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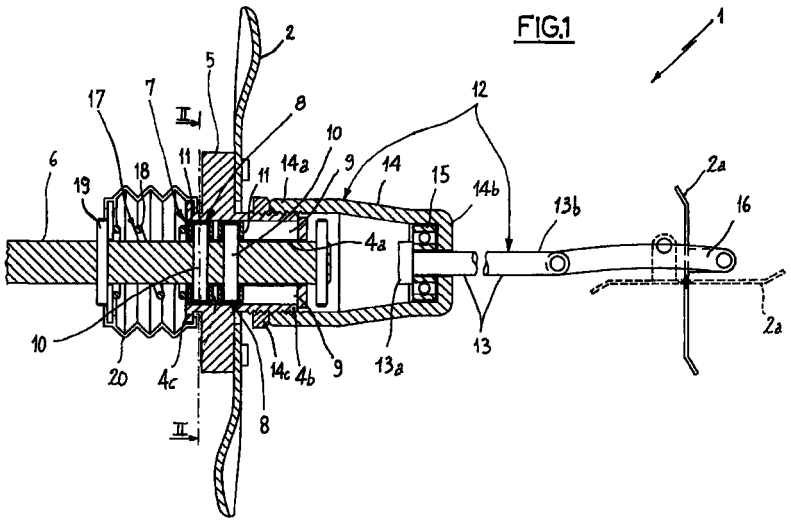
(54) Control device for fan air locks

(57) The device comprises a control organ (4) slidingly mounted on a shaft (6) able to be actuated in rotation by a motor of a ventilator. The control organ (4) rigidly bears a fan (2) and is movable in contrast to a helical spring (18) by effect of an axial thrust produced by the functioning fan. The translation of the control organ (4) between a first and a second operative position causes, through a transmission kinematic mechanism (12), an air lock (2a) of the ventilator to switch from a closed condition to an open condition. A bell element (14) and an extensible protecting shroud (20) safeguard the components of the device against the entry of dust and against the action of atmospheric agents.

FIG.1



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Description

[0001] The present invention relates to a control device for fan air locks, of the type comprising the characteristics expressed in the preamble to claim 1.

[0002] More specifically, the subject device is suitable for being associated to a ventilation unit of the type generally used, for instance, to guarantee aeration in loft buildings, barns and, more in general, in spaces dedicated to agricultural and/or industrial uses.

[0003] The ventilation units of the aforementioned type essentially consist of a fan able to be actuated in rotation by an electric motor and housed in a box structure open upstream and downstream of the fan to allow the passage of the flow of air produced thereby.

[0004] To prevent the undesired passage of air when the ventilation unit is inactive, to the box structure is associated an air lock which can be opened by means of a control device associated to the ventilator which exploits the rotatory motion transmitted to the fan to cause the air lock to open and close.

[0005] Such a control device is described in European Patent EP 563857. This control device is constituted by a kinematic mechanism able to be rigidly engaged to the fan by means of an attachment portion bearing guide means whereon a control organ is slidingly engaged. The control organ is fastened to the base portion by means of two or more articulated arms bearing respective masses in proximity to an intermediate articulation area. As a result of the activation of the fan, the effect of the centrifugal force on the masses determines, through the consequent actuation of the lateral arms, the displacement of the control organ along the guide means.

[0006] In this way the air lock is caused to open by means of an interconnecting kinematic mechanism operatively interposed between the control organ and air lock itself.

[0007] The device described above presents considerable problems connected to the complexity of its structure. This device is easily prone to jamming or malfunctions due to the deposit of impurities and dirt on the numerous parts in relative motion, directly exposed to the flow of air and of external agents.

[0008] It should also be considered that the device presents rather high realisation costs, which are compounded by the need to perform frequent maintenance operations to maintain the device constantly clean.

[0009] It should also be noted that the known devices described above, due to their considerable mass and bulk, tend undesirably to overload the fan motor, especially during the starting phases of the ventilation unit.

[0010] The forces transmitted to the control organ for the opening of the air lock are rather modest, and can reveal themselves insufficient to assure the proper operation of the air lock, especially when the ability of its kinematic components to move smoothly is reduced due to deposits of dirt and/or impurities.

[0011] The aim of the present invention is substantially that of solving the problems noted in the prior art, proposing a device which offers a better effectiveness whilst presenting an extremely simple structure with reduced size, easily protected against the entry of impurities.

[0012] This aim and others beside, which will become more readily apparent in the course of the present description, are attained by a control device for fan air locks comprising the characteristics expressed in the characterising part of claim 1.

[0013] Further features and advantages shall become more readily apparent from the description of at least one preferred, but not exclusive, embodiment of a control device for fan air locks according to the present invention. Said description shall be made below with reference to the accompanying drawings, provided solely by way of non limiting indication, wherein:

- Figure 1 is a longitudinal section of a control device according to the invention;
- Figure 2 is a cross section of the control device executed according to trace II-II of Figure 1;
- Figure 3 is a cross section of the control device representing a second embodiment;
- Figure 4 is a cross section of the control device showing a third embodiment.

[0014] In accordance with the aforementioned figures, the number 1 indicates in its entirety a control device for fan air locks, according to the present invention.

[0015] The control device 1 is able to be associated to a conventional ventilator comprising a fan 2 actuated by an electric motor and normally positioned in a box structure open on two opposite sides, to allow the axial passage of the flow of air produced thereby. In correspondence with one of the openings of the box structure is positioned an air lock 2a serving the function of impeding the flow of air when fan is inactive.

[0016] The air lock 2a comprises a plurality of parallel strips, whereof only one has been shown in Figure 1, the air lock being known an conventional in itself, as are the motor, the box structure and other components of the ventilator, which are therefore neither illustrated nor described in detail.

[0017] The control device 1 according to the present invention is able to be operatively interposed between the fan 2 and the shutter 2a to cause, simultaneously with the activation of the fan, the air lock to switch from a closed condition, wherein the aforesaid strips 2a are positioned on a common plane, and an open condition wherein the strips are oriented according to mutually parallel planes, to allow the passage of air.

[0018] To this end, in the device 1 between the fan 2 and the shutter 2a of the ventilator are operatively

interposed actuator means 3 able to sense the rotation of the fan 2 to cause the air lock to switch as described previously.

[0019] In accordance with the present invention the actuator means 3 comprise a control organ 4 able to be engaged co-axially and rigidly to the fan 2 by means of a flange 5. The control organ 4 is associated to a shaft 5 able to be co-axially engaged in a hole 4a, preferably through, obtained co-axially in the control organ itself.

[0020] The shaft 6 can be constituted by the same shaft associated to the motor of the ventilator, or it can be realised as a part distinct from the motor and able to be operatively engaged to its shaft.

[0021] Interconnecting means 7 interposed between the shaft 6 and the control organ 4 connect the latter slidingly in the axial direction and integrally in the rotatory direction with respect to the shaft itself.

[0022] More specifically, the interconnecting means 7 comprise at least a cursor 8 slidingly guided in at least a longitudinal groove 9 defined in the shaft 6 and/or in the hole 4a obtained in the control organ 4.

[0023] As Figure 2 shows, the interconnecting means 6 can for instance be defined by a pair of cursors 8 operating on respective pairs of longitudinal grooves 9 obtained both on the shaft 2 and in the hole 4a of the control organ 4. More specifically, the cursors 8 are defined by one or more pins 10 diametrically traversing the shaft 6 and presenting opposite extremities engaged in the respective longitudinal grooves 9. Sliding rollers 11 can also be present, pivoted at the extremities of each pin 10 to facilitate the sliding of the control organ 4 with respect to the shaft 6.

[0024] In the embodiment variation of Figure 3, each cursor 8 comprises a sphere engaged between two longitudinal grooves 9 shaped in a complementary manner to the sphere, whereof one belongs to the hole 4a of the control organ 4, and the other to the shaft 6.

[0025] In a further embodiment shown in Figure 4, the interconnecting means 7 provide as a cursor 8 a key engaged between two longitudinal grooves 9 shaped in complementary manner to the key, obtained respectively on the shaft 6 and in the hole 4a of the control organ 4.

[0026] The control organ 4 presents a first extremity 4b oriented towards the air lock 2a whereto a transmission mechanism 12 is connected, able operatively to connect the control organ to the air lock itself.

[0027] In the illustrated embodiment, the transmission mechanism 12 essentially comprises a control rod 13 pivoted and axially fastened with respect to the control organ 4, in such a way as to be involved in the axial movements made by the control organ itself, but not in its rotatory motion.

[0028] More in detail the control rod 13 is preferentially engaged to the control organ 4 with the interposition of at least an internally hollow bell element 14, presenting a first extremity 14a engaged, preferably by screwing, to the first extremity 4a of the control organ and a second extremity 13b pivoted to the control rod 13.

[0029] Between the control rod 13 and the bell element 14 is preferably interposed a rolling bearing to reduce friction during the operation of the ventilator. The engagement of the bearing 15 between the control rod 13 and the bell element is preferably obtained by forced keying, so as also to obtain the axial locking of the rod itself with respect to the control organ 4.

[0030] The control rod 13 further presents a terminal head 13a having increased diameter, laterally interacting against the rolling bearing 14.

[0031] To the opposite side from the terminal rod 13a, the control rod presents an extremity 13b connected to the shutter 2a of the fan through a connecting rod 16.

[0032] It should be noted that the connection between the control rod 13 and the control organ 4 can take place in any other convenient manner, differing from the one provided above. For instance, the control rod 13 can be fastened directly to the extremity 4b of the control organ 4, if the latter is realised according to a closed configuration, in such a way as to incorporate in a single body the bell element 14. Alternatively, the control rod 13 could be engaged in a relationship of sliding contact on the flange 5 of the control organ 4 to activate the transmission mechanism 12 as a result of the axial movements made by the control organ itself.

[0033] The connection between the control organ 4 and the shaft 6 effected by the interconnecting means 7 is such that, when the motor of the ventilator is activated, the rotation of the shaft 6 is transmitted to the control organ 4 and to the fan 2 fastened thereto, through the cursors 8 engaged in the respective grooves 9. The action of the fan 2 produces an axial thrust, directed opposite to the air flow produced thereby, which is consequently transmitted to the control organ 4. The engagement effected by the interconnecting means 7 is such that, under the effect of the aforementioned axial thrust, the control organ 4 is able to be translated axially with respect to the shaft 6 between a first and a second operative position, whereto respectively correspond the closed condition and the open condition of the air lock 2a.

[0034] Consequently to the translation of the control organ 4 from the first to the second operative position, through the transmission mechanism 12 the air lock 2a is made to switch from the closed condition to the open condition, thereby freeing the passage of the air flow produced by the fan 2.

[0035] The translation of the control organ 4 can be caused to stop in the second operative position by the interference in checking relationship of the terminal head 13a of the rod 13 against the extremity of the shaft 6.

[0036] This limit stop in the second operative position can be advantageously adjusted by modifying the degree of screwing of the bell element 14 on the first

extremity 4b of the control organ 4. A locking ring nut 14c can be positioned on the first extremity 4b of the control organ 4 to lock the bell element 14 in the desired position.

[0037] The actuation of the control organ 4 from the first to the second operative position preferably takes place in opposition to the action of return means 17 which tend to bring the air lock 2a back to the closed condition.

[0038] In the embodiment illustrated herein, these return means 17 essentially comprise at least a helical spring 18 positioned co-axially on the shaft 6 and operating, with the respective opposite extremities, between a diametrical shoulder 19 rigidly borne by the shaft 6 and a further diametrical shoulder defined by a second extremity 4c of the control organ 4.

[0039] The helical spring 18 is axially compressed as a result of the translation of the control organ 4 from the first to the second operative position to return the air lock 2a elastically in the closed condition when, consequently to the de-activation of the ventilator, the axial thrust produced by the fan 2 ceases.

[0040] It should be noted that, for the purposes of the present invention, the return means can be realised differently from the description provided above. In particular, the presence of a helical spring 18 can be revealed unnecessary if the ventilator, and consequently the device 1, is installed according to a vertical axis.

[0041] Between the second extremity 4c of the control organ 4 and the diametrical shoulder 19 is engaged an extensible protecting shroud 20, constituted for instance by a bellows shaped sleeve made of elastomeric material, enclosing the spring within it in such a way as prevent dirt and/or external agents from reaching the spring itself, as well as the internal components of the interconnecting means 7 and of the device 1 in general. At the opposite side from the extensible shroud 20, the entry of dirt and of external agents is adequately impeded by the bell element 14.

[0042] The present invention reaches the proposed aims.

[0043] The exploitation of the axial thrust produced by the functioning fan to determine the opening of the air lock allows to eliminate the complicated mechanisms with eccentric masses used by the prior art, obtaining considerable advantages in terms of structural simplification and of the reduction of realisation costs.

[0044] The extremely simple and compact structure of the device according to the invention entails a considerable increase in its reliability, in this regard it should be observed that the device is contained in extremely minimal size and can be easily protected against the entry of impurities and external agents.

[0045] In the example described, the entry of impurities and the like is hindered by the extensible shroud 20 and by the bell 14. However, it is evident that the protection of the device according to the invention can easily be attained in any manner convenient to the person versed in the art.

[0046] It should also be considered that the axial force produced by the fan is very large in that it can easily reach and exceed values of 20 kg, significantly greater than the thrust force achievable by prior art devices operating with centrifugal masses. This feature guarantees the effectiveness and functionality of the device, even in the case wherein, as normally occurs over time, the deposit of dirt and/or external agents cause the components of the air lock to lose some of their operating smoothness.

[0047] Naturally, the invention thus conceived can be subject to numerous modifications and variations, without thereby departing from the scope of the inventive concept that characterises it.

Claims

1. Control device for fan air locks comprising:

- actuator means able to be operatively engaged between a fan and an air lock of a ventilator, said actuator means being able to sense the rotation of the fan to switch the air lock selectively between an open condition and a closed condition, respectively in response to the activation and the de-activation of the fan itself,

characterised in that said actuator means comprise:

- a control organ able to translate between a first and a second operative position by effect of an axial thrust produced by the rotating fan;
- a kinematic transmission mechanism operatively associated to the control organ to switch the air lock from the closed condition to the open condition as a result of the translation of the control organ from the first to the second operative position.

2. Device according to claim 1, wherein said control organ is able co-axially and rigidly to engage said fan and axially to translate between the first and the second operative position together with the fan itself.

3. Device according to claim 2, further comprising interconnecting means to connect slidingly in the axial direction and integrally in the rotatory direction said control organ to a shaft which can be actuated in rotation by a motor of the ventilator.

4. Device according to claim 3 wherein said interconnecting means comprise at least a cursor slidingly engaged in at least a longitudinal groove defined in said shaft and/or in a hole co-axially obtained in the control organ and engaging the shaft itself.

5. Device according to claim 4, wherein said at least one cursor comprises at least a pint diametrically traversing said shaft and presenting opposite extremities engaged in respective grooves obtained in said hole.

6. Device according to claim 5 further comprising sliding rollers pivoted at the extremities of each pin.

7. Device according to claim 4, wherein each cursor comprises at least a sphere engaged between two longitudinal grooves with a shape complementary to the sphere, obtained respectively on the shaft and in the hole.

8. Device according to claim 4 wherein each cursor comprises at least a key engaged between two longitudinal grooves with a shape complementary to the key obtained respectively on the shaft and in the hole.

9. Device according to claim 1, further comprising return means operating in opposition to the translation of the control organ from the first to the second operative position.

10. Device according to claims 3 and 9 wherein said return means comprise at least a helical spring coaxially positioned on said shaft and operating between a first and a second shoulder respectively borne by the shaft itself and by said control shaft.

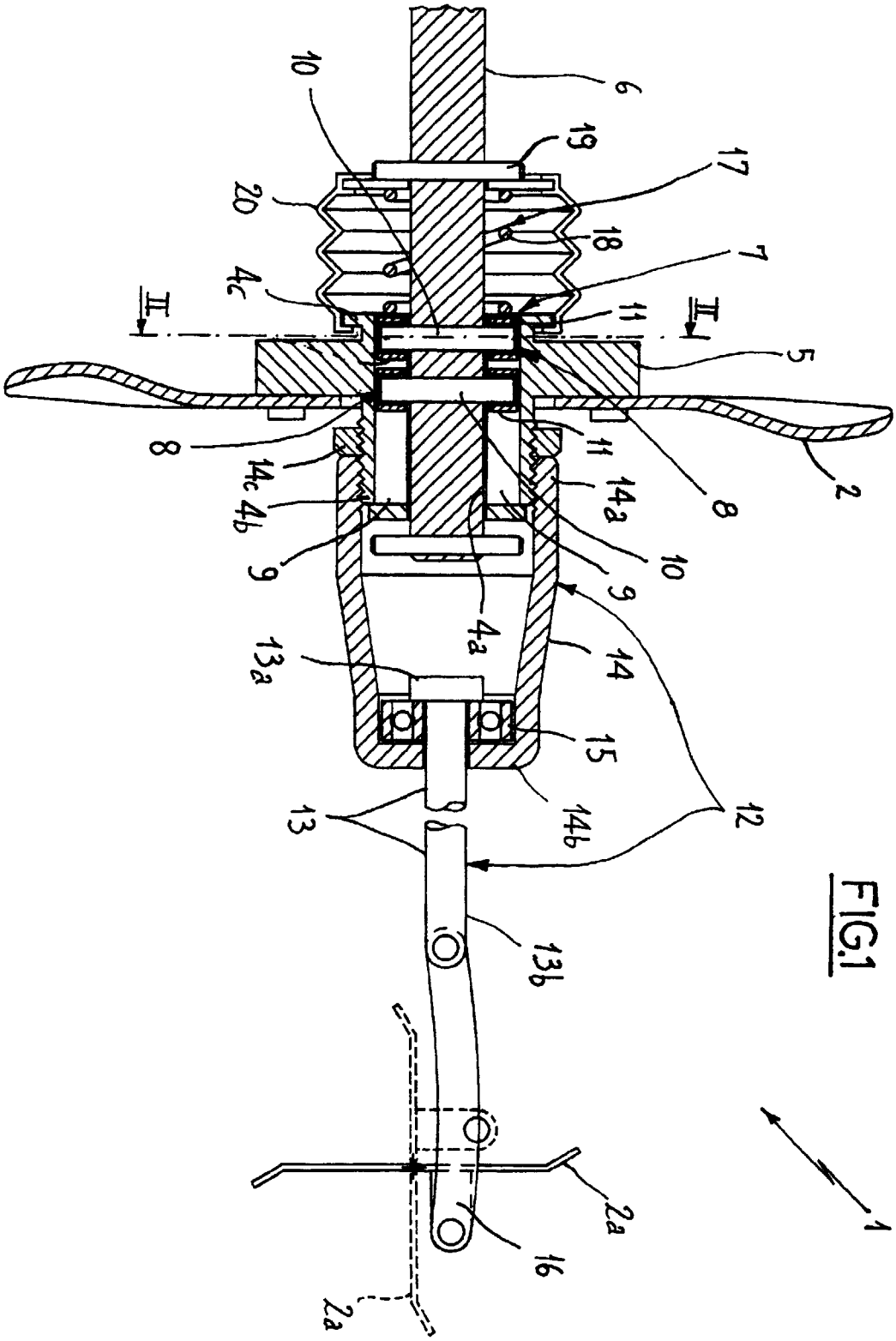
11. Device according to claim 3, further comprising an extensible protecting shroud engaged between the control organ and said shaft to impede the access of impurities to the interconnecting means.

12. Device according to claims 9 and 11, wherein said return means are enclosed in said extensible protective shroud.

13. Device according to claim 1, wherein said kinematic transmission mechanism comprises a control road having an extremity pivotingly engaged and axially fixed with respect to the control organ.

14. Device according to claim 13, further comprising a bell element having a first extremity fastened to the control organ and a second extremity pivotingly engaging said control rod.

15. Device according to claims 3 and 14, wherein said control rod presents a terminal portion set to act by checking against said shaft to arrest the translation of the control organ in the second operative position.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II
11
5
8
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14a
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2
14c
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FIG.1

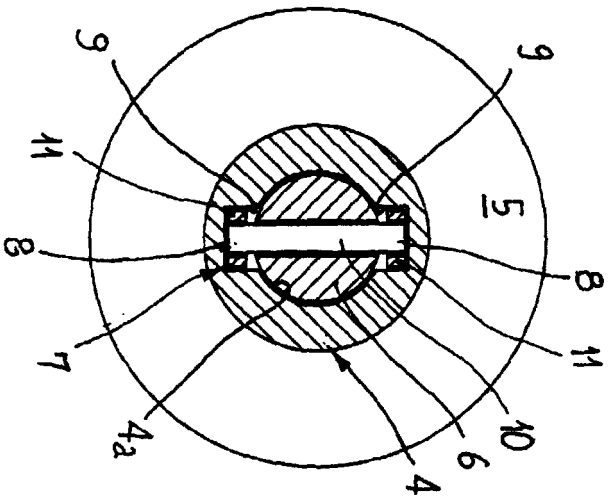

FIG.2

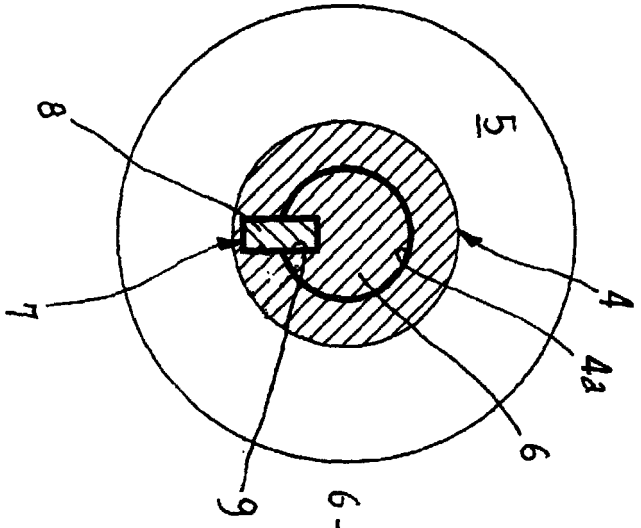

FIG.4

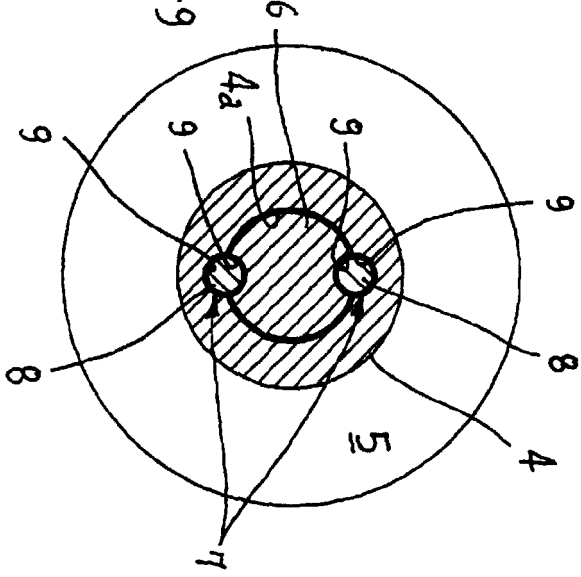

FIG.3

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EUROPEAN SEARCH REPORT

Application Number
EP 99 83 0664

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	GB 2 153 014 A (YOO BYUNG EUN) 14 August 1985 (1985-08-14) * the whole document *	1	F04D25/14 F24F7/007 F24F13/14
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

F04D
F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 March 2000	Gonzalez-Granda, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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