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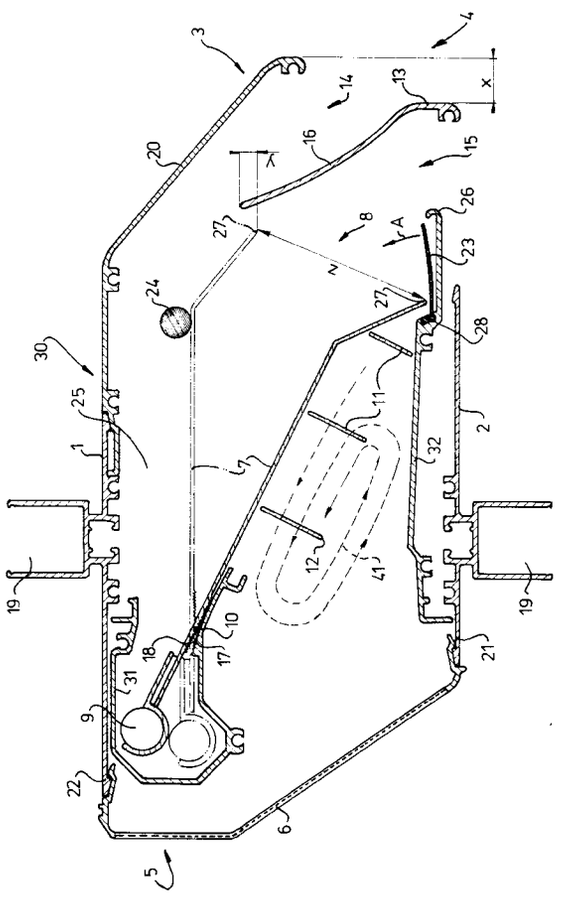
(71) Applicant : **COMPRI-ALUMINIUM B.V.**
Merwedeweg 6,
P.O. Box 76
NL-3330 AB Zwijndrecht (NL)

(72) Inventor : **Van Wegen, Johannes Jozef**
Geutoomserf 10
NL-3755 VN Eemnes (NL)
Inventor : **Brands, Jan Adriaan Nico**
Van den Broekerf 242
NL-3315 SK Dordrecht (NL)
Inventor : **Kamies, Wubbe Theodor**
Talmastraat 59 C
NL-3038 SL Rotterdam (NL)

(74) Representative : **de Bruijn, Leendert C. et al**
Nederlandsch Octrooibureau
Scheveningseweg 82
P.O. Box 29720
NL-2502 LS Den Haag (NL)

(54) Self-regulating ventilation grille.

(57) The invention relates to a self-regulating ventilation grille, comprising a housing (30) having a top wall (1), a bottom wall (2), two end panels, a first longitudinal side (3) with inlet (4), and a second longitudinal side (5) with outlet (6), opposite the first longitudinal side, an essentially plate-shaped valve (7) being provided in the housing, extending between the end panels, for the purpose of regulating an passage opening (8), which valve at its end facing the longitudinal side with the outlet means is provided with a counterweight (9) and rests on a rolling face (10) curved towards the valve, along which face the valve rolls during the regulation of the passage opening, while eddy-breaking means (11) are provided in and/or after the passage opening (8). These eddy-breaking means preferably comprise at least one strip (11) extending between the end panels and preferably comprising sound-damping material.



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The present invention relates to a self-regulating ventilation grille, comprising a housing having a top wall, a bottom wall, two end panels, a first longitudinal side with inlet, and opposite the first longitudinal side a second longitudinal side with outlet, an essentially plate-shaped valve, being provided in the housing and extending between the end panels, for the purpose of regulating the passage opening for air, which valve at its end facing the longitudinal side with the outlet is provided with a counterweight and rests on a rolling face curved towards the valve, along which face the valve rolls during the regulation of the passage opening.

Such a self-regulating ventilation grille is known from EP-A-0,503,722. This ventilation grille has the disadvantage that the essentially plate-shaped valve flaps to and fro. This flapping to and fro occurs already at a pressure difference of approximately 1.5 Pa. As a result of this flapping to and fro, a sort of "pumping action" which is not damped out occurs. This flapping to and fro of the valve has a negative effect on the regulating characteristic of the output of the ventilation grille. Furthermore, this flapping can cause undesirable noise.

The object of the present invention is to offer a solution to the abovementioned disadvantages. This object is achieved according to the invention through the fact that eddy-breaking means are provided in and/or after the passage opening. Eddies are present in and after the passage opening, below the valve. Surprisingly, it has been found that breaking these eddies counteracts flapping of the valve, and can even prevent it completely.

It has been found very advantageous according to the invention if the eddy-breaking means comprise at least one strip or lamella extending between the end panels. Such a strip or lamella, in the form of, for example, an essentially rectangular plate is easy to fit in the ventilation grille. Such a strip is preferably fitted in such a way that when the valve is closed it is in a position essentially at right angles to the plane of the valve. Such a strip can either be immovably fixed to the housing or immovably fixed to the underside of the valve. A combination is also conceivable, in other words, one or more strips immovably fixed to the housing, and one or more strips immovably fixed to the valve.

For good breaking of the eddies, it is very advantageous according to the invention if the edges of a strip or lamella are formed so that they are sharp. For example the edges are sharp if they are not rounded, so that the strip can be of a rectangular cross-section with sharp edges. But it is also possible to provide the strip with a sharp edge by providing a V-shaped longitudinal edge.

It is also advantageous according to the invention if the positioning of the strip(s) or lamella(e) is such that it counteracts direct radiation of sound from the inlet means to the outlet means. When such a self-regulating ventilation grille is installed in, for example, a window of a building, the penetration of sound from the outside into the building is counteracted in a simple way. In order to increase this sound damping, it is very advantageous according to the invention if a strip or lamella comprises sound-damping material. In this case said sound-damping material can be provided as a covering on the strip, but the strip itself can also be made of sound-damping material.

It is also advantageous according to the invention if the ventilation grille comprises a number of strips fitted essentially parallel to each other. Fitting a number of strips parallel to each other in the passage opening after/below the valve produces very good eddy-breaking, and also counteracts the direct inward radiation of sound.

In the case of a self-regulating ventilation grille of the type described above, in which a distribution plate is placed in the inlet, dividing the inlet opening into an upper passage for a pressure-building flow to the top side of the valve and a lower passage for the ventilation flow through the passage opening, and in which the distribution plate comprises a part pointing upwards and slanting into the housing, it is very advantageous if this slanting part is formed in such a way, preferably curved like the arc of a circle, that the upper passage gradually narrows from the outside inwards. This gradual narrowing, which is desirable for the build-up of pressure above the valve, means that the pressure difference over the grille (i.e. the pressure difference between the longitudinal side with inlet and the longitudinal side with outlet) is utilized as much as possible to make the valve react already when there are small pressure differences, and it means that the occurrence of eddies in the pressure-building flow to the top side of the valve is counteracted. If this slanting part is suitably formed, which will depend, inter alia, on the dimensions of the self-regulating ventilation grille, the response sensitivity of the valve can be very small, for example about 0.5 Pa. Where pressure differences over the grille are small, essentially a pressure-building flow passes through the upper passage, and where there are greater pressure differences, this pressure-building flow, via the opening between the downward moved end of the valve and the distribution plate, will partly join the ventilation flow and thus contribute to the ventilation.

It is also advantageous according to the invention if the end of the distribution plate situated in the housing lies higher than the end of the valve situated in the inlet opening when the valve is fully open. In this way, when the valve is fully open (as indicated by dashed and dotted lines), a flow between the end of the valve situated at the inlet opening and the distribution plate is counteracted, in such a way that the pressure-building flow is utilized as much as possible for the

response sensitivity of the valve. In this way, the occurrence of eddies when the valve is fully open is also counteracted.

In an advantageous embodiment of the self-regulating ventilation grille according to the invention, the valve and the rolling face are each provided with teeth, which are disposed in such a way that these teeth mesh with each other when the valve is rolling along the rolling face. Such teeth advantageously prevent the valve from sliding along the rolling face.

The present invention will now be explained in greater detail with reference to a drawing.

The figure shows a cross-section of a self-regulating ventilation grille according to the invention. This ventilation grille comprises a housing 30 with a top wall 1, a bottom wall 2, 32, two end panels (not shown) lying in the plane of the drawing, a first longitudinal side 3 with inlet 4, and a second longitudinal side 5 with an outlet 6, situated opposite the first longitudinal side. The housing 30 contains an essentially plate-shaped valve 7 for regulating the passage opening 8. At its end facing the longitudinal side 5 with the outlet, the valve 7 is provided with a counterweight 9 and rests on a rolling face 10 provided on a profiled part 31, which rolling face is curved towards the valve 7. Said rolling face 10 is provided with teeth 17, and the valve 7 is provided at the rolling face with matching teeth 18. These teeth 17 and 18 are provided in such a way that they mesh with each other when the valve is rolling along the rolling face. The valve 7 is movable between two end positions, a closed position shown by solid lines, and a fully open position shown by dashed and dotted lines. In the fully open position, the passage opening is open over the distance Z.

Eddy-breaking means, in the form of strips (or lamellae) 11 extending between the end panels, are fitted after the passage opening 8 under the valve. The precise positioning and the shape and the number of strips 11 depends, inter alia, on the dimensions of the parts of the ventilation grille. In the example of an embodiment shown, three strips 11 are disposed parallel to each other, in such a way that when the valve 7 is closed, the strips 11 just fall short of touching said valve. A sharp point 12 is formed at the underside of the strips 11. In the example of an embodiment shown, the strips 11 are secured to the housing, so that their position is fixed. However, it is very conceivable to attach the strips to the underside of the valve 7, so that the strips 11 move with the valve.

If the strips 11 are suitably positioned, they will effectively counteract the occurrence of eddies, as indicated by dashed lines 41, below the valve 7, with the result that the eddies will no longer cause the valve 7 to vibrate (flap to and fro).

As can also be seen from the figure, the positioning of the strips 11 means that direct sound radiation from longitudinal side 3 to longitudinal side 5 is virtually impossible. As a result, the penetration of sound through the ventilation grille is counteracted. This penetration of sound can be counteracted further by making the strips 11 of sound-absorbing material, or covering them with such a material.

The inlet 4 of the ventilation grille consists of an upper passage 14 for a pressure-building flow to the top side of the valve 7 and a lower passage 15 for the ventilation flow through the passage opening 8 to the outlet 6. The outlet 6 preferably consists of a grille 6 serving as a screen. Said grille 6 is preferably fixed by means of snap connections 21 and 22 to the bottom wall 2 and the top wall 1 respectively of the housing 30.

The top wall 1 ends at the longitudinal side 3 with the inlet in a downward slanting rain cap 20.

The shape of the inlet 4 is extremely important for good functioning of the self-regulating ventilation grille. On the one hand, the incoming air flow has to be divided into a pressure-building flow to the top side of the valve 7 and a ventilation flow through the passage opening to the outlet 6. For this purpose, provision is made for a distribution plate 13 extending between the end faces, which divides the inlet opening into an upper passage 14 for the pressure-building air flow and a lower passage 15 for the ventilation flow. In the case of small pressure differences over the grille, in the main a pressure-building flow passes through the upper passage 14, but at greater pressure differences, said pressure-building flow will, by way of the opening between the downward moving end 27 of the valve 7 and the distribution plate 16, partially join the ventilation flow and thus contribute to the ventilation. In the case of an air flow pushed upwards along the walls of, for example, a block of flats, in order to fill the chamber 25 above the valve 7 sufficiently, rain cap 20 projects over a distance X beyond the distribution plate 13. The part 26 projecting from the bottom wall 2 onwards projects just far enough to ensure that during such an upward air flow the flow resistance of the ventilation flow is sufficient to prevent the latter from flowing directly against the underside of valve 7 and making said ventilation flow slightly diffuse.

For a good pressure-building effect in chamber 25 above the valve 7, it is important for the upper passage 14 to narrow. For good functioning of the ventilation grille, this narrowing must be gradual, in such a way that, inter alia, the total pressure difference over the grille is utilized as much as possible to set the valve in motion, and the occurrence of eddies in the chamber 25 above the valve 7 is counteracted. Such eddies could cause a vibrating movement in the valve which is difficult or impossible to damp out. It is also important that the slanting part 16 of distribution plate 13 should end at least slightly higher than the end 27 when the valve 7 is fully open, as indicated

by Y. The gradual narrowing of the upper passage is advantageously caused by making the slanting part 16 of the distribution valve 13 curved in the shape of an arc of a circle, as can be seen in the figure.

In order to be able to close the ventilation grille fully by hand, a rod 24 is provided between the end panels, which rod can be moved downwards by means of an operating mechanism (not shown), in such a way that it pushes the valve 7 shut.

The passage opening 8, which determines the ventilation, can be reduced by means of a flexible element 23. Said flexible element 23, which is fixed to the bottom wall 2 at 28, can be bent or pivoted upwards in the direction of arrow A by means of a mechanism not shown. The passage opening 8 can be, for example, halved in this way.

Fixing means 19 are provided on the top wall 1 and bottom wall 2, by means of which the ventilation grille can be fixed in, for example, a window frame.

For the mode of operation of the ventilation grille described here, you are referred to EP-A-503,722. The ventilation grille according to the present invention can operate in, for example, a pressure difference regulating range of 0-20 Pa, with a response sensitivity of only 0.5 Pa, without the valve going into a vibration which cannot be damped out. In the case of a ventilation grille according to EP-A-503,722 a pressure difference of 1.5 Pa already leads to undesirable vibrations of the valve.

It is pointed out that, as can be seen from the figure, the cross-section shapes of the profiles for the top wall 1 and the bottom wall 2 of the housing are the same. This means that one mould will be sufficient for the extrusion of such top and bottom walls.

According to a particularly advantageous embodiment, the ventilation grille according to the invention is made up of two parts. The first part comprises the housing with, inter alia, top wall 1, to which rain cap 20 is fixed, bottom wall 2, snap-on screen-type longitudinal side 5, and distribution plate 13. The second part comprises the control unit with, inter alia, valve 7, operating mechanism 24, top profile 31, and bottom profile 32. Top profile 31 and bottom profile 32 are in this case connected to each other by means of the end panels (not shown). The top wall 1 and bottom wall 2 may be connected to each other in a similar way if desired, by means of end panels (not shown). In the case of such a ventilation grille the control unit can be placed as one assembled unit in the housing through the outlet side, following which the screen 6 can be snapped onto the housing. In this case, the housing can be, for example, 3 m long (viewed at right angles to the surface of drawing in the figure), and the control unit can be 0.55 m. In this way it is possible to design, for example, a 0.55 m long control unit for the ventilation requirements for, for example, two persons, which unit can subsequently be placed in a housing with a length depending on the width of the window frame (for example, 3 metres). The remaining part of the housing is armoured in this case, in such a way that the passage between inlet side and outlet side is shut off, and the ventilation thus takes place only by way of the control unit. If the ventilation in the room to be ventilated has to be adapted to more than two persons, it is, of course, possible to place two or more control units, designed for two persons, in one housing. Where there is an odd number of persons, the flexible element 23 of one of the control units can then be bent upwards, with the result that the maximum width of passage is halved. Moreover, a separate control unit can be designed for any desired number of persons. If a facility for separate installation is not necessary for the control unit, it is, for example, possible to leave out bottom profile 32, and the end faces of the housing, for example, can serve as the end panels.

Claims

1. Self-regulating ventilation grille, comprising a housing (30) having a top wall (1), a bottom wall (2), two end panels, a first longitudinal side (3) with inlet (4), and a second longitudinal side (5) with outlet (6), opposite the first longitudinal side, an essentially plate-shaped valve (7), being provided in the housing, and extending between the end panels, for the purpose of regulating a passage opening (8), which valve at its end facing the longitudinal side with the outlet means is provided with a counterweight (9) and rests on a rolling face (10) curved towards the valve, along which face the valve rolls during the regulation of the passage opening, characterized in that eddy-breaking means (11) are provided in and/or after the passage opening (8).

2. Self-regulating ventilation grille according to Claim 1, characterized in that the eddy-breaking means comprise at least one strip (11) extending between the end panels.

3. Self-regulating ventilation grille according to Claim 2, characterized in that a strip (11) is fitted in such a way that, when the valve (7) is closed, said strip is in a position essentially at right angles to the valve.

4. Self-regulating ventilation grille according to one of Claims 2 - 3, characterized in that a strip (11) is immovably fixed to the housing (30).

5. Self-regulating ventilation grille according to one of Claims 2 - 4, characterized in that a strip (11) is immovably fixed to the underside of the valve (7).

6. Self-regulating ventilation grille according to one of Claims 2 - 5, characterized in that the edges (12) of the strip (11) are sharp.

7. Self-regulating ventilation grille according to Claims 2 - 6, characterized in that the positioning of the strip(s) is such that it counteracts direct radiation of sound from the inlet (4) to the outlet (6).

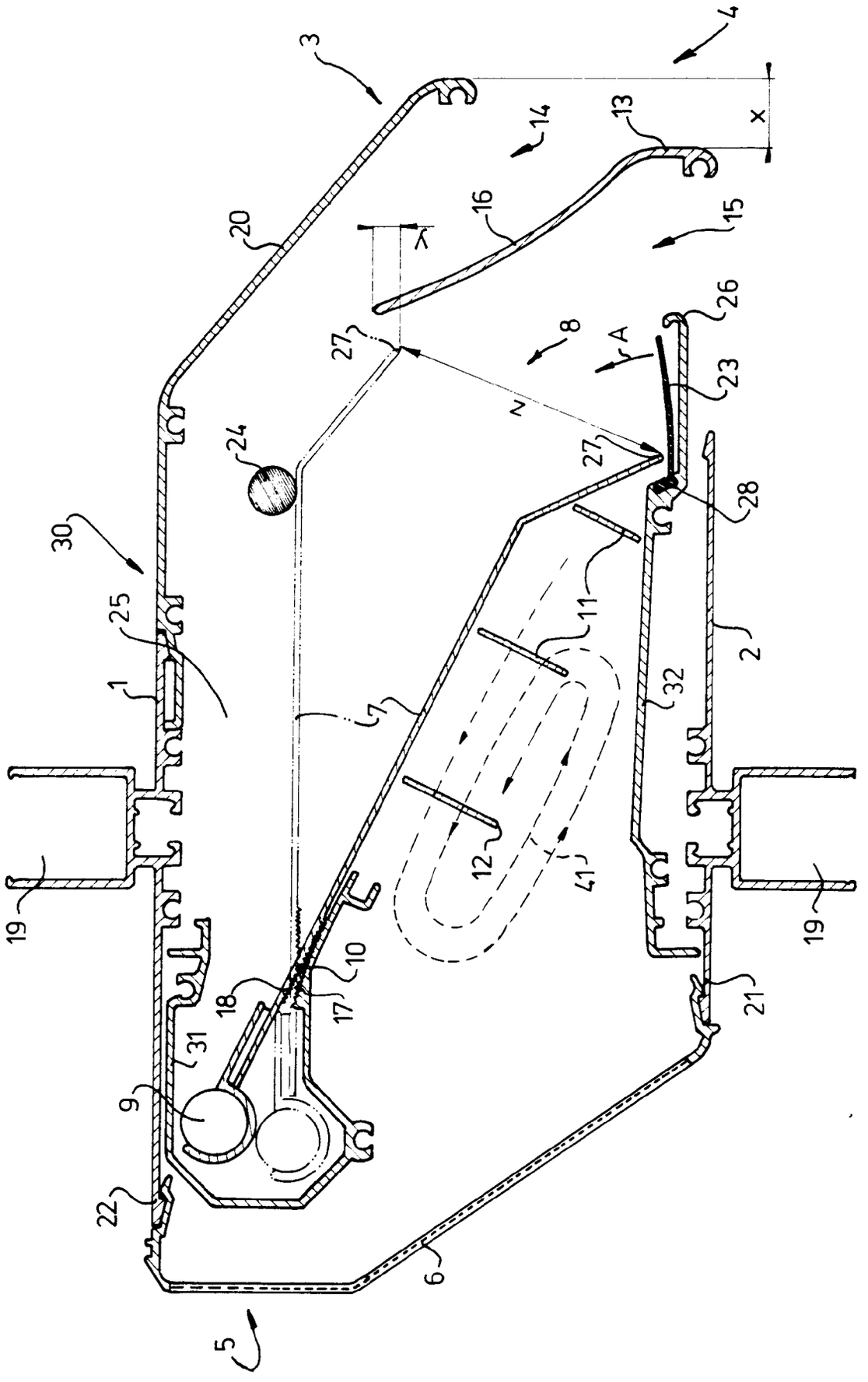
8. Self-regulating ventilation grille according to one of Claims 2 - 7, characterized in that a strip comprises sound-damping material.

9. Self-regulating ventilation grille according to one of Claims 2 - 8, characterized in that it comprises a number of strips fitted essentially parallel to one another.

10. Self-regulating ventilation grille according to one of the preceding claims, in which a distribution plate (13) is placed in the inlet (4), dividing the inlet opening into an upper passage (14) for a pressure-building flow to the top side of the valve (7) and a lower passage (15) for the ventilation flow through the passage opening (8), and in which the distribution plate comprises a part (16) pointing upwards and essentially slanting into the housing, characterized in that this slanting part (16) is formed in such a way, preferably curved in the shape of an arc of a circle, that the upper passage (14) gradually narrows from the outside inwards.

11. Self-regulating ventilation grille according to Claim 9, characterized in that the end of the distribution plate (13) situated in the housing lies higher than the end (27) of the valve (7) situated at the inlet opening when the valve (7) is fully open.

12. Self-regulating ventilation grille according to one of Claims 1 - 11, characterized in that the valve and the rolling face (10) are each provided with teeth (18, 17 respectively), which are provided in such a way that these teeth (17, 18) mesh with each other when the valve (7) is rolling along the rolling face (10).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EUROPEAN SEARCH REPORT

Application Number
EP 94 20 0033

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.5)
D,A	EP-A-0 503 722 (T.N.O.) * abstract; figure 1 * -----	1	F24F11/047 F24F13/24
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 April 1994	Peschel, G

CATEGORY OF CITED DOCUMENTS

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