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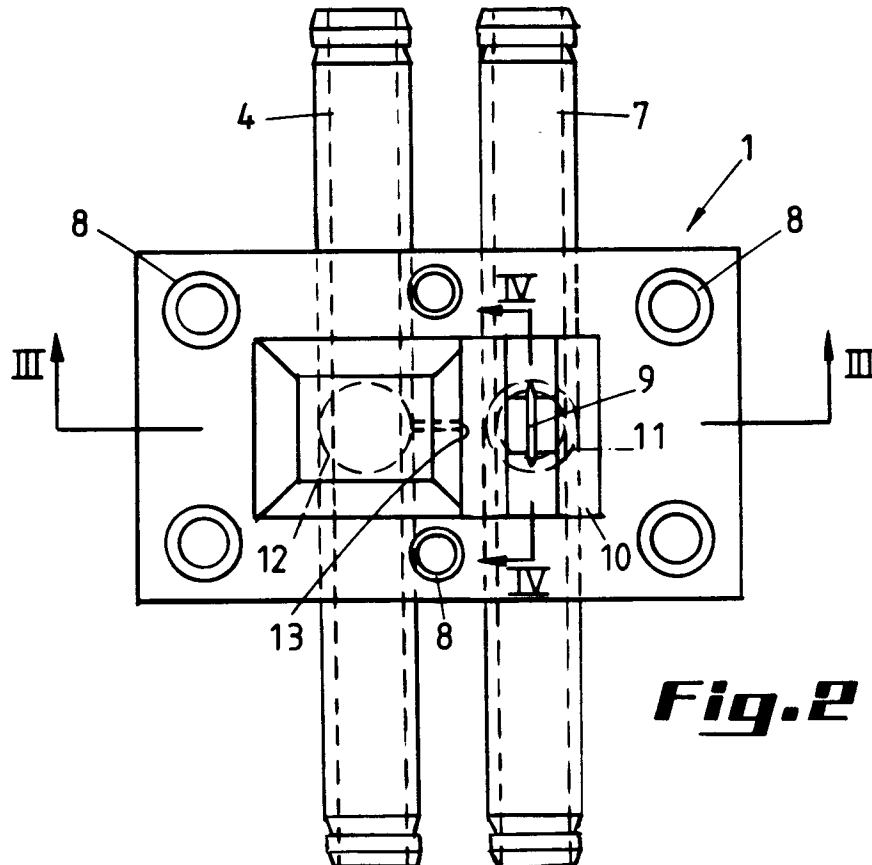
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(54) Method and spray head for atomizing a concentrated liquid product.

(57) A method for atomizing a concentrated liquid product over an object by means of a spray head, wherein said product has an active agent content of at least 30 percent by weight and is led to a first outlet of the spray head, a pressurized gas is led to a second outlet provided near the first outlet, and wherein the product coming out of the first outlet is atomized by said gas which is sprayed out through the slit-shaped second outlet in a fan-shaped spray pattern. The invention also relates to a spray head to be used in said method.



EP 0 465 454 A1

The invention relates to a method for atomizing a concentrated liquid product over an object by means of a spray head, wherein said product is led to a first outlet of the spray head, a pressurized gas is led to a second outlet provided near the first outlet, and wherein the product coming out of the first outlet is atomized by said gas. The invention relates also to a spray head for atomizing a concentrated liquid product.

Such a method and such a spray head are known from French patent n° 377 864. The known method is used for spraying a colour lacquer. In this method, use is made of a spray head, the first and the second outlet of which are substantially at right angles. A reflection plate is disposed at a small distance from the second outlet, which plate is directed perpendicularly with respect to gas flowing out of the second outlet. The lacquer coming out of the first outlet, flows up to the reflection plate and is then taken up into the escaping gas flow. In this way, the lacquer is mixed in the gas flow and is atomized into the direction of the escaping gas flow.

A drawback of the known method and spray head is that they are not very appropriate for atomizing concentrated products having an active agent content higher than 25 percent by weight. Such spray heads provide for an insufficient mixing of product and gas so that a uniform atomization of the product can hardly be realized. In order to obtain a uniform atomization of the product by means of such a spray head, this product has to be dissolved which requires the use of measuring devices and water or another solvent. The measuring devices have to be adjusted accurately and require maintenance, in particular when using detergents. The use of water involves the production of waste water which is harmful to the environment, especially when it contains detergents.

An object of the invention is to realize a method and a spray head which provide a solution for the hereabove mentioned drawbacks.

To this end, a method according to the invention is characterized in that a product having an active agent content of at least 30 percent by weight, is used as the product and the gas is sprayed out through the second outlet, which is slit-shaped, in a fan-shaped spray pattern.

To this end, a spray head according to the invention is characterized in that the first inlet is provided for supplying said product under pressure and in that the second outlet is slit-shaped and provided for spraying the gas in a fan-shaped pattern out of the spray head, with the outlet opening of said first outlet being smaller than 4 mm² and said second slit-shaped outlet having a width of up to 1 mm at the most. Due to the use of a slit-shaped outlet for the pressurized gas and the fan-shaped pattern in which the gas is sprayed out of the spray head, a gas flow is created over a sufficiently large surface around the second

outlet so that the concentrated product, which flows out of the first outlet, is taken up and mixed well there into the gas flow. This allows to use a concentrated product with a high active agent content, without having to dissolve this product first, so that no measuring devices have to be used. Hence, a considerable decrease of the solvent amount is possible, resulting in less waste products which has a positive effect on the environment. Mixing the product and the pressurized gas at the outlet of the spray head causes a very finely atomization since the escaping small particles are taken up into the Fan-shaped flow of the pressurized gas and are mixed there homogeneously. The fine atomization causes then further a substantially uniform spreading of the product over the objects.

A first preferred embodiment of a method according to the invention is characterized in that a product having an active agent content of up to 60 percent by weight is used as the product. A concentration of between 30 and 60 percent by weight results in a very effective activity and the contact time being moreover reduced considerably.

A second preferred embodiment of a method according to the invention is characterized in that the gas is led to the second outlet under a pressure comprised between 1.2 and 2 bars and preferably between 1.3 and 1.5 bar. Within these pressure ranges, the gas consumption remains limited so that also a limited energy consumption is required to form pressurized gas.

Preferably, a detergent is used as the product and the thus formed spray is spread over kitchenware. The production of waste water polluted with detergents is notably in dishwashing machines very important. The water saving realized by using the method according to the invention and the resulting lower waste water production has a favourable influence on the environment.

A first preferred embodiment of the spray head according to the invention is characterized in that said slit-shaped outlet comprises a curved base. This curved base increases the top angle of the spray pattern so that a more homogeneous spreading becomes possible.

A second preferred embodiment of a spray head according to the invention is characterized in that the extremities of the slit-shaped outlet are provided in a curved, upright surfaces. In this way, the length of the slit is increased which has also a positive effect on the top angle of the spray pattern.

A third preferred embodiment of a spray head according to the invention is characterized in that said second channel ends in a third channel having a diameter smaller than the diameter of the second channel and larger than the slit width. In this way, the third channel forms a resistance for the gas flow so that the pressure on the escaping gas increases.

Advantageously, a table is provided between said

first and second outlet, the upper surface of which table being located substantially at the same level as the first outlet. In this way, the product can well over the table and can be taken up into the gas flow.

A fifth preferred embodiment of a spray head according to the invention is characterized in that a small screen is provided substantially parallel to a plane passing through the slit-shaped outlet, the upper surface of which screen being located at a slightly higher level than the slit-shaped outlet. A function of this small screen is to guide the gas flow.

Advantageously, the spray head comprises a nozzle portion and a connecting block, with a gasket provided with a small slot near the first channel, being applied between the nozzle portion and the connecting block. The small slot forms a resistance for the product flow and provides for a uniform distribution over the different spray heads when several spray heads are connected to the same supply duct.

The invention will now be explained further by means of an example, more particularly a dishwashing device, which is shown in the drawings. It will be clear that the invention is not limited to dishwashing devices but that it can be used for any atomizing device or method which requires a high degree of atomization. In this respect, one has to think about spraying paints or coatings in paint trains, spraying plan protection agents or leaf fertilizers in agri- and horticulture or about cleaning and/or treating other objects than kitchen ware such as for example bottles, crates, barrels, CIP (Cleaning In Place), etc.

In the drawings:

Figure 1 shows schematically a section of a main wash zone from a chain dishwashing machine ;

Figure 2 shows a top plan view of an embodiment of a spray head according to the invention ;

Figure 3 shows a cross-section along line III-III' through a spray head according to Figure 2, with the different components being disassembled ;

Figure 4 shows a detail view of a gasket from the spray head according to the invention ;

Figure 5 shows a cross-section along line IV-IV through a spray head according to Figure 2.

In the drawings, the same or analogous element has been given the same reference numeral.

A chain dishwashing machine is usually composed of different zones and comprises a.o. a pre-rinse zone, a main wash zone, an after-rinse zone and a drying zone. The atomizing device according to the invention is preferably used in the main wash zone. Figure 1 shows a cross-section through such a main wash zone of a chain dishwashing machine. One or more spray heads 1, the beam pattern 2 of which is also shown in Figure 1, are mounted on the bottom and preferably also on the top. The spray heads are disposed in such a manner that the beam pattern of the different spray heads are mutually overlapping and show near the kitchen-ware an overlap angle α .

In this way, a substantially homogenous spray is formed near the kitchen-ware in such a manner that the detergent is sprayed substantially homogeneously over the kitchen-ware.

The spray heads are preferably mounted in a reversed gutter 3, with the nozzle portion 5 projecting itself partially out of the gutter whereas the connecting block 6 of the spray head is applied completely within the gutter. In this gutter are further applied supply ducts 4 which are connected to the spray heads. This gutter is used for protecting and fixing the spray heads and the supply ducts.

In order to prevent the supply duct which supplies the detergent, from becoming empty after stopping the machine, a one-way valve is provided in this supply duct. In this way, the duct comprises always detergent so that dead times are prevented when starting the machine.

Preferably, a set screw is provided in the duct to the uppermost and/or the lowermost spray heads in order to be able to adjust the flow rate and to provide, if desired, a different flow rate at the top and at the bottom.

Figure 2 shows a top plan view of an embodiment of a spray head according to the invention. The spray head 1 is for example made of stainless steel or of plastic material such as for example PVC. The spray head 1 is connected to a first 4 and respectively a second 7 supply duct through which a detergent and respectively a pressurized gas are supplied. The pressure of the supplied gas is comprised between 1.2 and 2 bars and preferably between 1.3 and 1.5 bar, so that the total gas consumption remains restricted.

The nozzle portion of the spray head 1 is provided with openings 8 wherein for example screws are to be applied in order to join the nozzle portion and the connecting block together. The nozzle portion comprises further a slit-shaped outlet 9 which is connected through a second channel 11 to the second supply duct 7. The slit has preferably a width of 0.7 mm and comprises upto 1 mm at the most. A small screen 10 is disposed substantially in parallel relationship to the slit 9 and has a guiding function as will be described hereinafter. The spray head comprises further a first channel 12 which is connected to the first supply duct 4 and which ends in an outlet 13, the surface of which is smaller than 4 mm² and the diameter of which comprises preferably 0.6 mm. The outlet 13 is situated out of the plane going through the slit 9 and forms an angle, preferably an angle of about 90°, with said plane.

As it has been represented in Figure 3, the outlet 13 is situated moreover at a somewhat higher level than the upper side of the slit 9, and this outlet ends onto a table 14, the upper surface of which has substantially the same level as the upper surface of the little screen 10.

Preferably, the nozzle portion of the spray head shows an obliquely rising bumper 15, which is disposed in such a manner that the kitchen-ware transported into the direction given by arrow 16 would knock first, during a possible malfunctioning of the transport, against the bumper 15 so that the risk of damaging the spray head is considerably reduced. Indeed, when the spray head would be disposed in opposite direction, then it would be possible that, during a malfunctioning in the transport, the kitchen-ware would bump into the small screen 10 and the slit 9 and would damage in this way the spray head considerably. Due to the position of the outlet 13 and the geometry of the channel 12, a surplus of material was already required near the channel 12 so that this zone was particularly appropriate to apply there the obliquely rising bumper 15.

The second channel 11 narrows conically towards the slit 9 in order to realize a compression effect near the slit.

Between the connecting block 18, wherein borings 19, preferably threaded borings, are applied and the nozzle portion, a gasket 20 is provided wherein a small slot 17, a kind of haircrack, is applied. The gasket is made of a flexible plastic material or of rubber and has a dimension which corresponds to the one of the upper surface of the connecting block so that the gasket can be applied sealingly between the nozzle portion and the connecting block. To this end, the gasket is also provided with corresponding borings near the openings 8 and 19. The small slot 17 is applied near the first channel 12 and forms in this way a resistance for the product to be led through, whereby it is obtained that, when several spray heads are connected to the same supply duct, the pressure built up by the flow of the detergent is distributed substantially uniformly over all of the spray heads and it is prevented in this way that the first spray head from the row receives more detergent than the last one from the row. Figure 4 illustrates said small slot 17 more into details and shows also that a boring 21, the diameter of which corresponds substantially to the one of the second channel, is applied near the second supply channel.

The special geometry of the slit-shaped outlet 9 will be explained now further with reference to Figure 5. As it has already been described, the end portion of the second channel 11 narrows somewhat conically so that obliquely upright lateral walls 22 are formed. The second channel ends in a third channel 23, the diameter of which is considerably smaller than the one of the second channel. However, the diameter of the third channel is larger than the width of the slit 9 and the diameter of the second and respectively the third channel comprise for example 4.5 mm and respectively 1 mm, whereas the slit comprises 0.7 mm. The latter means therefore that the gas which flows through the third channel 23, strikes against a wall 27

having a total width of 0.3 mm. This wall forms therefore a resistance for the gas flow so that the gas is obliged to spread itself over the total width of the slit and is therefore sprayed out in a fan-shaped way.

The slit shows a curved base 26, having for example a curvature radius of 24 cm, so that the hereabove already mentioned fan effect is enhanced and a relatively large top angle is thus obtained as it has been represented by the dashed lines 28. The top angle of the spray pattern has for example a value situated between 30 and 120°. In order to increase the length of the curved base, the extremities of the slit are preferably applied in curved upright surfaces 24 and 25. The curvature radius of these surfaces comprises for example 9 cm. Indeed, when perpendicularly upright lateral surfaces would be applied near the wall 27, this base plane 26 would extend over a smaller length.

The working of a spray head according to the invention will now be described further. Pressurized gas, for example compressed air from a compressor, is supplied through the second supply duct 7. Detergent is supplied also under pressure, for example under a pressure of 1.3 bar, through the first supply duct 4. The detergent is a concentrated product having for example an active agent content of 30 to 60 percent by weight, and is not diluted first with water, as it is usual in dishwashing machines before being sprayed onto the kitchen-ware. The detergent is thus led directly from a storage container to the first supply duct 4 so that pure concentrated detergent is sprayed.

The detergent arrives through the small slot 17 in the first channel 12 and reaches in this way the first outlet 13. Due to the dimensions of the outlet 13, which has preferably a diameter of 0.6 mm, the flow rate at that outlet is small and a small flow of detergent wells out where it arrives onto the table 14. The pressurized gas escapes, as it has already been described, in a fan-shaped way out of the slit 9 and will take up in this way the detergent present on the table 14. Due to the force present in the gas flow and the high concentration of detergent, each droplet of detergent which has been taken up bursts so that it will spread itself substantially homogeneously and very finely in the gas flow. A kind of mist curtain of detergent is formed then, which is spread substantially uniformly over the kitchen-ware to be cleaned and exerts in this way its cleaning action over the total surface of the dirty kitchen-ware. Due to the high concentration, the detergent works very effectively and requires only a small contact time, for example of about 2 seconds. Spraying with a very fine spray offers further the advantage that the detergent exerts a big impact onto the dirt and the starch present on the kitchen-ware, which is not the case when an aqueous solution of detergent is sprayed. Due to this big impact, the kitchen-ware is cleaned thoroughly and an after-treatment such as stripping is not necessary anymore.

By making use of a very fine spray it is possible to obtain a substantially homogeneous distribution of the detergent and to apply in this way the detergent on all places, even into deep pots. The substantially homogeneous distribution combined to the use of a highly concentrated detergent, has such a high cleaning activity that, as it has already been mentioned, the periodical stripping of the kitchen-ware becomes unnecessary.

By making use of a spray head having a separate outlet for the detergent and a separate outlet for the pressurized gas instead of spraying, as usual, an aqueous solution of the detergent, on the one hand, the risk of blockage of the spray head and in this way the susceptibility to malfunctions of the device is reduced considerably, indeed the pressurized gas will blow away possible contaminants, and, on the other hand, since no water is used, there is also no production of waste water in the main wash phase, so that the total production of waste water for the whole process is reduced considerably. Due to this last facet, the method according to the invention offers moreover an ecological solution.

The small screen 10, the upper surface of which is situated at a somewhat higher level than the slit 9, has, as already mentioned, a guiding function. Preferably, the upper surface of the small screen 10 is situated at the same level as the table 14 which simplifies the manufacture of the spray head since both surfaces can be realized during a same milling step. The small screen guides the gas escaping from the slit by preventing the gas from moving at right angles to the plane of the slit over a too big distance at the level of the slit. The small screen 10 prevents further also the detergent from leaving the zone around the slit 9.

As it has already been mentioned, the spray head is not only suited to be used in a dishwashing device but other applications are also possible. In this way, it is for example possible to apply a row of spray heads in a green-house and to atomize insecticides or liquid fertilizers with them.

Claims

1. A method for atomizing a concentrated liquid product over an object by means of a spray head, wherein said product is led to a first outlet of the spray head, a pressurized gas is led to a second outlet provided near the first outlet, and wherein the product coming out of the first outlet is atomized by said gas, characterized in that a product having an active agent content of at least 30 percent by weight, is used as the product and the gas is sprayed out through the second outlet, which is slit-shaped, in a fan-shaped spray pattern.
2. A method according to claim 1, characterized in that a product having an active agent content of up to 60 percent by weight is used as the product.
3. A method according to claim 1 or 2, characterized in that the gas is led to the second outlet under a pressure comprised between 1.2 and 2 bars and preferably between 1.3 and 1.5 bar.
4. A method according to anyone of the claims 1 to 3, characterized in that the product is led under pressure to the first outlet.
5. A method according to anyone of the claims 1 to 4, characterized in that a detergent is used as the product and the thus formed spray is spread over kitchen-ware to be washed.
6. A spray head for atomizing a concentrated liquid product, comprising a first and a second inlet for supplying respectively said product and a pressurized gas, which first and second inlet are connected respectively through a first and a second channel to respectively a first and a second outlet which are provided near one another, characterized in that the first inlet is provided for supplying said product under pressure and in that the second outlet is slit-shaped and provided for spraying the gas in a fan-shaped pattern out of the spray head, with the outlet opening of said first outlet being smaller than 4 mm² and said second slit-shaped outlet has a width of up to 1 mm at the most.
7. A spray head according to claim 6, characterized in that said slit-shaped outlet comprises a curved base.
8. A spray head according to claim 7, characterized in that the extremities of the slit-shaped outlet are provided in curved, upright surfaces.
9. A spray head according to anyone of the claims 6 to 8, characterized in that said second channel ends in a third channel having a diameter smaller than the diameter of the second channel and larger than the slit width.
10. A spray head according to anyone of the claims 6 to 9, wherein the first outlet ends substantially at right angles to a plane passing through the slit-shaped outlet, characterized in that a table is provided between said first and second outlet, the upper surface of which table being located substantially at the same level as the first outlet.
11. A spray head according to anyone of the claims 6 to 10, characterized in that a small screen is pro-

vided substantially parallel to a plane passing through the slit-shaped outlet, the upper surface of which screen being located at a slightly higher level than the slit-shaped outlet.

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- 12.** A spray head according to anyone of the claims 6 to 11, characterized in that the spray head comprises a nozzle portion and a connecting block, with a gasket provided with a small slot near the first channel, being applied between the nozzle portion and the connecting block.

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- 13.** An atomizing device provided with at least one spray head according to anyone of the claims 6 to 12, characterized in that the spray head comprises a first outlet and a second slit-shaped outlet.

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- 14.** A dishwashing device provided with at least one spray head according to anyone of the claims 6 to 12, characterized in that the spray head comprises a first outlet and a second slit-shaped outlet.

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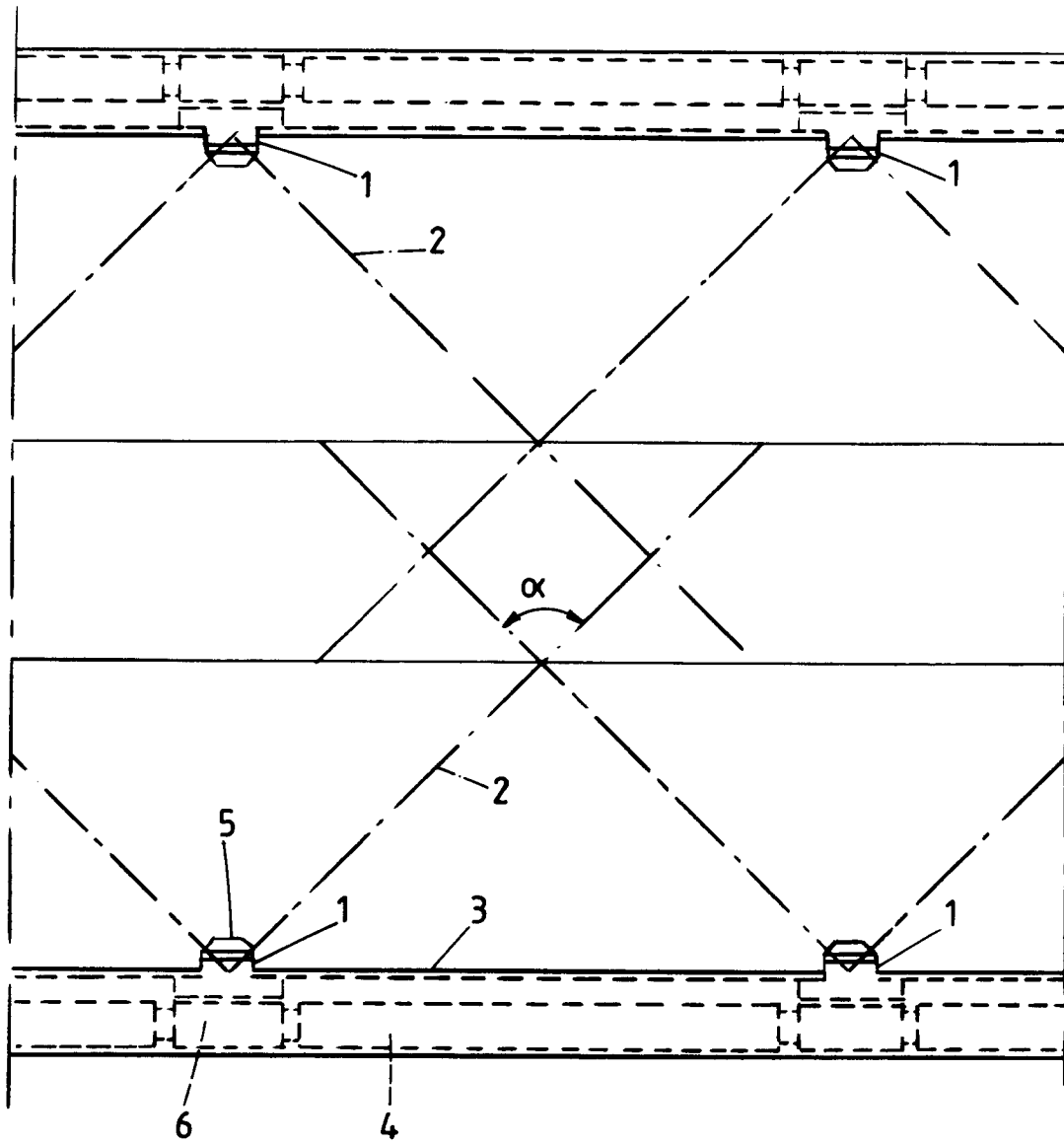


Fig.1

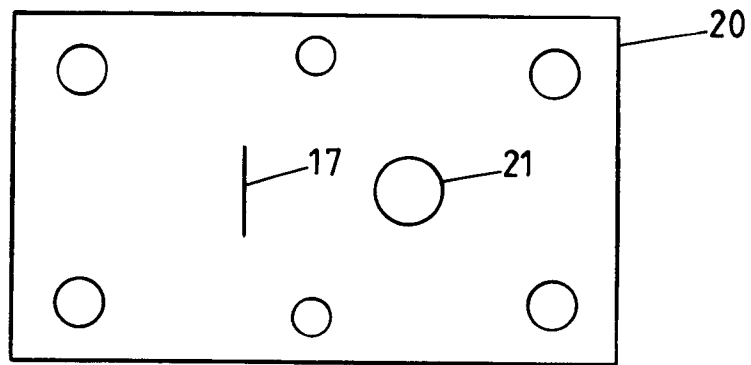


Fig. 4

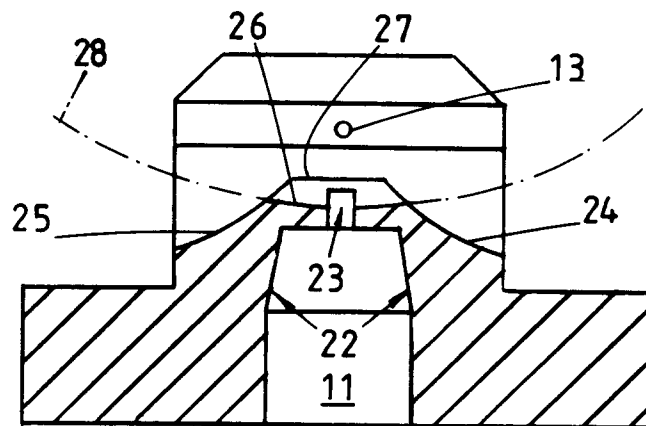


Fig. 5



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 87 0106

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, Y	FR-A-377 864 (MINIMAX) * the whole document *	1, 6	A47L15/00 A47L15/16
Y	US-A-4 046 321 (HEWETT) * the whole document *	1, 6	B05B7/02 A47L15/44
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A	US-A-2 910 391 (TOULMIN JR.) * the whole document *	1	
A	US-A-1 888 791 (COLE) * the whole document *	6	
A	EP-A-0 282 214 (DIVERSEY CORP.)		
A	DE-C-75 208 (BAARS)		
A	DE-C-447 937 (SCHULTHEISS)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A47L B05B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 20 SEPTEMBER 1991	Examiner SCHARTZ J.
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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