



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.05.2014 Bulletin 2014/20

(51) Int Cl.:
A62C 2/14 (2006.01) **A62C 2/06** (2006.01)
F24F 13/20 (2006.01) **F24F 13/02** (2006.01)

(21) Application number: **13192384.9**

(22) Date of filing: **11.11.2013**

(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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(30) Priority: **12.11.2012 IT VI20120304**
26.11.2012 IT VI20120316

(54) **Improved fire damper**

(57) The invention is a fire damper (1, 101) comprising a tubular case (2, 102) inside which there is a revolvingly associated shutter blade (3, 103) suited to rotate around a rotation axis (X) between an open position, in which the shutter blade (3, 103) is arranged parallel to the longitudinal axis (Y) of the tubular case (2, 102), and a closed position, in which the shutter blade (3, 103) is

arranged so that it is incident on the longitudinal axis (Y) of the tubular case (2, 102). The fire damper (1, 101) comprises at least one annular heatexpanding seal (4, 104) arranged around the tubular case (2, 102) in contact with the external surface (21, 121) of the same tubular case (2, 102).

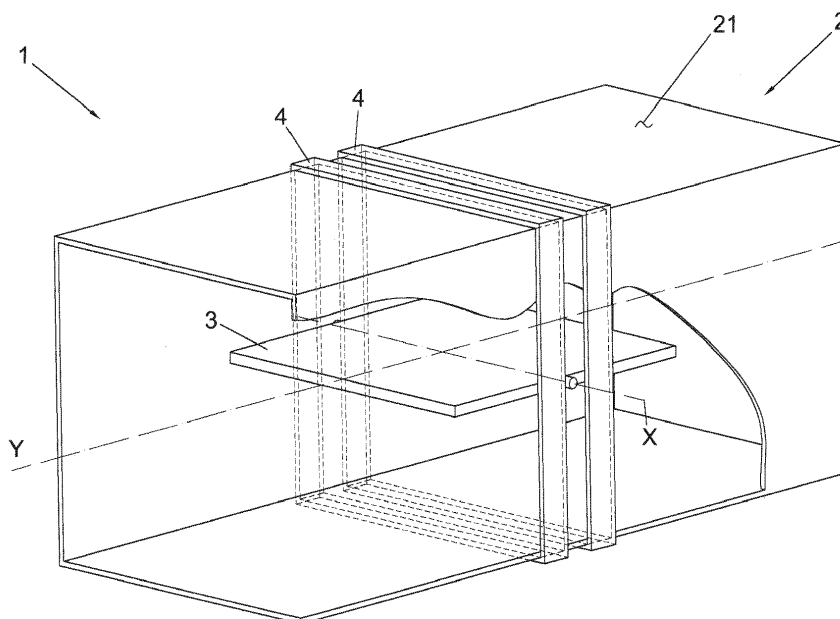


Fig.1

Description

[0001] The present invention concerns an improved fire damper, in particular the tubular case supporting said fire damper.

[0002] As is known, a fire damper is a device capable of closing a local vent when it is necessary to prevent the passage of fumes and/or flames in case of fire.

[0003] A fire damper of the known type comprises a tubular body, called "case" in technical jargon, generally made of a metallic material, which delimits one section of said vent and makes it possible to fix the fire damper to the rest of the vent.

[0004] Said tubular cases substantially have a rectangular or circular cross section.

[0005] It is also known that a first type of tubular cases of the fire dampers of the known art is provided with two half-cases between which there is an interposed frame in a heat-insulating material, which interrupts the continuity of said case in such a way as to prevent the transmission of heat along the walls of the same case.

[0006] In particular, the frame is provided with a through opening so as to revolvingly support a shutter blade that is configured so that it can rotate between an open position, in which the blade is arranged substantially parallel to the axis of the case in such a way as to allow the passage of air, and a closed position, in which the blade is arranged perpendicular to the axis of the case, so as to prevent said passage of air.

[0007] A second type of fire dampers according to the known art comprises, instead, a case made as a single piece, on which the rotary shaft of the shutter blade is directly hinged in such a way as to allow the latter to rotate from said open position to said closed position and vice versa.

[0008] It is also known that fire dampers are installed at the level of the walls that divide the various rooms inside a building.

[0009] In particular, the walls in which the fire dampers have to be installed are provided with holes that are larger than the cross section of the fire dampers, so that the latter can be introduced through the hole without obstacles. However, said difference in size clearly causes the presence of clearances between the surfaces of the hole and the external surface of the fire damper. Disadvantageously, said clearances give rise to two important drawbacks. The first drawback lies in that the fire damper simply introduced in the corresponding hole is not permanently fixed to the wall.

[0010] The second drawback lies in that said clearances, disadvantageously, do not prevent the flames and/or fumes from passing from one side of the wall to the other in case of fire.

[0011] In order to avoid these drawbacks, once the fire damper has been introduced in the corresponding hole it is necessary to use appropriate fixing elements and materials, such as concrete mixes, for example mortar, or special expanding polyurethane foams, in order to

eliminate said clearances between the external surface of the case and the surfaces of said hole.

[0012] Therefore, the use of said fixing elements and materials makes it possible to both permanently fix the fire damper to the respective wall and prevent the passage of flames and/or fumes through said clearances in case of fire.

[0013] This operation for fixing the fire damper to the wall, however, poses the drawback that it takes a certain amount of time and, therefore, increases installation costs.

[0014] In fact, once the fire damper has been arranged so that it passes through the hole made in the wall, the intervention of specialist personnel is required to fix it permanently to the wall with mortar or polyurethane foams.

[0015] In particular, in order to guarantee that the fire damper is safely and permanently fixed to the wall, it is necessary to introduce said fixing materials in both sides of the wall, in order to fill said clearances. In some cases said introduction may disadvantageously represent a problem.

[0016] Furthermore, in the case where the fire damper is installed against the edges of a wall, that is, adjacent to the ceiling or to a further side wall, the introduction of mortar or expanding polyurethane foams by said specialist personnel may be extremely difficult.

[0017] Furthermore, the presence of said clearances and the way in which the fire damper is fixed to the wall, just described above, may involve the drawback of favouring possible errors in the positioning of the fire damper itself.

[0018] In this case, to disadvantage, an incorrect positioning operation may affect the effectiveness of the fire damper and of the entire local vent.

[0019] The present invention intends to overcome all the drawbacks of the known art outlined above.

[0020] In particular, it is the object of the present invention to provide a fire damper that can be installed in a simpler and quicker way compared to the fire dampers of the known type.

[0021] Furthermore, it is the object of the invention to provide a fire damper suited to be installed without the aid of special instruments and fixing materials.

[0022] It is also the object of the invention to provide a fire damper that operates more effectively than the fire dampers of the known type.

[0023] It is another, yet not the least object of the invention to provide a fire damper that is more resistant to stresses and therefore less subject to possible damage during its production, transport and installation.

[0024] The above mentioned objects are achieved by a fire damper constructed according to claim 1.

[0025] Further characteristics of the fire damper of the invention are described in the dependent claims.

[0026] The said objects, together with the advantages that will be highlighted below, are illustrated in the description of some preferred embodiments of the invention

which are illustrated by way of non-limiting examples with reference to the attached drawings, wherein:

- Figure 1 shows an axonometric view of a first embodiment of the fire damper that is the subject of the invention;
- Figure 2 shows a side view of the fire damper shown in Figure 1;
- Figure 3 shows the cross section of the fire damper of Figure 2 according to the section plane π ;
- Figure 4 shows a variant of the first embodiment of the fire damper shown in Figure 1;
- Figure 5 shows an axonometric view of a second embodiment of the fire damper of the invention;
- Figure 6 shows the frame and the shutter blade belonging to the fire damper of Figure 5;
- Figure 7 schematically shows the cross section of the first and of the second embodiment of the fire damper of the invention, respectively shown in Figures 1 and 5, installed on a wall.

[0027] A first embodiment of the fire damper that is the subject of the invention is shown as a whole in Figures from 1 to 3, where it is indicated by 1.

[0028] As shown in Figure 1, the fire damper 1 comprises a tubular case 2 usually made of a metallic material.

[0029] Inside said tubular case 2 there is a shutter blade 3 revolvingly associated therewith and configured so that it can rotate around a rotation axis X between an open position, in which it is arranged parallel to the longitudinal axis Y of the tubular case 2, and a closed position, in which the same blade 3 is arranged so that it is incident on the longitudinal axis Y of said tubular case 2.

[0030] Preferably, the rotation of the blade 3 is obtained through moving means, not illustrated in the figure but known per se, that are activated in case of fire. According to the invention, the fire damper 1 comprises at least one annular heat-expanding seal 4 arranged around the tubular case 2 and resting on the external surface 21 of the same tubular case 2.

[0031] Advantageously, the presence of said annular heat-expanding seal 4 on the external surface 21 of the case 2 makes it possible to install the fire damper 1 in a wall P of a building through the so-called "dry" techniques, that is, with no need to use fixing elements or materials like for example concrete mixes or expanding polyurethane foams.

[0032] In particular, as shown in Figure 7, according to the installation procedure the fire damper 1 of the invention must be introduced in a hole F made in said wall P, whose size and shape substantially coincide with the cross section of the tubular case 2. When the section of the tubular case 2 in which said annular heat-expanding seal 4 is arranged is in proximity to the hole F, the same annular heat-expanding seal 4 comes into contact with the perimeter surfaces of the same hole F, fixing the fire damper 1 of the invention to the wall P through interfer-

ence, as can be seen in the detail shown in Figure 7. Furthermore, still advantageously, the presence of the annular heat-expanding seal 4, which is arranged between the external surface 21 of the tubular case 2 and the perimeter surfaces of the hole F when the fire damper 1 is installed, is sufficient to prevent the passage of flames and/or fume in case of fire, as the seal 4 expands and thus seals in an optimal manner any clearances and fissures that may be present between the wall P and the fire damper 1.

[0033] As shown in Figure 2, the fire damper 1 of the invention preferably comprises two annular heat-expanding seals 4 arranged parallel to each other on the external surface 21 of the case 2.

[0034] It cannot be excluded, however, that in different embodiments of the invention there may be a single annular seal 4 or there may be more than two annular heat-expanding seals 4 arranged parallel to one another.

[0035] Furthermore, according to the preferred embodiment of the fire damper 1 of the invention shown in Figures 2 and 3, the two annular heat-expanding seals 4 are arranged on the external surface 21 of the tubular case 2 in such a way that the planes π and γ on which they lie are two planes that are orthogonal to the longitudinal axis Y of the same tubular case 2.

[0036] In the embodiment of the invention shown in Figure 1, the tubular case 2 and the blade 3 of the fire damper 1, according to a cross-section plane orthogonal to the longitudinal axis Y, have a rectangular shape, as can be seen in Figure 3.

[0037] Alternatively, the tubular case 2 and the blade 3, always according to said cross-section plane, may have a circular shape, as can be seen in Figure 4. The tubular case 2 is preferably made as a single piece.

[0038] However, in alternative embodiments of the invention, not represented in the figures, the same tubular case may comprise two or more tubular half-cases joined to each other according to the direction defined by the longitudinal axis Y.

[0039] A second embodiment of the fire damper that is the subject of the invention, indicated by 101 in Figure 5, includes all the characteristics of the first embodiment of the fire damper 1 described above, as well as the possible variants.

[0040] However, said second embodiment of the invention can be distinguished from the fire damper 1 due to the fact that the tubular case 102 is made exclusively in a single piece and, furthermore, due to the fact that it comprises a frame 105 made in a heat-insulating material, preferably calcium silicate fibre or another refractory material.

[0041] Said frame 105 perimetally delimits an opening 106 with which the shutter blade 103 is revolvingly associated around the rotation axis X.

[0042] For clarity's sake, in Figure 6 the frame 105 together with the blade 103 are represented isolated from the tubular case 102.

[0043] In said second embodiment of the invention, as

shown in Figure 5, the tubular case **102** is configured in such a way as to internally define a recess **107** suited to permanently accommodate said frame **105**.

[0044] Advantageously, the presence of the recess **107** makes it possible to constrain the frame **105** to the tubular case **102** with no need to use screws, adhesive substances or other analogous fixing means.

[0045] Furthermore, the fact that the frame **105** is arranged on the inner side of the tubular case **102** allows for better protection of the same frame **105** during both transport and installation, with the advantage of obtaining a sturdier fire damper **101**.

[0046] As far as the two annular heat-expanding seals **104** are concerned, as shown in Figure 5, they are arranged in the portion **122** of the external surface **121** of the tubular case **102** at the level of which said recess **107** is defined. Preferably, between the frame **105** and the recess **107** there is a seal, not represented in the figures but known per se, which advantageously prevents the passage of gas between the two elements.

[0047] In particular, preferably but not necessarily, said seal is arranged in a housing obtained on the external perimeter surface of the frame **105**.

[0048] Still preferably, the tubular case **102** comprises a plurality of through openings **108** facing the recess **107**, visible in Figure 5, which reduce the average cross section of the tubular case **102** and thus limit its heat conductivity in the direction defined by the axis **Y**.

[0049] Advantageously, the through openings **108** make it possible to hinder heat transmission by conductivity along the tubular case **102** also in the case where the latter is made from a single piece of conductive material like, for example, a metal plate.

[0050] In particular, metal plate advantageously makes it possible to obtain a light, resistant and economic tubular case **102**.

[0051] As the through holes **108** are made at the level of the recess **107**, they are advantageously covered by the frame **105** on the inner side and by the annular heat-expanding seals **104** on the outer side, which therefore prevent the gas contained in the tubular case **102** from flowing towards the outside across the through openings **108**.

[0052] Preferably but not necessarily, the tubular case **102** is made starting from a bent metal plate.

[0053] In practice, the fire damper **1, 101**, as shown in Figure 7, is introduced in a hole **F** made in a wall **P** of a building and fixed therein through interference.

[0054] In particular, the fire damper **1, 101** of the invention is introduced in said hole **F** until the annular heat-expanding seals **4, 104** are coupled through interference to the perimeter surfaces of the hole **F**, as shown in the detail of Figure 7, therefore with no need to use fixing elements and materials.

[0055] In case of fire, the blade **3, 103** is rotated in the closed position, in such a way as to prevent the passage of flames and fume along the local vent.

[0056] The annular heat-expanding seals **4, 104**, ex-

pand thanks to the heat that is generated in case of fire and thus make it possible to seal any clearances and fissures that may be present between the hole **F** and the fire damper **1, 101**. The above clearly shows that the improved fire damper that is the subject of the invention achieves all the set objects.

[0057] In fact, the invention achieves the object to provide a fire damper that can be installed in a simpler and quicker way compared to the fire dampers of the known type.

[0058] In particular, the invention achieves the object to provide a fire damper suited to be installed without the aid of special instruments and fixing materials.

[0059] It also achieves the object to provide a fire damper that operates more effectively than the fire dampers of the known type.

[0060] The invention furthermore achieves the object to provide a fire damper that is more resistant to external stresses during production, transport and even installation.

[0061] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the protection of each element identified by way of example by such reference signs.

Claims

1. Fire damper (1, 101) of the type comprising a tubular case (2, 102) inside which there is a revolvingly associated shutter blade (3, 103) suited to rotate around a rotation axis (X) between an open position, in which said shutter blade (3, 103) is arranged parallel to the longitudinal axis (Y) of said tubular case (2, 102), and a closed position, in which said shutter blade (3, 103) is arranged so that it is incident on said longitudinal axis (Y) of said tubular case (2, 102), **characterized in that** it comprises at least one annular heat-expanding seal (4, 104) arranged around said tubular case (2, 102) in contact with the external surface (21, 121) of said tubular case (2, 102).
2. Fire damper (1, 101) according to claim 1, **characterized in that** said annular heat-expanding seal (4, 104) is arranged on said external surface (21, 121) of said tubular case (2, 102) so that the plane (π , γ) on which it lies is orthogonal to said longitudinal axis (Y) of said tubular case (2, 102).
3. Fire damper (1, 101) according to any of the preceding claims, **characterized in that** said at least one annular heat-expanding seal (4, 104) comprises two annular heat-expanding seals (4, 104) arranged parallel to each other on said external surface (21, 121).

4. Fire damper (1, 101) according to any of the preceding claims, **characterized in that** said tubular case (2, 102) is made in a single piece.
5. Fire damper (101) according to claim 4, **characterized in that** said tubular case (102) is configured in such a way as to internally define a recess (107) suited to permanently accommodate a frame (105) in a heat-insulating material with which said shutter blade (103) is revolvingly associated and **in that** said at least one annular heat-expanding seal (104) is arranged on the portion (122) of said external surface (121) of said tubular case (102) at the level of which said recess (107) is defined.
6. Fire damper (101) according to claim 5, **characterized in that** between said frame (105) and said recess (107) there is a seal suited to prevent the passage of gas between said two elements.
7. Fire damper (101) according to claim 6, **characterized in that** said seal is arranged in a housing obtained on the external perimeter surface of said frame (105).
8. Fire damper (101) according to any of claims from 5 to 7, **characterized in that** said tubular case (102) comprises a plurality of through openings (108) facing said recess (107) in such a way as to reduce the average cross section of said tubular case (102).

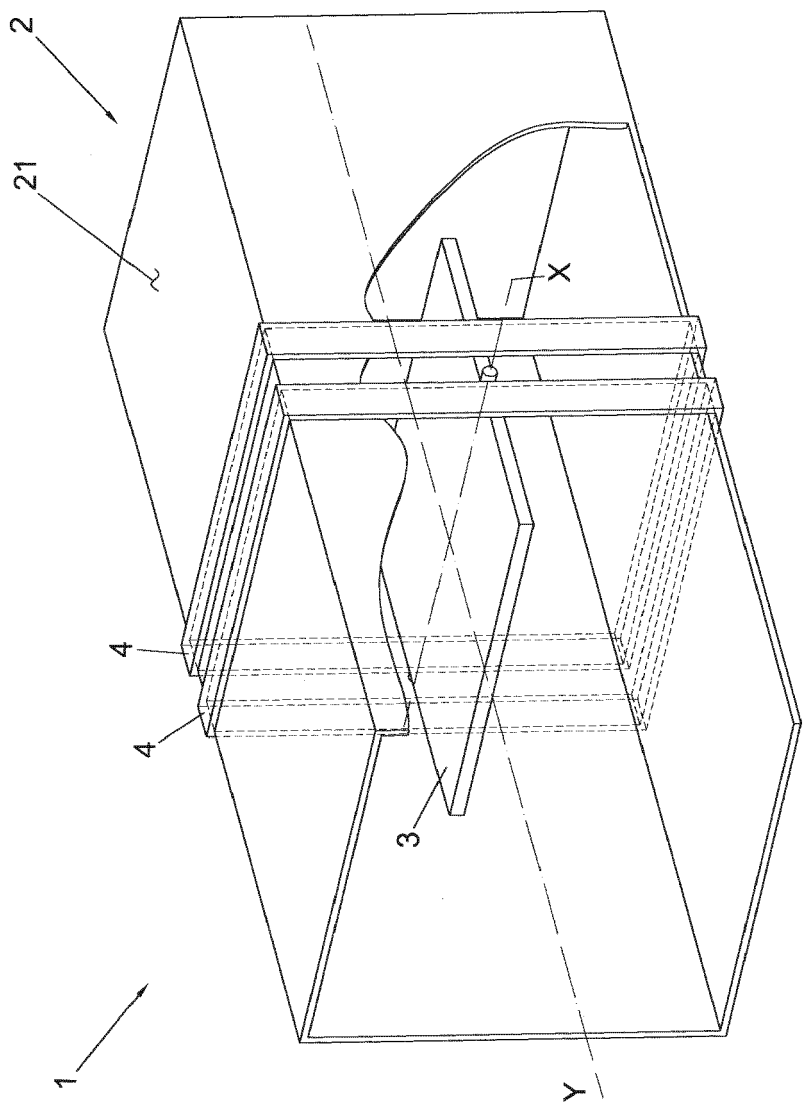
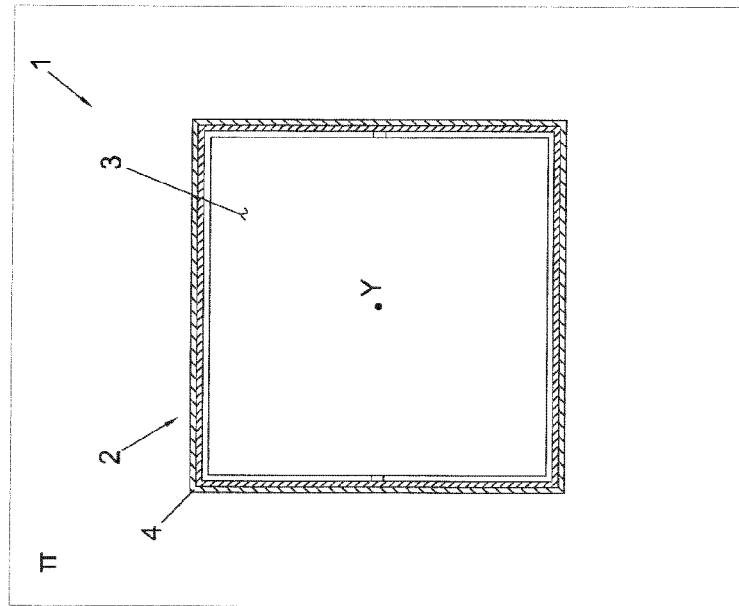
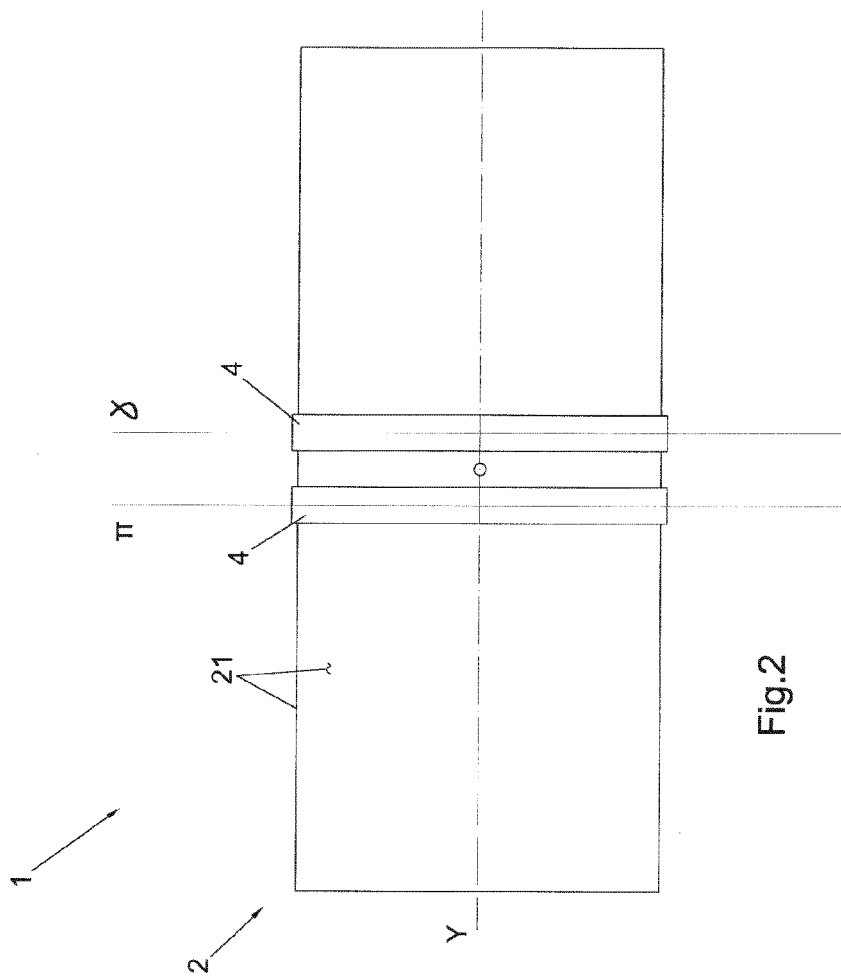


Fig.1



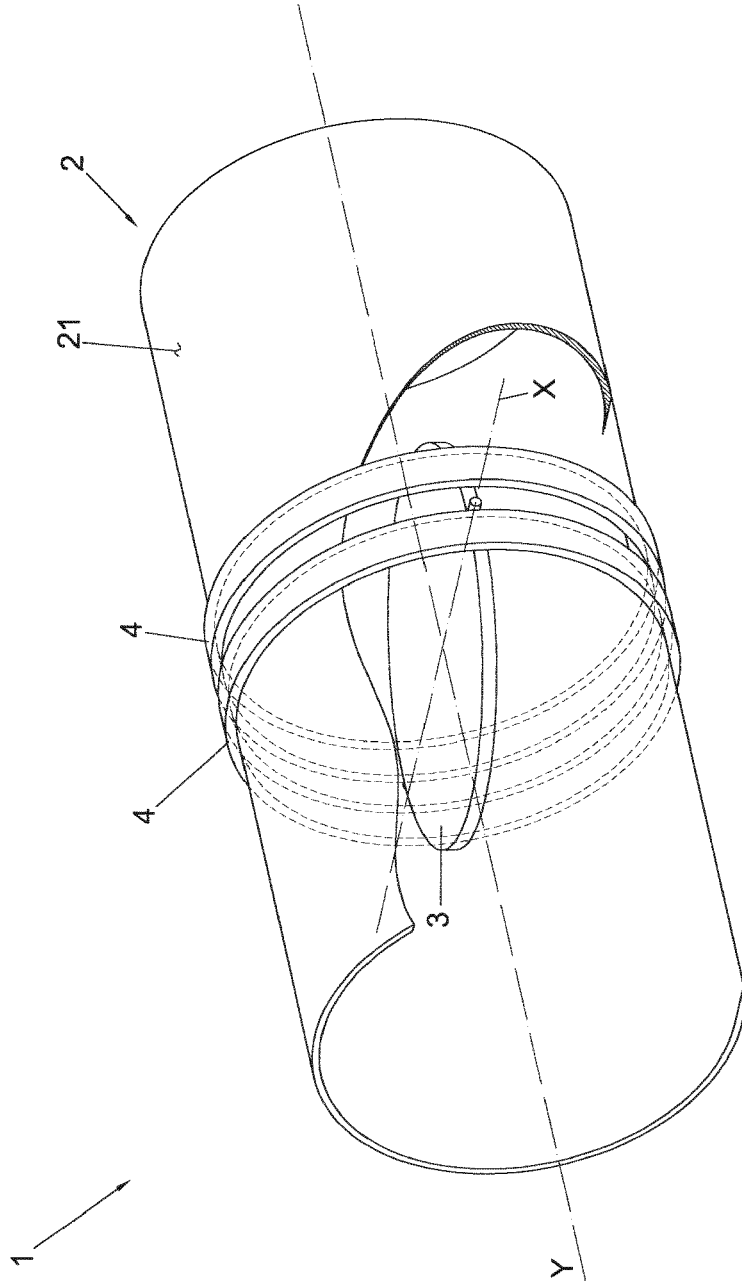


Fig.4

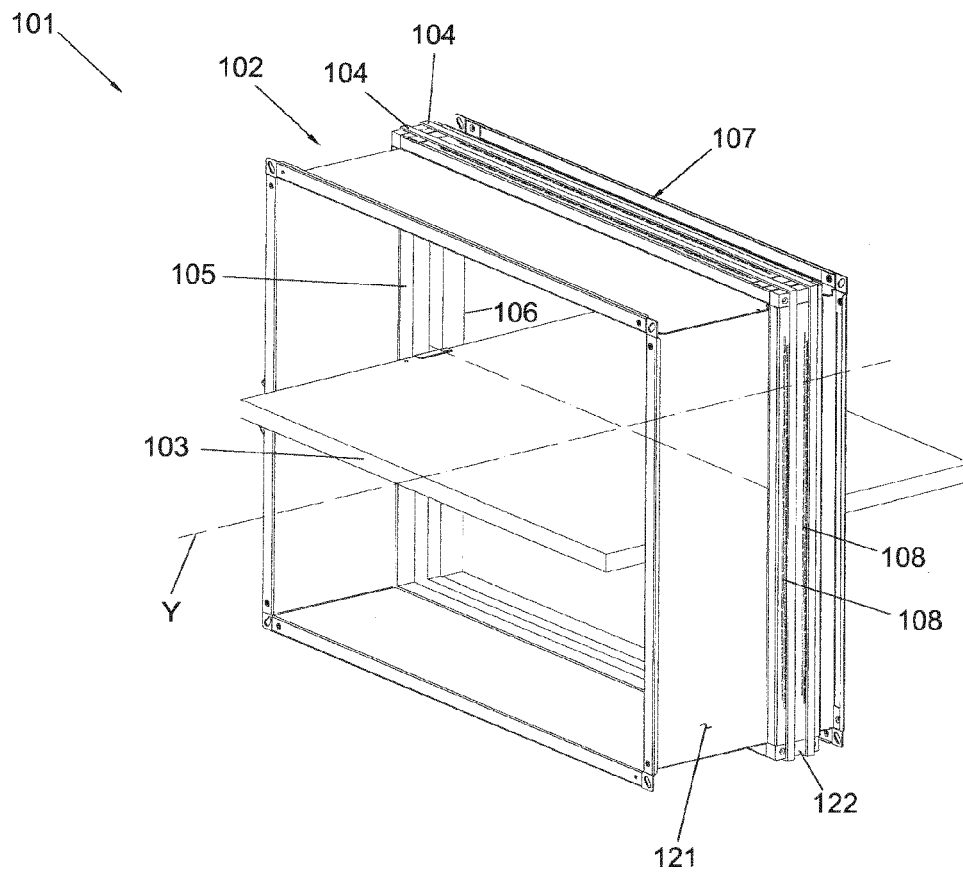


Fig.5

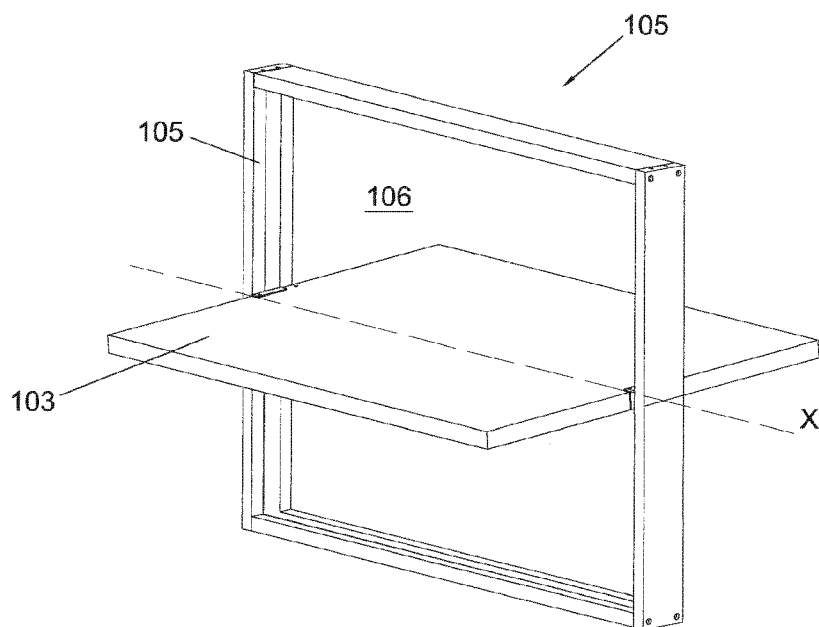
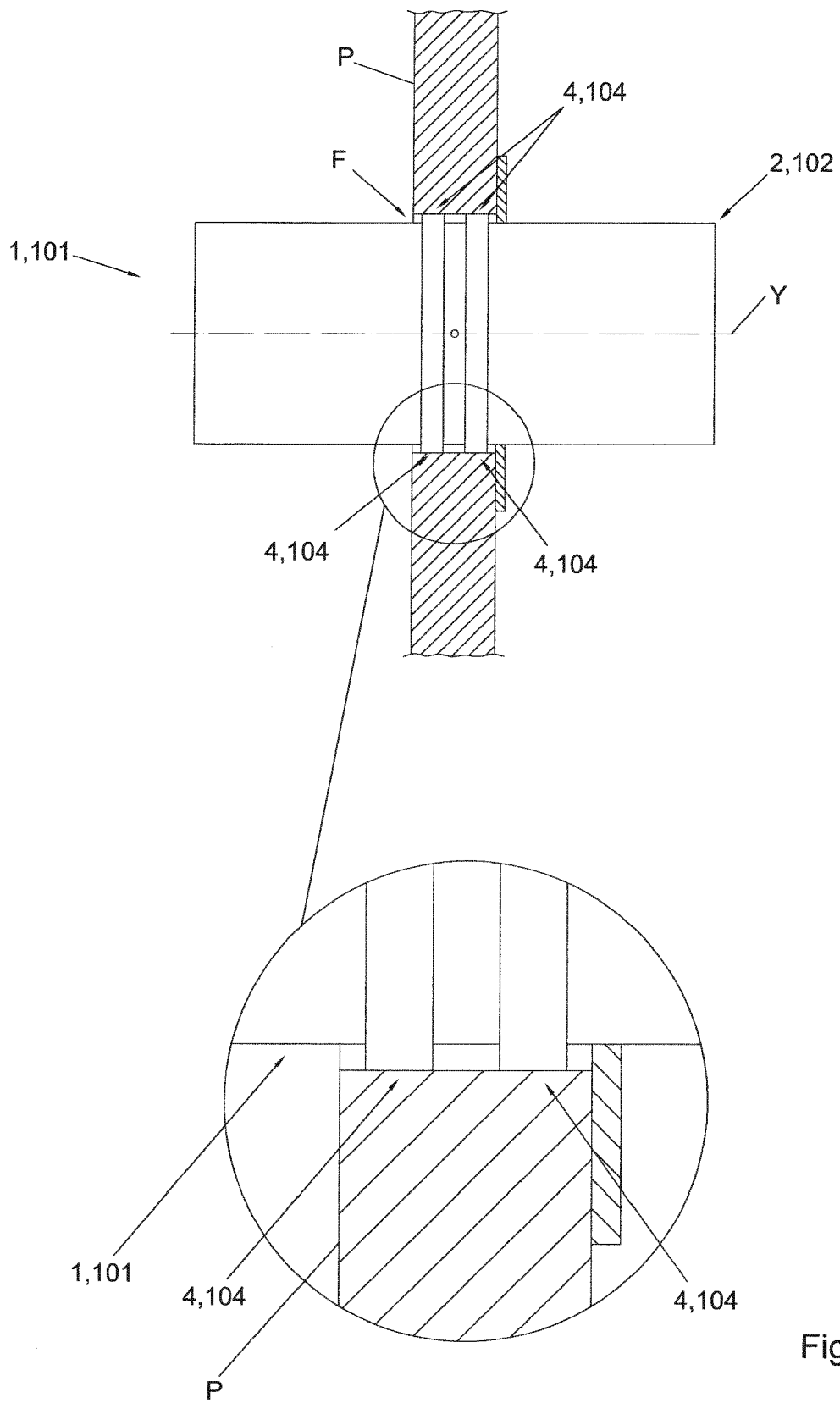


Fig.6





EUROPEAN SEARCH REPORT

Application Number
EP 13 19 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)
Y	EP 2 239 014 A1 (RF TECHNOLOGIES NV [BE]) 13 October 2010 (2010-10-13)	1-4	INV. A62C2/14
A	* abstract * * paragraph [0002] * * paragraph [0026] - paragraph [0030] * * claim 2 * * figures 1,4 *	5	ADD. A62C2/06 F24F13/20 F24F13/02
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A	* page 4, line 6 - page 5, line 14 * * abstract * * figures *	5	
A	EP 1 779 901 A2 (CIAT SP Z O O [PL]) 2 May 2007 (2007-05-02)	1	
	* abstract; figures 1,4 *		
A	EP 2 181 733 A1 (MP3 S R L [IT]) 5 May 2010 (2010-05-05)	1	
	* abstract * * figures 1-3 *		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) A62C F24F
Place of search The Hague		Date of completion of the search 19 March 2014	Examiner Nehrdich, Martin
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			

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EPO FORM 1503 03.82 (P04C01)

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

EP 13 19 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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