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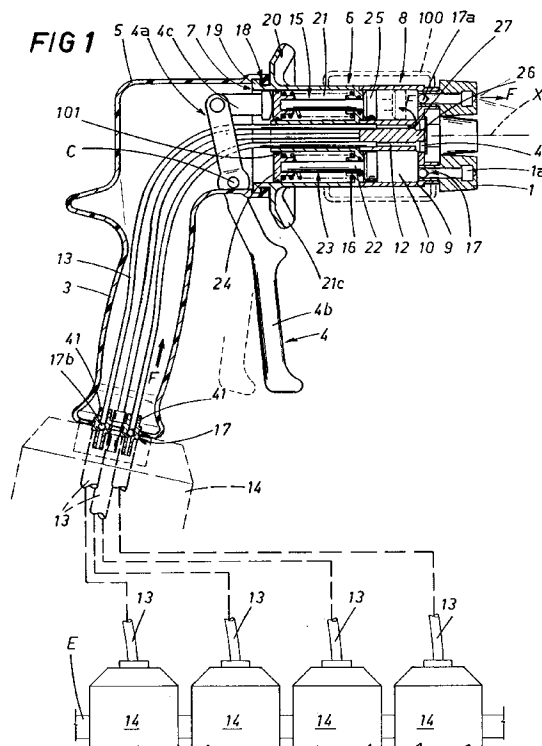
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(57) The spray-gun concerned comprises the following : a handle (3) equipped with a trigger (4) having an active portion (4a) inside the handle (3) itself and an external portion (4b) that may be operated by hand, and a front extension (5); a revolving block (6) rotatably coupled to the extension (5) and mounting a liquid dispensing unit (8) that comprises a cover (9) for closing the end of the extension (5) and nozzles (1) connected to corresponding dispensing cylinders (10); by turning the revolving block (6), each cylinder (10) may be lined up as necessary with the internal, section of the trigger (4); the liquid dispensing unit in the revolving block (6) also has a first tube (12) for each cylinder (10) and connecting the latter to a corresponding second tube (13) which feeds the liquid to be sprayed; compressive means (15) are located between the active end of the trigger (4) and the corresponding cylinder (10) in order to force the liquid out of the cylinder (10) towards the nozzle (1); finally, spring means (16) are envisaged to operate on the compressive means (15) in such a way as to determine a force counteropposing the force of the liquid discharge pressure.



The present invention relates to a multiple nozzle, liquid spray-gun, particularly useful for cleaning surfaces.

At present, manually operated liquid dispensing pumps, commonly known as spray-guns (the term "spray-gun" being used hereinafter as a synonym for "liquid dispensing pump") constitute one of the most convenient, effective and safe means of cleaning surfaces of various kinds; the said spray-guns are used to dispense liquids which attack the particles of dirt on the surfaces to be cleaned.

These spray-guns (for example, see patents EPO - 262.484 or US 4.260.079) consist basically of a spray-head attached (for example by screwing) to a tank containing the liquid to be sprayed. The spray-head has a discharge nozzle and internally defines a pumping chamber which enables the liquid to be drawn from the tank and channelled towards the discharge nozzle.

The flow of the liquid within the chamber is controlled by the user through an external lever or trigger which operates on the part of the pumping chamber located inside the spray-head and designed to control the operation of nonreturn valves mounted by the discharge nozzle and by the pumping chamber. To start operating the spray-gun, the user must alternately pull and release the trigger several times in such a way as to increase the pressure in the pumping chamber, thus opening the valve at the tank end to draw liquid from the tank itself, and closing the valve at the discharge nozzle so as to fill the liquid drawn from the tank into a prechamber (either rigid or flexible) adjacent to the nozzle itself.

The next time the trigger is released after the prechamber has filled with liquid, the valve at the nozzle opens, allowing some of the liquid to pass from the prechamber to the nozzle so that, when the trigger is next pulled, the valve closes again and the liquid is discharged to the atmosphere through the nozzle.

Although the systems adopted until now to pump the liquid from the tank or container to the nozzle differ from each other in complexity (for example, delayed-action springs to open the nozzle or systems with multiple relief valves), all the spray-guns disclosed in prior patents are single-purpose or "dedicated" spray-guns. In other terms, a user who wishes to clean different types of surfaces must have the corresponding number of individual containers with a different spray-head for each different type of liquid to be sprayed.

The results are a cumbersome load of equipment to be carried around by a user who needs to have a spray-gun handy for each type of work to be done and higher costs of maintenance because there are more spray-guns to be used.

Moreover, in accordance with current health regulations, public health authorities prohibit the use of an interchangeable spray-head for two or more tanks

because of the risk that different liquid chemical cleaners might mix, with dangerous consequences for both the environment and the user's health.

The object of the present invention is to eliminate the disadvantages mentioned above by providing a multiple nozzle, liquid spray-gun, comprising several pumps in a single casing, which is compact and manageable and which allows different cleaning components to be selected easily and safely, in a manner that conforms with the health standards of the trade.

The technical characteristics of the invention are laid out in the claims below and the advantages of the disclosure are apparent from the detailed description which follows, with reference to the accompanying drawings, which illustrate a preferred embodiment of the invention by way of example and in which:

- Figure 1 illustrates the spray-gun disclosed by the present invention in a schematic side view with some parts cut away in order to better illustrate other parts;
- Figure 2 is a schematic front view of the spray-gun as embodied in Fig.1.

Referring now to the embodiment illustrated in Figs. 1 and 2, the liquid spray-gun consists of the following basic parts: a handle 3, a revolving element or block 6, a liquid dispensing unit 8, compressive means 15, spring means 16 and valve means 17.

These parts will now be described in more detail, with reference to Fig. 1. The handle 3 comprises a trigger 4, pivoted on the handle itself, at point C, and having an active portion 4a inside the handle 3 itself and an external portion 4b that may be operated manually; the active portion 4a consists of a horizontal rod 4c hinged to the upper end of the trigger 4. The handle 3 also has a tubular extension 5 into which the aforesaid revolving block 6 fits.

The block 6, also tubular, is rotatably coupled to the extension 5 through appropriate means 7, which may, for example, be the ends of these two elements themselves, with an undercut 18 and a circumferential lip 19 forming a sliding fit which enables the two elements to rotate relative to each other. An anti-friction means (bearing or other) may also be provided to improve the sliding fit between the extension 5 and the block 6.

In addition, the outer edge of the revolving block 6 may have hand gripping means 20 designed to allow the block to be revolved about its longitudinal axis X and consisting, for example, of a crown element 21c forming an integral part of the block itself.

At its free end, the revolving block 6 mounts the aforesaid liquid dispensing unit 8 which in turn comprises: a cover 9 which closes the end of the block 6 and a series of nozzles 1 which, in the embodiment being described, are four in number but which may be more or less than this according to the cleaning requirements which the spray-gun is to be used for. Each of the nozzles 1 is connected to a corresponding

dispensing cylinder 10, which, when necessary, by turning the revolving block 6, may be lined up with the active portion of the trigger 4.

The aforesaid cover 9 is nonadjustably fixed (by gluing or welding) to the revolving block 6 and mounts the nozzles 1 which are interchangeable (with rapid fittings or screw-on connections with sealing rings, not illustrated), each nozzle being set in such a way as to be off centre with respect to the corresponding cylinder 10.

The revolving block 6 also mounts a dispensing unit for the liquids to be sprayed comprising a first tube 12 and a second tube 13; the first tube 12 is rigid and, there being one for each cylinder 10, connects the cylinder to the corresponding tube 13, which is flexible and which, being connected to a corresponding tank 14, feeds the liquid to be sprayed. In the embodiment being described, each tank 14 is separate from the spray-gun and may be carried by the user secured to his belt or to a special work belt E (not illustrated in detail).

The liquid dispensing unit 8 consists of a cylindrical sector 26 located in the middle of the revolving block 6 and associated to the first tubes 12, each of which has a channel 27 feeding into the corresponding cylinder 10. Each of the said channels 27 is open (for cleaning purposes) at the end leading out through the outer surface of the cover 9 and may be closed using stoppers 40.

Each of the second, flexible tubes 13 is coaxially connected to the corresponding first, rigid tube 12 and travels along the entire length of handle 3 and feeds out of the bottom end of the latter. At its bottom end, the handle 3 is equipped with a double-ended fitting 41 for each tube 13 where the external section of tube 13 connected to the related tank 14 may be attached.

In Fig. 1, the numeral 15 indicates compressive means located between the active end of the trigger 14 and the corresponding dispensing cylinder 10, the said compressive means revolving together with the cylinder and being designed, when active, to force liquid out of the related cylinder 10 towards the corresponding nozzle 1. The said compressive means 15 consist, for each cylinder 10, of a chamber 21 housing the stem 22 of a plunger 23; one end of the said plunger is equipped with a plate 24 which lines up with the aforesaid active portion 4a of the trigger 4.

At its opposite end, the stem 22 has a second plate 25 integral with it which travels inside the corresponding cylinder 10 and which is designed to force the liquid outwards. Inside each chamber 21, there is also a spring 16 placed around the stem 22 and retained at one end by the first plate 24 and at the other end by an inner surface of the chamber 21 itself; the said springs 16 operate on the compressive means 15 to determine a force counteropposing the force of the liquid discharge pressure in such a way as to cause

the trigger 4 to move back to its inactive position ready to be activated again (as described in more detail below).

Finally, the numeral 17 indicates valve means located at each nozzle 1 and at the second tubes 13, enabling the liquid to be drawn from the tanks 14 into the cylinders 10 when the compressive means 15 are operated.

The said valve means 17 consist of pairs of non-return valves 17a and 17b (the number of valve pairs depending on the number of chambers the spray-gun has), one valve being located at the corresponding nozzle 1 (at the point where the latter is connected with the cylinder 10) and the other at the point on the corresponding second tube 13 where the latter feeds out of the handle 3, that is to say, on the double-end fitting 41 on the handle itself.

A spray-gun constructed in the manner described above, assuming a configuration with four nozzles 1 and with the tanks 14 full of different liquids already connected to the related tubes, may be used as follows.

By turning the crown 21c, the user selects the cylinder 10 to be set to spraying position, the crown itself having appropriate reference marks on it, if necessary. Once the cylinder 10 corresponding to the liquid to be sprayed has been selected, the user pulls the trigger 4, thus creating vacuum, thanks to nonreturn valves 17a and 17b, which causes the liquid to rise through the second tube 13, the first tube 12 and the channel 27 and to fill the corresponding cylinder 10 (see arrow F in Fig. 1).

When the cylinder 10 is full, that is, when a balance of pressure has been reached, the liquid starts being pressed against valve 17b of the nozzle 1, the valve opens and allows the liquid to be discharged in the form of a jet.

The jet is created by the trigger 4 which presses on the first plate 24 of plunger 23 which in turn causes the second plate 25 to move into the cylinder 10 creating a high pressure that forces the liquid out of the cylinder (in Fig. 1, this position is shown with a broken line). The spring 16 returns the trigger quickly to its starting position so that the spraying cycle may be repeated (in Fig. 1, this position is shown with a continuous line).

When the user has finished spraying, he may turn the revolving block 6 in either direction in order to select another liquid to be sprayed, the spraying cycle being carried out in exactly the same way as that just described.

If there are many different types of liquids to be sprayed, the tanks 14 may be fitted to the user's belt whilst if there are just a few different liquids (two or three), they may be attached directly to the bottom of the handle 3 (as shown by the broken line in Fig. 1).

In another embodiment of the present invention, shown in Fig. 1, again by a broken line, the spray jet

is improved as follows: the revolving block 6 is fitted with an additional external tube 100 for each cylinder 10 (four in the case described above), to connect the chamber 21 housing the plunger 23 with the discharge chamber 1a of the corresponding nozzle 1 located after the aforesaid valve 17a. The said tube 100 allows the air generated by the forward motion of the stem 22 of plunger 23 during the compression stage, since each plate 24 is equipped with a ring 101 which seals chamber 16, to pass into the aforesaid chamber 1a in such a way as to exert a greater discharge pressure on the liquid, irrespective of the position of the valve 17a. In effect, the tube 100 not only accelerates the discharge of the liquid but also guarantees that the liquid will be discharged if the valve 17a temporarily fails to operate.

The spray-gun disclosed by the present invention accomplishes the aforestated objects in that it the gun and tank assembly is extremely easy to handle; in addition, the internal structure of the spray-gun is simple and economical and at the same time guarantees efficient operation and safety thanks to the separate, sealed tubes which make it impossible for different liquids to mix. The crown element makes for fast easy changing from one cylinder to another, and may, if necessary, have appropriate graphic symbols on it and be used in combination with stop devices made between the revolving block and the tubular extension of the handle in order to facilitate selection of the tank corresponding to the liquid to be sprayed.

The invention described can be subject to modifications and variations without thereby departing from the scope of the inventive concept.

Moreover, all the details of the invention may be substituted by technically equivalent elements.

Claims

1) A liquid spray-gun with multiple nozzles (1) characterized in that it comprises:

- a handle (3) with a lever or trigger (4) having an active portion (4a) inside the handle (3) itself and an external portion (4b) that may be operated by hand, and a tubular extension (5);
- a tubular, revolving element or block (6) rotatably coupled to the said tubular extension (5) by appropriate means (7); the said revolving block (6) mounting, at its free end, a liquid dispensing unit (8) comprising a cover (9) for closing the said free end and at least two nozzles (1) connected to corresponding dispensing cylinders (10); it being possible by turning the said revolving block (6) to line up each of the cylinders (10) with the internal active end of the trigger (4); the said revolving block (6) enclosing a liquid dispensing unit comprising for each of the said dispensing cylinders (10) a first tube

(12) connecting the related cylinder (10) to a corresponding second liquid supply tube (13) which is connected to a tank (14) from which it draws the liquid to be sprayed;

- compressive means (15) being located between the active end of the said trigger (4) and the corresponding cylinder (10), rotatable together with the latter and designed, when activated by the operation of the said trigger (4), to force liquid out of the related cylinder (10) towards the corresponding nozzle (1);
- spring means (16) placed between the compressive means (15) and each of the cylinders (10) and operating on the compressive means themselves in order to determine a force counteroppositing the force of the liquid discharge pressure in such a way as to cause the compressive means (15) to return to their inactive configuration;
- valve means (17) located at each nozzle (1) and at the second tubes (13), enabling the liquid to be drawn from the tanks (14) into the cylinders (10) when the compressive means (15) are operated.

2) The spray-gun according to claim 1, characterized in that the said coupling means (7) consist of the tubular extension (5) of the handle (3) and the tubular end of the revolving block (6) fitted, respectively, with an undercut (18) and a circumferential lip (19) forming a sliding fit which enables the two elements themselves to rotate relative to each other; the outer edge of the said revolving block (6) being equipped with hand gripping means (20) designed to allow the block to be revolved about its longitudinal axis (X).

3) The spray-gun according to claim 1, characterized in that the said compressive means (15) consist, for each cylinder (10), of a chamber (21) housing the stem (22) of a plunger (23), one end of the latter being equipped with a plate (24) which lines up with the aforesaid active portion (4a) of the trigger (4) and the other end with a plate (25) integral with it which travels inside the corresponding cylinder (10) and which is designed to force the liquid outwards; inside each chamber (21) there also being a spring (16) placed around the stem (22), defining the said spring means (16) and retained at one end by the first plate (24) and at the other end by an inner surface of the chamber (21) itself.

4) The spray-gun according to claim 1, characterized in that the said liquid dispensing unit (8) comprises a cylindrical sector (26) located in the middle of the revolving block (6) and associated to the first, rigid tubes (12), each of which has a channel (27) feeding into the corresponding cylinder (10).

5) The spray-gun according to claim 1, characterized in that the said second tube (13) is flexible and travels along the entire length of handle (3) and feeds out of the bottom end of the latter.

6) The spray-gun according to claim 1, characterized in that the said cover (9) which closes the revolving block (6) mounts the nozzles (1) in such a way that the latter are off centre with respect to the corresponding cylinders (10); the said nozzles (1) being of the rapid fitting type. 5

7) The spray-gun according to claim 1, characterized in that the said valve means (17) consist of pairs of nonreturn valves (17a and 17b), one being located at the corresponding nozzle (1) and the other at the point on the corresponding second tube (13) where the latter feeds out of the handle (3). 10

8) The spray-gun according to claim 3, characterized in that for each of the said nozzles (1) there is envisaged a tube (100) outside the revolving block (6) and connecting the chamber (21) that houses the plunger (23) with the liquid discharge chamber (1a) associated to the corresponding nozzle (1); the said chamber (21) being equipped with sealing means (101) at least on the aforesaid first plate (24). 15 20

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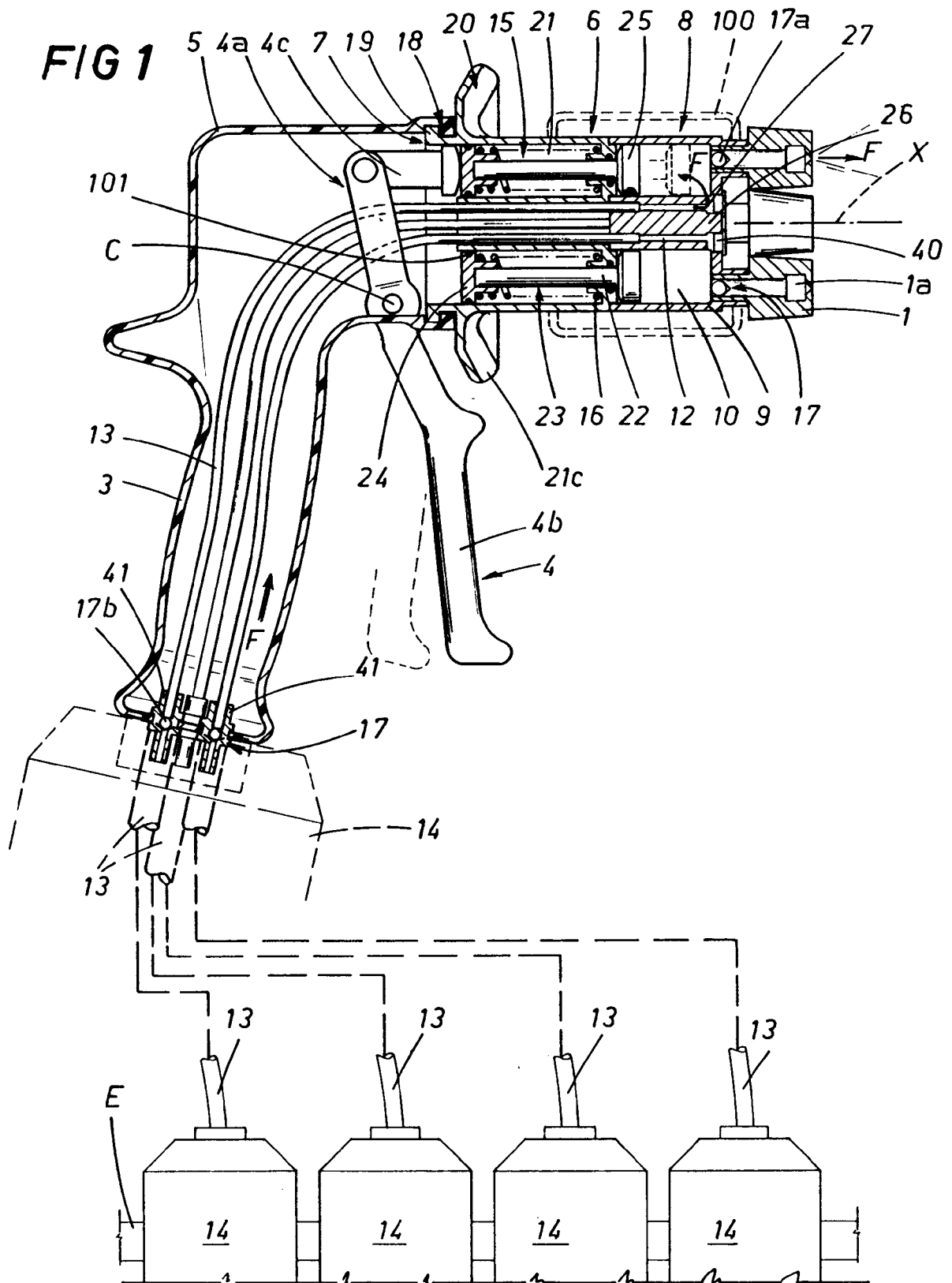
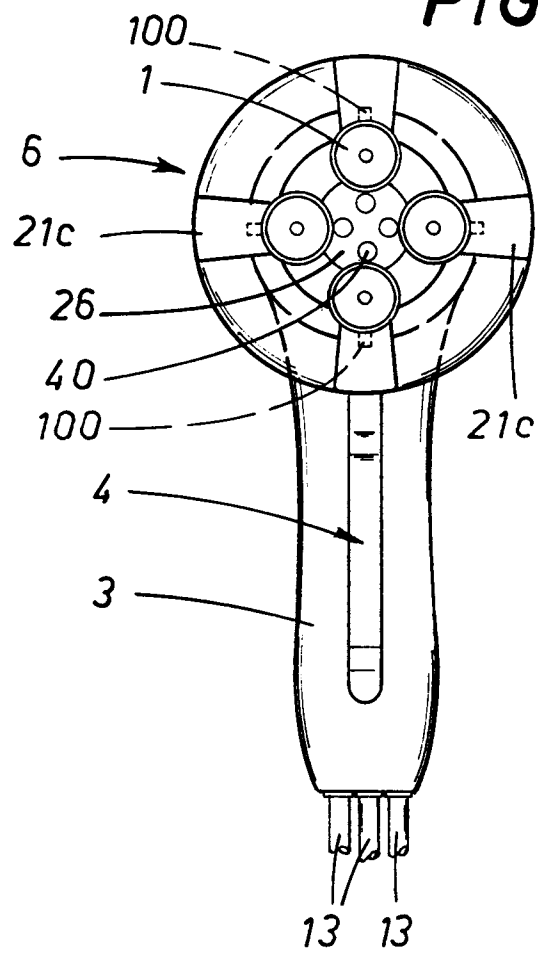


FIG2





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 83 0513

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.6)
A	EP-A-0 379 627 (DISPRAY S.A.) * abstract * * column 3, line 19 - line 35 * ---	1	B05B11/00 B05B7/24 B05B7/08
A	DE-A-30 11 634 (DAUBNER) * page 2, paragraph 2 * ---	1	
A	DE-A-30 09 759 (DAUBNER) * claim 1 * ---	1	
A	FR-A-958 376 (FOIRET) * page 3, line 42 - page 4, line 6 * ---	1	
A	BE-A-546 389 (PASSERA) * claim 1 * ---	1	
A	US-A-5 152 431 (GARDNER ET AL.) * abstract * ---	1	
A	EP-A-0 391 746 (TOSOH CORPORATION) * claim 4 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B05B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 31 January 1995	Examiner Juguet, 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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