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(54) Device for filling specified amount of liquid.

(57) A device for filling a liquid in a specified amount comprises a vertical tubular filling nozzle (18) and a multibored member (24) attached to the lower end of the filling nozzle and having parallel discharge bores (42). The discharge bores have a flow channel resistance permitting the liquid within the nozzle to flow down when pressure is applied to the liquid but preventing the liquid from flowing down under gravity.

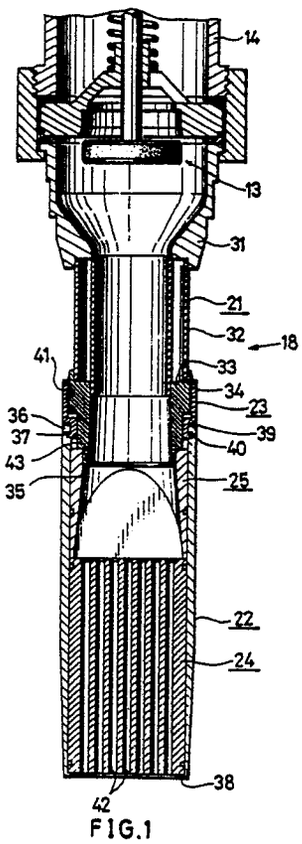

FIG.1

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DEVICE FOR FILLING SPECIFIED AMOUNT OF LIQUID

Liquid filling devices are known which include those having a filling nozzle with a metal net attached to the nozzle orifice at its lower end for preventing the liquid from flowing out from the nozzle by the surface tension of the liquid.

Although such a device operates free of any problems for free-flowing liquids such as milk, the liquid will not be discharged quickly without dripping due to the presence of the metal net when containing the flesh of fruit or fibrous substance. Moreover, the flesh or the like clogs the net. These problems may be precluded by using a net of larger mesh size, but the net will then permit the liquid to flow out from the nozzle under gravity.

The main object of the invention is to provide a device which is adapted to fill a liquid containing the flesh of fruit or fibrous substances at a high speed free of any trouble as when handling usual liquids.

The liquid filling device of the invention comprises a vertical tubular filling nozzle and a multibored member attached to the lower end of the filling nozzle and having discharge bores arranged in parallel, the discharge bores having a flow channel resistance permitting a liquid within the filling nozzle to flow down when pressure is applied to the liquid but preventing the liquid from flowing down under gravity.

With the device of the invention which is usable for a liquid containing the flesh of fruit or fibrous substances, the discharge bores have such a diameter that the liquid will not clog the bores, whereas the discharge bores have a flow channel resistance permitting the liquid to flow out from the filling nozzle when pressure is applied to the liquid but preventing the liquid from flowing out under gravity. Consequently, the liquid can be filled at a high speed smoothly without clogging the discharge bores.

The drawings show a filling device embodying the invention.

Fig. 1 is a view in vertical longitudinal section of a filling nozzle;

Fig. 2 is a perspective view partly broken away and showing the nozzle; and

Fig. 3 is a view in vertical longitudinal section showing the filling device in its entirety.

An embodiment of the invention will be described below with reference to the drawings.

Fig. 3 shows a filling device which comprises a filling cylinder 14 connected by a connecting pipe 11 to an unillustrated tank containing the liquid to be filled and having upper and lower check valves 12, 13, a metering cylinder 17 connected by a connecting pipe 15 to the filling cylinder 14 at an intermediate portion with respect to its height and having a piston 16 therein, and a filling nozzle 18 connected to the lower end of the filling cylinder 14.

The components of the filling device other than the filling nozzle 18 are known and therefore will not be described.

As shown in greater detail in Figs. 1 and 2, the filling nozzle 18 comprises a tubular nozzle body 21, a square tube 22 having an upper end opening with the lower end of the nozzle body 21 inserted therein, a connecting nut 23 connecting the lower end of the nozzle body 21 to the upper end of the square tube 22, a multibored member 24 provided within the lower portion of the square tube 22, and an annular holder 25 provided within the square tube 22 and held between the lower end of the nozzle body 21 and the upper end of the multibored member 24 for holding the multibored member 24.

The nozzle body 21 comprises an upper member 31 having approximately the same diameter as the filling cylinder 14, an intermediate member 32 of double-wall structure and having a smaller diameter than the upper member 31, and a lower member 33 having approximately the same diameter as the intermediate member 32. The lower member 33 has an externally threaded upper portion 34 and is formed at the inner periphery of its lower end with an annular projection providing a spigot 35. One of two pairs of opposed sides of the square edge defining the upper end opening of the square tube 22 is formed with upward projecting edges 36 opposed to each other. The opposed faces of the two projecting edges 36 are each formed with a horizontal groove 37. The open lower end of the square tube 22 is provided with an inward flange 38 for supporting the multibored member 24 thereon. The connecting nut 23 has in its entirety a generally square contour in cross section. Of the four flat outer surfaces of the nut 23, two surfaces facing toward directions opposite to each other are each formed with a cutout 39 close to its lower end to provide an outward horizontal ridge 40 at the lower end. These two horizontal ridges 40 are fitted in the respective horizontal grooves 37 of the square tube 22. The connecting nut 23 includes an upper portion having a larger inside diameter than its lower portion. The larger-diameter portion is internally threaded as at 41 and is screwed on the externally threaded portion 34 of the nozzle body 21. The multibored member 24 is generally in the form of a prism of fluorocarbon resin or like synthetic resin and is fitted in the square tube 22 in intimate contact therewith. A plurality of vertical di-

scharge bores 42 of circular cross section are arranged in parallel and extend through the multibored member 24. In cross section, the holder 25 for the member 24 has a generally square contour conforming to the internal shape of the square tube 22. The holder 25 has an inner periphery which is circular in cross section at its upper end portion. The circular portion serves as a socket 43 for the spigot 35. Downward from the socket 43, the inner surface of the holder 25 gradually alters from the circular cross section to a square cross section.

When the piston 16 in its raised position is lowered, the upper check valve 12 opens, permitting the liquid to flow out from the tank into the metering cylinder 17 downward through the filling cylinder 14. When the cylinder 14 is filled with the liquid, the piston 16 is raised, whereupon the lower check valve 13 is opened, forcing the liquid into the filling nozzle 18 from the filling cylinder 14. The liquid flows out from the nozzle 18 through the discharge bores 42. When the rising piston 16 comes to a halt, the lower check valve 13 is closed, whereby one cycle of filling operation is completed. At this time, the interior of the filling nozzle 18 remains filled with the liquid, but the upward movement of the valve disk of the lower check valve 13 for closing the valve produces a negative pressure inside the cylinder 18, thereby causing some air to flow into portions of the discharge bores 42 including their lower ends. The air flowing in acts to prevent the liquid from flowing out from the nozzle 18.

In accordance with the kind of liquid to be filled, a suitable bored member 24 having discharge bores 42 of desirable diameter and length is selected for use.

Examples of liquids to be handled are milk, synthetic cream and juice containing the flesh of fruit as already mentioned.

Preferably, the discharge bores 42 have a diameter of 1 to 5 mm. If it is less than 1 mm, the bores will be clogged, whereas when it is over 5 mm, the liquid is likely to flow out under gravity. It is desired that the discharge bores 42 have a length of 5 to 100 nm. If the length is less than 5 mm, the liquid is likely to flow out from the nozzle under gravity, whereas if it is more than 100 nm, the bores are difficult to make.

When discharged from the nozzle at an excessively high speed, the liquid is forced against the bottom of the container to be filled or vigorously impinges on the liquid portion already placed in, agitating or splashing the liquid to produce air bubbles or other objectionable phenomena. When the discharge bores 42 are less than 2 mm in diameter and more than 60 mm in length, such objectionable phenomena are likely to occur. When having a length of up to 60 mm, the bores 42 are preferably up to 4 mm in diameter so as not to permit the liquid to fall under gravity.

In cross section, the discharge bores, which are circular, may alternatively be polygonal or elliptical. Such non-circular discharge bores achieve satisfactory results when having a cross sectional area corresponding to that of the circular bores.

For example, the multibored member is formed with discharge bores having a hexagonal cross section which is 2.5 mm in the length of each side and having a length of 60 mm. The member is 65.7% in opening ratio (sum of the cross sectional areas of the plurality of bores/nozzle end area x 100). When the member was used for filling milk, 2 cp in viscosity,or synthetic cream, 220 cp in viscosity, at a rate of 250 to 1000 ml/sec, satisfactory results were achieved.

Claims

1. A device for filling a liquid in a specified amount comprising a vertical tubular filling nozzle and a multibored member attached to the lower end of the filling nozzle and having discharge bores arranged in parallel, the discharge bores having a flow channel resistance permitting the liquid within the filling nozzle to flow down when pressure is applied to the liquid but preventing the liquid from flowing down under gravity.

2. A device as defined in claim 1 wherein the discharge bores are circular in cross section, 1 to 5 mm in diameter and 5 to 100 mm in length.

3. A device as defined in claim 1 wherein the discharge bores are circular in cross section, 2 to 4 mm in diameter and 40 to 60 mm in length.

4. A device as defined in claim 1 wherein the discharge bores are polygonal or elliptical in cross section and correspond to the discharge bores defined in claim 2 in cross sectional area and in length.

5. A device as defined in claim 1 wherein the discharge bores are polygonal or elliptical in cross section and correspond to the discharge bores defined in claim 3 in cross sectional area and in length.

6. A device for filling a liquid in a specified amount comprising:

a vertical filling cylinder having an upper check valve and a lower check valve and communicating with a tank for containing the liquid through the upper check valve,

a metering cylinder having a piston housed therein and connected to the filling cylinder between the upper and lower check valves,

a vertical tubular filling nozzle connected to the lower end of the filling cylinder, and

a multibored member attached to the lower

end of the filling nozzle and having discharge bores arranged in parallel, the discharge bores being circular in cross section, 2 to 4 mm in diameter and 40 to 60 mm in length.

7. A device for filling a liquid in a specified amount comprising:

a vertical filling cylinder having an upper check valve and a lower check valve and communicating with a tank for containing the liquid through the upper check valve,

a metering cylinder having a piston housed therein and connected to the filling cylinder between the upper and lower check valves,

a vertical tubular filling nozzle connected to the lower end of the filling cylinder, and

a multibored member attached to the lower end of the filling nozzle and having discharge bores arranged in parallel, the discharge bores being polygonal or elliptical in cross section and corresponding to the discharge bores defined in claim 3 or 6 in cross sectional area and in length.

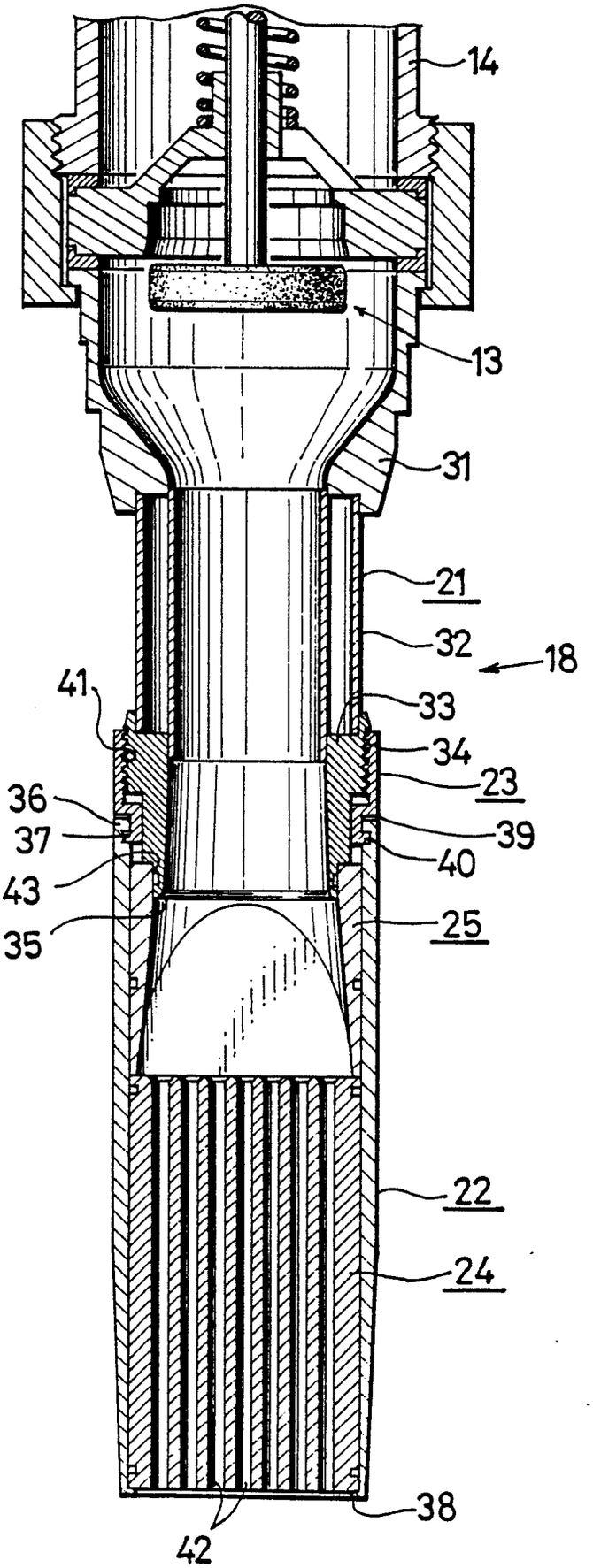

FIG.1

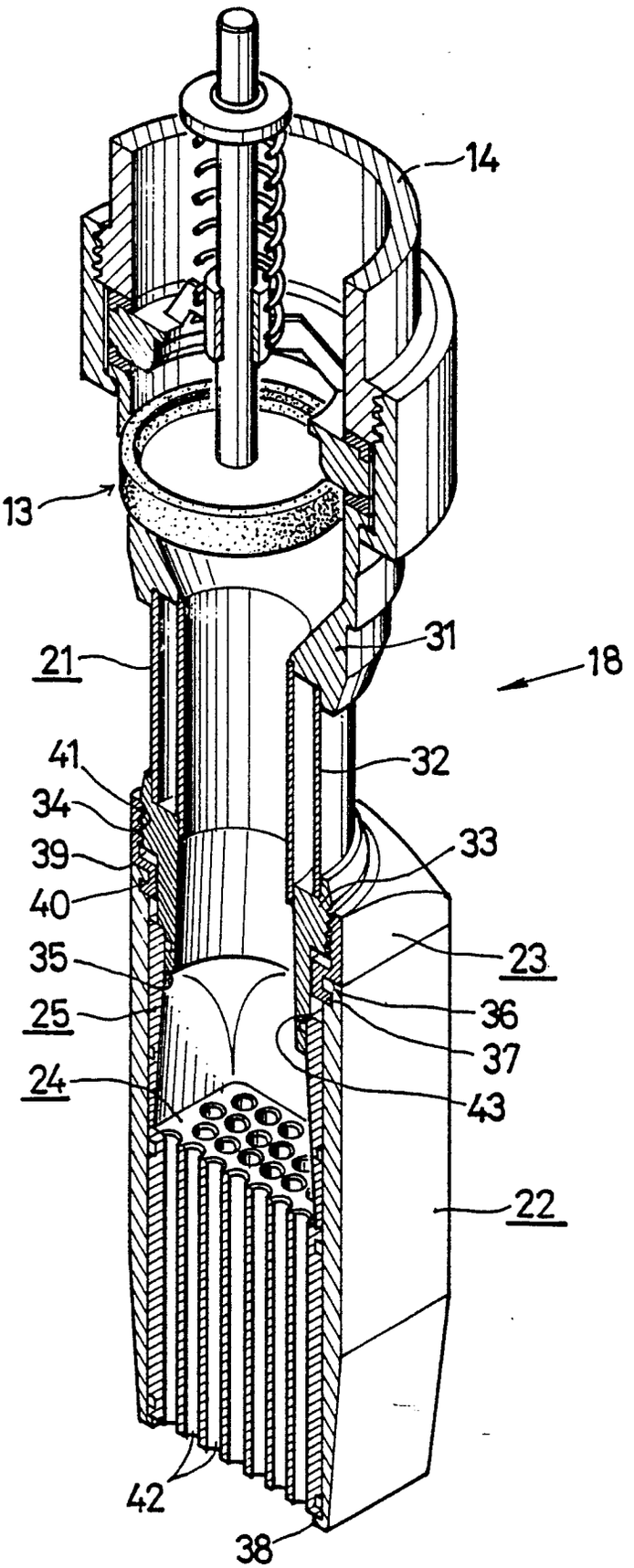

FIG. 2

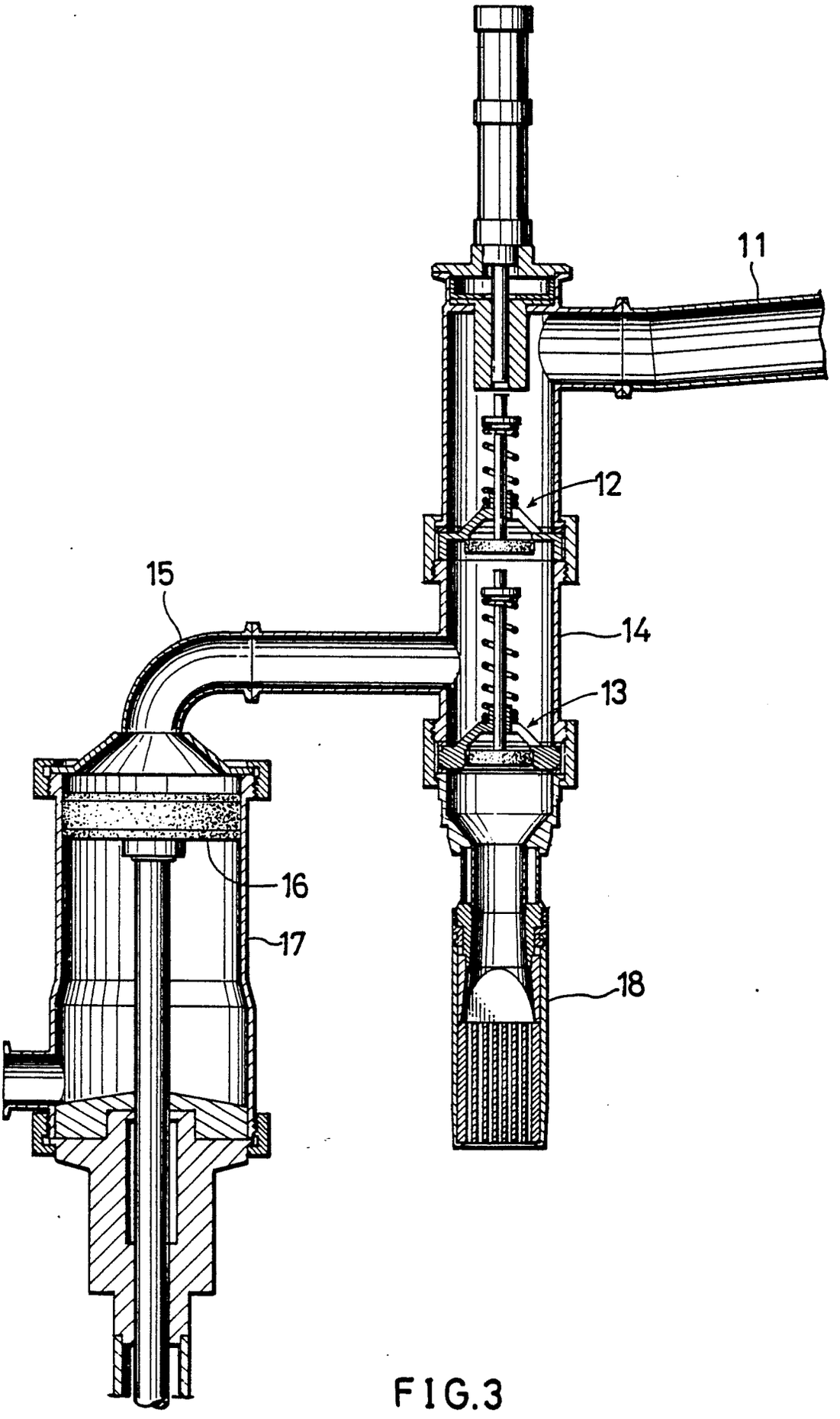

FIG.3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 20 0174

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.4)
X	US-A-1 959 694 (STEVENS) * Page 3, lines 104-127; figures 5-7 *	1	B 65 B 39/00
Y		2,3	
A		6	
Y	GB-A- 876 290 (MATHER & PLATT) * Page 1, line 73 - page 2, line 2; figures 2,3 *	2,3	
A		6	
A	DE-C- 690 574 (JAGENBERG) * Page 2, lines 21-31; figures 1,2 *	4	
A	EP-A-0 138 234 (SHIKOKU KAKOOKI CO., LTD) * Page 7, line 25 - page 8, line 35; figures 1,4 *	6	
A	EP-A-0 099 582 (CLISH) * claim 6; figure 2 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 65 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	04-05-1988	CLAEYS H.C.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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