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(54) **Dishwashing machine with pulsed water spray jets**

(57) A rotating spray arm (8) with main spray nozzles (10) and at least an auxiliary spray nozzle (12) is supplied by a circulation pump (13) through a sequence of alternating periods and pauses in which the pressure of the water supplying the rotating spray arm is at its

highest and its lowest value, respectively. A hydraulically operated valve (21) shuts off the auxiliary nozzle (12) during said pauses only.

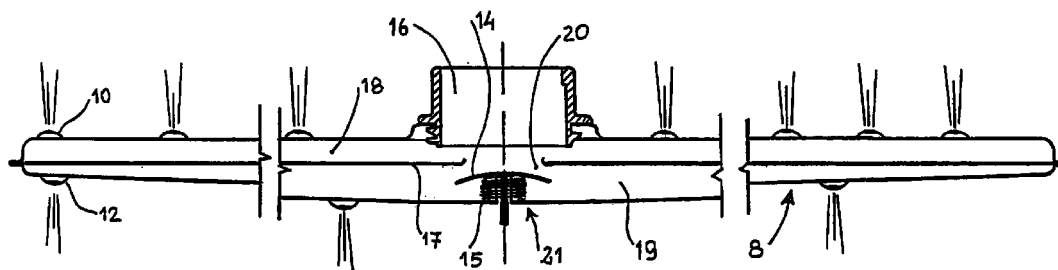


Fig. 4

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Description

[0001] The present invention relates to a dishwashing machine with pulsed washing water spray jets, which is capable of enabling energy usage in general to be reduced drastically.

[0002] A dishwashing machine of the above cited kind is known from US-A-5 525 161, in which the rotating spray arms are supplied by a circulation pump so as to issue, towards the dishes to be washed, respective pulsed water spray jets, ie. with an alternating sequence of periods and pauses in which the pressure of the water supplying said rotating spray arms is at its highest and its lowest value, respectively. In a preferred manner, during the above cited pauses the rotating spray arms issue low-pressure water spray jets so as to keep up an adequate operating effectiveness of the machine and lower the overall water-generated noise thereof.

[0003] However, to the purpose of supporting the various washload items, dishwashing machines generally comprise an upper rack and a lower rack, below which there is arranged an associated rotating spray arm with main nozzles adapted to issue washing water spray jets directed upwards. In order to ensure a more thorough washing action, at least one of said rotating spray arms also comprises auxiliary nozzles adapted to issue water spray jets that are directed downwards. This is normally applied to the upper rotating spray arm, in view of ensuring a more accurate and thorough washing effect on the washload items arranged in the lower rack. However, also the lower rotating spray arm may (alternatively or additionally) be adapted to issue auxiliary water spray jets that are directed downwards, for instance in view of bringing about a washing action aimed at automatically cleaning the filtering means provided on the bottom of the washing vessel of the machine.

[0004] Anyway, during the above cited pauses, the auxiliary water spray jets turn out to be substantially ineffective and practically constitute respective water losses, or leakages, that further reduce the pressure of the main water spray jets. As a result, even these main water spray jets lose much of their efficiency during said low-pressure operating pauses, under resulting reduction in the overall performance of the machine.

[0005] It is a main purpose of the present invention to provide a dishwashing machine with main and auxiliary pulsed water spray jets, the effectiveness of which is really adequate and optimal under all operating conditions.

[0006] Furthermore, it is a purpose of the present invention to provide a dishwashing machine of the above cited kind, which is simple in its construction and automatic in its operation.

[0007] According to the present invention, these aims are reached in a dishwashing machine with pulsed water spray jets embodying the features as recited in the appended claims.

[0008] Anyway, characteristics and advantages of the present invention will become more readily apparent from the description that is given below by way of non-limiting example with reference to the accompanying drawings, in which:

- Figures 1 and 2 are schematical, partial views of a dishwashing machine according to the present invention, in respective operating conditions thereof; and
- Figures 3 and 4 are schematical, longitudinal-section views of an enlarged detail of the dishwashing machine illustrated in Figures 1 and 2, respectively.

[0009] With reference to the Figures, the dishwashing machine comprises mainly a washing vessel 5, in which there are accommodated, for supporting the washload items, at least an upper rack 6 and preferably at least a lower rack 7.

[0010] Said racks 6 and 7 are associated to respective spraying means that preferably comprise hollow rotating spray arms 8 and 9 arranged therebelow. These rotating spray arms are provided with a plurality of main spray nozzles 10 adapted to eject respective washing water spray jets towards the respective racks, as this will be described in greater detail further on.

[0011] In a per sé known manner, at least one of these rotating spray arms 8, 9 also comprises at least an auxiliary nozzle 12 adapted to eject a respective water spray jet, as this will be better explained further on.

[0012] In the example being described here, a plurality of auxiliary nozzles 12 are provided in the upper rotating spray arm 8 to the purpose of ejecting water spray jets that are directed against the lower rack 7 arranged therebelow.

[0013] Either alternatively or additionally thereto, one or more auxiliary nozzles 12 may be provided also in the lower rotating spray arm 9 to the purpose of ejecting water spray jets which may for instance be directed towards the filtering means 11 of the machine, so as to clean them automatically. Such a particular alternative embodiment, which is not shown in the Figures owing to reasons of greater simplicity, is known for instance from US-A-4 972 861.

[0014] In all cases, the rotating spray arms 8, 9 are supplied with water which is delivered under pressure by a circulation pump 13, which is adapted to be operated in the manner as substantially described in the afore cited publication US-A-5 525 161 so as to ensure that the pressure of the water supplying the rotating spray arms 8, 9 is variable between a highest value and a lowest value during an alternating sequence of operating periods and pauses, respectively.

[0015] According to a feature of the present invention, each rotating spray arm that is so provided with main nozzles 10 and auxiliary nozzles 12 (ie. the rotating spray arm 8 in the example described here) com-

prises control means adapted to substantially shut off the auxiliary nozzles 12 during said operating pauses, ie. when the same rotating spray arm is supplied, in correspondence of an inlet port 16 thereof connected to the pump 13, with water having the afore cited lowest pressure value.

[0016] In a preferred manner, the control means are adapted to be operated hydraulically in an automatic manner and, to such a purpose, a partition wall 17 may be provided so as to substantially divide the interior of the rotating spray arm 8 into two distinct chambers 18 and 19.

[0017] The chamber 18 communicates normally with the inlet port 16 and the main nozzles 10, whereas the chamber 19 communicates normally with the auxiliary nozzles 12 only.

[0018] Furthermore, the two chambers 18 and 19 of the rotating spray arm 8 are adapted to communicate with each other through at least a passage 20 that is normally shut by a valve arrangement 21. The latter comprises substantially a shutter 14 that is loaded by a compression spring 15, or the like, which keeps it normally in its position in which it shuts the passage 20, as this is shown in Figure 3.

[0019] The spring 15 is so sized as to make it possible for the pushing force thereof to be overcome when, during the afore cited operating periods, the rotating spray arm 8 receives, at the inlet port 16 thereof, water at its highest pressure value, which therefore is capable of acting with an adequately great pressure on said shutter 14. As a result, the same shutter 14 is thereby caused to switch over to a position in which it opens the passage 20 (Figure 4), through which said chambers 18 and 19 are then able to communicate with each other. As a result, the water supplying the inlet port 16 of the rotating spray arm 8 is then delivered to both the main nozzles 10 and the auxiliary nozzles 12, which are in this way to issue respective water spray jets at an adequate pressure (Figure 2).

[0020] On the contrary, during the afore cited operating pauses, ie. when the rotating spray arm 8 receives water at its lowest pressure value at the inlet port 16 thereof, the valve arrangement 21 substantially shuts off the passage 20 and, as a result, also the auxiliary nozzles 12, as this has already been described above. As a consequence, although the water delivered to the inlet port 16 of the rotating spray arm 8 is at its lowest pressure value, it anyway supplies the main nozzles 10 only, which are in this way able to anyway eject respective water spray jets with a pressure that is sufficient to enable them to perform a substantial mechanical cleaning action on the washload items arranged in the upper rack 6 (Figure 1).

[0021] In other words, during said operating pauses, the lower pressure of the water at the inlet port 16 of the rotating spray arm 8 is substantially compensated for by the smaller overall passage or flow-through cross-section area of the nozzles that are to be supplied

by the same water, ie. the main nozzles 10 only.

[0022] The simplicity in the construction and operation of the valve arrangement 21 is at this point fully apparent.

[0023] It will be appreciated that the afore described dishwashing machine may be the subject of a number of modifications without departing from the scope of the present invention.

[0024] For instance, it may prove advantageous for the valve arrangement 21 to be adapted so that, during said operating pauses, it actually shuts off the main nozzles 10, instead of the auxiliary nozzles 12, for example in view of ensuring a more thorough cleaning of the washload items arranged on the lower rack 7 only. Anyone skilled in the art will in this case readily appreciate that, to this purpose, all it takes is to invert the position of the inlet port 16 and the valve arrangement 21 with respect to the chambers 18, 19 of the rotating spray arm 8.

[0025] Furthermore, both the main nozzles 10 and the auxiliary nozzles 12 may be provided on the same side of the rotating spray arm 8, so as to cause them to eject respective water spray jets that are in all cases directed against the upper rack 6, for instance. In this case, anyone skilled in the art is able to readily understand that, with a simple modification of the structure of the partition wall 17, it will be possible to arrange things so as to have the washload items arranged on the rack 6 normally showered by all of the nozzles 10, 12 during said operating periods, while being showered to an adequate extent of effectiveness by either the nozzles 10 only or the nozzles 12 only during said operating pauses.

[0026] It should also be noticed that the present invention may be advantageously applied also to a dishwashing machine in which the rotating spray arms 8, 9 are supplied alternately, as described for instance in EP-B-0 237 994.

Claims

1. Dishwashing machine, comprising a washing vessel in which there are accommodated at least a rack supporting the washload items, as well as spraying means having at least a main nozzle and at least an auxiliary nozzle adapted to release respective water spray jets, said spraying means being supplied by a circulation pump with an alternating sequence of operating periods and pauses in which the pressure of the water supplying said spraying means is at its highest and its lowest value, respectively, **characterized in that** it also comprises control means (21) adapted to substantially shut off said auxiliary nozzle (12), or said main nozzle (10), during said operating pauses only.
2. Dishwashing machine according to claim 1, **characterized in that** said control means (21) are

adapted to be operated hydraulically by the water supplying said spraying means (8; 9).

3. Dishwashing machine according to claim 1, **characterized in that** said control means comprise a valve arrangement (21) adapted to normally shut a passage (20) provided in a partition wall (17) that delimitates in the interior of the spraying means (8; 9) a first chamber (18), which communicates with said main nozzle (10), and a second chamber (19), which communicates with said auxiliary nozzle (12), the valve arrangement (21) being adapted to switch said passage (20) into its opened position when the spraying means (8; 9) are supplied with water at its highest pressure during said operating periods.
4. Dishwashing machine according to claim 3, **characterized in that** said valve arrangement (21) comprises a shutter (14) loaded by a spring (15) which keeps it normally in a position in which it closes said passage (20).

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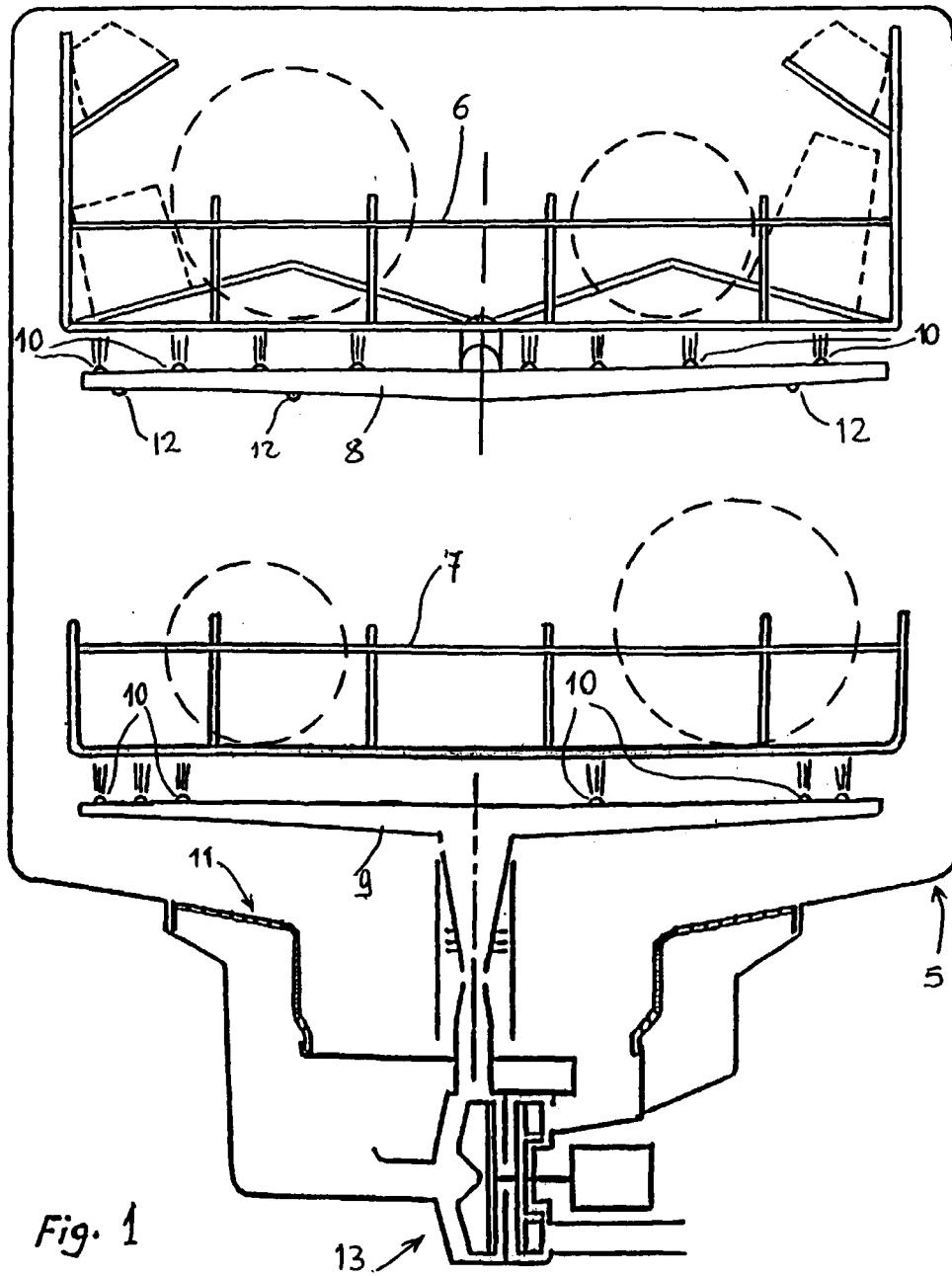
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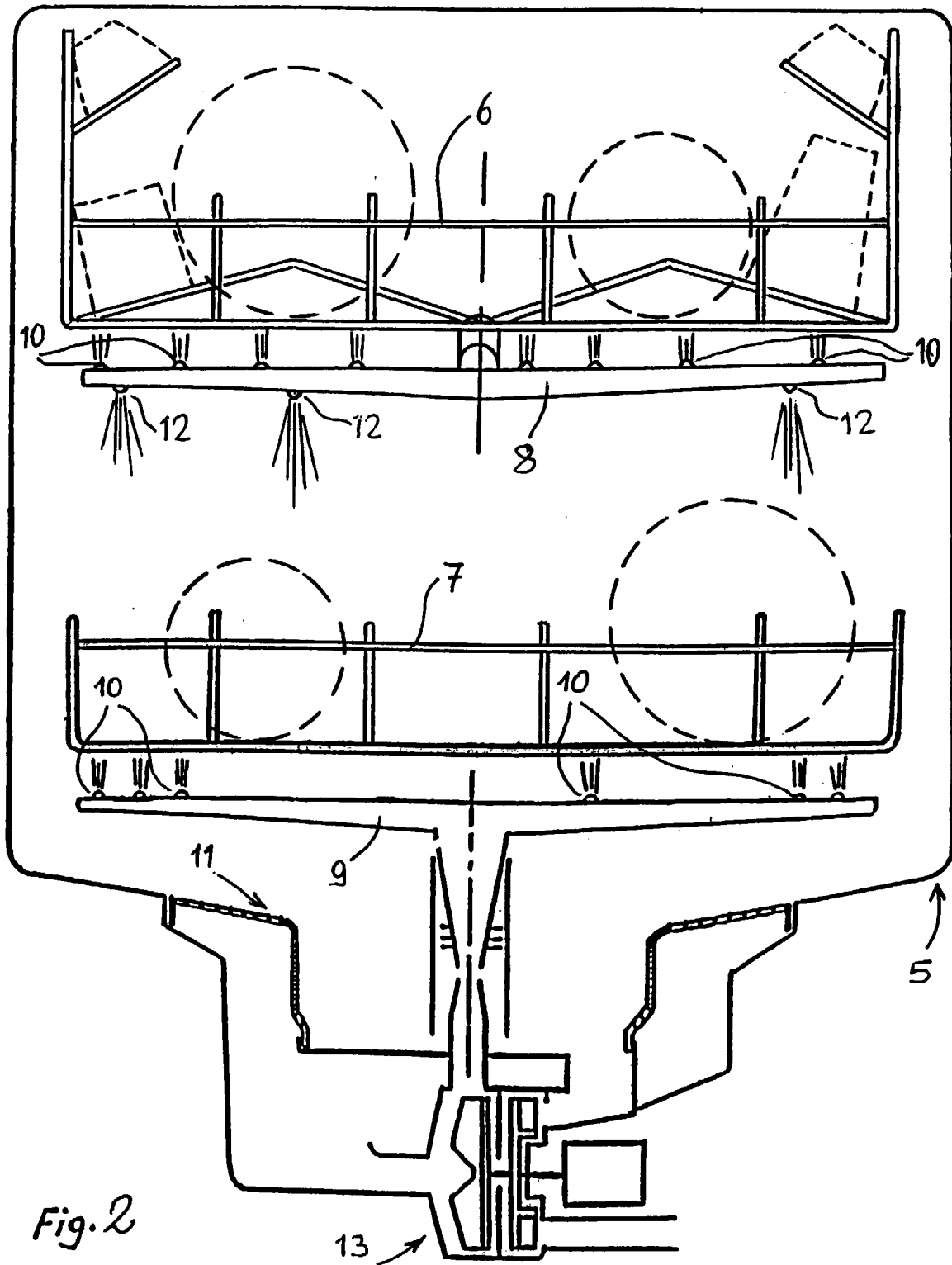
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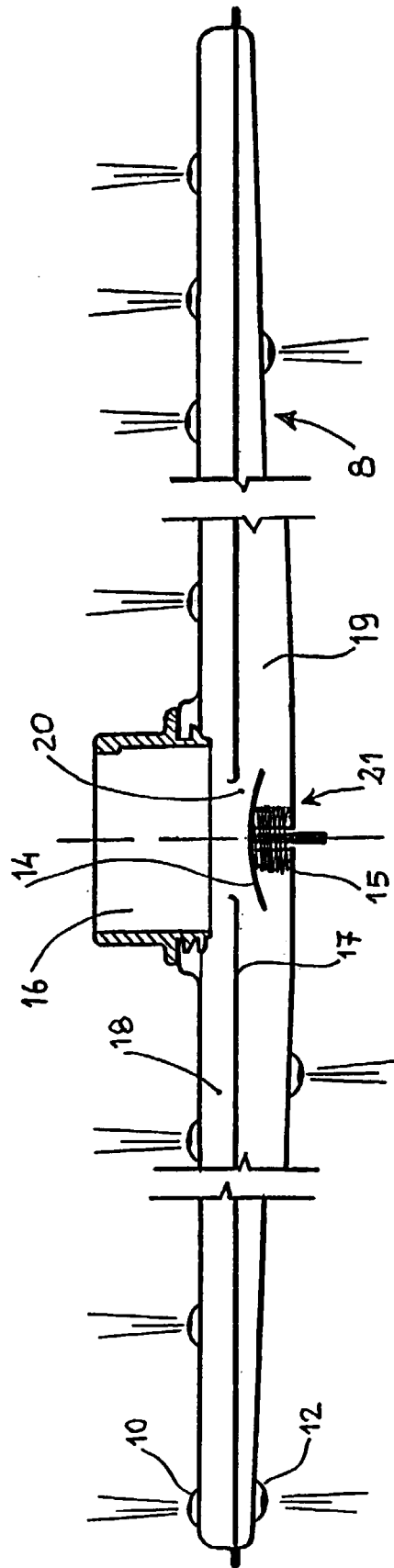
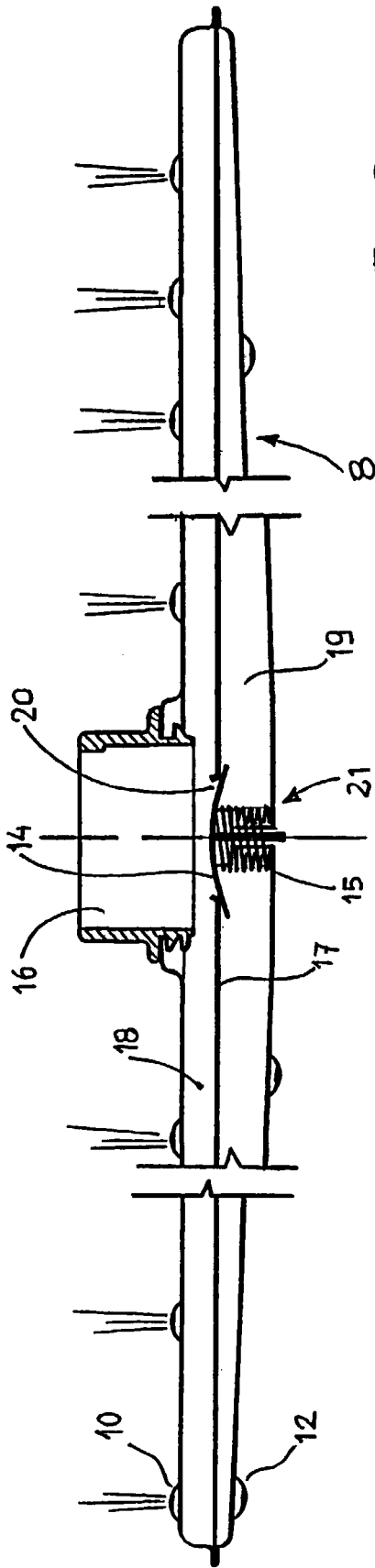
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EUROPEAN SEARCH REPORT

Application Number
EP 00 10 2533

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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A	EP 0 057 672 A (INDESIT) 11 August 1982 (1982-08-11) * the whole document *	1	
A	DE 197 36 919 A (AEG HAUSGERAETE GMBH) 4 March 1999 (1999-03-04) * the whole document *	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			A47L
Place of search		Date of completion of the search	Examiner
THE HAGUE		3 August 2000	Norman, P
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 00 10 2533

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
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03-08-2000

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