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(54) Roof fan

(57) The invention relates to a fan adapted for placing on the roof of a building. Roof fans are known which blow substantially vertically, while fans are also commercially available which have a substantially horizontal, radial outflow pattern.

The fan according to the invention now has the feature that the fan is constructed such that the air blown to the outside has both a considerable horizontal and a considerable vertical directional component. Due to the angle at which the outflowing air is displaced, ambient air is carried along through so-called "induction". An air flow will for instance be created which travels downward from above in the direction of the fan, is then deflected and carried along by the obliquely blowing air flow. Also occurring along the roof in the direction of the fan is an air flow which will deflect in the vicinity of the fan to be then carried along in the direction of the obliquely blowing air flow.

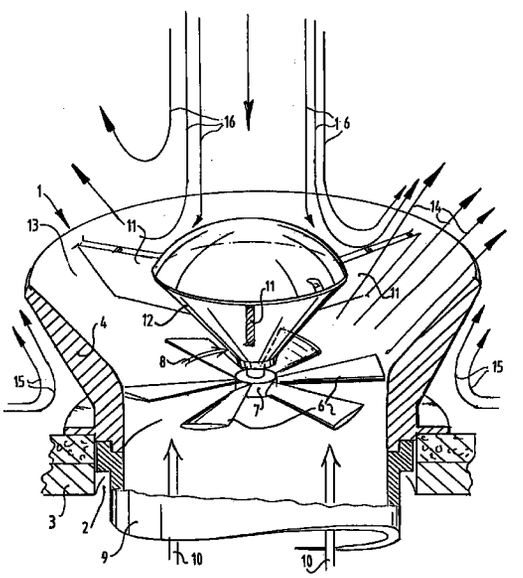

FIG.1

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Description

The invention relates to a fan adapted for placing on the roof of a building. Roof fans are known which blow substantially vertically, while fans are also commercially available which have a substantially horizontal, radial outflow pattern.

The fan according to the invention now has the feature that the fan is constructed such that the air blown to the outside has both a considerable horizontal and a considerable vertical directional component. Due to the angle at which the outflowing air is displaced, ambient air is carried along through so-called "induction". An air flow will for instance be created which travels downward from above in the direction of the fan, is then deflected and carried along by the obliquely blowing air flow. Also occurring along the roof in the direction of the fan is an air flow which will deflect in the vicinity of the fan to be then carried along in the direction of the obliquely blowing air flow.

The advantage of this structure according to the invention is that the air flow brushing over the roof effectively carries away contaminants present there. It is noted in this respect that vents, inter alia of sewage systems, often debouch on the roof. The fan according to the invention effectively discharges these contaminants and stench components so that there is no danger or at least a considerably reduced danger of these being drawn into ventilation systems placed in the surrounding area.

A further advantage of an air flow which brushes along the surface of the roof is that a certain cooling thus results therefrom. A high temperature can build up on a roof, particularly during solar radiation. The brushing-along air effectively breaks up the stationary thermal boundary layer whereby the temperature occurring in the roof itself and sometimes rising to very high values is reduced considerably.

Claims 2-7 give advantageous embodiments.

The invention will now be elucidated with reference to the annexed drawings. Herein:

figure 1 shows a cut away perspective view of a fan according to the invention; and

figure 2 shows a cut away perspective view of a variant.

Figure 1 shows a fan 1 which is placed via an opening 2 into a roof structure 3. Fan 1 comprises a rotation-symmetrical housing 4, a motor (not drawn) accommodated in a motor housing 5 which drives a rotor 7 carrying air displacement blades 6 for rotation as according to arrow 8. Fan 1 connects onto a tube 9 for suction therefrom of air designated with arrows 10 and blowing out thereof. Motor housing 5 is suspended in housing 4 by means of spokes 11. Motor housing 5 has an outer surface 12 of truncated cone form facing toward the blades 6. The inner surface 13 likewise has the general shape of a truncated cone in the region of motor housing 5, whereby the blown air is urged to move outward as according to arrows 14 in a direction such that this air flow has both a considerable horizontal and a considerable vertical directional component.

Due to the rotation-symmetrical structure of fan 1 the outward blown air has a substantially rotation-symmetrical flow pattern.

In the drawn embodiment the direction of the outward blown air forms an angle of roughly 45° with both the vertical and the horizontal direction.

The main flow 14 carries induced air flows along with it. These are designated 15 and 16 respectively. The air flow 15 is carried over the surface of the roof structure 3 and deflected obliquely upward. The air flow 16 is drawn downward from above and deflects to then be carried along with the main flow 14.

Figure 2 shows a fan 17 which is likewise arranged on the roof structure 3. Housing 18 bounds together with a motor housing 20 supported by supports 19 a rotation-symmetrical outlet cavity in order to obtain the main flow 14. Accommodated in motor housing 20 is a motor 21 which drives a rotor 22 which carries blades 23. Other than the blades 6 in figure 1, the blades 23 have bent end zones 24 which display a radially outward tapering form in the rotation direction 8. The end zones 24 hereby provide the generated air flow with a radial component during rotation whereby the fan has a higher efficiency.

Attention is drawn to the fact that it is not always a prerequisite for the inner surface of the fan housing to have a shape widening toward the outside. Deflection means giving the blown air flow the desired direction could for instance be sufficient. These deflection means can consist of a central obstruction, comprise deflection plates or be embodied such that the fan comprises a plurality of rotors blowing out air in desired directions.

With reference to the embodiment according to figure 2 it is noted that the motorhouse on the one hand bounds and on the other hand covers the air outlet, i.e. the substantially rotation symmetric structure between the blades 23 and the blown-out main air flow 14, due to which the entry of rain, hail and snow is at least more or less prevented.

The figures to be discussed below also exhibit this feature.

Figures 3, 4, 5 and 6 show respective fans 31, 32, 33, 34, having in common an internal structure comprising a motor 35, a cover cap 136 carried by said motor, a blade wheel 36 carried by motor 36 and rotatably driven thereby, said blade wheel 36 having strips 37, the form of which is more clearly visible in figures 9 and 10. The blade wheel exhibits an in axial direction slanting position, whilst the blades have a curved shape and a position differing from the radial direction. The blade wheel displaces the inflowing air 10 in outward direction in a more or less cone-shaped pattern. The outflowing air flow is again indicated with reference numeral 14. The more or less conically shaped outlet opening 38 is bounding by a lower plastic foam part 39 and an upper plastic foam part 40. These parts may be formed inte-

grally, in which locally spacers are formed together integrally, or said parts may be connected by suitable means, such as bolds.

The upper part 40 is effective for covering opening 38 in a way such that the entrance of rain is prevented. In asfar as unintentionally rain water enters opening 38, this water is guided in downward direction along the lower plastic foam part 39, where it can be removed by means of not-shown means, particularly small holes, avoiding entrance in the inlet tube through which inlet air 10 is sucked in.

Figures 4, 5 and 6 need after the foregoing description little explanation.

The fan 32 according to figure 4 exhibits a circumferential outlet opening 41 bounded by a respective lower dish 42 and an upper dish 43, said dishes being connected with a lower plastic foam part 44 and an upper plastic foam part 45, respectively.

The fan 33 according to figure 5 exhibits a lower plastic foam part 46 and an upper plastic foam part 47, said foam parts together bounding a substantially rotation symmetric blow-out opening 48.

The fan 34 according to figure 6 exhibits only an upper foam part 49 which is carried by means of vertical strips 50 by a support plate 51 which in its turn is supported by the support structure 52.

Figure 7 shows a fan 71 having motor 35 and blade wheel 36 with blades 37 in common with fans 31, 32, 33 and 34. In this embodiment the fan has the same advantage as fans 31, 32, 33, namely the relatively large length of the blow-out opening 72 guiding the air effectively and furthermore is embodied in a way such that the lower guiding surface 73 transports entering water, if any, to a ring 73 for removal to the outside according to arrow 74.

Fan 81 according to figure 8 has a slightly different structure, but also in this case entering water, if any, is transported to the outside according to arrow 74.

Figure 9 shows a fan, the several structural parts of which consist of metal, but the structure of which basically corresponds with the structure of the fan 32 according to figure 4.

The fan 101 according to figure 10 is in a comparable fashion analogous to the fan 34 according to figure 6.

It should be noted that in the drawings no necessary fixation means are drawn for mutually fixing the several parts of the respective fans.

It should be noted that the blow-out opening does not necessarily have to be rotation symmetrical, but can also have a non-round shape, which in that case may be adapted to the entire external shaping of the fan. As an example use may be made of a polygonal, e.g. square main shape.

Claims

1. Fan adapted for placing on the roof of a building, which fan comprises:

   a housing;

   a motor which drives for rotation a rotor carrying air displacement blades;

   an air intake which is adapted for connection to an air discharge conduit debouching on the roof of the building; and

   an air outlet which is adapted to blow to the outside air which is drawn from the air intake by the driven air displacement blades,

   characterized in that

   the fan is constructed such that the air blown to the outside has both a considerable horizontal and a considerable vertical directional component.

2. Fan as claimed in claim 1, **characterized in that** the air blown to the outside has a substantially rotation-symmetrical flow pattern.

3. Fan as claimed in claim 1, **characterized in that** the direction of the air blown to the outside forms an angle of $(45 \pm 20)°$ with the vertical and the horizontal direction.

4. Fan as claimed in claim 1, **characterized in that** the outlet has a shape widening toward the top.

5. Fan as claimed in claim 4, **characterized in that** the outlet has in the middle an obstruction urging the air for blowing to the sides.

6. Fan as claimed in claim 1, **characterized in that** the outlet comprises air guiding means guiding the air for blowing to the sides, for instance obliquely disposed blades, optionally with a rotation-symmetrical form.

7. Fan as claimed in claim 1, **characterized in that** the air displacement blades are formed and placed such that they further displace the air for blowing at an angle to the axial direction.

8. Fan according to claim 5, **characterized in that** the obstruction is embodied and positioned in a way such that it covers the air oulet, in a way such that it substantially prevents the direct entry of rain, hail or snow in the air outlet.

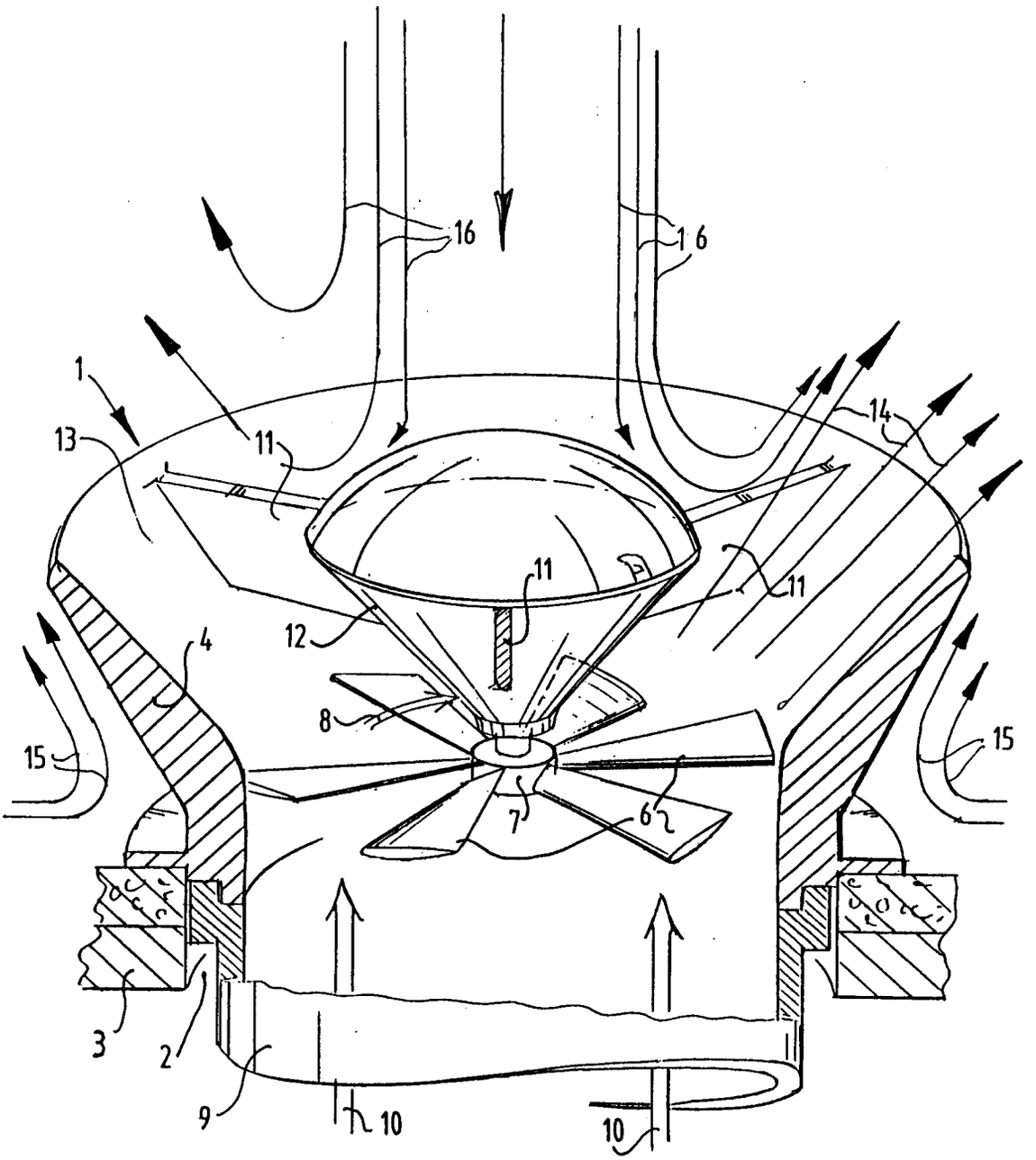

FIG.1

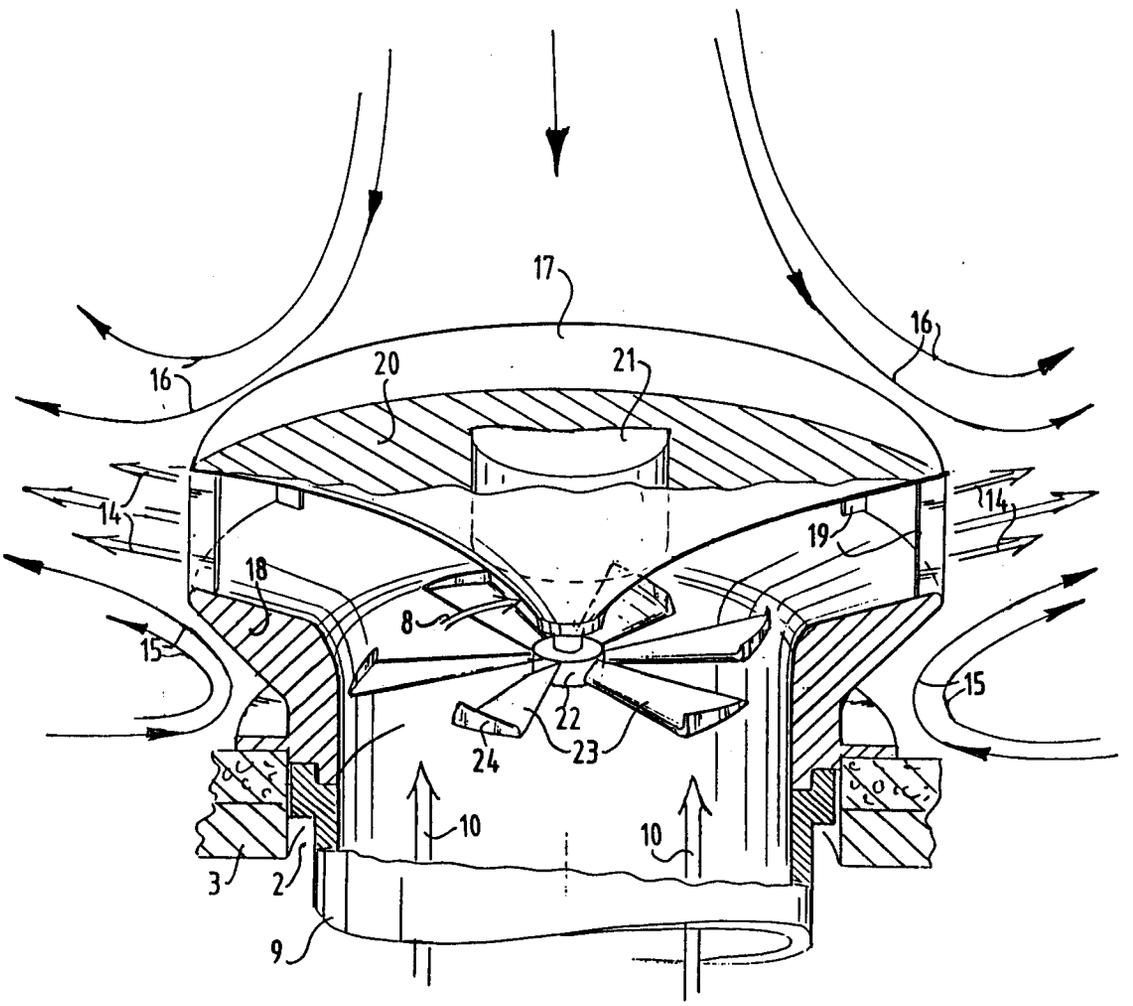

FIG.2

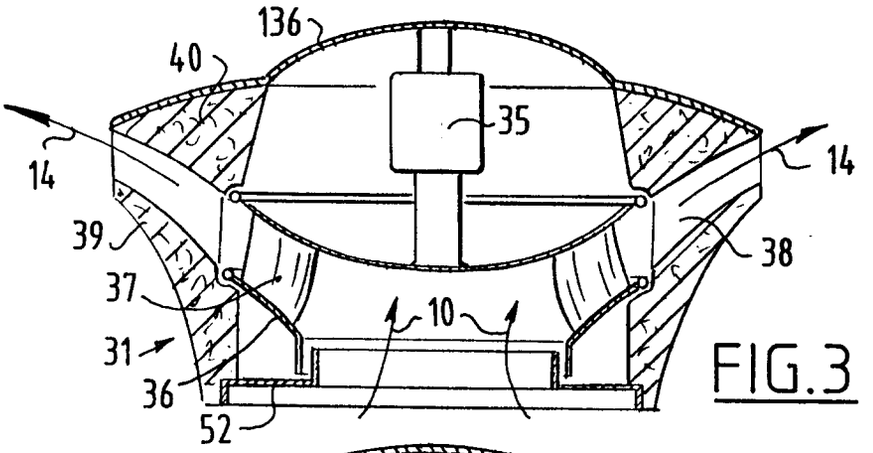

FIG.3

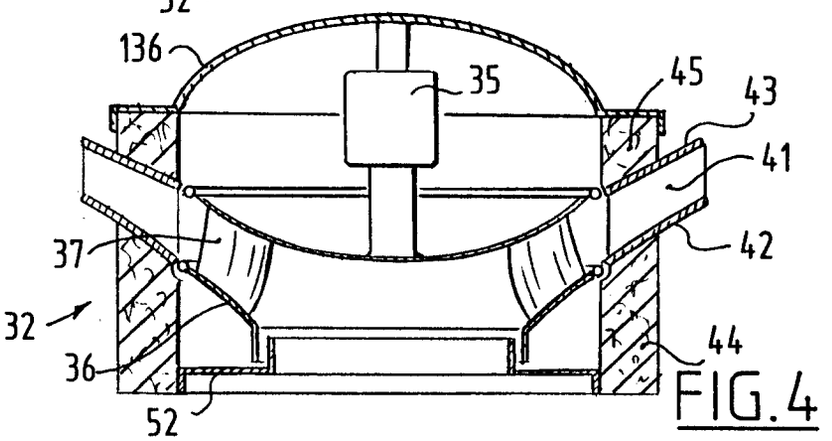

FIG.4

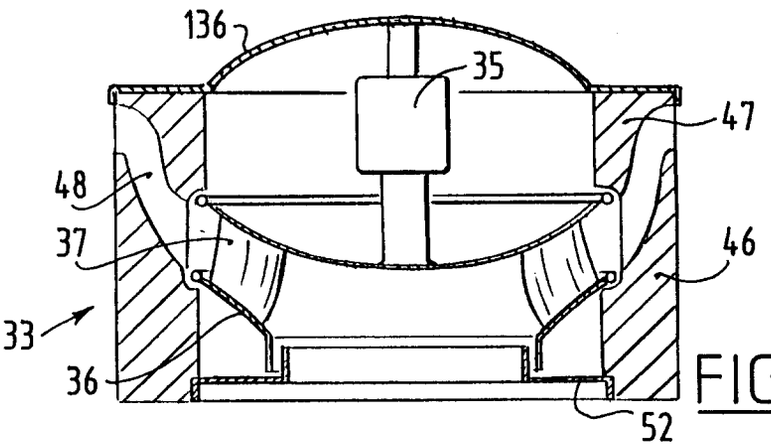

FIG.5

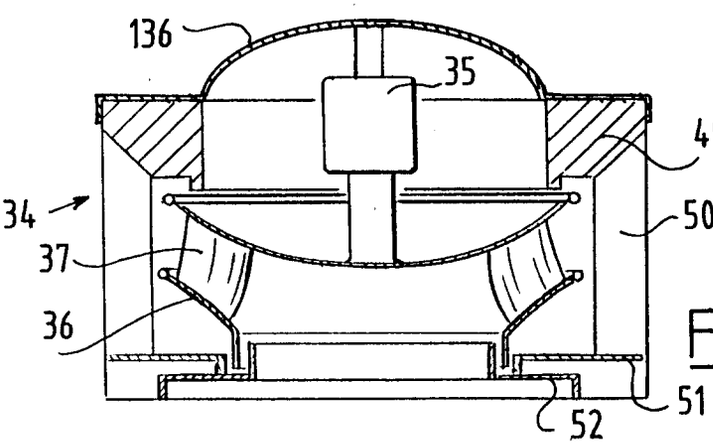

FIG.6

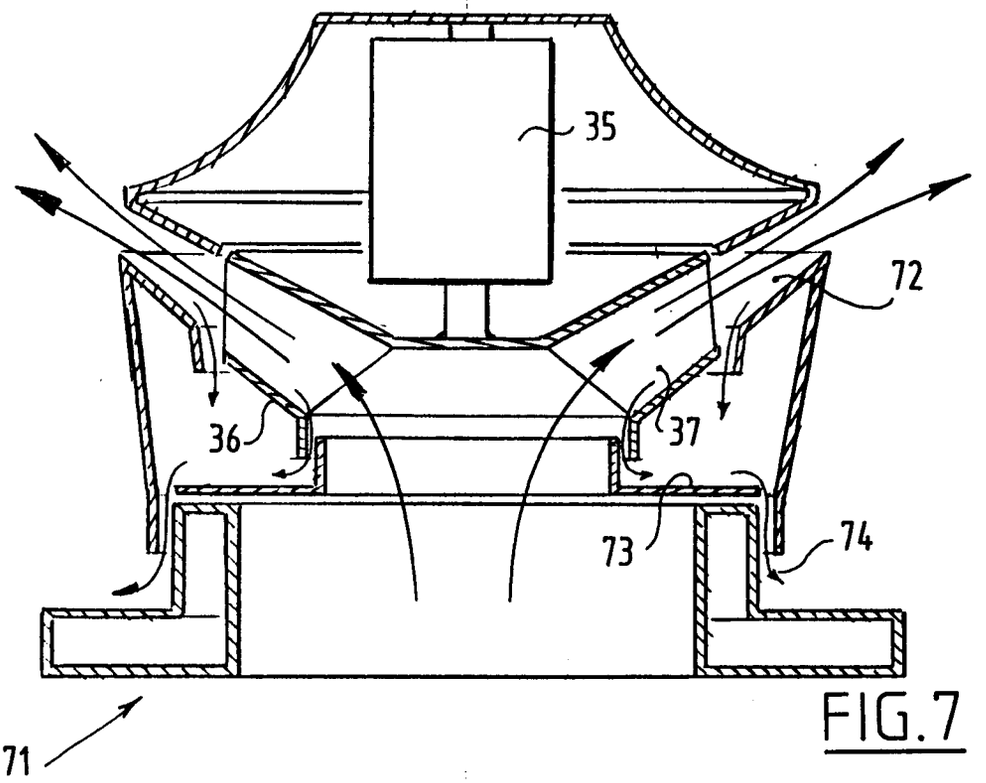

FIG.7

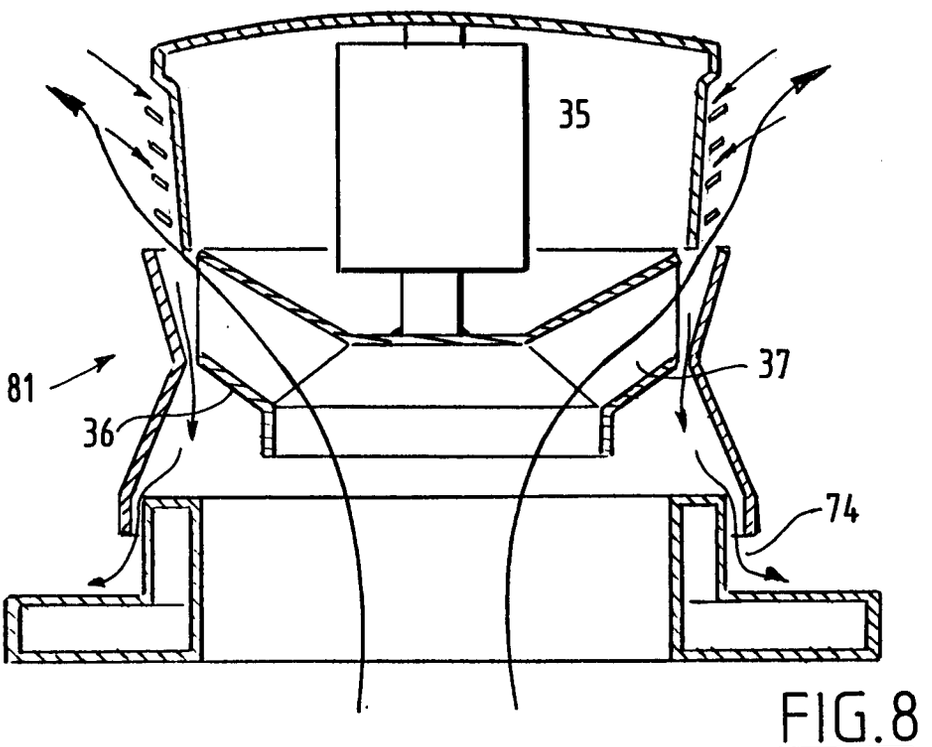

FIG.8

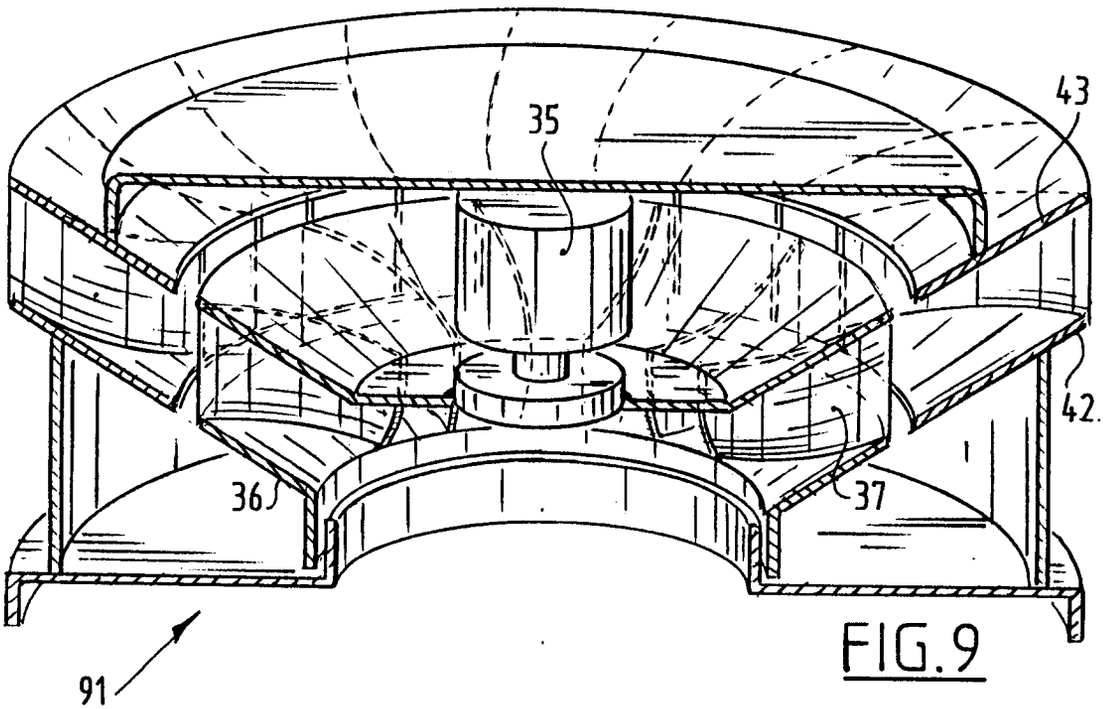

FIG.9

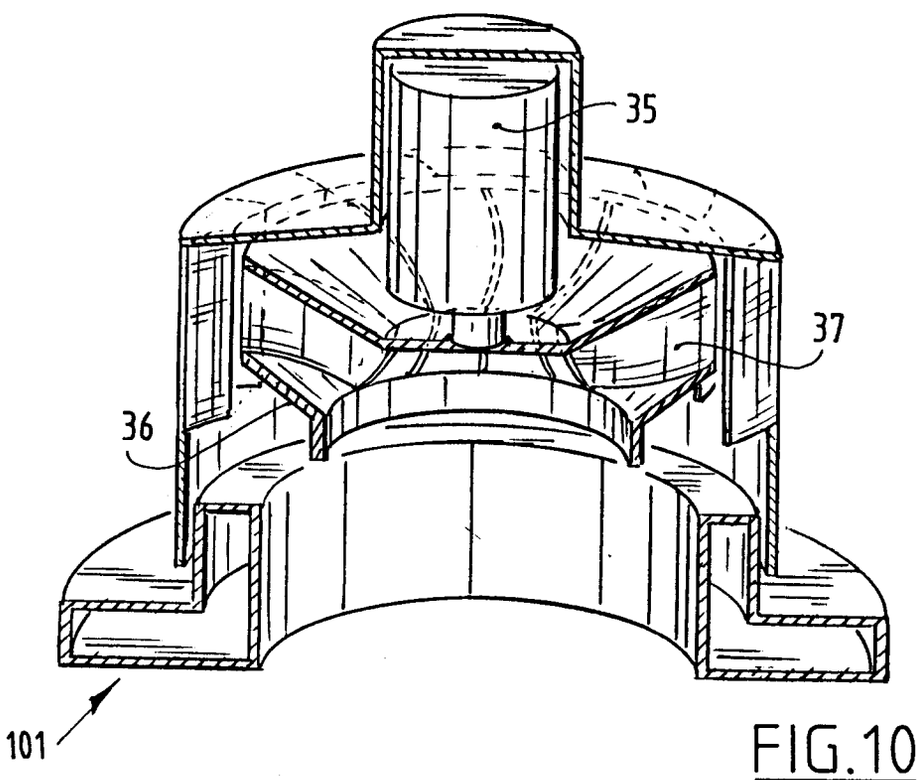

FIG.10