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(71) Applicant: **Ruskin Air Management Limited**
South Street
Whitstable
Kent CT5 3DU (GB)

(72) Inventors:
- **Backham, Michael Buller**
  Kent CT2 8ET (GB)
- **Fernandez, Maria Ebelia**
  Kent CT10 1SL (GB)
- **White, Paul Nicholas**
  Kent CT5 4TH (GB)

(74) Representative: **Every, David Aidan et al**
Marks & Clerk LLP
Sussex House
83-85 Mosley Street
Manchester
M2 3LG (GB)

Remarks:
Claim 17 is deemed to be abandoned due to non-payment of the claims fee (Rule 45(3) EPC).

(54) A damper

(57) A fire and/or smoke damper for a duct comprises a blade pivotally disposed in a frame for movement between an open position and a closed position in said duct. The blade has a peripheral channel that supports a seal for sealing engagement with the inner surface of the frame. The seal comprises a core of intumescent material and a deformable sleeve surrounding said core with an air gap. The sleeve provides sealing at low temperatures. In the event of a fire the intumescent material expands at high temperatures to maintain the seal but is retained in position by the sleeve.

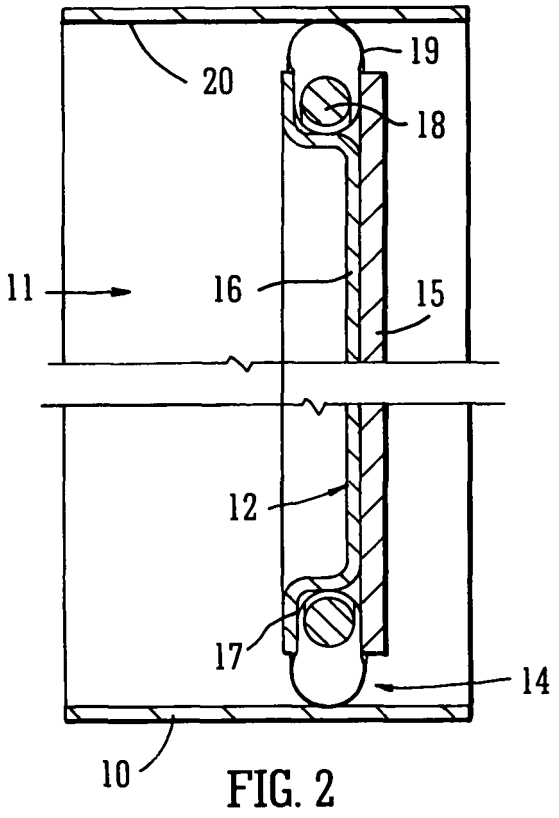

FIG. 2

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Description

[0001] The present invention relates to a fire and/or smoke damper of the kind that is used to seal an air distribution duct in the event of a fire.

[0002] It is known to provide dampers in ducts particularly those that penetrate a fire barrier or wall. Such dampers are arranged to close the duct in the event of temperatures within and/or outside the duct exceeding a pre-determined threshold. This may be done on receipt of an external signal received from a fire or smoke detection system or a fire alarm panel. Dampers of this type are specified where it is necessary to ensure the integrity of the fire barrier and thereby prevent the spread of a fire through a duct penetrating the fire barrier. With such an arrangement the damper is normally open but closes in the event of an excess temperature being sensed. One example in which such dampers are used is in air ventilation systems.

[0003] Typical dampers comprise a casing that fits into the duct and houses one or more steel blades which can be rotated through 90 degrees between a first position in which the blade or blades are edge-on to the direction of the ducts and a second position in which the blade or blades extend transversely with respect to the direction of the duct so as to form an effective barrier across the duct. Generally the blades are held in the first (open) position to allow air flow through the ducts by means, for example, of a spring return actuator. In one particular damper design a single blade damper is pivotally disposed in the casing and has a peripheral seal for sealing engagement with the casing when in the closed position so as to restrict air flow and prevent the progress of a fire in the duct.

[0004] It is an object of the present invention, amongst others, to provide for an improved fire damper and, particularly to such a damper with an improved sealing arrangement.

[0005] According to the present invention there is provided a fire and/or smoke damper for a duct comprising a blade for movement between an open position and a closed position in said duct, the blade having a peripheral seal for sealing engagement with a surface, the seal comprising a core of intumescent material and a deformable sleeve surrounding said core.

[0006] The sleeve provides a seal at relatively low temperatures but in the event of a fire the sleeve may develop leaks in which case the intumescent material expands to fill the sleeve and maintain the seal. There may be provided an air gap between sleeve and core to accommodate such expansion. The sleeve is deformable to provide the sealing characteristics and may be flexible and/or resilient.

[0007] The blade may conveniently have a peripheral channel in which seal is received. The seal preferably seal extends outwards of said channel so as to come into sealing contact with a surface.

[0008] The blade may be substantially circular and the seal may be substantially annular but it is to be understood that the blade may take any desirable or suitable shape including, for example, rectangular or square.

[0009] The blade may comprise two disc-shaped members overlying one another and configured to form the channel at their periphery. One of the disc shaped members may be generally planar and the other may be formed at its periphery to provide the channel.

[0010] The sleeve may comprise a woven material that is preferably fire-resistant. It may comprise a woven glass-fibre scrim. The fibres of the woven material may be coated with silicon or rubber or similar to afford sealing characteristics. The fibres may be arranged into multifilament yarns, each yarn being coated. In the event of a fire the coating may perish at relatively high temperatures leaving the sleeve uncoated and prone to leakage.

[0011] The blade may be pivotally mounted in a frame that defines a conduit, the blade being movable between a first position in which the conduit is open and a second position in which it closes the conduit. The seal may extend outwardly from the periphery of the blade to an inside surface of the frame so as to seal the blade to the surface. The sleeve may be compressed between the surface and the blade periphery when the blade is in said second position.

[0012] An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a damper in accordance with the present invention, a damper blade being shown in a closed position in a frame that is partially cut away to reveal the blade;

Figure 2 is a sectioned side view of the damper of figure 1; and

Figure 3 is a sectioned view of a seal of the damper of figures 1 and 2, the seal shown in an undeformed configuration.

[0013] Referring to the figures, the illustrated damper comprises a cylindrical frame 10 for mounting in a duct (not shown) or between duct portions. The frame defines a conduit 11 that is closable by a disc-shaped damper blade 12 pivotally disposed in the conduit.

[0014] The frame 10 and damper blade 12 are typically manufactured from thin sheet galvanised steel, their diameters depending on the application. The blade 12 is pivotally disposed in the conduit 11 on a pivot pin 13 that extends into the wall of the frame 10 on each side. If necessary the ends of the pin 13 may be received in bearings. The periphery of the damper blade 12 is fitted with a seal 14 and in use, the damper blade 12 is pivotal between a closed position where it substantially closes the conduit 11 such that the seal 14 bears against the inside surface of the frame in a sealing relationship and an open position where it is moved through 90 degrees so that the conduit is fully open.

[0015] The damper blade 12 is constructed from two

coterminous discs 15, 16 of galvanised steel plate that are joined together by any suitable means. A first disc 15 is planar across is diameter but the second disc 16 is axially stepped at its outer periphery so as to define a peripheral annular channel 17 with the first disc. The channel 17 is designed to receive the seal 14 and may be typically 5mm wide and of a similar depth.

[0016] The seal 14 (see figure 3) is substantially annular and comprises an inner core 18 of intumescent material bead surrounded by a substantially cylindrical and flexible outer sleeve 19 of glass fibre scrim comprising a plurality of multifilament yarns each coated with silicon. It is to be appreciated that other suitable materials may be used both for the fibres and the coating. In particular, the coating may be polyester or acrylic based. Coating each yarn in this manner allows the sleeve to bend into the annular form without it kinking. Intumescent materials are well known in the art and typically comprise an expansible graphite but any suitable material is contemplated.

[0017] When the seal 14 is inserted into the channel 17 the outer sleeve 19 is squeezed inwards in an axial direction so that it fits between the channel walls. In squeezing the sleeve in this way it deforms to the radially elongated state depicted in figure 2. In the case of a channel 17 that has a 5mm depth, the sleeve 19 may be in the region of 7mm diameter. When deformed it extends radially outboard of the channel 17 and contacts the inner surface 20 of the frame 10. The intumescent core 18 may be typically 2.5-3mm such that there is an air gap 20 between the core 18 and the sleeve 19. When the core expands it fills the air gap and presses on the sleeve so as to improve the sealing relationship.

[0018] In the event of a fire or receipt of an appropriate external signal representing detection of a fire or smoke or an equivalent test signal, an actuator is automatically operated to pivot the damper blade to the closed position. Actuator mechanisms and their operation are known in the art and are not described herein on the basis that they are not pertinent to the inventive aspects of the damper. In the closed position the sleeve 19 of the seal 14 comes into contact with the inner surface 20 of the frame 10 and is compressed slightly radially inwards thereby providing a degree of sealing at low temperatures. If the heat generated by the fire continues to increase the temperature in the duct rises to such a level that the silicon coating perishes at which point the seal would ordinarily become impaired. However, at such temperatures the intumescent core 18 expands to fill the air gap 20 to enhance the stealing relationship with the inner surface 20 of the frame. The expansion of the core ensures that the sleeve, whose sealing function might be impaired as a result of the fire or temperature increase, is pressurised into sealing against the inside surface of the frame. The glass fibre scrim of the sleeve 19 serves to retain the intumescent material 18 from further expansion and from coming into direct contact with the flame.

[0019] It will be appreciated that although the described embodiments of the invention are arranged such that a duct is closed in the event of a fire. There may be circumstances in which the damper assembly could be arranged to open only in the event of fire. It is also to be appreciated that there are numerous modifications and variations to the above described embodiments that may be adopted without departing from the scope of the present invention as defined by the appended claims. In particular the shape and dimensions of the various components of the damper may vary from those described above and shown in the figures.

Claims

1. A fire and/or smoke damper for a duct comprising a blade for movement between an open position and a closed position in said duct, the blade having a peripheral seal for sealing engagement with a surface, the seal comprising a core of intumescent material and a deformable sleeve surrounding said core.

2. A damper according to claim 1, wherein there is provided an air gap between sleeve and core.

3. A damper according to claim 1, wherein the blade has a peripheral channel in which seal is received.

4. A damper according to claim 3, wherein the seal extends outwards of said channel.

5. A damper according to any preceding claim, wherein the blade is substantially circular.

6. A damper according to any preceding claim, wherein the seal is substantially annular.

7. A damper according to any one of claims 1 to 4, wherein the blade is non-circular.

8. A damper according to any preceding claim wherein the blade comprises two disc-shaped members overlying one another and configured to form the channel at their periphery.

9. A damper according to claim 8, wherein one of the disc shaped members is generally planar and the other is formed at its periphery to provide the channel.

10. A damper according to any preceding claim, wherein the sleeve comprises a woven material.

11. A damper according to claim 10, wherein the sleeve comprises a woven glass-fibre scrim.

12. A damper according to claim 10 or 11, wherein fibres

of the woven material are coated with silicon or rubber.

13. A damper according to any preceding claim, wherein the sleeve comprises a fire resistant material.

14. A damper according to any preceding claim, pivotally mounted in a frame that defines a conduit, the blade being movable between a first position in which the conduit is open and a second position in which it closes the conduit.

15. A damper according to claim 14, wherein the seal extends from the periphery of the blade to an inside surface of the frame so as to seal the blade to the surface.

16. A damper according to claim 15, wherein the sleeve is compressed between the surface and the blade periphery when the blade is in said second position.

17. A damper substantially as hereinbefore described with reference to the accompanying drawings.

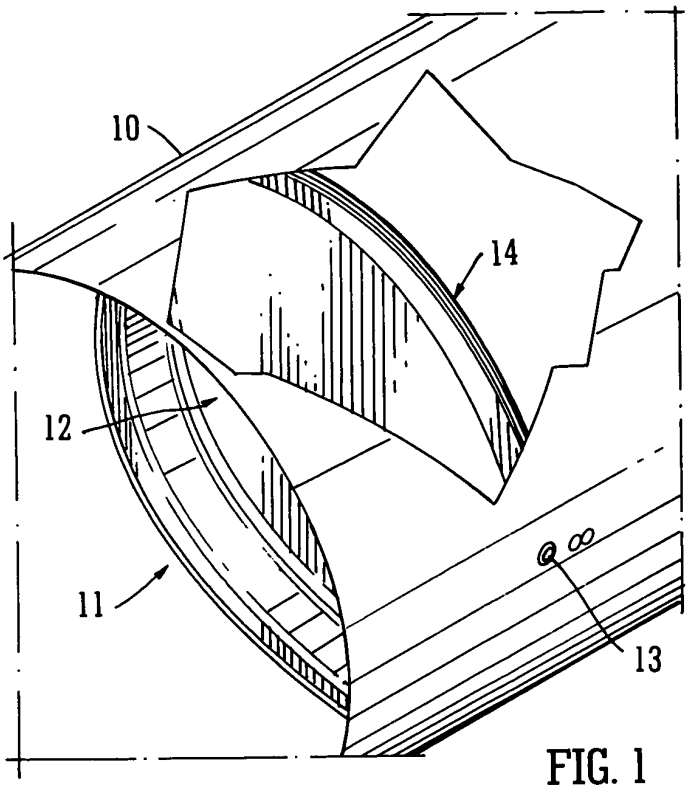

FIG. 1

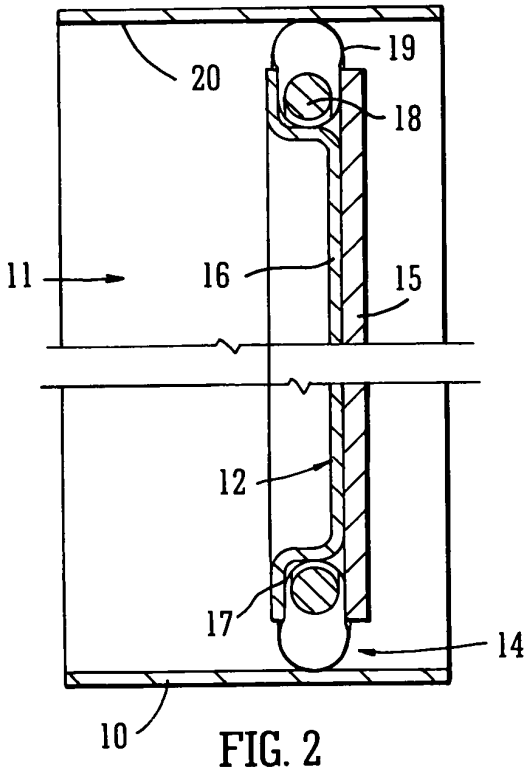

FIG. 2

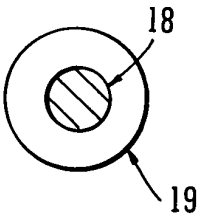

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 08 25 2384

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	WO 2007/068786 A (FLAEKT WOODS AB) 21 June 2007 (2007-06-21) * abstract; figure 4 * * page 2, line 5 - line 19 * * page 3, lines 13,20 * * page 4, line 12 - line 28 *	1,2,5-7, 10-14	INV. A62C2/06 A62C2/12
Y		3,4,8,9, 15,16	
Y	US 3 980 272 A (NAKAI TAKAO) 14 September 1976 (1976-09-14) * abstract; figure 2 *	3,4,9, 15,16	
Y	EP 0 447 944 A (SCHAKO METALLWARENFABRIK) 25 September 1991 (1991-09-25) * abstract * * page 3, line 50 - line 56 *	8	
A	DE 295 07 931 U1 (WILDEBOER WERNER) 10 August 1995 (1995-08-10) * abstract; figure 2 * * page 4, line 3 - line 13 *	1	TECHNICAL FIELDS SEARCHED (IPC) A62C
A	DE 203 17 181 U1 (GLUSKE GMBH) 17 March 2005 (2005-03-17) * abstract; figure 1 *	1	

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
The Hague	8 April 2009	Tempels, Marco

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

EPO FORM 1503 03.82 (P04C01)

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Application Number
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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

[X] Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

1-16

[ ] No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

[ ] All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

[ ] As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

[ ] Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

[ ] None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

[ ] The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 25 2384

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
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08-04-2009

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82