



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
26.06.2002 Bulletin 2002/26

(51) Int Cl.7: **A47L 11/30**, A47L 11/34,
A47L 9/06

(21) Application number: **00204747.0**

(22) Date of filing: **22.12.2000**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**
Designated Extension States:
AL LT LV MK RO SI

(72) Inventor: **Kjelgaard, Anders H.**
8850 Bjerringbro (DK)

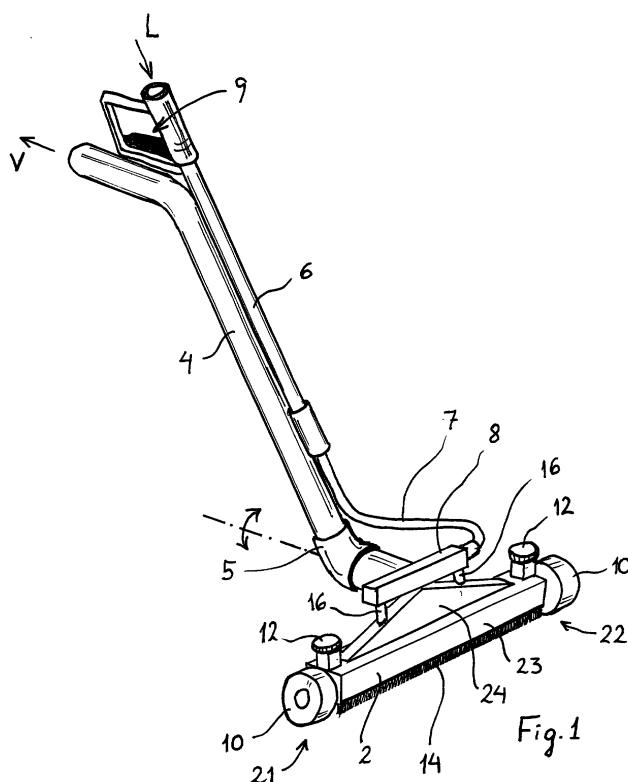
(74) Representative: **Elmeros, Claus**
Patentgruppen ApS,
Arosgaarden,
Aaboulevarden 31
8000 Aarhus C (DK)

(71) Applicant: **Nilfisk-Advance A/S**
2605 Brøndby (DK)

(54) **A cleaning head for a surface cleaning apparatus**

(57) The invention relates to a cleaning head for a surface cleaning apparatus comprising an elongated housing (2) with a vacuum chamber (3) having an open bottom (25) and an exhaust opening (18) with means for applying vacuum, liquid spraying means including spraying nozzles (16) and means (6,7,8) for supplying a liquid from a high-pressure cleaning liquid source, said spraying nozzles (16) being arranged inside the vacuum chamber (3), roller support means (10) for supporting the head on the surface to be cleaned, wherein the roller

support means (10) being provided at each end (21,22) of the elongated housing (2) for providing a gap between the bottom (25) of the chamber (3) and the underlying surface, and the front and rear side edges of the bottom (25) of the chamber (3) being provided with air permeable liquid retention means (14) covering the gap. Hereby, the cleaning head according to the invention may easily be swept over a surface for cleaning this surface with both high-pressure cleaning releasing residues on the surface and vacuum cleaning.



Description

[0001] The present invention relates to a cleaning head for a surface cleaning apparatus, the head comprising a housing with an elongated vacuum chamber having an open bottom and an exhaust opening with means for applying vacuum, liquid spraying means including spraying nozzles and means for supplying a liquid from a high-pressure cleaning liquid source, said spraying nozzles being arranged inside the vacuum chamber, and roller support means for supporting the head on the surface to be cleaned.

[0002] A cleaning device of this kind is known from US-A-4,392,270. Herein, the cleaning apparatus comprises an array of spraying nozzles that are spraying water under pressure towards the surface to be cleaned at an inclined angle in order to dislodge residue from the surface. The residue is removed through the vacuum chamber. The open bottom of the vacuum chamber is inclined relative to the surface to be cleaned. The cleaning head as well as the entire apparatus may be moved and also tilted as wheels are provided behind the cleaning head.

[0003] Due to the partial vacuum in the vacuum chamber, the cleaning head will be sucked to the surface. This means that it becomes difficult if not impossible to move. By the known cleaning head, air from outside the vacuum chamber is also drawn into the chamber due to the inclined bottom opening of the vacuum chamber and the position of the wheels. However, this results in water being sprayed or flows outside the vacuum chamber.

[0004] It is clear that the amount of water escaping the vacuum chamber may be reduced the more air tight the contact between the vacuum chamber and the surface is. Other designs of cleaning heads with combined liquid spraying and vacuum cleaning are known from e. g. US-A-3,962,745 or US-A-3,958,298. However, nowhere in the art a suitable and effective balance between the prevention of water escaping the vacuum chamber and preventing the cleaning head from being sucked to the surface is found.

[0005] This problem may be reduced by reducing the suction force, i.e. the partial vacuum of the vacuum source. However, this leads to a less efficient cleaning apparatus and an increase in the likeliness that cleaning liquid is left on the surface as the suction applied is insufficient to lift it off the surface.

[0006] The known cleaning head is not appropriate for indoor application as the water must be manually removed afterwards. For indoor floor cleaning, polishing machines are known. These machines are limited in use as the machines are relatively bulky and unpractical for floor cleaning where it is necessary to clean in between obstacles. They are only suitable for large surfaces. However, it is desirable to be able to use a spray and vacuum cleaning apparatus similar in utility as a domestic vacuum cleaner with a mouthpiece or cleaning head so that it is possible to reach the sections of the floor

behind or underneath obstacles on the floor, e.g. furniture, fixed installations, etc.

[0007] Therefore, it is an object of the present invention to provide a cleaning head for a cleaning apparatus wherein the above mentioned drawbacks of the cleaning heads known in the art are reduced or even eliminated.

[0008] This object is achieved by a cleaning head of the initially mentioned kind, wherein the roller support means are provided at each end of the housing for providing a gap between the bottom of the chamber and the underlying surface, and the front and rear side edges of the bottom of the chamber are provided with air permeable liquid retention means covering the gap.

[0009] By the invention, the bottom of the vacuum chamber is slightly lifted above the surface by the roller means. This results in a gap that is covered by liquid retention means so that the cleaning liquid sprayed onto the surface is retained within the vacuum chamber. Since the retention means are air permeable, "false" air is drawn into the vacuum chamber whereby it is prevented that the suction head is sucked so firmly onto the surface that it is difficult or even impossible to sweep across the surface to be cleaned. As the roller means are positioned at each the side of the housing, it is ensured that the gap at the front and rear side of the vacuum chamber is substantially the same. Hereby, the cleaning head according to the invention may easily be swept across a surface for the cleaning of this surface with both high-pressure cleaning releasing residues on the surface and vacuum cleaning.

[0010] The cleaning head according to the invention may of course be used as a vacuum cleaner only or as a high-pressure cleaning only, besides the combined functions.

[0011] In the preferred embodiment of the invention, the water retention means are brushes that are provided along the front and rear side edges of the housing at the bottom of the chamber. Such lines of brushes are advantageous since they provide a flexible liquid retention cover where air is allowed to penetrate and that automatically adapt its shape to irregularities in the surface.

[0012] The liquid spraying means may further comprise a manifold communicating with one or more spraying nozzles arranged in the vacuum chamber. Hereby, the supply of cleaning liquid at high-pressure is distributed to the nozzles. The manifold may be connected via a flexible tube to the means for supplying the liquid. The cleaning liquid may be water or other cleaning solutions, depending on the required kind of cleaning.

[0013] In the preferred embodiment, the roller support means being adjustable in height relative to the bottom of the chamber. Hereby, the size of the gap between the vacuum chamber and the surface may be adjusted according to the nature and structure of the surface, the wear of the liquid retention means, the power of the vacuum source and other parameters in order to ensure that the cleaning head according to the invention may be

swept across the surface in a smooth and easy manner.

[0014] In the preferred embodiment, the means for applying vacuum includes a pipe conduct that is connected to the opening via an angular tube member mounted on the housing around the vacuum opening. Moreover, the angular tube member may be rotatably mounted on the housing around the opening. Hereby, the cleaning head or mouthpiece according to the invention is designed so that a relative small height is obtainable. This makes the mouthpiece particularly suitable for cleaning underneath and in between obstacles on the surface to be cleaned, e.g. permanently installed seats or the like.

[0015] In order to provide a cleaning head with a low weight, one or more parts of the housing, the liquid spraying means and the roller means are produced in aluminium and/or a plastic material.

[0016] In the preferred embodiment, the vacuum opening is positioned centrally in the top of the chamber and the spraying nozzles and the roller means are arranged symmetrically around said opening. Additionally, at least one spraying nozzle is arranged on each side of the opening directing essentially orthogonal liquid spray fans towards the surface to be cleaned, said spraying fans defining an unbroken spraying line on the surface. Hereby, an efficient design of the cleaning head is provided.

[0017] The invention is described in further detail in the following under reference to the drawings, in which:

- fig. 1 is a perspective view of a cleaning head according to a preferred embodiment of the invention,
- fig. 2 is a cross section front view of the cleaning head according to the invention,
- fig. 3 is a bottom view of the cleaning head according to the invention, and
- fig. 4 is a cross section side view of the cleaning head according to the invention.

[0018] Figure 1 shows a cleaning head according to the invention. The cleaning head comprises an elongated housing 2. The housing 2 is pivotably connected to a pipe member 4 via an tubular angular piece 5 that is rotatably mounted on the housing 2. The pipe member 4 is connected to a vacuum cleaner (not shown) that applies a partial vacuum (shown by the arrow V) to the cleaning head. The cleaning head is also provided with liquid spraying means including a supply pipe 6 that at one end is connectable to a high-pressure liquid source (indicated by the arrow L) and at the other end is connected via a flexible tube 7 to a manifold 8 that distributes the cleaning liquid at high-pressure to spraying nozzles 16. At the top of the cleaning head, a handle 9 for operating the spraying function is provided.

[0019] The mouthpiece housing 2 defines a vacuum chamber 3 (see figs 2 to 4) with an open bottom. The housing 2 consists of a lower box-like portion 23 and an upper triangular portion 24. The housing 2 is provided

with roller means 10 at the two sides 21, 22. The roller means 10 "lifts" the housing above the underlying surface creating a gap there between. Brushes 14 are provided along the front and rear of the bottom of the housing 2 filling the gap. The roller means 10 are mounted to the sides 21, 22 of the lower portion 23 of the housing 2 over adjustment means 12, so that the height of the open bottom of the housing 2 over the surface to be cleaned may be adjusted (see also figs. 2 and 4). In the shown embodiment, the roller means essentially covers both the end sides of the gap. However, if deemed necessary, brushes may also be provided at the ends of the bottom edges of the housing.

[0020] In fig. 2, the mouthpiece of the cleaning head is shown in more detail. In the housing 2, a vacuum chamber 3 is formed having an open bottom 25. In upper triangular portion 24, the spraying nozzles 16 are arranged, preferably symmetrically around the opening 18 that is connected to the tubular angular piece 5 and the pipe member 4 (see also fig. 1). The vacuum chamber 3 is formed in both the upper and lower portion 23, 24. The vacuum chamber 3 serves also as a spraying chamber. The spraying nozzles 16 are supplied with cleaning liquid at high pressure through the manifold 8 that is positioned above the housing 2. As indicates in fig. 2, the nozzles 16 produce spraying fans F that at the surface to be cleaned produces a "spraying line" that expends across the entire vacuum chamber 3. The nozzles 16 are designed in such a way that the produced spraying fans F "just meet" each other or overlap slightly for producing the unbroken spraying line across the surface beneath the vacuum chamber 3.

[0021] At the edges of the housing 2, the vacuum chamber 3 is provided with the brushes 14 both at the front and rear, as shown in fig. 3 and 4.

Claims

1. A cleaning head for a surface cleaning apparatus comprising:

an elongated housing with a vacuum chamber having an open bottom and an exhaust opening with means for applying vacuum, liquid spraying means including spraying nozzles and means for supplying a liquid from a high-pressure cleaning liquid source, said spraying nozzles being arranged inside the vacuum chamber, roller support means for supporting the head on the surface to be cleaned,

characterised by

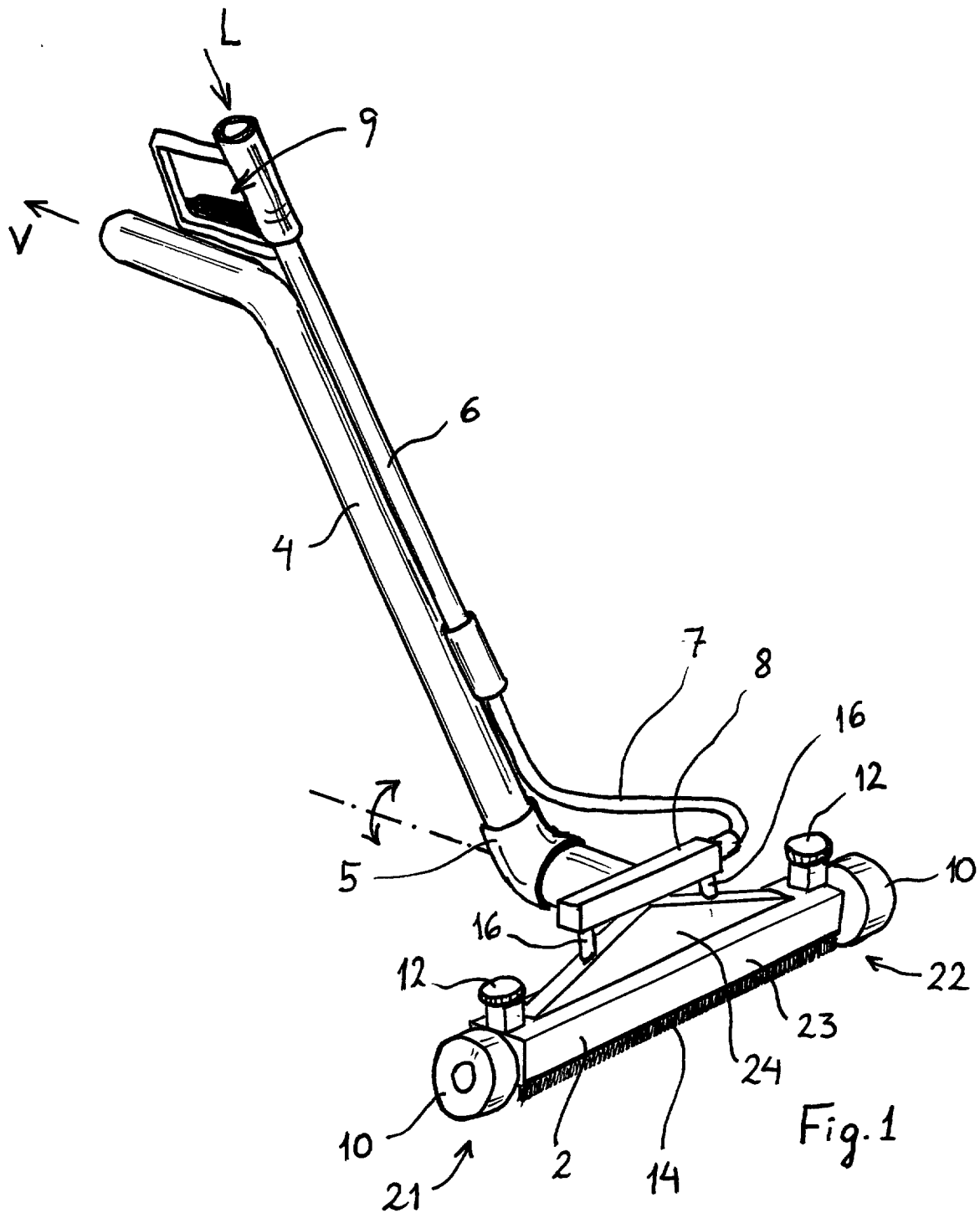
the roller support means being provided at each end of the elongated housing for providing a gap between the bottom of the chamber and the underlying surface, and

the front and rear side edges of the bottom of the chamber being provided with air permeable liquid retention means covering the gap.

2. A cleaning head according to claim 1, wherein the water retention means are brushes provided along the front and rear side edges of the housing at the bottom of the chamber. 5
3. A cleaning head according to claim 1 or 2, wherein the liquid spraying means further comprise a manifold communicating with one or more spraying nozzles arranged in the vacuum chamber. 10
4. A cleaning head according to any of the preceding claims, wherein the roller support means are adjustable in height relative to the bottom of the chamber. 15
5. A cleaning head according to any of the preceding claims, wherein the means for applying vacuum includes a pipe conduct that is connected to the opening via an angular tube member mounted on the housing around the vacuum opening. 20
6. A cleaning head according to claim 5, wherein the angular tube member is rotatably mounted on the housing around the opening. 25
7. A cleaning head according to any of the preceding claims, wherein one or more parts of the housing, the liquid spraying means and the roller means are produced in aluminium and/or a plastic material. 30
8. A cleaning head according to any of the preceding claims, wherein the vacuum opening is positioned centrally in the top of the chamber and the spraying nozzles and the roller means are arranged symmetrically around said opening. 35
9. A cleaning head according to any of the preceding claims, wherein at least one spraying nozzle is arranged on each side of the opening directing essentially orthogonal liquid spray fans towards the surface to be cleaned, said spraying fans defining an unbroken spraying line on the surface. 40
45

50

55



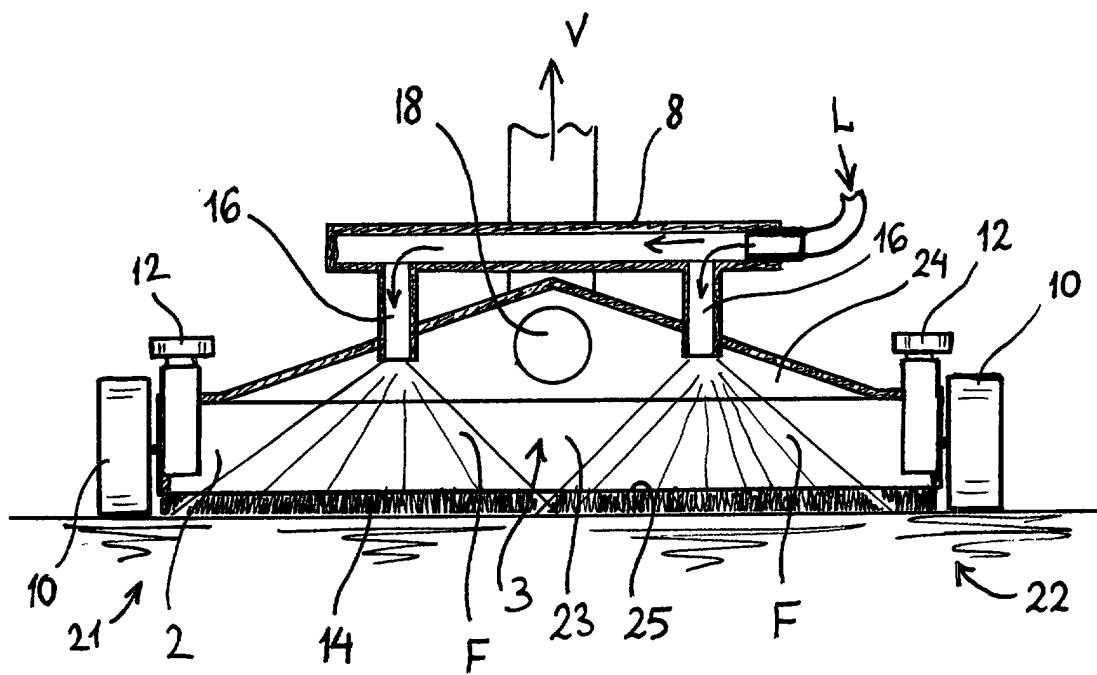


Fig. 2

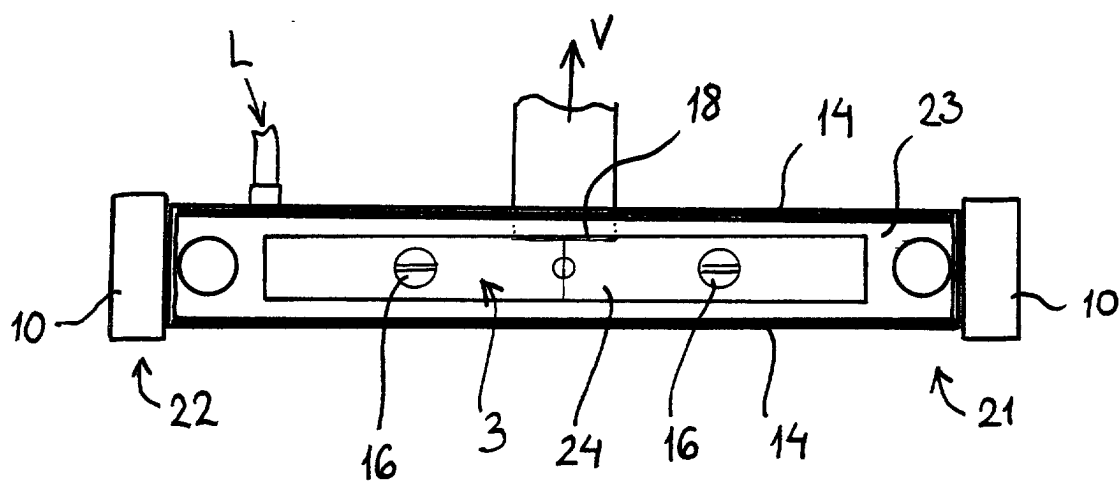


Fig. 3

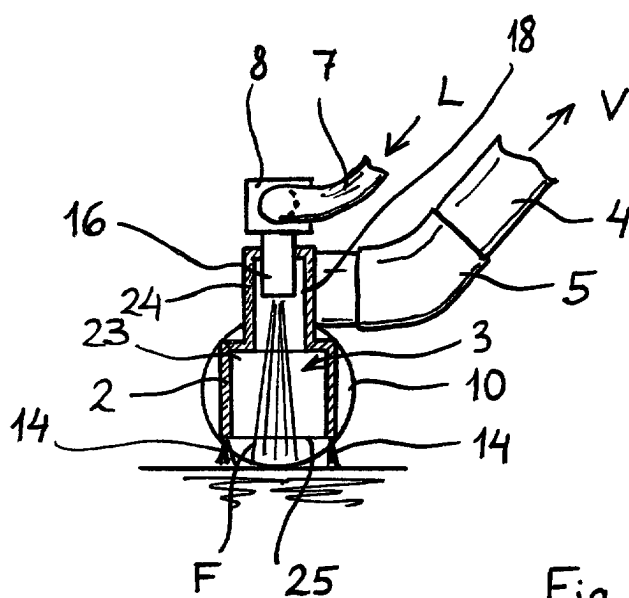


Fig. 4



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 20 4747

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.7)
X	WO 97 21378 A (HEIDT G) 19 June 1997 (1997-06-19) * abstract * * page 2, line 24 - page 4, line 4 * * page 5, line 9 - line 11 * * page 5, line 27 - line 29 * * figures * ---	1-6,8	A47L11/30 A47L11/34 A47L9/06
X	DE 298 03 826 U (HSB UMWELTECHNIK GMBH) 6 August 1998 (1998-08-06) * page 3, paragraph 1 - page 5, paragraph 2 * * page 2, paragraph 4 * * figures * ---	1,3,5,7-9	
A	US 3 939 518 A (WHITNEY R P ET AL) 24 February 1976 (1976-02-24) * the whole document * ---	7	
A	US 3 821 831 A (GROVER D) 2 July 1974 (1974-07-02) * the whole document * ---	7	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	EP 0 858 760 A (TECHNO FINISH GMBH) 19 August 1998 (1998-08-19) * the whole document * -----	7	A47L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 8 June 2001	Examiner Cabral Matos, A
CATEGORY OF CITED DOCUMENTS 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 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			

EPO FORM 1503 03 82 (PC4001)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 20 4747

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-06-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9721378 A	19-06-1997	DE 19546756 A	10-10-1996
DE 29803826 U	25-06-1998	NONE	
US 3939518 A	24-02-1976	NONE	
US 3821831 A	02-07-1974	AU 476787 B	07-10-1976
		AU 5589673 A	21-11-1974
		DE 2330867 A	17-01-1974
		GB 1433015 A	22-04-1976
EP 0858760 A	19-08-1998	DE 29702598 U	03-04-1997