (5) in the lateral plane corresponding to the closed position of the division (6)
3. A fire damper according to claim 1, wherein limit switches (8,9) are placed inside the body (5) for monitoring the position of the division (6).
4. A fire damper according to claim 1, wherein the releasing fuse link (3) is connected in series with an electromagnet providing a remote control for the division (6).

## Patentansprüche

1. Brandschutzklappe bestehend aus einem walzenförmigen Körper (5), umfassend einen selbstschließenden Sperrteil (6), der innerhalb des Körpers (5) mittels Lagern auf einer Achse (1) befestigt ist, wobei der Sperrteil (6) mittels einer schließenden Feder Vorrichtung (2) mit der Innenwand des Körpers (5) verbunden ist und mittels eines auslösenden Schmelzelements (3) in geöffneter Stellung gehalten wird, wobei der Sperrteil (6) auch mit einem elastischen Dichtring (11) versehen ist, der in seiner Umfangsnut (10) befestigt ist und mit einer thermisch dehnbaren Dichtung (12) zusammenwirkt, die auf der Innenwand des Körpers (5) auf einer Querebene entsprechend der geschlossenen Stellung des Sperrteils (6) angeordnet ist, dadurch **gekennzeichnet**, dass der elastische Dichtring (11) durchgehend ist und einen rechteckigen Querschnitt aufweist, die

schließende Federvorrichtung (2) und das auslösende Schmelzelement (3) innerhalb des Körpers (5) angeordnet sind, verbunden mit derselben Seite des Körpers (5).

tée en série avec un électro-aimant, fournissant une commande à distance pour la division (6).

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2. Brandschutzklappe nach Anspruch 1, wobei auf der Körperwand (5) in der Querebene entsprechend der geschlossenen Stellung des Sperrteils (6) mindestens zwei Reihen von Längsöffnungen (13) zum Schutz gegen Wärmeleitung vorgesehen sind. 10
3. Brandschutzklappe nach Anspruch 1, wobei innerhalb des Körpers (5) Grenzschaftern (8, 9) zur Überwachung der Stellung des Sperrteils (6) angeordnet sind. 15
4. Brandschutzklappe nach Anspruch 1, wobei das auslösende Schmelzelement (3) in Reihe mit einem Elektromagnet verbunden ist, der die Fernsteuerung des Sperrteils (6) zur Verfügung stellt. 20

### Revendications

1. Un clapet coupe-feu, composé d'un corps cylindrique (5) comprenant une division de fermeture automatique (6) qui est fixée à l'intérieur du corps (5) sur un axe (1) par des paliers, la division (6) étant reliée à la paroi intérieure du corps (5) au moyen d'un dispositif de ressort de fermeture (2) et étant maintenue en position ouverte au moyen d'un élément de libération de liaison fusible (3), la division (6) étant en outre pourvue d'une bague d'étanchéité souple (11) fixée dans son encoche périphérique (10) et coopérant avec un joint d'étanchéité à expansion thermique (12) situé sur la paroi intérieure du corps (5) dans un plan latéral correspondant à la position fermée de la division (6) **caractérisé en ce que** la bague d'étanchéité souple (11) est continue et a une section transversale rectangulaire, le dispositif de ressort de fermeture (2) et l'élément de libération de liaison fusible (3) étant situés à l'intérieur du corps (5), connectés au même côté du corps (5). 25  
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2. Un clapet coupe-feu selon la revendication 1, dans lequel au moins deux rangées d'orifices longitudinaux (13) protégeant contre la conduction thermique sont prévues dans la paroi du corps (5) dans le plan latéral correspondant à la position fermée de la division (6). 45  
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3. Un clapet coupe-feu selon la revendication 1, dans lequel des contacts de fin de course (8, 9) sont disposées à l'intérieur du corps (5) pour surveiller la position de la division (6). 55
4. Un clapet coupe-feu selon la revendication 1, dans lequel la liaison fusible de libération (3) est connec-

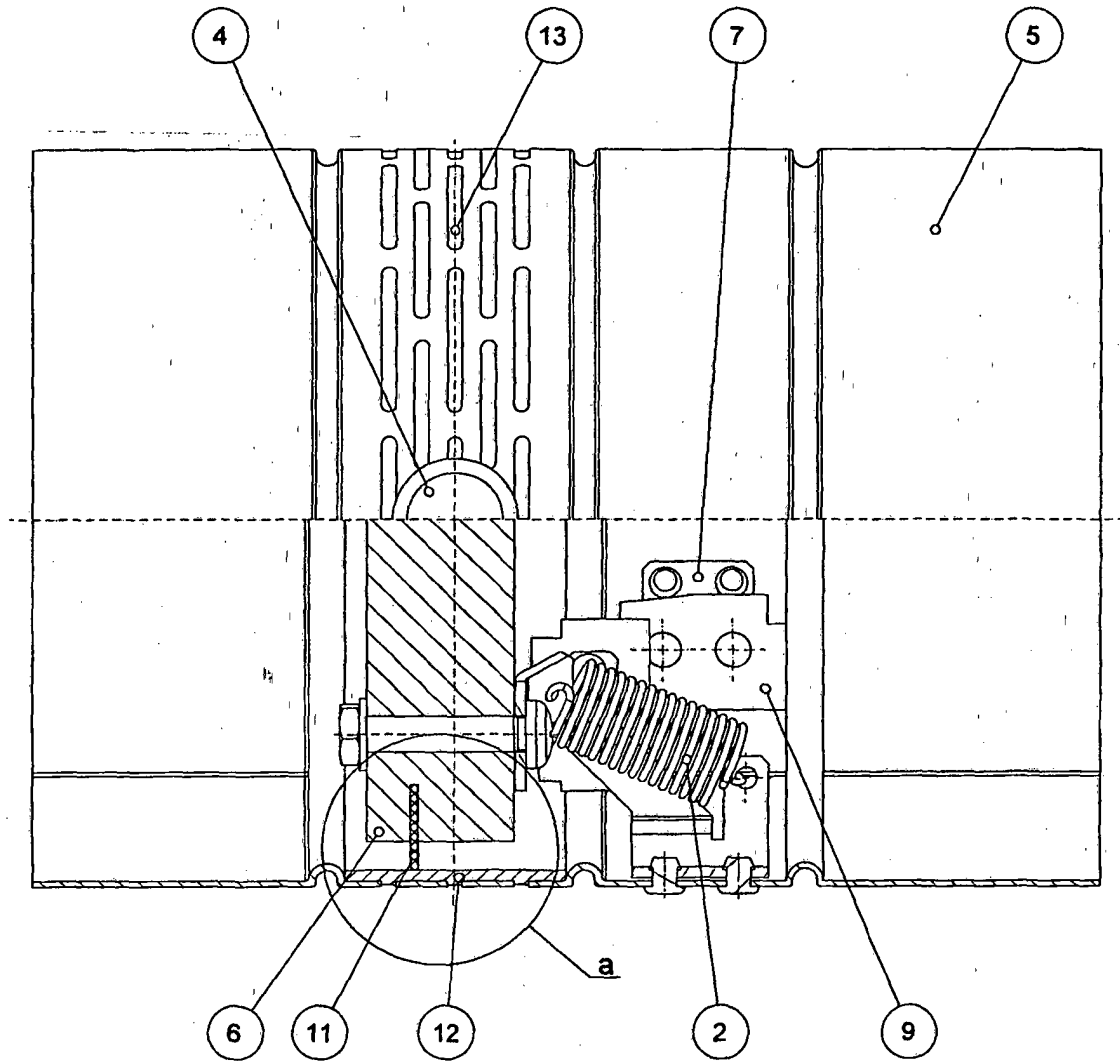


Fig. 1.

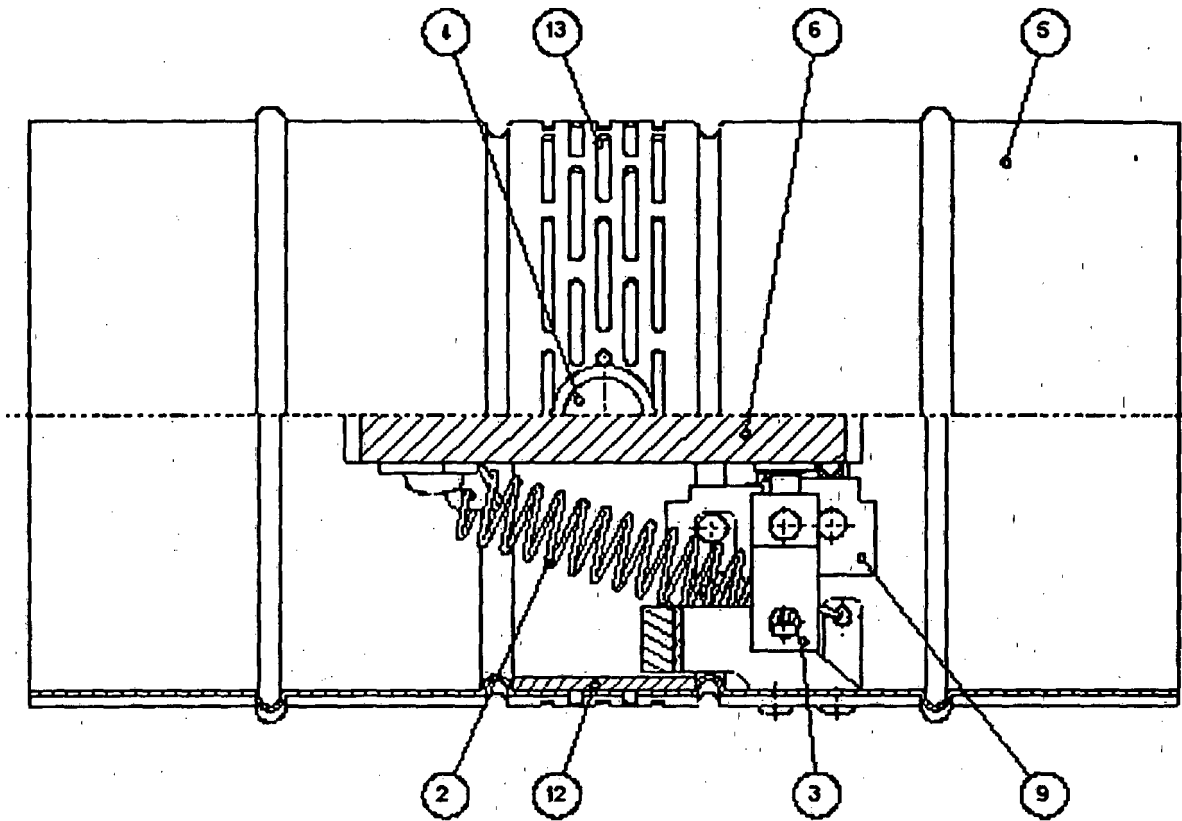


Fig. 2

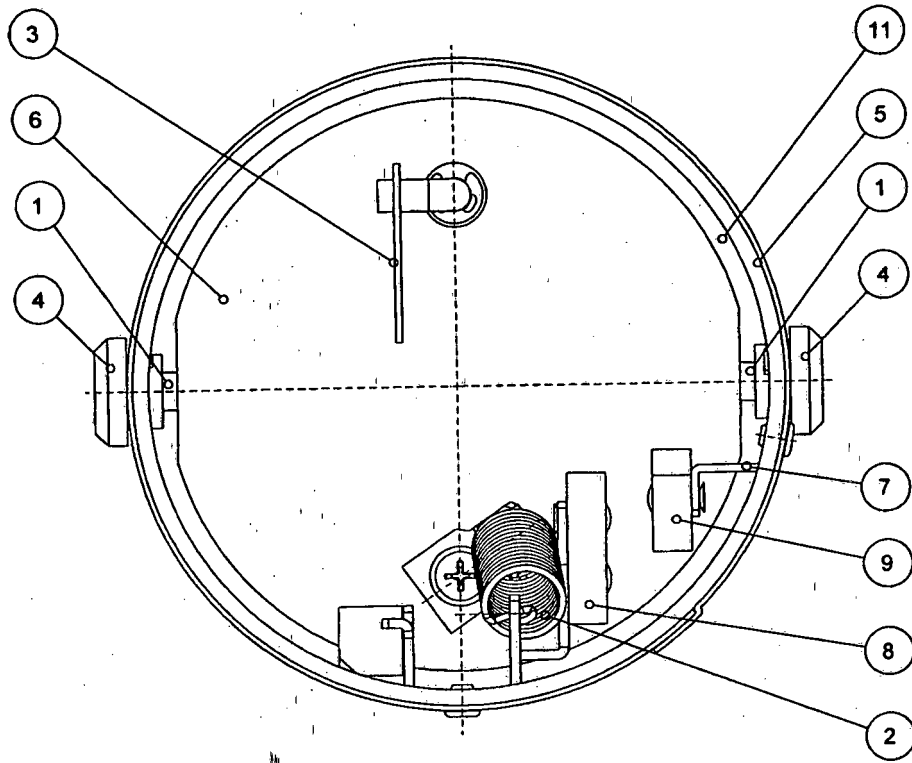


Fig. 3.

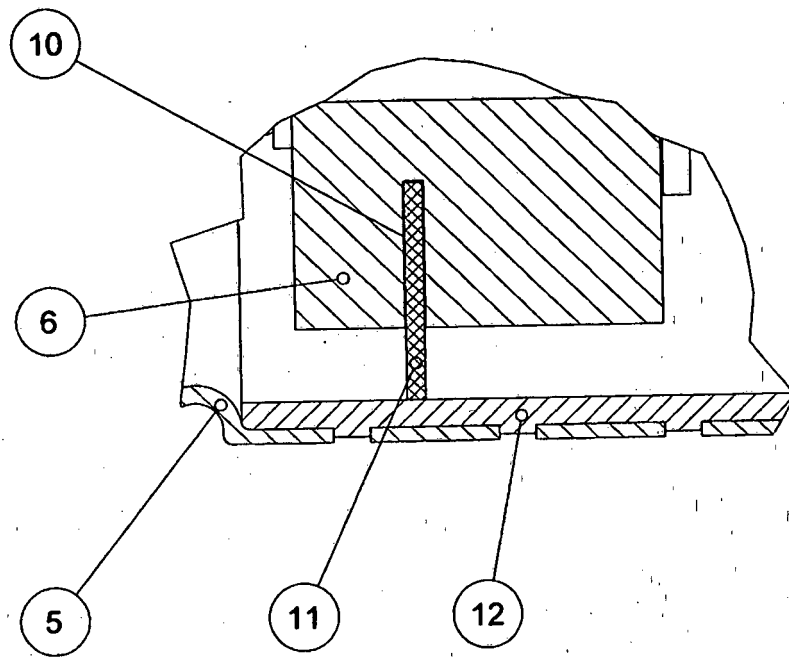


Fig. 4.

**REFERENCES CITED IN THE DESCRIPTION**

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