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(72) Inventor: Canzian, Lorenzo  
31020 San Pietro di Feletto (Treviso) (IT)

(74) Representative: Da Riva, Ermanno  
AGENZIA BREVETTI "PORDENONE"  
Via S. Quirino, 9  
33170 Pordenone (IT)

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(71) Applicant:  
Airplast S.a.s. di Canzian Lorenzo & C.  
31058 Susegana (TV) (IT)

(54) Air opening device for room ventilation

(57) Air opening device for room ventilation with a louver and/or multifunctional louvers made of plastic material. The air opening device comprises a first air opening (A) having baffles (15) to control the direction of the airflow and, if required, a second air opening (B) connectable thereto and provided with slats (8) which are laterally connected to toothed wheels (7) made of molded plastic material.

The toothed wheels are so reciprocally connected that the deflection applied to a slat (8) is transmitted to the others (8) and changes the airflow rate.

The casing of the first air opening (A) is formed by an "L" shaped element (1).

Magnets (M) are applicable to the external part (11) of the "L" shaped element (1), which is forming the frame for the application to the wall, to produce magnetic attraction on the rim (91) of the metallic conduit (9) and to allow the removable fixing of the casing.

The casings of the air openings (A-B) and their baffles and slats (15 and 8) are formed by extruded pieces of plastic material which can be cut into different lengths thus allowing to obtain air opening devices (A-B) having different dimensions.

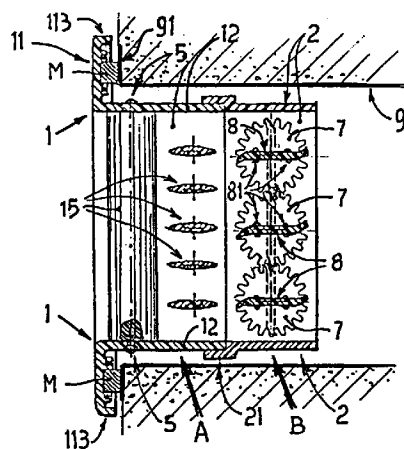


Fig. 3

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## Description

[0001] The present invention relates to an air opening device, in particular an air opening device for room ventilation, having one or more louvers made of plastic material and opportunely disposed in order to obtain various airflow control functions.

[0002] The louvers for industrial and residential ventilation are already known.

[0003] Such louvers are usually obtained by means of metallic materials (aluminum or steel), they are disposed inside and/or outside of the rooms and their construction is considerably expensive because it needs machining and electric-arc welding operations for the construction of the frames. Such working operations require high material and skilled labor costs. At first, the skilled worker welds the outer frame and then it welds the baffles together with the inner edge of the outer frame.

[0004] In other cases, the metallic sections are bored along their sides in such a way as to obtain a regular plurality of holes within which, before the welding operations, can be housed slats that are previously worked in such a way as to present, at their ends, two opposite shaft which are fit to engage the holes of the frame in a way permitting the change of the slat's inclination.

[0005] In this assembly system, the shafts of the slats are provided with small bearings of plastic material in such a way as to avoid an excessive wear of the shaft's seats and to brake the movement of the slats which remain removably stopped in the desired position.

[0006] Moreover, other kinds of traditionally made air openings are constituted also by plastic elements forming the outer frames for wall bearing and for support of said slats.

[0007] Such air openings are obtained by means of injection molding processes. It is well understood that the frames of such kind of air openings have standardized sizes in connection to those more used in the market, and the frames are realized by means of injection molds which limit the number of the various dimensions of the louvers and involve high realization costs in the case of dimensional change of said louvers.

[0008] It is to be pointed out that it is possible to obtain also louvers made of metallic materials by means of sheet metal forming processes (pressing - bending - shearing processes) that are limiting the real strength of the louvers and that are usually supported by the additions of components made of plastic and/or other material.

[0009] Also such a solution allows a fixed inclination of the slats, it needs a great variety of dies for the obtainment of the same slats. Moreover air openings made of ferrous materials are unsuitable for polluted air containing corrosive substances and there is always the risk of their oxidation, their aesthetic-functional degradation with increased risk of breakages and consequent various dangers.

[0010] Moreover, in the above mentioned cases, above all in the case of metallic air openings, there are additional costs for painting and/or rust preventing processes.

[0011] The air openings made of metallic materials are inadequate not only in the case of rooms in which there is the risk of electric leakages or high thermal dispersion, but also for the reason that they require hard phases of installation and therefore, they result expensive in all and, in some cases, they are aesthetically criticized. Moreover, it is to be noted that there is the impossibility to obtain air openings having a shape which is different from the shapes of the commonly used solutions.

[0012] It is the aim of the present invention to overcome the above stated drawbacks by providing an air opening device made of plastic material and allowing the control of the slat's inclination as well as the fine adjustment of the airflow rate by means of the application of a further air opening device that is series-placed with respect to the first air opening.

[0013] In order to better understand the features and the advantages attainable by the air opening device forming the object of the present invention, this air opening device is hereinafter described, by way of a not limitative example only, and with reference to the accompanying drawing, wherein:

- the Figure 1 is a front view of an air opening device of the machine according to the invention;
- the Figure 2 is a rear view of the same air opening device of the Fig. 1 that is viewed from the opposite side with respect to the Fig. 1;
- the Fig. 3 is a view made according to section I - I of Fig. 1 and shows not only a first traditional air opening device for controlling the direction of the airflow and a second air opening device for changing the airflow rate but also their mutual connection and disposition;
- the Fig. 4 shows a detail, on a larger scale, of the air opening device forming the object of the present invention, in which it is shown the application of a magnet for its fixing to the conduits of metallic kind.

[0014] Referring now to such Figures, in which the common items are marked with the same reference numerals, it will be hereinafter described the process of producing such air opening devices and precisely a first traditional air opening A for controlling only the direction of the airflow and a second air opening B suitable to change the airflow rate.

[0015] As it can be seen from the above-mentioned figures and with particular reference to Fig. 3, the first air opening device is obtained from a suitable "L" shaped piece that is made of extruded plastic material

developing two wings 11 and 12 that are disposed orthogonally to each other.

[0016] The wing 11 is suitable to form the outer and visible part of the frame for the application to the wall and is presenting an outer level surface while on its inner opposite surface ( see Figures 2, 3 and 4) are realized two protruding longitudinal elements 111.

[0017] Each of this longitudinal element 111 is internally provided with a groove 112 and is disposed near the lateral edges of said wing 11 in such a way as to form a recess 115 between themselves.

[0018] As it can be seen from the Figures 2, 3 and 4, suitable magnets M, that are distributed along the sides of the frame for the reasons hereinafter described, can be inserted in the recess 115.

[0019] Such wing 11 has one end connected to the wing 12, while the other free end of the wing 11 is connected to a protruding edge 113 that is turned in the same direction of the wing 12.

[0020] The wing 12 is constituted by a substantially level sheet that is extending for an adequate length and is suitable to form, as it will hereinafter described, the conduit for the airflow as well as to house the baffles 15.

[0021] Such piece 1 will be cut into pieces of desired length by means of cuts in its respective ends. These cuts are inclined at an angle of 45° and are convergent departing from the outer part of the wing 11 in order to form the frame having the dimensions which are desired and/or required by its particular application.

[0022] At this point, the worker makes holes through the inner wing 12 of the piece 1 for allowing the insertion of self-tapping screws 5 engaging the ends of suitable baffles 15.

[0023] Such baffles 15 are previously obtained by cutting an other suitable extruded plastic material having a lenticular cross section that is symmetrically biconvex.

[0024] At this point, the pieces of the piece 1 for forming the frame, are joined together by means of suitable angle-irons 4 which are constituted by "L" shaped lengths of metallic wire.

[0025] Such angle-irons are inserted into the ends of the grooves 112 realized in the above-mentioned longitudinal elements 111. Moreover, a more secure fixing of the junction points between the adjacent ends of two pieces of piece 1 can be obtained also by ultrasonic sealing and/or by bonding with suitable adhesives.

[0026] Such composition embodies a first eventual group for deflecting the airflow.

[0027] Clearly, a second group of baffles 15, orthogonally disposed with respect to those of the first group, can be applied in the rear of this eventual first group.

[0028] It is to be pointed out that the insertion of the self-tapping screws in the ends of the deflecting baffles 15 will held the same baffles 15 in such a frictioned manner to allow their rotation round their longitudinal axis but to stop them in the desired position.

[0029] Such first air opening device A embodies a first solution that allows the adjustment of the direction of

the airflow. Clearly, there is the possibility to apply a second element, that is from various angles assimilable to a further air opening device but operating for the adjustment of the airflow rate, which would result, in a lot of cases, very useful when combined with the operation of the first air opening device A.

[0030] Such second air opening device B is constituted by an other extruded piece 2 that is clearly different from the first above-described extruded piece.

[0031] Such second piece 2 constituting the second air opening device B has an essentially rectangular cross section. The one end of the cross section presents a protruding length 21 that, during the assembly of the air opening device B, occupies an outer position in order to engage the adjacent ends of the wings of the first air opening device A to which it can be added. Obviously, the connection between the air opening devices A and B can be obtained in a different way and with different means, such as a spring fixing that is obtainable by means of shaping the connecting parts in a suitable and per se known way or by means of elastic elements such as coil springs hooked on suitable elements or shaped parts of the air opening devices A and B.

[0032] Such extruded and opportunely cut piece 2 is assembled, as the first extruded piece 1, by means of suitable angle-irons made of "L" shaped metallic wire that are insertable into corresponding grooves realized on the outer surfaces of the resulting conduit and not shown by reason of simplicity, and/or by means of sealing and/or bonding.

[0033] Such second extruded piece 2 will be provided, in the same way of the piece 1, with holes realized in the central portion and along the axis of two opposite pieces. Such holes are suitable to allow the insertion of short pins (not shown) that are protruding from respective toothed wheels 7 made of injection molded plastic material.

[0034] Such short pins being provided with a counter-bored part for receiving a self-tapping screw which is screwed into them in such a way as to obtain a frictional effect for the hereinafter stated reasons.

[0035] These toothed wheels 7 support slats 8 having a particular shape which is essentially constituted by a central portion presenting a rectangular shaped cross section, the ends of which are ending with lengths that are curved in opposite directions to each other in order to form a lip. If required, this lip may be placed in close contact with the corresponding lip of an adjacent slat in order to allow a mutual hermetic seal of the air opening.

[0036] The dorsal surfaces of such slats 8 are preferably provided with ribs 81 so as to engage suitable seats realized on the toothed wheels 7 and to form a firm mechanical connection. Nevertheless, the above-described connection does not exclude other known connecting means.

[0037] The position of the slats 8 can be changed in such a way as to allow their movement from the maxi-

mum closing position , as indicated in the Figure 3 by means of dashed line, to the maximum opening position as indicated by means of continuous thick line.

[0038] The control of only one slat 8 allows the contemporary movement of the other slats 8 because the toothed wheels 7 supporting the slats 8 are reciprocally connected by means of their respective teeth.

[0039] The air opening A or the air openings A together with the air opening B can be applied by their insertion into the corresponding openings made in the application walls and therein fixed by means of screws which pass through the holes drilled through the peripheral frame of the air opening A ( that is formed by the wing 12 of the piece 1 ) and screwed into the application wall.

[0040] Such normal and traditional solution involves the aesthetical drawback resulting from the visible presence of the heads of the fixing screws.

[0041] Moreover, the application and the removal require several tools and relative working time.

[0042] However, as it is known, the opening made in the wall are usually coated with a conduit 9 which is usually made of galvanized metallic sheet . The conduit ends in correspondence of the surface of the wall and presents a collar 91 which forms a peripheral edge having a discrete width ( see Figures 3 and 4 ).

[0043] Therefore, the above-described application of the magnets M to the frame of the air opening A affords the considerable advantage to perform, without tools and in a simple and quick way , the application as well as the removal of the air opening A.

[0044] From what stated and described it is clear that the system for forming the air opening devices according to the invention affords considerable advantages which may now be summarized.

[0045] In the first place, it will be possible to made air opening devices having any dimensions because they will be obtained by pieces of extruded plastic material.

[0046] The above-mentioned advantage permits a remarkable reduction in the production costs, moreover, the operations for making the air opening devices will be simple, quick and inexpensive.

[0047] The use of plastic material for making the various components of the said air opening devices allows to avoid pickling and painting operations which are always indispensable in working metallic materials and permits of making air opening devices in any colour for complying with particular aesthetical requirements.

[0048] Moreover, the use of plastic material avoids any possible and undesired electrical conductivity deriving from unexpected contacts with energized parts. The above-mentioned feature together with the low thermal conductivity of the plastic material allow , in particular during the cold seasons, to obtain remarkable savings of energy.

[0049] A further advantage derives from the possibility of using only one air opening device for controlling only the direction of the airflow or to add thereto a further air

opening device for changing the airflow rate to such a degree that the airflow is nearly interrupted.

[0050] In the end, the magnetic fixing of the air opening device on the wall allows to avoid the use of screws having heads unaesthetically protruding from the surface of the frame and , moreover, to avoid fixing and /or removal operations which are requiring the use of tools and a lot of labour time.

[0051] It is well understood that modifications and variations may be made to the air opening device forming the object of the present invention without departing however from the scope defined by the following claims with reference to the accompanying drawings and thence from the protection extent of the present industrial invention.

## Claims

1. Air opening device for room ventilation with a louver and/or multifunction louvers made of plastic material , such air opening device being characterized to be constituted by a first traditional air opening ( A ) for controlling only the direction of the airflow as well as and , if required , by a second air opening ( B ) suitable to change the airflow rate and connectable to said first air opening ( A ), the conduits of the first ( A ) and of the second ( B ) air openings are constituted by extruded pieces of plastic material , the piece ( 1 ) used for executing the conduit of said first air opening ( A ) being substantially "L" shaped and developing an inner wing ( 12 ) from an end of which is orthogonally departing a suitably shaped outer wing ( 11 ) that is suitable to form the peripheral frame for fixing said first air opening ( A ), the piece ( 2 ) used for executing the conduit of the second air opening ( B ) being essentially constituted by a level sheet having a lateral length ( 21 ) that results outwardly displaced as well as parallelly to an other its surface, the possibility of cutting said pieces ( 1 - 2 ) , in a per se known way, to lengths that are at will changeable , allows to make , without limitations , air openings ( A-B ) having different dimensions.
2. Air opening device according to the claim 1 , characterized in that on the inner surface of the outer wing ( 11 ) of the said piece ( 1 ) of the first air opening ( A ) are realized protruding longitudinal element ( 111 ) which are disposed near the lateral edges and are internally provided with an inner groove ( 112 ) , the outer end of such outer wing ( 11 ) is connected to a protruding edge ( 113 ) that is turned in the same direction of the wing ( 12 ) , suitable magnets ( M ) are applicable in the recess ( 115 ) resulting between said longitudinal protruding elements ( 112 ) for allowing the fixture of the frame formed by said wing ( 12 ) and then of the entire air opening ( A ) on the metallic edge ( 91 ) of the conduit ( 9 )

which is usually applied in the wall opening housing the air opening device.

3. Air opening device according to the claims 1 and 2 characterized in that the cuts, executed in particular on the piece ( 1 ) for obtaining pieces to be connected at their ends in order to form the said first air opening ( A ), are inclined at an angle of 45° from the outer edge of the wing ( 11 ) which is forming the application frame so that to penetrate following convergent directions and towards the opposite inner wing ( 12 ), the so obtained pieces are connectable at their respective pairs of ends which are disposed adjacent between themselves in order to form the relative first air opening ( A ), the connection and the mutual fixing of two adjacent ends being obtainable by known systems and means as ultrasonic sealing and/or bonding with suitable adhesives as well as by means of eventual cooperating angle-irons ( 4 ) made of "L" shaped metallic wire whose orthogonal arms are inserted in the inner grooves ( 112 ) of the protruding longitudinal elements and in correspondence of the respective connecting angles.
4. Air opening device according to the claim 1, characterized by the fact that deflecting baffles ( 15 ), which are constituted by extruded pieces of plastic material having a lenticular and simmetrically biconvex cross section, are suitable to be inserted and fixed in the first air opening ( A ), the fixing of such deflecting baffles ( 15 ) is obtained by means of self-tapping screws penetrating through holes previously drilled through said inner wings ( 12 ), said self-tapping screws engage the opposite ends of corresponding deflecting baffles ( 15 ) in such a way as to produce a frictional stopping action which permits of changing the position of each deflecting baffle ( 15 ) and to stop each baffle in the desired position, a first group of deflecting baffles ( 15 ) can be applied on a relative plane which is transversal to the conduit formed by the inner wings ( 12 ) of said first air opening ( A ) thus allowing to direct the airflow to only one direction, a second group of the same deflecting baffles ( 15 ) can be moreover applied on a further transversal plane which is suitably spaced apart from the first group, the deflecting baffles ( 15 ) of said second group being orthogonally disposed with respect to those of the first group thus allowing to direct the airflow also in a direction that is orthogonal to that caused by the baffles ( 15 ) of the first group, the airflow can be therefore directed towards any desired direction by varying contemporaneously the deflections of the baffles ( 15 ) of both groups.
5. Air opening device according to the claim 1, characterized in that said second air opening ( B ) is con-

stituted by a conduit formed by walls made of pieces of said piece ( 2 ) presenting the same dimensions of the conduit of the air opening ( A ) formed by walls defined by the inner wings ( 12 ) of the relative piece ( 1 ), said conduit of said second air opening ( B ) is connectable to the conduit of the first air opening ( A ) by inserting the inner end of the air opening ( A ) in its enlarged end formed by the outwardly protruding edge obtained with said lateral length ( 21 ), the mutual connection and the removable fixing of both the air openings ( A and B ) are obtainable in a per se known way and by means of per se known kind; suitable slats ( 8 ) are disposed inside the conduit of said second air opening ( B ) and are transversally as well as orthogonally disposed with respect to two opposite walls of the same conduit, the ends of such slats engage the inner parts of respective toothed wheels ( 7 ) whose outer parts are centrally provided with short pins which are suitable to engage respective holes made in the two above mentioned opposite walls of the conduit, such pins can be fixed in a frictioned manner by screwing in them suitable self-tapping screws, said toothed wheel ( 7 ) disposed on each side of the conduit are so reciprocally connected that the rotation applied to any slat ( 8 ) transmits motion between the other slats ( 8 ) thus allowing to vary the position of the slats from a closing position, wherein the slats are orthogonally disposed with respect to the airflow, to an opening position which is orthogonal with respect to the above-mentioned closing position thus allowing the free passage of the airflow, such disposition and conformation are therefore allowing to change at will the airflow rate.

6. Air opening according to the claim 5 characterized in that such slats ( 8 ) are formed by an extruded piece of plastic material having a width equal to the outer diameter of the toothed wheels ( 7 ) on which the slats are applied and that such slats are shaped with a central portion presenting a rectangular shaped cross section the ends of which are ending with lengths that are curved in opposite direction to each other.

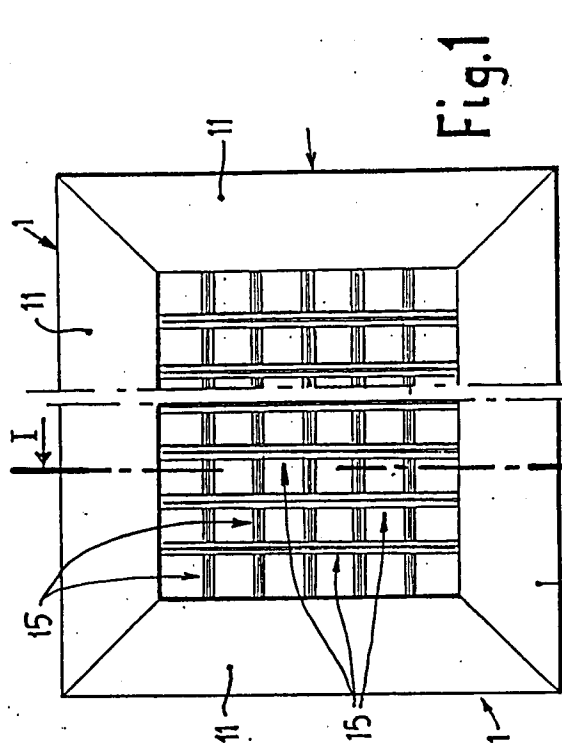


Fig. 1

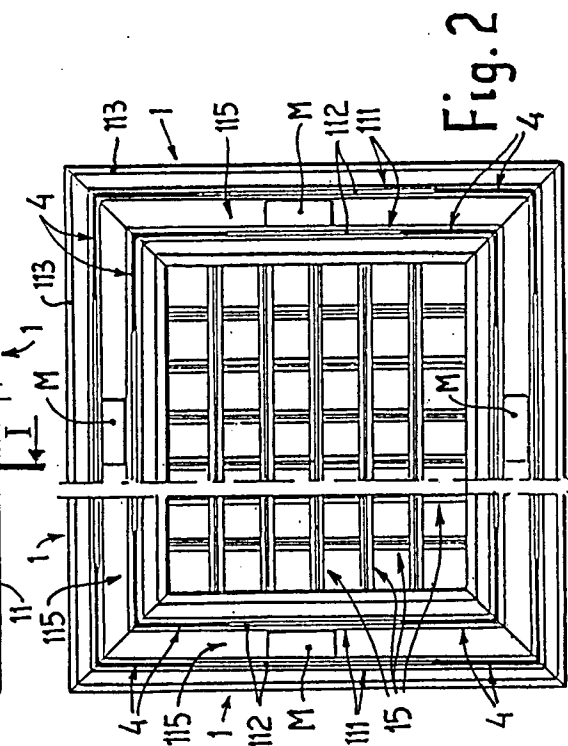


Fig. 2

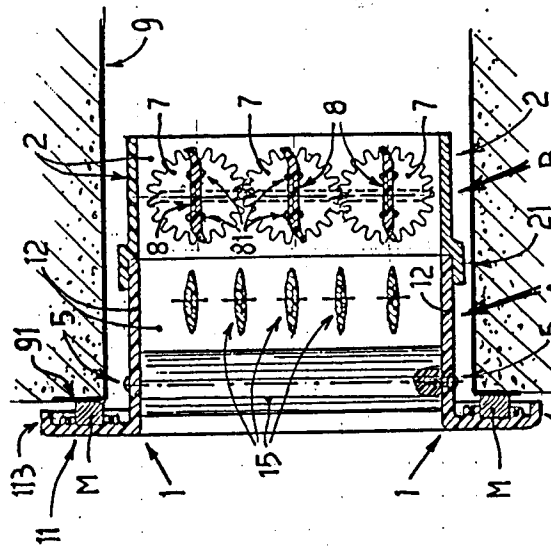


Fig. 3

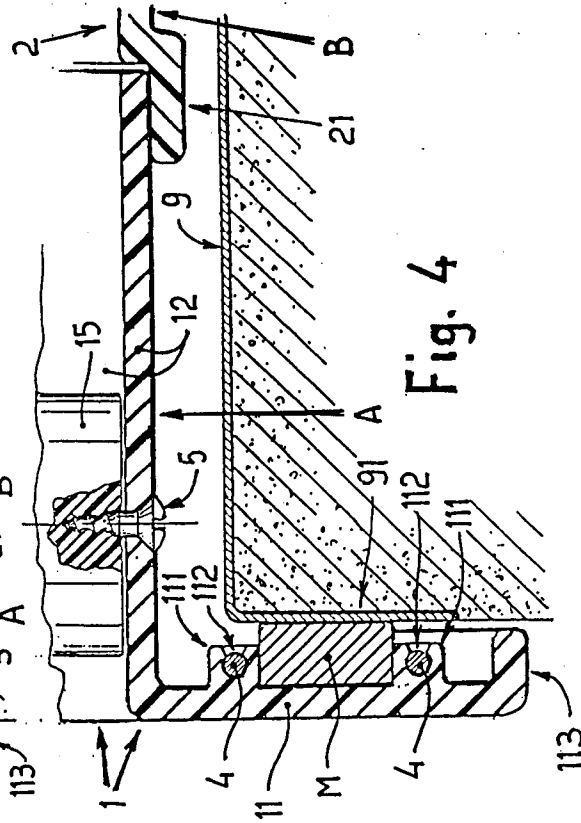


Fig. 4