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(71) Applicant: **Koolair, S.A.**
28936 Mostoles (Madrid) (ES)

(72) Inventor: **SUSARTE TORRIJOS, Jose Tomás**
E-28936 Mostoles Madrid (ES)

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(74) Representative: **Carpintero Lopez, Francisco**
Herrero & Asociados, S.L.
C/ Alcala, 35
28014 Madrid (ES)

(54) **AIR DIFFUSER WHICH CAN BE AUTOMATICALLY ORIENTED ACCORDING TO THE TEMPERATURE OF THE DISCHARGE AIR, WITH LIMITATION OF TRAVEL**

(57) The invention relates to an automatically orientable air diffuser according to the discharge temperature, such that a blast of hot air is directed towards lower positions of the enclosure to be conditioned and a blast of cold air is directed towards upper positions of said enclosure, as a result of the pivoting with respect to a transverse horizontal axis of an inner body (2) or diffuser nozzle pushed by a lever pushed by a heat-expandable body. The outer casing (1) includes a pivoting movement-limiting element in the form of an angle bracket, one of the branches of which forms a stop element (10) for the pivoting inner body (2), whereas the heat-expandable element is assembled in a unit pushed by a spring (17) and can move backwards against the action of said spring (17) when it continues to push against the pivoting inner body (2) after the latter has reached the end of its travel. The assembly includes marks (14) which allow adjusting the pivoting amplitude.

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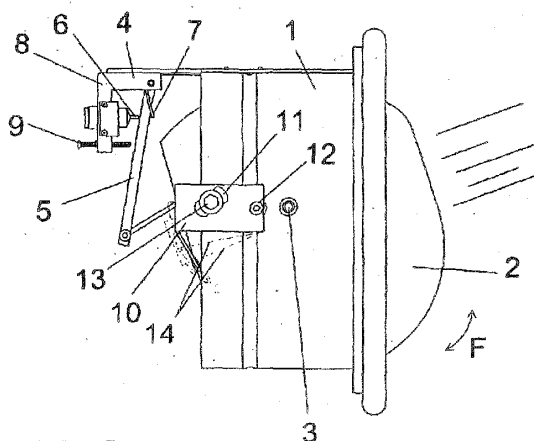


FIG. 1

Description

Object of the Invention

[0001] The present invention relates to an automatically orientable air diffuser according to the temperature of the discharge air, with limitation of travel, which provides essential features of novelty and considerable advantages with respect to the means known and used for similar purposes in the current state of the art.

[0002] More particularly, the invention proposes the development of an air diffuser, particularly a diffuser of the type of those which are used embedded mainly in walls of enclosures to be conditioned, the automatic orientation capacity of which, according to the temperature of the discharge air, allows directing the discharge air with variable inclination angles dependent on said temperature, the design features of which confer operational and functional capacities which are substantially improved and increased with respect to the diffusers of the current art, upon allowing an adjustment, at will, of the pivoting travel of the inner body in charge of such directing, together with a capacity to absorb the stresses and strains which the members performing the push on said pivoting inner body are subjected to, which allows assuring a more precise operation and a more prolonged operational life than in conventional devices.

[0003] The field of application of the invention is obviously comprised in the industrial sector dedicated to the manufacture and installation of air conditioning apparatuses and devices.

Background and Summary of the Invention

[0004] It is known by all that it is necessary to adapt the closes spaces through which people move for the maintenance of a suitable temperature both in hot seasons and in cold seasons. In this sense, air conditioning installations provide very suitable solutions for the different spaces since they allow supplying cold or hot air, as appropriate.

[0005] When spaces of considerably dimensions are to be conditioned, it is necessary to use a larger number of diffusers to emit the air at the desired temperature towards the space of the enclosure which is to be conditioned. Several types of diffusers are currently known, from which some types are prepared for their installation in the wall in multiple positions for the purpose of suitably cover the mentioned space which is to be conditioned, whereas other types are prepared for their installation in the wall, likewise in multiple positions along the walls surrounding the considered space.

[0006] In any of the cases, an objective to be fulfilled is providing apparatuses which allow optimally conditioning the space in the best conditions and in the shortest possible time. To that end, it is necessary for the air projected through the diffusers to be emitted to the space with the suitable direction, so that the space is swept

more efficiently and the conditioning conditions can be reached as expected.

[0007] As it is known, the fact that cold air is heavier than hot air is a physical characteristic. Taking this circumstance into account, the position towards which a blast of cold air is directed must necessarily be different from the position towards which a blast of hot air is directed, such that approximately equivalent results are obtained. Thus, cold air must be projected towards an upper position, such that as a result of its greater weight, it falls downwards, displacing hot air towards higher positions and causing a heat exchange by convection which allows gradually reducing the temperature of the space which is to be conditioned. On the contrary, when hot air is to be introduced in said space, it is necessary for the blast to be directed towards lower positions, such that the upward movement derived from its lower weight provides the displacement of the colder air towards the lower part and the heat exchange allowing a rise of the ambient temperature of such space occurs simultaneously.

[0008] In known diffusers existing in the state of the art, it is usual for the air discharge nozzle to be oriented manually, through any type of threaded stud acting on pushing rods which change the orientation for directing air according to whether it is hot or cold, which is difficult and needs a large amount of time, especially in the case of spaces of considerable dimensions in which there is a large number of such diffusers. The position changing operation must necessarily be modified at least twice a year, coinciding with the coldest season and the hottest season, which doubles the inconvenient situations. All this, together with the additional drawback of the fact that operations of this type can also give rise to lacks of precision and incorrect positioning, prevents the efficiency of the installation from being suitable.

[0009] In other cases, the diffusers include motor-driven position changing mechanisms, for which it is necessary for them to incorporate driving elements of the type of an electrically operated motor, together with transmission mechanisms for communicating the movement to the air passage nozzle, electric power cables, ..., etc. All this makes the installation be complex and expensive, and furthermore make it need frequent maintenance operations.

[0010] A solution to the aforementioned problems in relation to currently existing air conditioning installations is known in the state of the art and consists of an embodiment of a diffuser which allows a self-adaptation in terms of directing the blast of air, dependent on the temperature of said blast of air passing through the diffuser towards the space of the environment which is to be conditioned. This solution has been proposed by the same proprietor of the present application by means of the invention contained in document U-200601710, whereby an air diffuser is provided which is automatically oriented according to the temperature reached by the discharge air, such that the blast of cold air can be directed towards the highest areas of the environment, and the blast of

hot air can be directed towards the lowest positions. To that end, the diffuser has an inner body which can pivot with respect to a central horizontal axis, which in the rest position is always directed towards the highest position due to the action of a spring driving it in that pivoting direction (cold air discharge position), whereas when the temperature of the air passing through said body gradually rises, the longitudinal extension of a heat-expandable element occurs, which element is supported against a lever which it pushes when it expands, and through which the pivoting of the orientable inner body of the diffuser occurs with the consequent change of the direction of the discharge blast.

[0011] Evidently, a solution such as the one proposed by the mentioned document is not only a simple and cost-effective embodiment, but also a highly effective way to solve the needs of the state of the art in terms of orientation of the diffuser, automatically and therefore without needing intervention from the outside. Although the solution proposed by the mentioned prior art document allowed favorably solving the needs inherent to diffusers of this type, it has been observed nevertheless that in certain situations stresses are generated which are derived from the push exerted by the heat-expandable element when the pivoting orientation member has reached the end of the travel, which in certain cases can even cause the breakage of said element. In order to solve this solution which can possibly occur in practice and to prevent breakages of elements which may cause a malfunction of the assembly of the diffuser, investigations have been conducted which have led to the improvement of the diffuser described in said document by means of providing the additional operational capacities which are advantageously complemented with those of the initial embodiment.

[0012] In this sense, according to the present invention, the embodiment which is proposed consists of an air conditioning diffuser, which can automatically orient the discharge blast according to the temperature of the latter, formed by an outer casing and by an inner body attached to the outer casing by means of facing pivoting side anchors according to a horizontal pivoting axis, in which the rest position of said inner body corresponds to an upward orientation as a result of the action of a first retraction spring acting on an articulated lever in said orientable inner body (cold air discharge position), and in which the discharge air passes over a heat-expandable element such that with the increase of the temperature the expansion of said element is caused, whereby a longitudinal rod pushes said articulated lever in the opposite direction to that of the retraction spring, causing the pivoting inner body to be oriented for an air discharge in a downward direction. For the purpose of absorbing the possible stresses and strains derived from the fact that the temperature of the air causes the heat-expandable element to continue pushing when the orientable inner body has reached the end of its pivoting travel, it has been provided that the mentioned heat-expandable ele-

ment is assembled in a support such that it is maintained in its operational position as a result of the action of a second spring, such that when the pivoting body reaches the end limit of its travel, the reaction caused on the pushing element causes this second spring to be compressed and thus absorb the dimensional difference caused by the excessive expansion of the heat-expandable element. The unwanted breakage thereof is thus prevented and a perfect operation of the assembly for a more prolonged operational life is assured.

[0013] Additionally, the invention has furthermore provided that, in this embodiment, the limit amplitude of the pivoting angle of the inner body can also be adjusted. For such purpose, the incorporation of a mechanical stop means, secured to the casing at a pivoting point and which can be fixed in the chosen position by means of a screw or another element with equivalent features, has been provided. The casing can include means for indicating the chosen limit pivoting angle, associated with the positioning of said stop, and of direct reading.

[0014] As will be understood, with an embodiment of an air diffuser such as the one which has been described in a summarized manner above, the operational features thereof are considerably improved, breakages or defects which can cause its malfunction are prevented, and with all this much more reduced maintenance needs than in the case of the diffusers currently known and used in the state of the art are assured.

Brief Description of the Drawings

[0015] These and other features and advantages of the invention will be more clearly shown from the following detailed description of a preferred embodiment thereof, given only by way of an illustrative example and without any limiting character, taken together with the attached drawings, in which:

Figure 1 shows a schematic side elevational view of an air diffuser according to the invention, arranged in the cold air discharge position;

Figure 2 shows a schematic side elevational view, of the air diffuser of Figure 1, arranged in the hot air discharge position;

Figure 3 shows a schematic rear elevational view of the same air diffuser of the previous figures;

Figure 4 illustrates a schematic perspective exploded view in relation to the different components associated with the heat-expandable element incorporated in the diffuser of the invention, and

Figure 5 illustrates a schematic perspective view of a stop element of the type incorporated in the diffuser of the invention.

Description of a Preferred Embodiment

[0016] As has been mentioned above, the detailed description of the preferred embodiment of the present in-

vention will be carried out below with the aid of the attached drawings, throughout which the same reference numbers are used to designate identical or similar parts. Thus, considering first Figure 1 of the drawings, it shows an illustrative depiction of an air diffuser of the type described in the prior art document mentioned above, formed by an outer casing 1 prepared to be coupled in a hole of the wall made for that purpose, and an inner body 2 located inside said casing 1 and with the possibility of pivoting with respect to the latter to which it is attached at two diametrically opposite anchor points 3 determining a horizontal pivoting axis. Arrow F precisely indicates the rotation capacity of the inner body 2 with respect to the outer casing 1. The diffuser includes an automatic actuation unit, which will be described in greater detail in Figure 4, assembled in a support arm 4 integral with the outer casing 1 and including a heat-expandable element which, when it expands, frontally pushes on an articulated lever 5 acting on the mentioned inner body 2, forcing it to change position.

[0017] According to the depiction of Figure 1, the inner body 2 with its discharge mouth 2a (Figure 3) directed upwards, i.e., in the cold air directing position, is observed. This situation is maintained due to the fact that, on one hand, the heat-expandable element is contracted, and therefore its front element 6 occupies the most retracted position, and on the other hand, a spring 7 forces the articulated lever 5 to occupy its most withdrawn position with respect to the outer casing 1 by means of pivoting in its attachment to an angle bracket element 8 integral in turn with the support arm 4. There is an adjustable stop 9 limiting, in any case, the backward movement of the articulated lever 5, and thus the upward inclination angle of the air discharge mouth 2a.

[0018] However, when the air passing through the diffuser rises in temperature (i.e., hot air is supplied), the heat-expandable element expands, forwardly pushing with its front end 6 the articulated lever 5, and with the movement thereof, forcing the inner body 2 to pivot and direct the blast of air downwards, as shown in Figure 2.

[0019] In any case, as has been mentioned in the description above, this pivoting rotation movement of the inner body 2 with respect to the outer casing 1 is limited by a stop element 10 linked to the mentioned casing 1 with the possibility of variable positioning. To that end, the stop element 10 has a slit opening 11, the link to the casing being performed at a pivoting point 12 by means of a rivet or the like, and being able to be fixed in the chosen position with the aid of a screw 13 or the like. The casing 1 can in turn include one or more marks 14, either stamped in the wall itself of the casing or printed on a sheet or another adhered element, which inform the user or installer of the maximum degree of travel of the inner body 2 with respect to said outer casing 1.

[0020] Returning to the depiction of Figure 2, it can be seen that when the articulated lever 5 is pushed by the heat-expandable element of the diffuser, this push is transformed into a rotation movement of the inner body

2 which has the stop element 10 as a limit. Indeed, upon changing position from the one shown in Figure 1 to the one shown in Figure 2, there comes a time when the rear part of the inner body 2 collides against the stop element 10, this reaching the end of its travel. Evidently, depending on the position chosen for the stop element 10, the amplitude of the angular travel of the inner body 2 is also adjusted, allowing the diffuser to adapt with more precision and efficiency to the spatial and dimensional features of the site in which it is installed. When the position of the stop is reached and it is impossible for said inner body 2 to continue rotating, it may occur that the temperature of the air is sufficient to make the heat-expandable element continue expanding. This reaction is compensated according to the present invention due to the fact that the heat-expandable element can move backwards in its assembly position, against the action of a spring, according to a portion 6a which is perfectly visible in the mentioned Figure 2. The depiction of Figure 3 shows a rear elevational view of the diffuser in which the different components of the assembly in their respective positions are shown.

[0021] With reference now to Figure 4 of the drawings, it shows a schematic perspective exploded view of the assembly associated with the heat-expandable element. According to said depiction, this assembly is formed based on a body which encloses an enclosure delimited by a first element 8 configured in the form of an angle bracket, prepared to be integral with the support arm 4 extended from the casing 1, provided with a hole 8a to allow the passage of the portion 6a of the heat-expandable element, and a second element 15, configured in the form of a C-shaped profile and provided with a hole 15a, arranged such that it faces the position of the hole 8a when the assembly is put together, and intended to allow the passage of the front portion 6 of the heat-expandable element, through a bushing 16, with which the push on the articulated lever 5 is exerted. The heat-expandable element has a perimetrically extended thickened portion 6b, intended to provide a support for a spring 17 which is pressed on the portion 6a and which at the opposite end is supported against a bushing 18 provided with a tubular portion sized for its coupling inside the mentioned hole 8a. This spring 17 is in charge of maintaining the heat-expandable element in its most forward position and it is furthermore in charge of absorbing the backward movement of said element when it continues to expand after the inner body 2 has reached the end of its pivoting travel.

[0022] Finally, if the depiction of Figure 5 is considered, a schematic perspective view of a stop element 10 of the type incorporated by the embodiment of a diffuser proposed by the invention can be observed. As can be seen, the configuration chosen for this stop element 10 is in the form of an angle bracket, which in one of the branches includes the hole 12 made in a position close to the end and intended for the passage of a pivoting fixing element, and a slit opening 11 with an inclined positioning with

respect to the longitudinal direction of this branch and with sufficient amplitude to allow an adjustment between pre-established limits. On the other hand, in relation to the opposite branch of this stop element 10, it has an integral extension in the form of a flap, identified with reference number 10a, projected from the edge which faces the pivoting inner body 2 of the diffuser, in which there has been coupled an elastic element 19 against which the mentioned pivoting inner body 2 is supported when, in the position of Figure 2, it has reached the end of its travel, damping and softening the effect of the contact between both bodies.

[0023] It is not considered necessary to further extend the content of the present description for a person skilled in the art to be able to understand its scope and the advantages derived therefrom, as well as for carrying out the practical embodiment of its object.

[0024] Despite the foregoing, and since the description made only corresponds to a preferred embodiment of the invention, it will be understood that multiple, likewise protected variations of detail may be introduced within its essence, which may affect features such as the shape, the size, the manufacturing materials, or even the type of heat-expandable elements which are incorporated in the diffuser, without thus departing from the scope of the invention which is only defined by the following claims.

Claims

1. Automatically orientable air diffuser according to the temperature of the discharge air, with limitation of travel, the diffuser being of the type of those which are installed embedded in the wall of the enclosure which is to be conditioned, the diffuser comprising:

an outer casing (1);
 an inner body (2), assembled inside said casing (1) with the possibility of pivoting with respect to two pivoting anchor points (3) with the mentioned casing (1), located in diametrically opposite positions defining a horizontal axis of rotation;
 an articulated lever (5), pivoting with respect to its upper end in relation to a support integral with the mentioned casing (1) through an arm (4), and which at the opposite end is attached to the mentioned inner body (2) to pivotably drive said inner body (2) and cause the change of position thereof;
 a spring (7) acting directly on the articulated lever (5), forcing it to move backwards to a limit determined by an adjustable stop (9), thus taking the mentioned inner body (2) towards the cold air discharge position, and
 a unit associated with a heat-expandable element, located in the direction of passage of the discharge air, which has a front portion (6) which

can push on the mentioned articulated lever (5), against the action of the spring (7), when the temperature of the discharge air rises and said heat-expandable element expands, to thus take the inner body (2) to the hot air discharge position,

which is **characterized in that**

the mentioned diffuser furthermore includes a stop element (10), adopting the form of an angle bracket profile, assembled in the mentioned casing (1) by means of one of its branches with the possibility of adjustable positioning, for which purpose it includes a pivoting securing hole (12) and a slit opening (11), formed with a certain inclination with respect to the longitudinal direction of the branch of the part, through which there passes a screw (13) or the like for fixing the stop element (10) in the chosen position, whereas the other branch of the angle bracket is projected behind the casing (1), and forms an effective stop with respect to the pivoting travel of the inner body (2) when it is pushed by the expansion of the heat-expandable element through the mentioned articulated lever (5),

and **in that** the mentioned heat-expandable element is configured such that it has a perimetrically thickened portion (6b) determining a front portion (6) with which it performs the push on the mentioned articulated lever (5) and a rear portion (6a), carrying a spring (17) pressed thereon and supported at the opposite end in a bushing (18) configured such that it has a tubular portion sized to be coupled in a hole (8a) of a support element (8), such that when the heat-expandable element continues to expand due to the effect of the temperature of the discharge air after the inner body (2) has reached the end of its travel, against the stop (10), said heat-expandable element can move backwards against the action of the spring (17), absorbing with the effect of this additional expansion.

2. Diffuser according to claim 1, **characterized in that** the stop element (10) has a flap (10a) in the edge facing the inner body (2), provided with a supplement (19) made of elastic material with which the contact with said inner body (2) is softened and damped.
3. Diffuser according to claims 1 and 2, **characterized in that** it includes marks (14) indicative of the position selected for the adjustable positioning stop (10) and, therefore, indicative of the amplitude of the angular travel selected for the pivoting inner body (2).
4. Diffuser according to claim 3, **characterized in that** the marks (14) can be stamped in the wall itself of the casing (1) or printed on a sheet adhered to the wall of the casing.

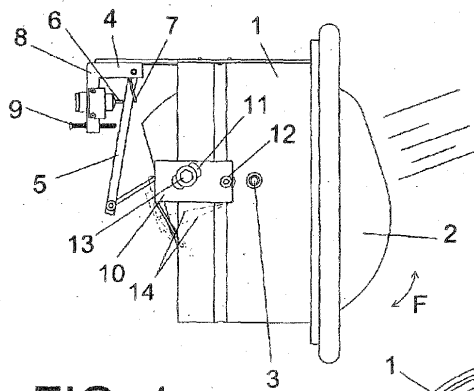


FIG. 1

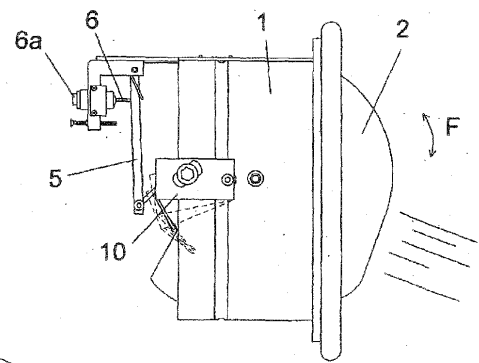


FIG. 2

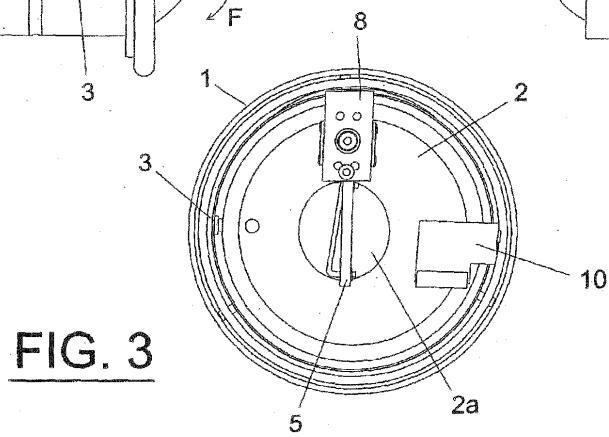
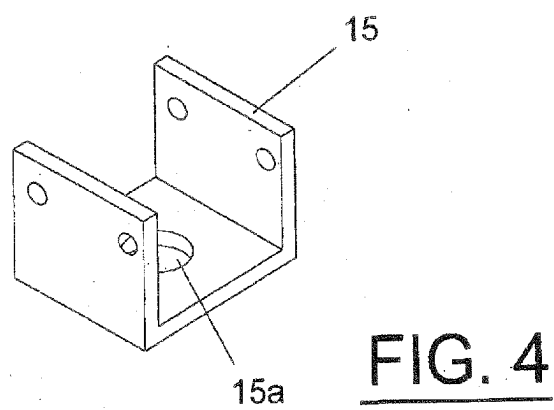
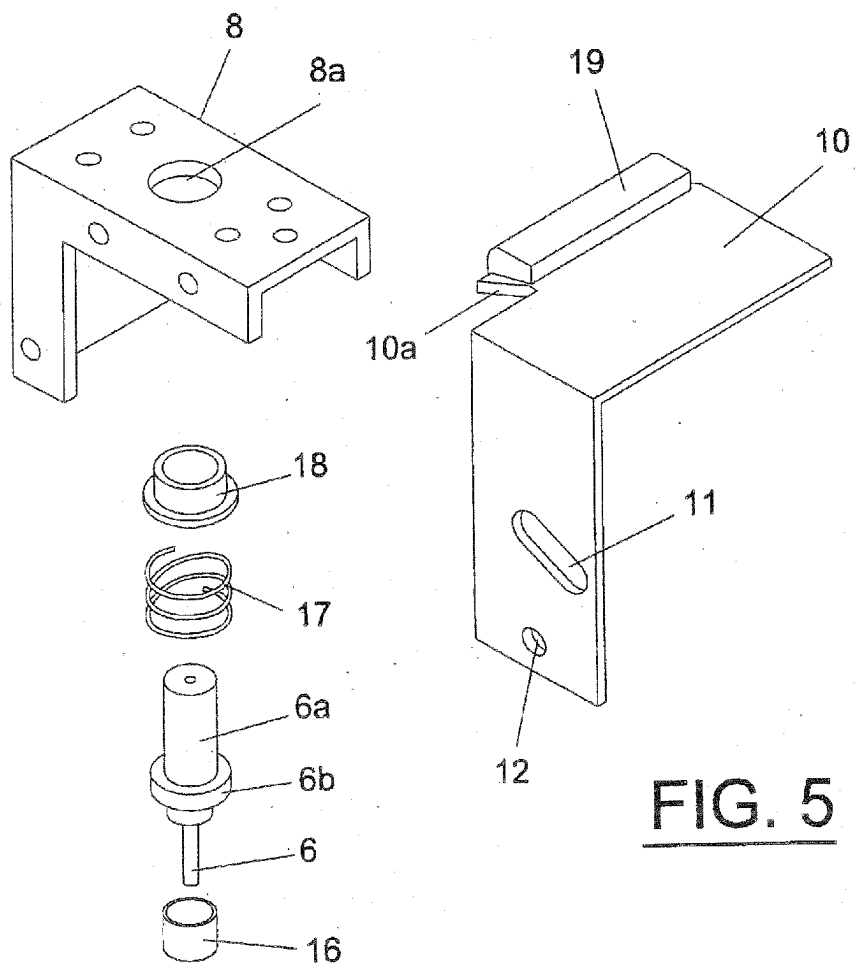


FIG. 3



INTERNATIONAL SEARCH REPORT

International application No.
PCT/ ES 2008/000300

A. CLASSIFICATION OF SUBJECT MATTER

F24F 13/065 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F24F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

INVENES,EPODOC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	ES 1063488 U (KOOLAIR SA) 01.11.2006, the whole document.	1-4
A	JP 2007085571 A (DOHWATECH CO LTD) 05.04.2007, (abstract). Retrieved from the: EPO PAJ.	1-4
A	ES 1063489 U (KOOLAIR SA) 01.11.2006, the whole document.	1-4

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance.	
"E" earlier document but published on or after the international filing date	
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"O" document referring to an oral disclosure use, exhibition, or other means	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other documents, such combination being obvious to a person skilled in the art
"P" document published prior to the international filing date but later than the priority date claimed	
	"&" document member of the same patent family

Date of the actual completion of the international search

08.September.2008 (08.09.2008)

Date of mailing of the international search report

(29/09/2008)

Name and mailing address of the ISA/
O.E.P.M.Paseo de la Castellana, 75 28071 Madrid, España.
Facsimile No. 34 91 3495304

Authorized officer

J. A. Celemín Ortiz-Villajos

Telephone No. +34 91 349 54 93

Form PCT/ISA/210 (second sheet) (July 2008)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/ES 2008/000300

Patent document cited in the search report	Publication date	Patent family member(s)	Publication date
ES 1063488 U	01.11.2006	ES 1063488 Y	01.02.2007 01.02.2007 01.02.2007
JP 2007085571 A	05.04.2007	NONE	-----
ES 1063489 U	01.11.2006	ES 1063489 Y	01.02.2007 01.02.2007 01.02.2007

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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