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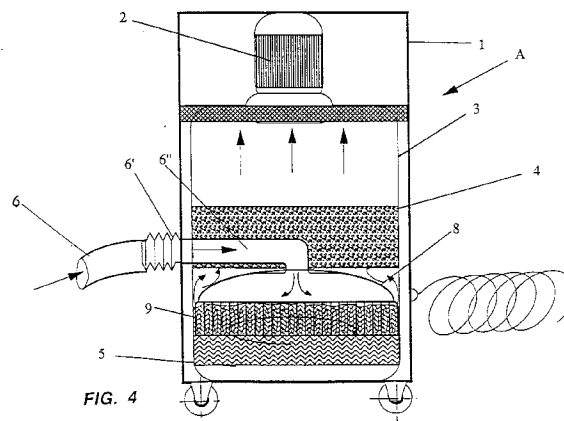
**54 A vacuum cleaner and relative filter system.**

**57** Improvement to an apparatus specifically a vacuum cleaner (1) and relative filter, of the type comprising a body which supports a unit used for suctioning the external air through a nosepiece, thus conveying it to the interior of a container (3) in order to be filtered, such that in the interior of the said container is provided :

— a primary filter (8), being composed of an air distribution device (8"-9) at least partially submerged in a quantity of water (5) contained in the underlying reservoir (3), said device being directly connected to the suction manifold (6") of air drawn from the exterior ;

— a secondary filter (4), being placed above and in proximity to the said distribution device of the suctioned air, the said filter being obtained from processed vegetable or animal fibres ;

— of water (5) previously introduced into the underlying reservoir and which may be topped up, the level of water submerging at least partially the said distribution device.



This invention has for object an improvement to an apparatus specifically a vacuum cleaner and relative filter.

The invention finds particular even if not exclusive application in the sector of electrical appliances for cleaning of surfaces in various environments, and at the same time as an air purifier.

At the present stage of technology, vacuum cleaner apparatuses are well known. The more traditional ones may be composed essentially of an external coat or body, supported by feet or rotating wheels, inside of which body is a power unit consisting of a suction motor or vacuum pump. The said pump, by suctioning through a nosepiece handhold by the user, the external air which is in proximity to the surfaces being treated, allows, depending on necessity, the cleaning of dust from carpets, mats, reedmatting, and similar articles. The air so suctioned by the pump is first passed through at least one filter, which generally consists of the dustbag itself, and then once filtered is returned to the surrounding environment. The dustbag-filter is made of a particular type of fine-meshed cloth, allowing in such a way the flow of the suctioned air, but retaining inside the large dust particles and grit generally.

In the situation described above different drawbacks are noticeable. Amongst these is notable the fact that a careful cleaning of the surface undergoing treatment is not possible, but what is worse is that to the air is returned an enormous quantity of superfine dust that once vacuumed and removed may not be retained within the traditional dustbag-filter. Furthermore it is a somewhat common opinion that this dust would appear to be the cause of the numerous allergies noticeable in the those living within domestic walls, for example rhinitis, asthma, and others.

A recent solution to the aforesaid problems has consisted in providing, in combined form with a traditional vacuum cleaner, a device used for washing the said surfaces. More particularly the said apparatus consists always of a movable body to which is attached a motor suction unit, and inside of which body is a reservoir that contains water. The air, together with the water distributed by a delivery device attached to the nosepiece, is successively suctioned and then introduced to the interior of the said reservoir. Here, a type of perpendicular fan, being placed in connection with the exit hole of the suctioned air, by rotating creates a vacuum, which whilst obstructing the entry of the dust, at the same time agitates both the water and the air. One will obtain in such a way, due to its catalytic effect, a precipitation of the dust in the water, discharging to the surrounding environment only air purified from such residues.

However even in this case some drawbacks are noticeable, the first being that the aforesaid apparatus cannot operate exclusively as a vacuum cleaner. Secondly, when treating surfaces with liquids, these

surfaces remain somewhat damp, even if only for a short period, and this limits the usefulness and field of application of the apparatus. Thirdly but not lastly it is a somewhat complex apparatus that does not allow to further optimise the function of filtering the suctioned air.

The Patent Application for industrial invention "IT-TV91A000117" filed in the name of the same applicant, has for object an apparatus, specifically a vacuum cleaner and relative filter, in which is provided a body for the support of a suction unit, and a reservoir, inside of which, placed above and in contact with the water previously introduced therein, and also in proximity to the suction mouth, is a filter, said filter being obtained from processed vegetable or animal fibres.

The aim of the present invention is to realise an improvement to the patent application, "IT-TV91A000117", and also to remedy the possible drawbacks noticeable in it.

This and other aims are achieved with the present innovation according to the characteristics of the attached claims, solving the disclosed problems by means of an improvement to an apparatus, specifically a vacuum cleaner and relative filter, of a type comprising a body for the support of a suction unit which suctiones the external air through a collecting nosepiece, conveying it to be filtered to the inside of a container, and inside of which container is provided:

- a primary filter, being composed of an air distribution device at least partially submerged in a quantity of water contained in the underlying reservoir, said device being directly connected to the suction manifold of air drawn from the exterior.
- a secondary filter, being placed above and in proximity to the said distribution device of the suctioned air, said filter being obtained from processed vegetable or animal fibres;
- of water previously introduced into the underlying reservoir, and which submerges at least partially the said distribution device.

In such a way, through the important creative contribution whose effect constitutes an immediate technical progress, different advantages are obtained, amongst which is firstly the capacity to achieve a double use, on one side optimizing the function of a vacuum cleaner, on the other performing the task of an air purifier, above all by retaining the superfine dust particles. It presents itself, finally, as an extremely sensible apparatus, and flexible in its multiple applications.

These and other advantages will become obvious from the following detailed description of the preferred solutions of execution and with the help of the attached schematic designs, the details of execution of which are not to be considered limiting but only illustrative.

Figure 1 represents a view in perspective and from the lower side, of an air filter to be utilised inside the vacuum cleaning apparatus.

Figure 2 represents a view in perspective of a component, the first filtration device, in particular the air distribution device.

Figure 3 represents a view from below of the component of the previous Figure.

In Figure 4, finally, is represented the internal part of a vacuum cleaning apparatus, in which is used the filter of Figure 1. and the filtration device illustrated in the two successive Figures.

Also by making reference to the Figures, it is revealed that an apparatus (A) specifically a vacuum cleaner and air purifier, is composed essentially of a body (1) which supports a suction unit (2). The suction unit (2) of the known type, provides for a vacuum pump which creates a vacuum in the underlying area, in such a way conveying to the inside of the apparatus (A) the air mixed with the dust removed and collected from the exterior by the user through the corresponding and noted nosepiece (6). Inside the body, (1) and in this case underlying the suction unit, (2) there is a container (3) for filtration of the air first suctioned and then conveyed to the interior, and which is then returned for circulation to the surrounding environment. The nosepiece for the collection of the external air (6) is connected to a coupling (6') keyed to the container, on which in turn a manifold (6'') joins to provide a duct that conducts directly, through an aperture (10) made on the bottom of the distribution device (8), to the first filtration device. The air distribution device (8) is composed, more particularly, of a structure, preferably made of a plastic material, and similar in shape to a small upturned basin, the base of which forms a dome (8') whilst the walls (8'') of the basin perimeter are arranged almost parallel with and in proximity to the internal walls of the water reservoir (5). The walls (8'') are almost submerged and have multiple longitudinal holes (9) through which flows, all around the small basin (8), the air so introduced. The air, sucked through the nosepiece (6) is introduced directly into the small domed basin (8) which, being partially submerged, will allow the air to flow in the direction of the following filter (4), first passing peripherally under the level of the water provided (5). The filter (4) rests on the air distribution device (8) which is partially submerged in a reservoir containing water (5) which can be topped up or replaced depending on necessity, by way of the appropriate means provided for this purpose. The filter (4) has a cylindrical section at least equal in diameter to that of the water reservoir (5), and is placed with one side in contact with the dome (8') of the said small basin (8) upturned in the reservoir. (3). The structure of the filter (4) consists of a mesh of interwoven fibres, preferably coconut fibre but not excluding synthetic fibres, obtained by way of a moulding process. The said

process provides substantially for the preparation of a slurry composed of filamentous coconut fibres and of a binder, which may be glue. The whole is then cast into a mould and relative counter-mould, eventually undergoing thermoforming, after which it will be extracted, and finally dried. The structure of the filter (4) thus obtained is such as to provide a smooth upper side, on which, extending along the perimeter for some centimetres, are dug out perpendicularly two diametrically opposed recesses (7) that allow for the insertion of fingers to extract the filter (4) from the machine body (1). Finally, the underside (4') of the filter (4) provides an area expressly shaped for housing at least partially the duct (6'') joining the suction tube (6) with the distribution device (8).

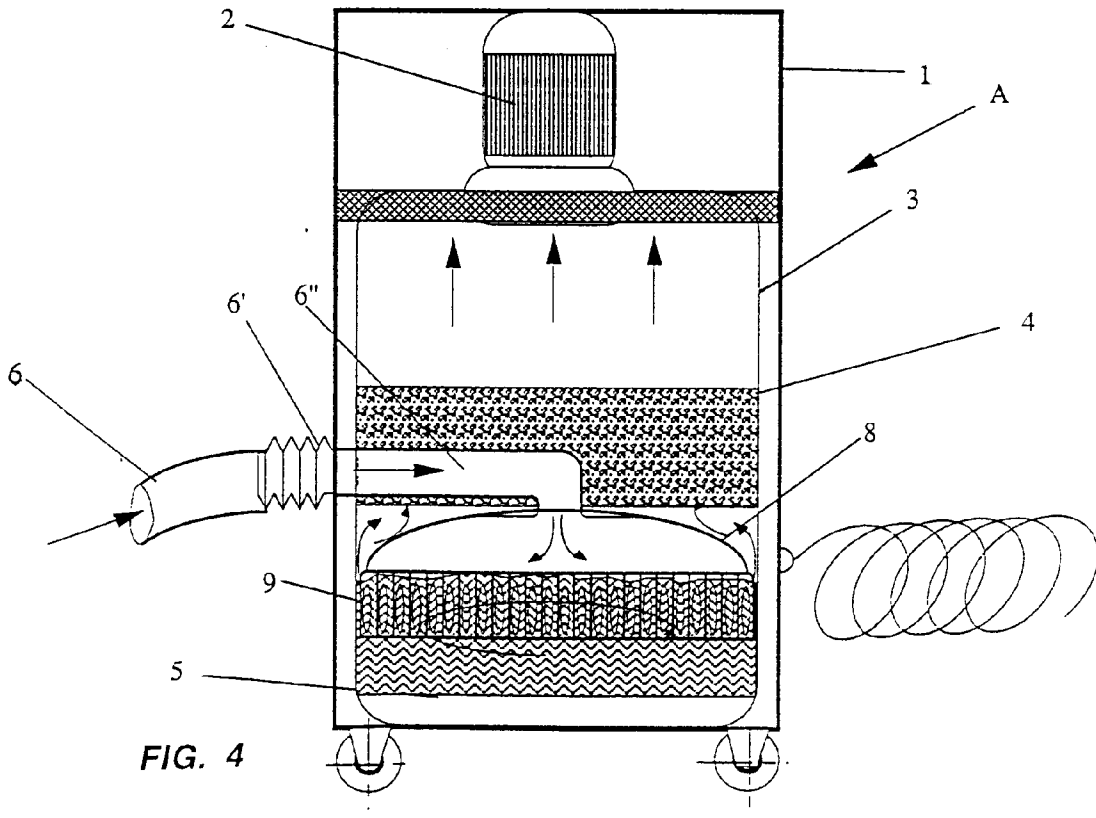
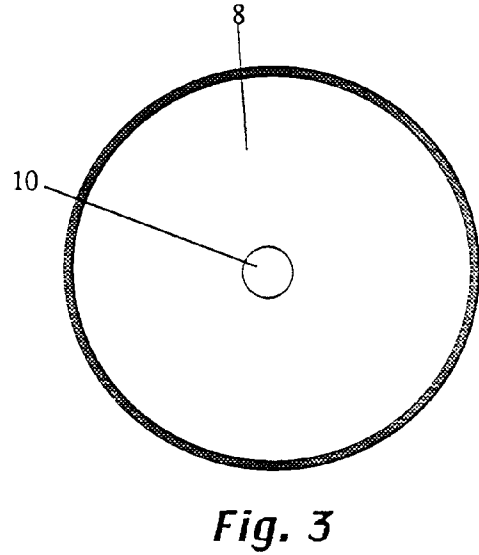
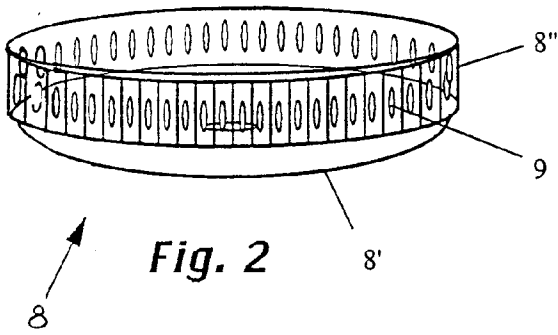
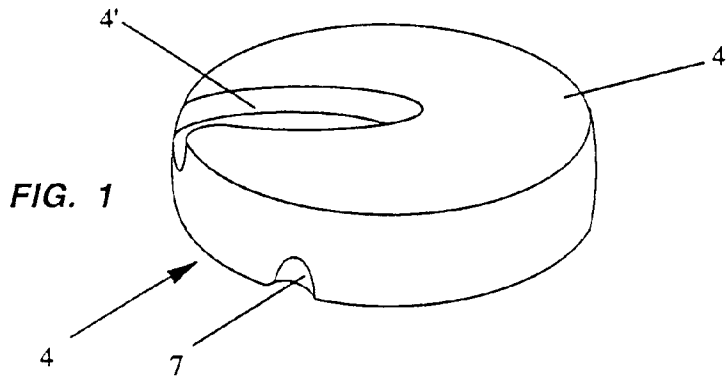
### Claims

1. Improvement to an apparatus specifically a vacuum cleaner and relative filter system, of the type comprising a body which supports a unit used for suctioning the external air via a collecting nosepiece, thus conveying it inside a container in order to be filtered, characterised in that inside the said container is provided:
  - a primary filter (8) composed of an air distribution device (8''-9) at least partially submerged in a quantity of water (5-9) contained in an underlying reservoir (3), said device being directly connected to a suction pipe for air drawn from the exterior (6-6'-6'').
  - a secondary filter (4), placed above and in proximity to the said distribution device (8-9) of the suctioned air (6), the said filter (4) being obtained from processed vegetable or animal fibres.
  - a quantity of water (5), previously introduced into the said reservoir (3) and which may be topped up, the level of water submerging at least partially (8''-9) the said distribution device (8).
2. An improvement to an apparatus according to claim 1., characterised by the said suction pipe (6) that conveys to the interior of said container (3), the mixed air and dust removed and collected from the exterior in order to be filtered, by:
  - a first filtration device comprising a manifold (6'') that is connected to the said suction pipe used for collecting the external air (6), and which outputs into the said air distribution device (8) partially submerged in the water (5) contained in said container (3);
  - and by a secondary filter (4) placed above the first, and composed of a preformed mesh of interwoven fibres.

3. An apparatus according to claims 1. and 2., characterised in that the said air distribution device (8) is composed of a structure similar in shape to a small upturned basin, the base of which forms a dome (8') whilst the walls of its perimeter (8'') are arranged almost parallel with and in proximity to the internal walls of said water container (5). 5
4. An apparatus according to previous claims, characterised in that the walls (8'') of the said air distribution device (8) are almost submerged and have multiple longitudinal holes (9) through which is discharged all around from inside the said distribution device (8), the air so introduced. 10  
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5. Filter according to claims 1. and 2, characterised in that the structure of the said secondary filter (4) is composed of a mesh of interwoven fibres, preferably coconut fibre, obtained by the process of moulding a slurry consisting of filamentous coconut fibres and a binder, which may be glue. 20
6. A filter that, according to the previous claims, characterised in that it presents a cylindrical section at least equal in diameter to that of the said water container (5), said filter being placed with one side touching the coupling (6) of the inlet of the air suctioned through said manifold (6) and then into said container (3). 25  
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7. A filter according to previous claims, characterised in that the upper side of the said air distribution device is smooth (8) , whilst the underside, corresponding to the side being in contact with the water (5), provides an entrance dome (8') which has an impermeable surface, and that is placed in connection with the coupling(6') of the air inlet of the apparatus, and in which the said entrance dome (8') has a spiral conformation to produce a cyclone or vortex. 35  
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8. A filter according to previous claims, characterised in that, extending for some centimetres along the upper perimeter, there are two diametrically opposed recesses (7). 45

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EUROPEAN SEARCH REPORT

Application Number

EP 93 10 0401

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)
X A	NL-C-32 508 (H. KOHL) * the whole document * ---	1,2,7 3-6	A47L9/18
X	DE-C-588 379 (H. KOHL) SPECIALLY PAGE 1 LINES 60-63 * the whole document * ---	1-3	
A	WO-A-9 110 392 (H. ZENGERER) * the whole document * ---	1,2,6,7	
A	US-A-2 954 095 (C.A. BROCK) * figure 1 * ---	1,2	
X	PATENT ABSTRACTS OF JAPAN vol. 14, no. 077 (C-0688)14 February 1990 & JP-A-12 93 831 ( SANYO ELECTRIC CO LTD ) * abstract * ---	1,2	
A	PATENT ABSTRACTS OF JAPAN vol. 2, no. 142 (M-041)24 November 1978 & JP-A-53 112 571 ( TOKYO ELECTRIC CO LTD ) * abstract * -----	5	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A47L
Place of search THE HAGUE		Date of completion of the search 26 MARCH 1993	Examiner M. VANMOL
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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