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(54) ADJUSTABLE AIR SUPPLY DIFFUSER AND RESPECTIVE RETROFIT KIT

(57) Adjustable air supply diffuser (1) for diffusing an airflow (40) in a room (20), connectable to, but functionally independent of, a centralized air ventilation system (30), comprising a frame (3) fixable to a structure (21) so as to face toward the room (20); a plurality of movable fins (4) rotatably coupled to the frame (3) about respective axes that are parallel to each other; an actuator (5); a mechanism (6) coupled to any or all the fins (4) and to the actuator (5); a temperature sensor (7) configured to generate a signal (8) representative of a temperature of the air touching the sensor (7); a control unit (9) operatively connected to the temperature sensor (7), to a power source (10) and to the actuator (5), said control unit (9) being configured to power and to operate the actuator (5) as a function of the temperature signal (8) generated by the sensor (7); wherein the actuator (5), the power source (10) and the control unit (9) are embedded in the diffuser (1) and the temperature sensor (7) is connected to the frame (3) behind the fins (4) with respect to the room (20) so as to sense the temperature of the airflow crossing the diffuser (1) before the airflow (40) pass through the fins (4) and comes out from the diffuser (1) into the room (20).

Retrofit kit (100) for an air supply diffuser (200).

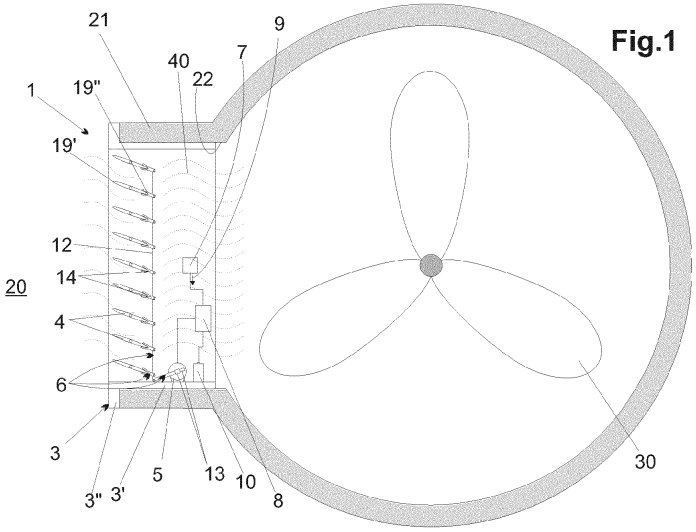

Fig.1

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Description

TECHNICAL FIELD

[0001] The present invention relates to the sector of air diffusion systems and apparatus for civil and industrial systems, in particular air distribution terminals for centralized systems, even more particularly air diffusers, of the type which remains exposed, recessed for walls and ceilings.

BACKGROUND ART

[0002] The state of the art includes various known solutions for directing the airflow of a centralized air conditioning or heating system towards the facing or underlying room.

[0003] In particular, it is known to have a system comprising a centralized ventilation system which, through ducts or pipes, delivers air to several diffusers, which direct the hot or cold air into respective rooms.

[0004] Normally these diffusers are grilles comprising mobile fins which are manually inclined with respect to the frame to divert upwards or downwards the air that flows out of the diffuser.

[0005] In a room, for example in a hotel room, the airflow coming out of the diffuser can be hot or cold depending on the user's preferences. By varying the temperature of the air leaving the diffuser, the orientation of the fins should also vary, because the hot air should be blown downwards to heat the room more efficiently and quickly, while the cold air should not be blown downwards to increase user comfort.

[0006] Varying the angle of fins of each diffuser in each room would impose a centralized system connected to the thermostat of each room, with very high costs. Alternatively, the orientation of the fins on each diffuser should be changed manually, especially when the season changes, i.e. when the centralized ventilation system no longer delivers hot air but cold air or vice versa. In this circumstance, the fins of all the diffusers, for example in a hotel, should be redirected to avoid unnecessary inefficiencies in the cooling or heating process of the rooms, with a consequent waste of energy.

[0007] The prior arts available therefore do not solve the problem of improving comfort in an environment and allowing a room or space to be cooled or heated quickly and effectively in a simple and economical way.

[0008] Known examples of wall or ceiling diffusers are provided in patent documents US2020365344A1, US6692349B1 and CN110470036A.

[0009] In particular, the patent document US2020365344A1 describes a retrofit device of a manual type register. This solution provides for a device equipped with a mechanism for moving the fins of the register, a motor for operating the mechanism, a microcontroller and a group of batteries to power it. However, the device does not independently manage the movement of the register fins since the temperature detected by a sensor, which can be installed on the micro-processor, is sent to a central controller, external to the register, which manages the operation of all the registers of a building. The diffuser according to this solution is therefore not capable of adjusting the fins autonomously, only on the basis of the temperature detected, and is functionally dependent on the central controller of the centralized air ventilation system.

[0010] Document US6692349B1 instead describes a diffuser with actuated fins, equipped with a temperature sensor which can be housed on an external part of the lid or on a remote control, to detect the temperature of a room. This diffuser is therefore not able to adjust the fins according to the temperature of the air flow passing through the diffuser, but it does so according to the temperature of the room in which the diffuser faces.

[0011] Document CN110470036 describes a diffuser connected to a main control unit which is external to the diffuser, and which is connected to at least one temperature sensor present in the room to be air-conditioned and to a sensor located at the diffuser outlet. The control unit calculates the difference between the temperatures detected by the two temperature sensors and adjusts the fins to minimize this temperature difference. This diffuser therefore does not include a control unit integrated in the diffuser and furthermore the diffuser fins are not adjusted according to the temperature passing through the diffuser itself.

[0012] It is also known the possibility of actuating the fins of a diffuser by means of a thermostatic actuator, thus using a purely mechanical system. Examples in this sense are described in the patent documents US4537347A and US4699314A.

[0013] Furthermore, the background art does not provide a solution for modifying a diffuser with movable fins so as to make it automatic and adaptive in a simple and economical way.

SUMMARY

[0014] A first object of the present invention is to solve the aforementioned drawbacks of the prior art by means of an air delivery diffuser of the adjustable type, which serves to diffuse an air flow in a room. The air supply diffuser is only fluidly connected to a centralized air ventilation system, although it is operatively independent from it, and comprises:

- a frame fixable to a structure so as to face toward the room;
- a plurality of movable fins rotatably coupled to the frame about respective mutually parallel axes;
- an actuator;
- a mechanism coupled to one or all of the fins and the actuator;
- a temperature sensor configured to generate a signal representative of a temperature of the air which con-

tacts the sensor;

- a control unit operatively connected to the temperature sensor, to a power source and to the actuator, said control unit being configured to power and operate the actuator according to the temperature signal generated by the sensor.

[0015] The actuator, the power source and the control unit are integrated into the diffuser and preferably they are connected, directly or indirectly, to the frame. The temperature sensor is located on the frame behind the fins with respect to the room in order to sense the temperature of the airflow passing through the diffuser before the airflow passes through the fins and leaves the diffuser towards the room. A diffuser conceived in this way makes it possible to adjust the exit direction of the air according to the sensed temperature of the air passing through the diffuser itself. In this way, the orientation of the fins of the diffuser takes place automatically and completely autonomously by the centralized air ventilation system. The air is therefore directed into a room as a function of the temperature of the air supplied by the centralized air ventilation system and not as function of the air temperature detected in the environment. This makes the entire ventilation system adaptive, despite that the diffuser has not a direct electrical connection to the centralized air ventilation system. Basically, the diffuser is completely independent from the ventilation system and they interact with each other only through the air flow. The diffuser is also independent of the room in which it diffuses the air, as the fins are regulated on the basis of the temperature of the air coming from the centralized ventilation system and not on the basis of the temperature of the air present in the conditioned room. The term "centralized air ventilation system" refers to a system capable of heating/cooling the air and flowing it.

[0016] Advantageously, the actuator may comprise a shaft and the actuator may be configured to rotate the shaft between a plurality of angular positions comprising a first angular position and a second angular position. Preferably the actuator is a digital or stepper motor. This type of actuator allows an accurate control of the operating position of the actuator without the need for closed loop control, thus with feedback from the actuator to the control unit.

[0017] In particular, the mechanism may comprise a rod coupled to the movable fins and an extendable arm coupled to the actuator shaft and to the rod, wherein the extendable arm is configured to extend in an axial (longitudinal) direction. This architecture of the mechanism makes it possible to transform the rotary movement of the actuator into a linear movement of the rod.

[0018] Preferably, the fins can be inclined by an angle comprised between 0° and 45° upwards with respect to a horizontal plane perpendicular to the frame when the shaft is in the first angular position, and the fins are positioned inclined by an angle between 20° and 45° downwards with respect to horizontal plane perpendicular to the frame when the shaft is in the second angular position. Preferably, the control unit can operate the actuator to move the shaft to said first angular position when the temperature detected by the temperature sensor is lower than 22°C and can operate the actuator to move the shaft to said second angular position when the temperature detected by the temperature sensor is higher than 22°C. A selective angular orientation of the fins allows a better distribution of the air in the room when the air blown by the air ventilation system is cold or warm.

[0019] In particular, the rod can be coupled to the fins by means of clips configured to clamp the fins. This solution allows to quickly and easily anchor the rod to all the flaps that need to be actuated.

[0020] Preferably, the clips can be rotatably coupled to the rod, so as to transform the linear movement of the rod into a rotary movement of the fins.

[0021] Advantageously, each fin can comprise a hole engaged by a respective pin belonging to the clip. In this way, the clip cannot slip off the fin.

[0022] In particular, the power source can be a battery incorporated in the diffuser. In this way, the diffuser is completely independent from the centralized air ventilation system, allowing an automatic and free management of the air distribution in the room.

[0023] Advantageously, the diffuser can comprise a receiver operatively connected to the control unit and configured to receive a radio control signal from a remote control. Preferably the receiver is of the infrared type. The remote control allows an autonomous management of the orientation of the diffuser fins according to the wishes of the user who occupies the room and independently of the centralized air ventilation system.

[0024] A further object of the present invention is that of providing a retrofit kit for an air delivery diffuser comprising an actuator, a mechanism which can be coupled to a plurality of fins of the diffuser and to the actuator, a temperature sensor configured to generate a signal representative of a temperature of the air touching the sensor, a control unit operatively connected to the temperature sensor, a power source and the actuator. Said control unit being configured to power and operate the actuator according to the temperature signal generated by the sensor. Said actuator, said power source, said control unit and said temperature sensor are configured to be coupled, directly or indirectly, to a frame of the diffuser. This retrofit kit allows to transform a manual type diffuser into an automatic and adaptive type diffuser.

[0025] These and other advantages will become apparent in more detail from the description, given hereinafter, of an embodiment given by way of example and not of limitation with reference to the attached drawings.

DRAWINGS DESCRIPTION

[0026] In the drawings:

Fig. 1 shows a schematic sectional side view of the

diffuser according to the present invention installed on a duct of a centralized ventilation system, in a first operating position;

Fig. 2 shows a schematic sectional side view of the diffuser according to the present invention installed on a duct of a centralized ventilation system, in a second operating position;

Fig. 3 shows a schematic view of a particular form of connection between the fin and the clip;

Fig. 4 shows a schematic isometric view of the actuator and the mechanism of the diffuser according to the present invention;

Fig. 5 shows a schematic side view of a retrofit kit according to the present invention;

Fig. 6 shows a schematic side view of a retrofit kit installed on an air diffuser;

Fig. 7 shows a schematic isometric view of a first installation form of the diffuser according to the present invention;

Fig. 8 shows a schematic isometric view of a second form of installation of the diffuser according to the present invention;

Fig. 9 shows a schematic top view of an air conditioning system of a building comprising a plurality of diffusers according to the present invention.

DETAILED DESCRIPTION

[0027] The following description of one or more embodiments of the invention refers to the attached drawings. The same reference numbers in the drawings identify the same or similar elements. The object of the invention is defined by the attached claims. The technical details, structures or characteristics of the solutions described below can be combined with each other in any way.

[0028] The terms "coupled" and "connected" may be used, together with their derivatives. It is clear that these terms are not meant to be synonymous with each other. Rather, in particular embodiments, "connected" may be used to mean that two or more items are in direct physical contact with each other. "coupled" can mean that two or more items are in direct physical contact. However, "coupled" can also mean that two or more items are not in direct contact with each other, but are nevertheless cooperating or interacting with each other.

[0029] With reference to Figs. 1, 2 and 3, an air supply diffuser 1 of the type with adjustable fins is shown. The diffuser 1 is installed on a structure 21, specifically on an aeration duct of the room 20, as illustrated in Fig. 7. The term room 20 means any room, space or local for residential or recreational purposes which requires a ventilation system. The diffuser 1 can also be installed on a wall 21' of the room 20, as illustrated in Fig. 8. The wall 21', and in particular its hole for housing the diffuser 1, represents the distal element of the centralized air ventilation system 30.

[0030] The diffuser 1 is installed inside a hole 22 on the structure 21. The hole 22 is normally sized so as to accommodate a longitudinal portion 3' of the frame 3 of the diffuser 1. The diffuser 1 is inserted in the hole 22, until a flange 3" of the frame 3 abuts the structure 21. The diffuser 1 is then anchored to the structure 21 by means of specific connection means, for example screws.

[0031] The diffuser 1 is fluidly connected to a centralized air ventilation system 30, which is configured to deliver hot or cold air. The centralized air ventilation system 30 comprises one or more ducts 21 suitable for conveying the air from a hot/cold air generator to the diffuser 1.

[0032] The diffuser 1 comprises a plurality of fins 4 which are configured to rotate with respect to the frame 3 about respective longitudinal axes. The rotation axes of the fins 4 can correspond to the axes of symmetry of the mobile fins 4. The rotation axes of the fins 4 are parallel to each other.

[0033] The diffuser 1 can also comprise one or more fixed fins, which do not vary their inclination with respect to the frame 3.

[0034] The movable fins 4 vary their inclination with respect to the frame to vary the direction of the air flow coming out of the diffuser 1.

[0035] Each fin 4 comprises a trailing edge 19' facing the room 20 and a leading edge 19" facing the centralized air ventilation system 30.

[0036] The flaps 4 can have a horizontal or vertical orientation depending on whether they have to direct the air up/down or right/left.

[0037] The diffuser 1 further comprises an actuator 5, which may be a rotary electric motor such as the one illustrated in Figs. 1, 2 and 4. The actuator 5 comprises an output shaft 11. The shaft 11 can rotate between a plurality of angular positions, as illustrated in Fig. 3.

[0038] This plurality of angular positions comprises a first angular position, which corresponds to a first end-of-stroke, depicted in Fig. 1, and a second angular position which corresponds to a second end-of-stroke, depicted in Fig. 2.

[0039] The actuator 5 is preferably a digital or a stepper motor, so as to allow a precise and gradual movement between the various angular positions.

[0040] The shaft 11 of the actuator 5 is connected to a rod 12 via an extendable arm 13, as illustrated in Figs. 1, 2 and 4.

[0041] The term extendable arm 13 refers to any means configured to allow an axial extension. Examples in this sense can be a piston or a pin 13" coupled cylindrically to a sleeve 13', as illustrated in Fig. 4.

[0042] Figs. 1, 2 and 4 show an extendable arm 13 comprising a sleeve 13' pivoted on the shaft 11, so as to be integral with it in the rotary movement. A pin 13" can slide longitudinally inside the sleeve 13' which, at its distal end, is coupled to the rod 12.

[0043] The rod 12 is connected to the clips 4 by means of fins 14 which are rotatably connected to the rod 12. The rod 12, together with the fins 14, connects the fins

4 to each other, allowing them to move in a coordinated manner. The mobile fins 4 are therefore always parallel to each other, regardless of the inclination assumed with respect to the frame 3.

[0044] The assembly comprising the extendable arm 13, the rod 12 and the fins 14 forms the mechanism 6, which connects the actuator 5 to the fins 4. This mechanism 6 allows the rotary motion of the actuator 5 to be converted in a rotary movement of the fins 4.

[0045] Each clip 14 is shaped so as to grip a fin 4 between two elongated elements, as shown in Figs. 1, 2 and 3. Alternatively, each clip can be a different connection device able to rigidly connect to the fin 14, for example an element screwed onto the fin 14 (not shown) or a rear protrusion of the fin 4 itself (not shown).

[0046] The clip 14, according to any of its embodiments, is also hinged, at its end opposite to that connected to the fin 4, to the rod 12. In this way, when the rod 12 goes up, the end of the clip 14 connected to the rod 12 rises and, since the flap 4 is hinged to the frame 3, it forces the inclination of the flap 4 so that its trailing edge 19' lowers. Conversely, when the rod 12 goes down, the clip 14 imposes a rotation of the fin 4 around its axis of rotation so that the trailing edge 19' of the same rises.

[0047] The rod 12 goes up and down based on how the shaft 11 of the actuator 5 rotates.

[0048] During the movement of the shaft 11 and of the rod 12, the extendable arm 13 lengthens and shortens, allowing the rotational movement of the actuator 5 to be transformed into a linear-translational movement of the rod 12. This movement of the rod 12 therefore allows the rotation of the mobile fins 4.

[0049] The fin 4 can comprise a hole 15 able to engage with a pin 16 belonging to the gripper 14, as illustrated in Fig. 3. Once the clip 14 clamps the fin 4, the pin 16 engages the hole 15 preventing the clip 14 from slipping off the fin 4.

[0050] In an embodiment not shown, instead of the fins, the diffuser can comprise a diaphragm or a nozzle. Both the diaphragm and the nozzle are configured to rotate relative to a frame. In both of these cases, the mechanism is configured to transmit the movement of the actuator to the diaphragm or nozzle and move them with respect to the frame so as to vary the direction of the air flow leaving the diffuser.

[0051] The diffuser 1 comprises a control unit 9 which manages the electronic components. In particular, the control unit 9 is electrically connected to a temperature sensor 7, to the actuator 5 and to an electric power source 10.

[0052] The temperature sensor 7 is connected to the frame 3 of the diffuser 1 in such a position that the sensor 7 lies behind the row of fins 14 with respect to the room 20. In this way, the sensor is not visible from the room and the temperature of the air in transit through the diffuser 1 is not altered by the temperature present in the room 20, thus providing a more prompt reaction of the diffuser 1 in the event of a variation in the temperature of the air flow 40.

[0053] The temperature sensor 7 detects the temperature of the airflow 40 and sends a corresponding signal 8 representative of the temperature detected to the control unit 9. The temperature sensor 7 faces inside the frame 3.

[0054] The control unit 9 therefore powers the actuator 5, with the energy supplied by the power source 10, when a temperature variation is detected.

[0055] The diffuser 1 can be configured to bright the fins 14 to assume a plurality of positions according to the temperature detected by the sensor 7. Normally, an inclination of the fins 14 with the trailing edge 19' downwards is related to warm airflows 40, while an inclination of the fins 14 with trailing edge 19' upwards are typical of cold air flows 40. Substantially horizontal fins 14 are typical of an air flow at a temperature similar to that of the room 20.

[0056] The concept of cold and warm are expressed as a function of the temperature present in the ambient. For example, if the ambient temperature is 25°C, an airflow 40 is warm when its temperature is above 25°C and an airflow 40 is cold when its temperature is below 25°C.

[0057] Alternatively, the diffuser 1 is configured to set the inclination of the fins 14 according to only two or three methods. These modes are function of the cold and hot seasons. In particular, the first mode can be used during the hot season and provides for a first angular position suitable for positioning the fins 14 so that they are inclined upwards with respect to the horizontal plane perpendicular to the frame 3 by an angle between +20° and +45°, as illustrated in Fig. 1. The cold air therefore exits towards the upper portion of the room 20, cooling the room 20 more quickly and effectively. A second mode can be used during the cold season and provides for a second angular position suitable for positioning the fins 14 so that they are inclined downwards with respect to the horizontal plane perpendicular to the frame 3 at an angle between -20° and -45°, as illustrated in Fig. 2. In this way, the hot air is blown downwards allowing for a faster heating of the room 20.

[0058] The first angular position of the shaft 11 is set by the control unit 9 when the air temperature detected by the temperature sensor 7 is lower than a temperature threshold comprised between 19°C and 22°C, thus the air blown from the diffuser is cold. The second angular position of the shaft 11 is set by the control unit 9 when the air temperature detected by the temperature sensor 7 is greater than a temperature threshold comprised between 20°C and 23°C, thus the air blown from the diffuser is warm.

[0059] Optionally, the diffuser 1 is configured to set the inclination of the fins 14 so that they are orthogonal and horizontal with respect to the frame 3. This neutral position of the fins 14 corresponds to a third angular position of the shaft 11 and it is set by the control unit 9 when the air detected by the temperature sensor 7 is between 20°C and 22°C. This mode allows the air to circulate in the

room without substantially changing its temperature.

[0060] The power source 10 can be a battery as shown in Figs. 1 and 2. This allows to not modify the entire system and to avoid masonry work to pass the electric wires.

[0061] The battery 10 is arranged directly on the frame 3, preferably inside a specific casing 2 which also contains the temperature sensor 7, the control unit 9 and, at least in part, the actuator 5.

[0062] In an embodiment not shown, the power source 10 can be the urban electrical grid, after a connection of the diffuser 1 to this grid.

[0063] Optionally, the diffuser 1 can comprise a receiver 17, of an infrared or otherwise type, connected to the control unit 9 to remotely control the inclination of the fins 14, regardless of the actuation according to the temperature detected by the sensor 7. A remote control 18 is configured in a known manner to send a radio command signal to the receiver 17, as shown in Figs. 5 and 6. The remote control 18 can allow to move, automatically or not automatically, the flaps up and down and to select the oscillation effect. The control unit 9 is configured to receive the signal from the remote control 18 and to implement the strategy (optional) requested by the user through the remote control 18.

[0064] Fig. 5 shows a retrofit kit 100 for transforming a diffuser with movable fins 200 of the manual type into an automated one. As illustrated in Fig. 5, the kit includes few simple elements and is extremely versatile and compact, and it can be easily adapted to any type of diffuser with movable fins.

[0065] The retrofit kit 100 comprises an actuator 5, a mechanism 6 couplable to the fins 204 of the diffuser 200 and to the actuator 6, as previously described.

[0066] The retrofit kit 100 further comprises a casing 2 that includes the control unit 9, the temperature sensor 7, the power source 10 and the actuator 5 which are electrically connected to each other as previously described.

[0067] The temperature sensor 7, as well as the optional receiver 17, are arranged on the casing 2 so that the portion suitable for detecting the temperature and the radio signal are positioned outside the casing 2.

[0068] The casing 2 also comprises a slit within which the extendable arm 13 slides.

[0069] The operation and architecture of mechanism 6 of kit 200 corresponds to that previously described for diffuser 1.

[0070] Preferably, the rod 12 comprises a plurality of holes, so as to be able to vary the height of the clips 14 according to the mutual distance of the fins 204 of the diffuser 200.

[0071] The casing 2 is configured to be connected to the frame 203 by means of known connection means, for example an adhesive or screws.

[0072] With reference to Fig. 9, the centralized air conditioning system of a building, for example of a hotel or an office building, is schematically illustrated and it comprises six rooms 20, a centralized air ventilation system 30 and diffusers 1 according to the present invention.

[0073] The centralized air ventilation system 30 comprises a ventilation device 80, one or more delivery ducts 50, one or more return ducts 60 and a fan coil unit 70 for each room 20. The fan coil units 70 are fluidly connected to the ventilation device 80 through the delivery ducts 50. The fan coils 70 are fluidly connected to the rooms 20 through respective diffusers 1. The rooms 20 are also fluidly connected to the ventilation device 80 through the return ducts 60. Each fan coil 70 is controlled via an interface 90 present in the room 20. Via the interface 90, the user can set a desired temperature of the air in the room 20. The interface 90 itself is normally equipped with a temperature sensor (not shown) to detect whether the temperature in the room Ta1,Ta2,Ta3,Ta4,Ta5,Ta6 has reached the desired temperature or not. When a user requests cold air or hot air, the fan coil 70 cools or heats the air blown by the ventilation device 80. The exhaust air in the room 20 is then sucked in and filtered by the ventilation device 80 to keep the room 20 healthy. The diffuser 1, completely independently of the centralized air ventilation system 30, adapts to the temperature of the air Tf1,Tf2,Tf3,Tf4,Tf5,Tf6 crossing the diffuser 1. If the air temperature Tf1,Tf2,Tf3,Tf4,Tf5,Tf6 entering the diffuser 1 is above a predetermined threshold, the fins of diffuser 1 assume a certain inclination, for example downwards, while if the air temperature Tf1,Tf2,Tf3 ,Tf4,Tf5, Tf6 entering the diffuser 1 is lower than a further predetermined threshold, the fins of the diffuser 1 assume another inclination, for example upwards. The diffuser 1 is functionally independent of the centralized air ventilation system 30 and is only fluidly connected with it. The inclination of the fins of the diffusers 1 is therefore independent of the temperature Ta1,Ta2,Ta3,Ta4,Ta5,Ta6 in the rooms 20, since the purpose of the diffusers 1 is to optimize the air circulation in the rooms 20, both during the hot and cold seasons, for improving heating or cooling and therefore energy consumption.

[0074] In conclusion, it is clear that the invention thus conceived is susceptible to numerous modifications or variations, all included in the invention; moreover all the details can be replaced by technically equivalent elements. In practice, the quantities may be varied according to technical requirements.

Claims

1. Adjustable air supply diffuser (1) for diffusing an airflow (40) in a room (20), connectable to, but functionally independent of, a centralized air ventilation system (30), comprising:

   - a frame (3) fixable to a structure (21) so as to face toward the room (20);
   - a plurality of movable fins (4) rotatably coupled to the frame (3) about respective axes that are parallel to each other;

- an actuator (5);
- a mechanism (6) coupled to any or all the fins (4) and to the actuator (5);
- a temperature sensor (7) configured to generate a signal (8) representative of a temperature of the air touching the sensor (7);
- a control unit (9) operatively connected to the temperature sensor (7), to a power source (10) and to the actuator (5), said control unit (9) being configured to power and to operate the actuator (5) as a function of the temperature signal (8) generated by the sensor (7);

wherein the actuator (5), the power source (10) and the control unit (9) are embedded in the diffuser (1) and the temperature sensor (7) is connected to the frame (3) behind the fins (4) with respect to the room (20) so as to sense the temperature of the airflow crossing the diffuser (1) before the airflow (40) pass through the fins (4) and comes out from the diffuser (1) into the room (20).

2. Adjustable air supply diffuser (1) according to claim 1, wherein the actuator (5) comprises a shaft (11) and the actuator (5) is configured to rotate the shaft (11) between a plurality of angular positions comprising a first angular position and a second angular position, preferably said actuator (5) is a stepper motor.

3. Adjustable air supply diffuser (1) according to claim 2, wherein the mechanism (6) comprises a rod (12) coupled to said movable fins (4) and an extendible arm (13) coupled to the shaft (11) of the actuator (5) and to the rod (12), wherein the extendible arm (13) is configured to extend according to an axial direction.

4. Adjustable air supply diffuser (1) according to claim 2 or 3, wherein the fins (4) are positioned inclined by an angle comprised between 0° and 45° upwards with respect to a horizontal plane orthogonal to the frame (3) when the shaft (11) is the first angular position, and the fins (4) are positioned inclined by an angle comprised between 20° and 45° downwards with respect to a horizontal orthogonal to the frame (3) when the shaft (11) is the second angular position, preferably the control unit (9) operates the actuator (5) to move the shaft (11) to said first angular position when the temperature sensed by the temperature sensor (7) is lower than 22°C and operates the actuator (5) to move the shaft (11) to said second angular position when the temperature sensed by the temperature sensor (7) is greater than 22°C.

5. Adjustable air supply diffuser (1) according to claim 3 or 4, wherein the mechanism (6) comprises clips (14) and the rod (12) is coupled to the fins (4) through said clips (14) configured to clamp the fins (4).

6. Adjustable air supply diffuser (1) according to claim 5, wherein the clips (14) are rotatably coupled to the rod (12).

7. Adjustable air supply diffuser (1) according to claim 5 or 6, wherein the fins (4) coupled to the clips (14) comprise a hole (15) engaged by a respective pin (16) belonging to the clip (14).

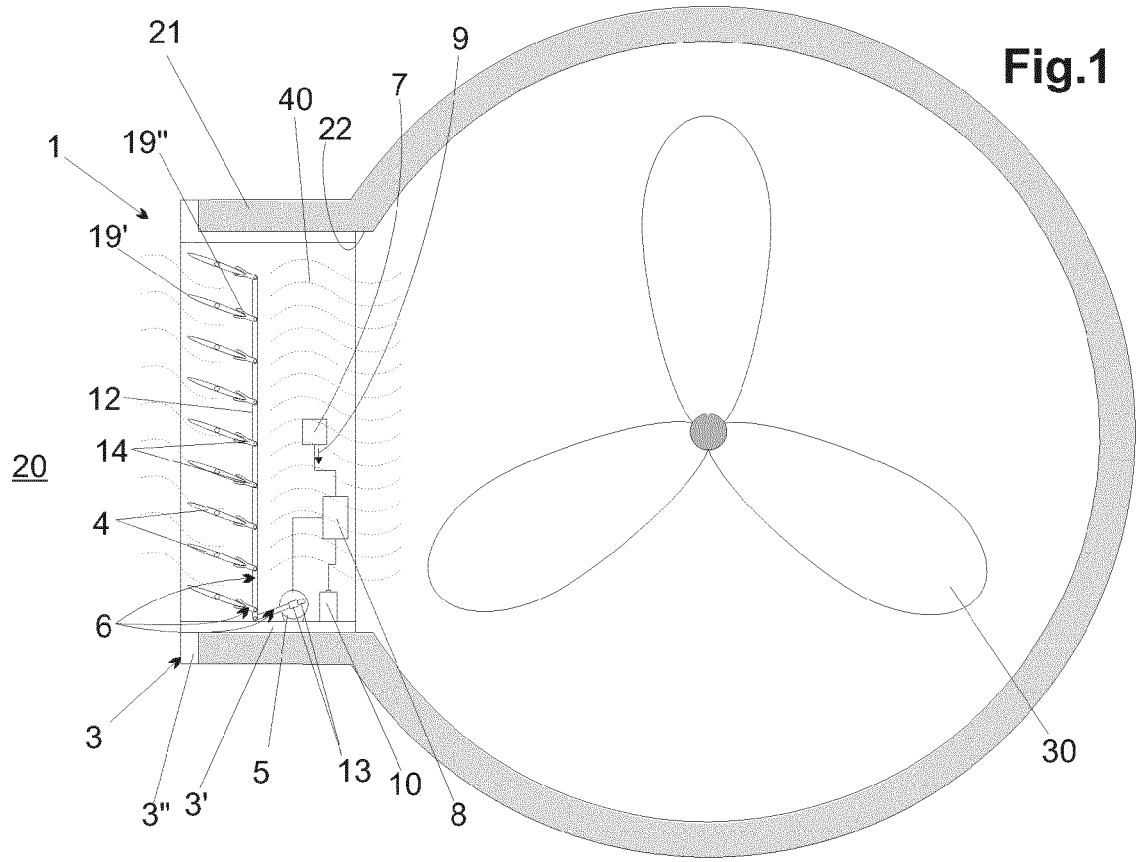
8. Adjustable air supply diffuser (1) according to any one of preceding claims, wherein the power source (10) is a battery embedded in the diffuser (1).

9. Adjustable air supply diffuser (1) according to any one of preceding claims, also comprising a receiver (17), preferably an IR receiver, operatively connected to the control unit (9) and configured to receive an control radio signal from a remote control (18).

10. Retrofit kit (100) for an air supply diffuser (200) comprising:

- an actuator (5);
- a mechanism (6) couplable to a plurality of fins (204) of the diffuser (200) and to the actuator (6);
- a temperature sensor (7) configured to generate a signal (8) representative of a temperature of the air touching the sensor (7);
- a control unit (9) operatively connected to the temperature sensor (7), to a power source (10) and to the actuator (5), said control unit (9) being configured to power and to operate the actuator (7) as a function of the temperature signal (8) generated by the sensor (7);

wherein the actuator (5), the power source (10), the control unit (9) and the temperature sensor (7) are couplable to a frame (203) of the diffuser (200).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9
7
40
22
1
19"
19'
12
14
20
4
6
3
3"
3'
5
13
10
8
30

Fig.1

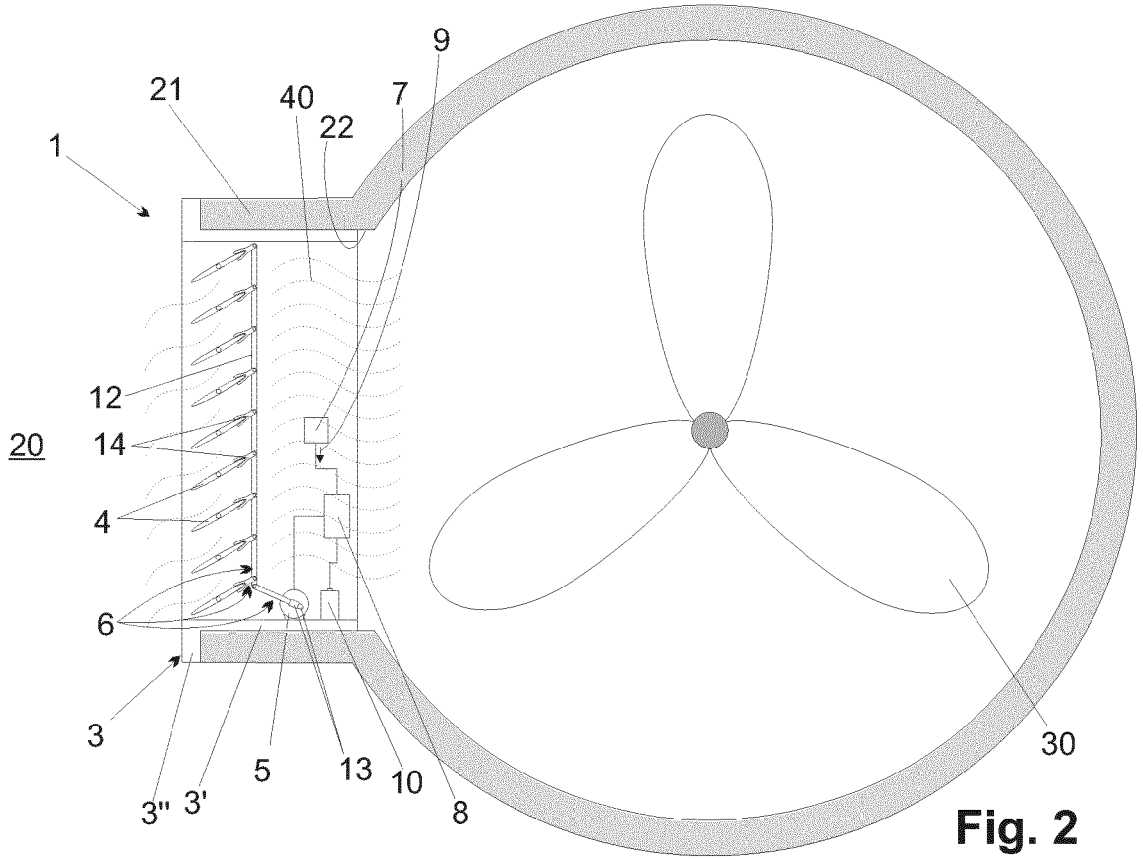

9
21
40
7
22
1
12
20
14
4
6
3
3"
3'
5
13
10
8
30

Fig. 2

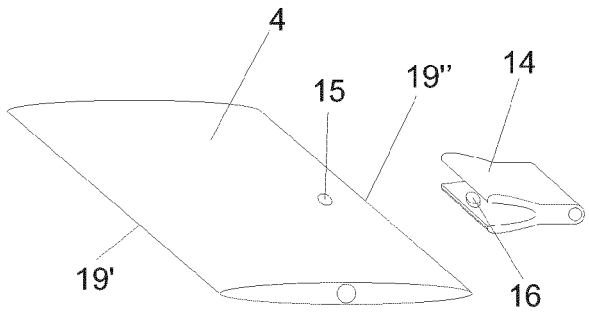


Fig.3

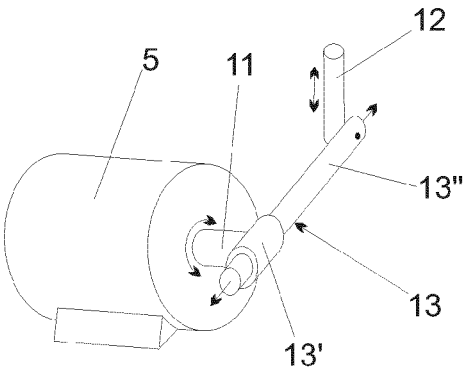


Fig. 4

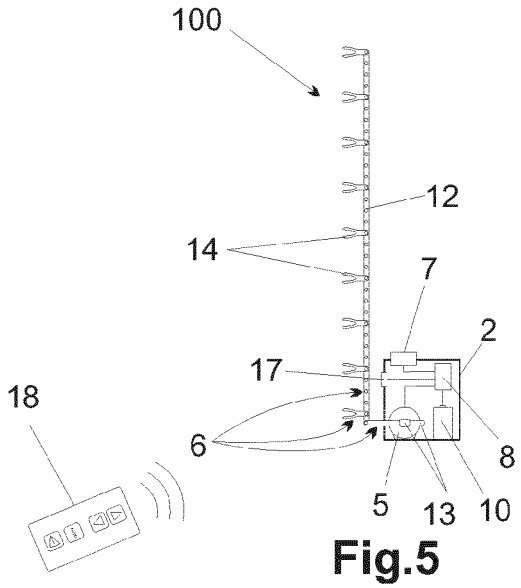


Fig.5

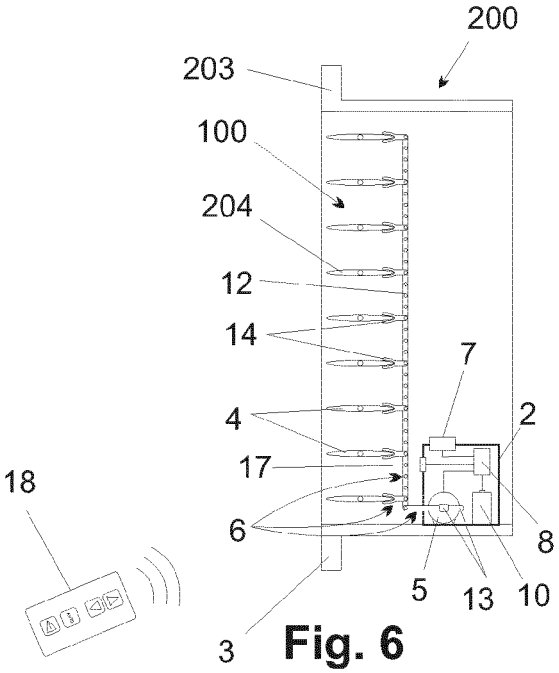


Fig. 6

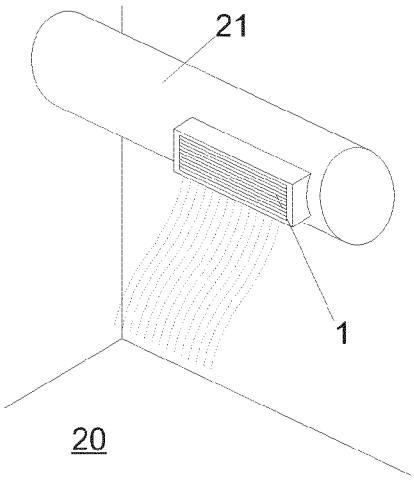


Fig. 7

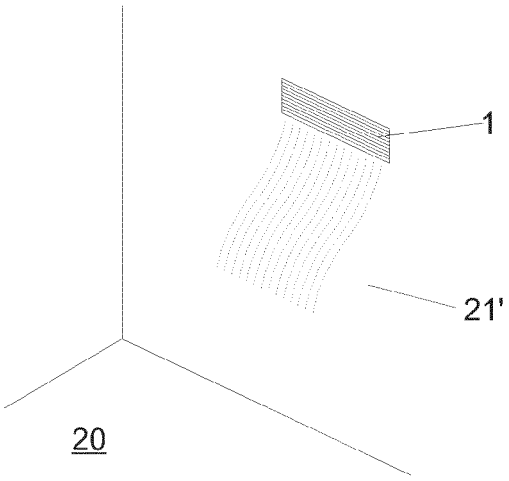
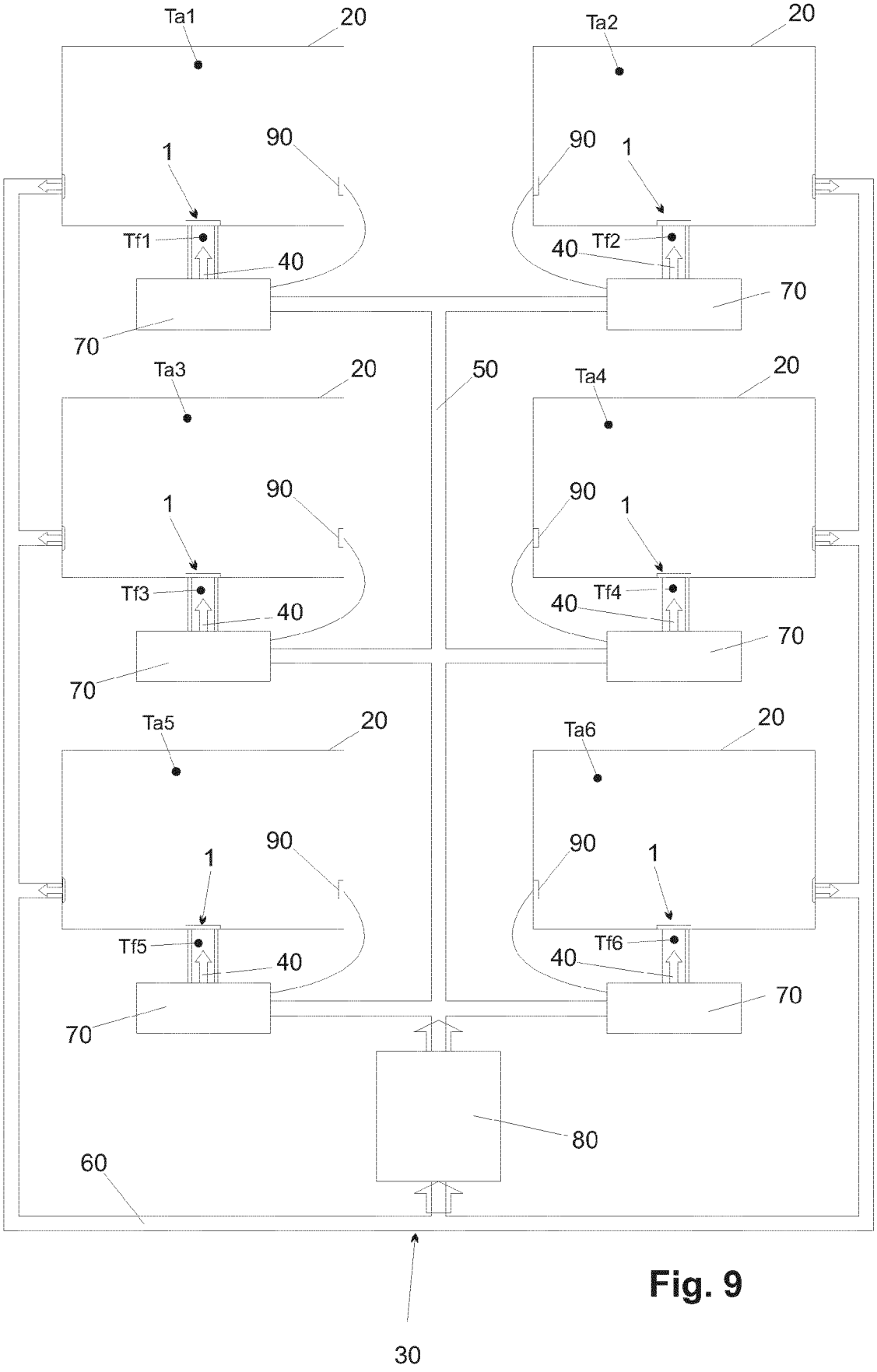


Fig. 8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Ta2
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90
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Tf3
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Tf4
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70
70
Ta5
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Ta6
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90
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90
1
Tf5
40
Tf6
40
70
70
80
60
30

Fig. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 23 02 0097

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13-06-2023

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