



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11) EP 0 903 297 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:  
24.03.1999 Bulletin 1999/12

(51) Int. Cl.<sup>6</sup>: B65B 55/02

(21) Application number: 98202856.5

(22) Date of filing: 27.08.1998

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

• Arao, Takashi,  
c/o Shikoku Kakoki Co., Ltd.  
Iano-gun, Tokushima (JP)  
• Ueda, Michio,  
c/o Shikoku Kakoki Co., Ltd.  
Iano-gun, Tokushima (JP)

(30) Priority: 19.09.1997 JP 254911/97

(71) Applicant:  
Shikoku Kakoki Co., Ltd.  
Iano-gun Tokushima (JP)

(74) Representative:  
Vollebregt, Cornelis Jacobus, Ir. et al  
Algemeen Octrooibureau  
World Trade Center  
P.O. Box 645  
5600 AP Eindhoven (NL)

(72) Inventors:  
• Fujikawa, Yasuji,  
c/o Shikoku Kakoki Co. Ltd.  
Kitajimacho, Iano-gun, Tokushima (JP)

(54) Clean air booth for a packaging machine

(57) A clean booth (13) in the form of a box left open at the bottom side thereof is provided over the upper side of a bed (12). The clean booth (13) has a top wall formed with a clean air inlet (104) facing downward. An air discharge clearance is formed between the upper side of the bed (12) and the lower end of the clean booth (13). A container conveyor (16) is installed inside the clean booth (13) to provide a container transport path extending forward. A group of devices (18) are arranged along the transport path for performing a required pack-

aging operation and include a filling device (31). The filling device (31) comprises a filling nozzle (41) disposed above the transport path inside the clean booth (13), a filling device body (42) disposed outside the clean booth (13) for supplying a filling liquid to the filling nozzle (41), and a pipe (43) disposed inside through outside the clean booth (13) and connecting the device body (42) to the filling nozzle (41).

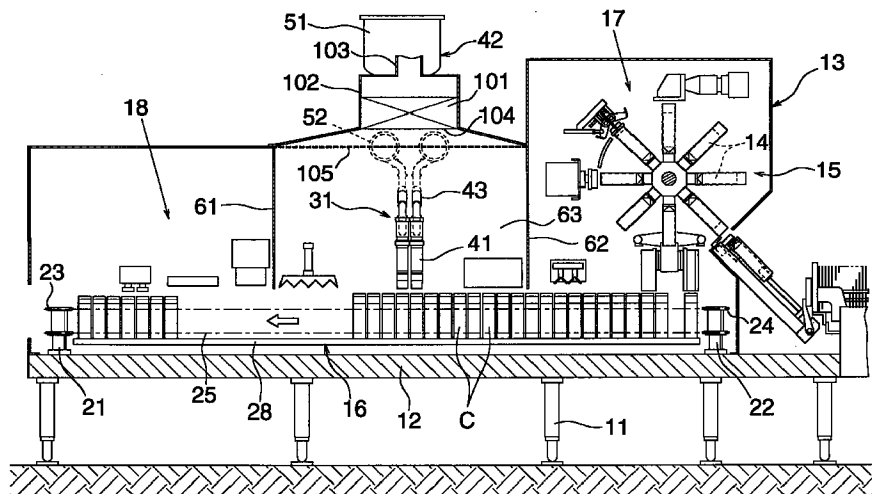


FIG.1

EP 0 903 297 A1

## Description

### BACKGROUND OF THE INVENTION

[0001] The present invention relates to packaging machines, and more particularly to packaging machine adapted to perform a packaging operation, such as filling contents into containers, in a clean environment.

[0002] Packaging machines of the type mentioned are known which comprise a clean booth covering the upper side of a bed and in the form of a box left open at the bottom side thereof, the clean booth having a top wall formed with a clean air inlet facing downward, an air discharge clearance being formed between the upper side of the bed and the lower end of the clean booth, a container conveyor being installed inside the clean booth to provide a container transport path, a group of devices being arranged along the transport path for performing a required packaging operation, the group of devices including a filling device comprising a filling nozzle, a filling device body for supplying to the filling nozzle the liquid to be filled, and a pipe connecting the device body to the filling nozzle, the filling nozzle, the device body and the connecting pipe being arranged inside the clean booth.

[0003] Since the entire filling device is provided inside the clean booth, the flow of clean air around the filling device is disturbed by the device. This entails the likelihood that the outside air will flow into the clean booth to contaminate the interior of the clean booth. The outside air may be prevented from flowing in by supplying an increased quantity of clean air to the clean booth, whereas the increase is not economical.

### SUMMARY OF THE INVENTION

[0004] An object of the present invention is to provide a packaging machine adapted to prepare containers in a clean environment by maintaining the interior of a clean booth at an ideal positive pressure with a minimized quantity of air required.

[0005] The present invention provides a packaging machine comprising a clean booth provided over an upper side of a bed and in the form of a box left open at a bottom side thereof, the clean booth having a top wall formed with a clean air inlet facing downward, an air discharge clearance being formed between the upper side of the bed and a lower end of the clean booth, a container conveyor being installed inside the clean booth to provide a container transport path extending forward, a group of devices being arranged along the container transport path for performing a required packaging operation, the group of devices including a filling device, the packaging machine being characterized in that the filling device comprises a filling nozzle disposed above the container transport path inside the clean booth, a filling device body disposed outside the clean booth for supplying a filling liquid to the filling nozzle, and a pipe

disposed inside through outside the clean booth and connecting the device body to the filling nozzle.

[0006] Thus, the filling device comprises a filling nozzle disposed above the container transport path inside the clean booth, a filling device body disposed outside the clean booth for supplying a filling liquid to the filling nozzle, and a pipe disposed inside through outside the clean booth and connecting the device body to the filling nozzle, so that the clean booth has disposed therein only the filling nozzle of the filling device. The clean air forced into the clean booth downward from the ceiling thereof flows in the form of a laminar flow around the filling nozzle without being disturbed, for example, by the device body. Accordingly, containers can be filled with a liquid in a clean environment without the likelihood of the outside air flowing into the clean booth.

[0007] A filling chamber may be formed inside the clean booth by surrounding the filling nozzle and the neighborhood thereof with a partition wall.

[0008] Preferably, the interior of the clean booth or the filling chamber is adapted to be maintained at a positive pressure with the clean air forced in from the clean air inlet.

[0009] The filling device body may be of the type comprising a filling liquid tank, and a metering cylinder for causing the filling liquid to flow out from the tank into the cylinder in a specified quantity at a time and subsequently to flow out from the cylinder into the filling nozzle through the connecting pipe.

### BRIEF DESCRIPTION OF THE DRAWINGS

#### [0010]

FIG. 1 is a side elevation of a packaging machine according to the invention;

FIG. 2 is a view in cross section showing filling devices of the machine and components thereof in the vicinity of the devices;

FIG. 3 is a plan view of a conveyor of the machine and a disinfecting device therefor;

FIG. 4 is a view in section taken along the line IV-IV in FIG. 3; and

FIG. 5 is a view in section taken along the line V-V in FIG. 3.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

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

[0011] In the following description, the terms "front" and "rear" refer respectively to the left-hand side of FIG. 1 and the opposite side thereof, and the terms "left" and "right" are used for the machine as it is seen from behind toward the front.

[0012] FIG. 1 shows a packaging machine, which comprises a bed 12 having legs 11 and in the form of a rectangular plate which is elongated in the front-to-rear

direction, and a clean booth 13 covering the upper side of the bed 12 and in the form of a box which is left open at the bottom side thereof.

[0013] A rotor 15 is disposed in the rear portion of the interior of the clean booth 13, approximately at the mid-portion of the height of the rear portion. The rotor 15 has radial mandrels 14 and is intermittently driven so as to stop the mandrels 14 successively at processing stations which are equal in number to the number of the mandrels 14 (on each mandrel wheel). Extending forward from below the rotor 15 is a conveyor 16 which is intermittently driven for transporting containers. A first group of devices 17 are arranged at required processing stations along the path of movement of the mandrels 14. A second group of devices 18 are arranged along the path of transport by the conveyor 16.

[0014] Although not shown, the rotor 15 has four mandrel wheels arranged side by side transversely of the machine. The conveyor 16 has left and right two container transport paths arranged in parallel. The first group of devices 17 comprises four units corresponding to the number of mandrel wheels and identical in components. The second group of devices 18 comprises two units corresponding to the number of container transport paths and identical in components.

[0015] The left and right transport paths of the conveyor 16 have the same construction. With reference to FIG. 3, each transport path of the conveyor 16 is provided by a pair of left and right vertical front drive shafts 21, a pair of left and right driven shafts 22, a pair of upper and lower drive sprockets 23 and a pair of upper and lower driven sprockets 24 mounted on the front drive shaft 21 and the rear driven shaft 22, respectively, at each of the left and right sides, an endless chain 25 reeved around the drive sprocket 23 and the driven sprocket 24 at each of the upper and lower levels on each of the left and right sides, a plurality of holder plates 26 each in the form of a vertical piece of L-shaped cross section and attached to the upper and lower chains 25 on each of the left and right sides, resin guides 27 (see FIG. 4) for guiding the chains 25 at required portions thereof, and a horizontal guide rail 28 disposed below the space between the left and right chains 25.

[0016] When seen from above, the left chains 25 are driven counterclockwise, and the right chains 25 clockwise. The forwardly movable opposed portions of the left and right chains 25 provide feed paths. Two holder plates 26 on the chains 25 moving along each of left and right feed paths, i.e., four holder plates 26 on opposite paths, are fitted to the respective four corners of the container C, with the bottom of the container C bearing on the guide rail 28 to transport the container C forward.

[0017] By each unit of the first group of devices 17, tubular blanks of square to rectangular cross section are fitted around the respective mandrels 14 of each mandrel wheel, and the bottom forming end portion of each fitted blank is folded flat to make a tubular con-

tainer C having a bottom and a square to rectangular cross section. Four containers are formed at a time by the first group of devices 17. The four containers are dividedly delivered to the left and right transport paths of the conveyor 16, two containers onto each path. The conveyor, driven intermittently, transports containers a distance at a time on each path which distance corresponds to two containers as arranged in a row on the path. By each unit of the second group of devices 18, contents are filled into the containers C transported on the conveyor 16, and each of the filled containers C has its top portion closed by being folded to the shape of a gable roof to complete a closed container C.

[0018] The second group of devices 18 include left and right filling devices 31. As seen in FIG. 2, these devices 31 face toward different directions transversely of the machine but have the same construction. More specifically, each filling device 31 comprises filling nozzles 41, filling device bodies 42 and connecting pipes 43, the components of each of these different kinds being two in number and arranged longitudinally of the machine (see FIG. 1).

[0019] Mounted on the upper side of the bed 12 is a stand 44 provided between the left and right transport paths. The stand 44 is provided at its upper end with left and right arms 45 extending in opposite directions transversely of the machine. The outer ends of the arms 45 are positioned above the left and right container transport paths, respectively.

[0020] The two filling nozzles 41, each in the form of a vertical cylinder, are attached as arranged side by side to the outer end of the corresponding arm 45. In this state, the nozzles 41 are positioned immediately above the corresponding transport path inside the clean booth 13.

[0021] Each of the filling device bodies 42 is disposed outside the clean booth 13 and comprises a filling liquid tank 51 and a metering cylinder 52. The metering cylinder 52 has incorporated therein an unillustrated piston, which operates to cause the liquid to be filled to flow out of the tank 51 into the cylinder in a specified quantity at a time and to subsequently flow out of the cylinder into the filling nozzle 41 through the connecting pipe 43.

[0022] The connecting pipe 43 extends through a side wall of the clean booth 13 and is connected to the filling nozzle 41 and the metering cylinder 52.

[0023] Front and rear partition walls 61, 62 each in the form of a vertical plate are arranged respectively at the upstream side and the downstream side of the left and right filling nozzles. The two partition walls 61, 62 define a filling chamber 64 inside the clean booth 13. Cutouts 64, 65 are formed in the lower edge portions of the respective partition walls 61, 62 so as to avoid interference with the conveyor 16 and containers C.

[0024] FIG. 3 shows a conveyor disinfecting device 71, which comprises a first disinfectant nozzle 81 provided for the feed paths of the left and right chains and disposed to the rear of the rear partition wall 62, and a sec-

ond disinfectant nozzle 82 provided for the return paths of the chains and disposed to the front of the front partition wall 61. As shown in greater detail in FIG. 4, the first disinfectant nozzle 81 comprises inverted U-shaped dripping pipes 92 having outlets 91 opposed to the respective feed paths from above. As seen in greater detail in FIG. 5, the second disinfectant nozzle 82 comprises spray balls 93 arranged above the respective return paths and facing downward, and a horizontal dripping pipe 95 disposed in the rear of each of the spray balls 93 and formed with a multiplicity of downward orifices 94 as arranged in a row.

[0025] An aqueous electrolytic acid solution is used as the disinfectant. This solution is highly effective for destroying microorganisms. The conveyor 16 is disinfected with the solution immediately before advancing into the filling chamber 63 and is therefore free of the likelihood that the exposure of the conveyor 16 to the outside air will permit microorganisms to adhere to and contaminate the conveyor 16. Furthermore, the aqueous electrolytic acid solution is unlikely to adversely affect the human body or metal parts of the machine. The solution further serves as a lubricant, diminishing the sliding friction involved in the contact of the guides 27 with the chains 25 or holder plates 26 to reduce the resistance to the operation of the conveyor and give a prolonged life to the parts.

[0026] With reference to FIG. 2 again, an air filter 101 is provided on the ceiling of the filling chamber 63. The air filter 101 has a casing 102 in the form of a box left open at its bottom side. An air duct 103 is connected to the top wall of the casing 102. The bottom opening of the casing 103 serves as an air outlet 104 (i.e., an air inlet for the filling chamber 63). A baffle 105 made of a perforated plate is provided under the outlet 104.

[0027] A clearance is formed between each side edge of upper side of the bed 12 and the lower end of the corresponding side wall of the clean booth 13, allowing air to flow out through the clearance.

[0028] The clean air forced out from the filter 101 is passed through the baffle 105 and thereby made into a laminar flow which is uniform in flow rate throughout the interior of the filling chamber 63 to flow down the chamber 63. Since only the filling nozzles 41 and portions of the connecting pipes 43 of the filling devices 31 are present within the filling chamber 63, the clean air smoothly flows around the filling nozzles 41 without being disturbed. The interior of the filling chamber 63 is maintained at a positive pressure by suitably determining the balance between the amount of clean air to be forced out from the filter and the amount of air to be discharged through the clearances between the bed 12 and the clean booth 13. With no disturbance involved in the flow of clean air, the internal pressure of the filling chamber 63 remains free of variations, and the clean air is discharged from the filling chamber 63 to the outside at a constant rate, so that there is no likelihood of the outside air flowing reversely into the filling chamber 63.

## Claims

1. A packaging machine comprising a clean booth provided over an upper side of a bed and in the form of a box left open at a bottom side thereof, the clean booth having a top wall formed with a clean air inlet facing downward, an air discharge clearance being formed between the upper side of the bed and a lower end of the clean booth, a container conveyor being installed inside the clean booth to provide a container transport path extending forward, a group of devices being arranged along the container transport path for performing a required packaging operation, the group of devices including a filling device, the packaging machine being characterized in that the filling device comprises a filling nozzle disposed above the container transport path inside the clean booth, a filling device body disposed outside the clean booth for supplying a filling liquid to the filling nozzle, and a pipe disposed inside through outside the clean booth and connecting the device body to the filling nozzle.
2. A packaging machine comprising a clean booth provided over an upper side of a bed and in the form of a box left open at a bottom side thereof, the clean booth having a top wall formed with a clean air inlet facing downward, an air discharge clearance being formed between the upper side of the bed and a lower end of the clean booth, a container conveyor being installed inside the clean booth to provide a container transport path extending forward, a group of devices being arranged along the container transport path for performing a required packaging operation, the group of devices including a filling device, the packaging machine being characterized in that a filling chamber is formed inside the clean booth by a front partition wall and/or a rear partition wall intersecting the container transport path, the filling device comprising a filling nozzle disposed above the container transport path inside the filling chamber, a filling device body disposed outside the filling chamber for supplying a filling liquid to the filling nozzle, and a pipe disposed inside through outside the filling chamber and connecting the device body to the filling nozzle.
3. A packaging machine according to claim 1 wherein the interior of the clean booth can be maintained at a positive pressure with clean air forced in from the clean air inlet.
4. A packaging machine according to claim 2 wherein the interior of the filling chamber can be maintained at a positive pressure with clean air forced in from the clean air inlet.
5. A packaging machine according to any one of

claims 1 to 4 wherein the filling device body comprises a filling liquid tank, and a metering cylinder for causing the filling liquid to flow out from the tank into the cylinder in a specified quantity at a time and subsequently to flow out from the cylinder into the filling nozzle through the connecting pipe. 5

10

15

20

25

30

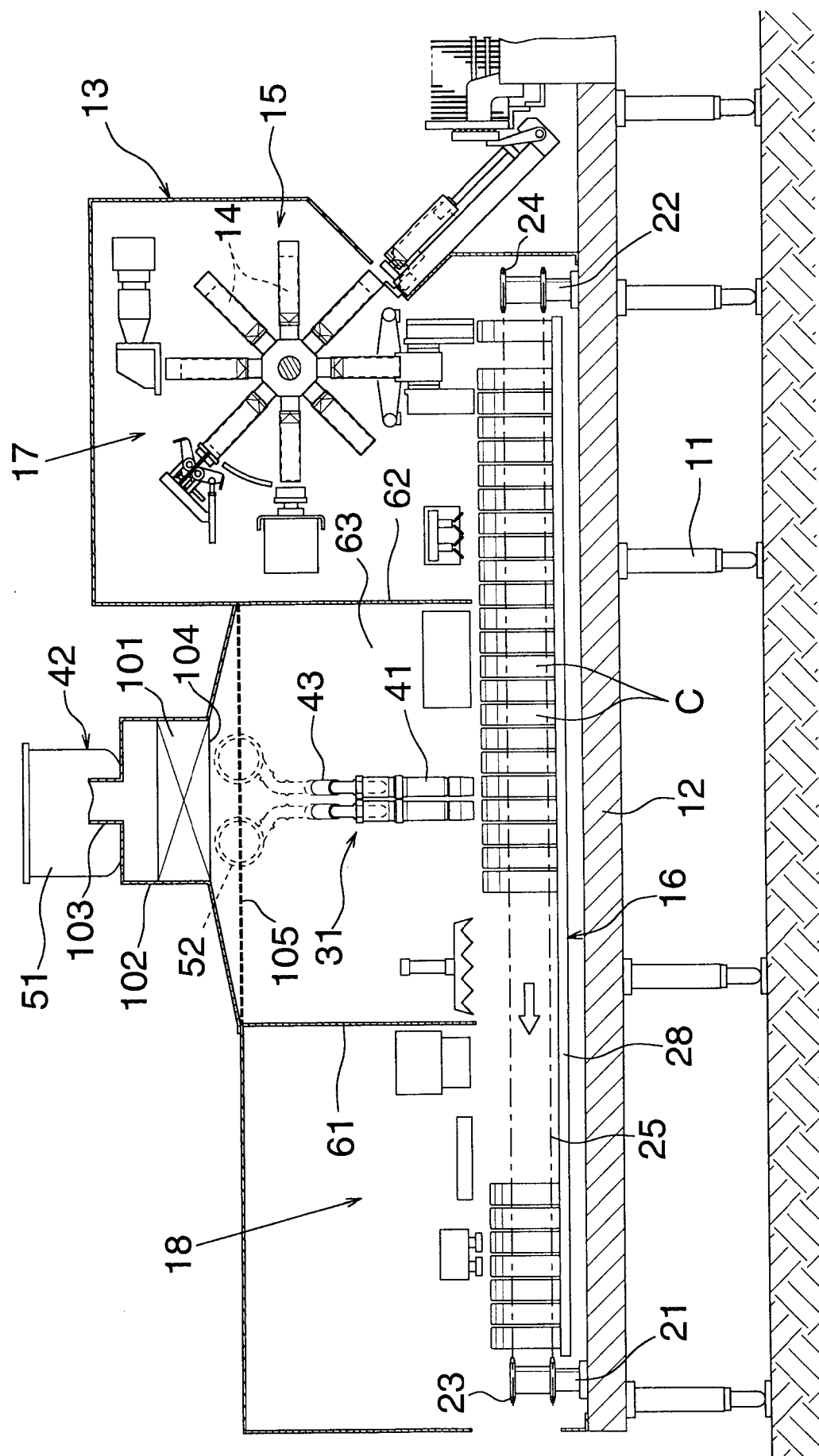
35

40

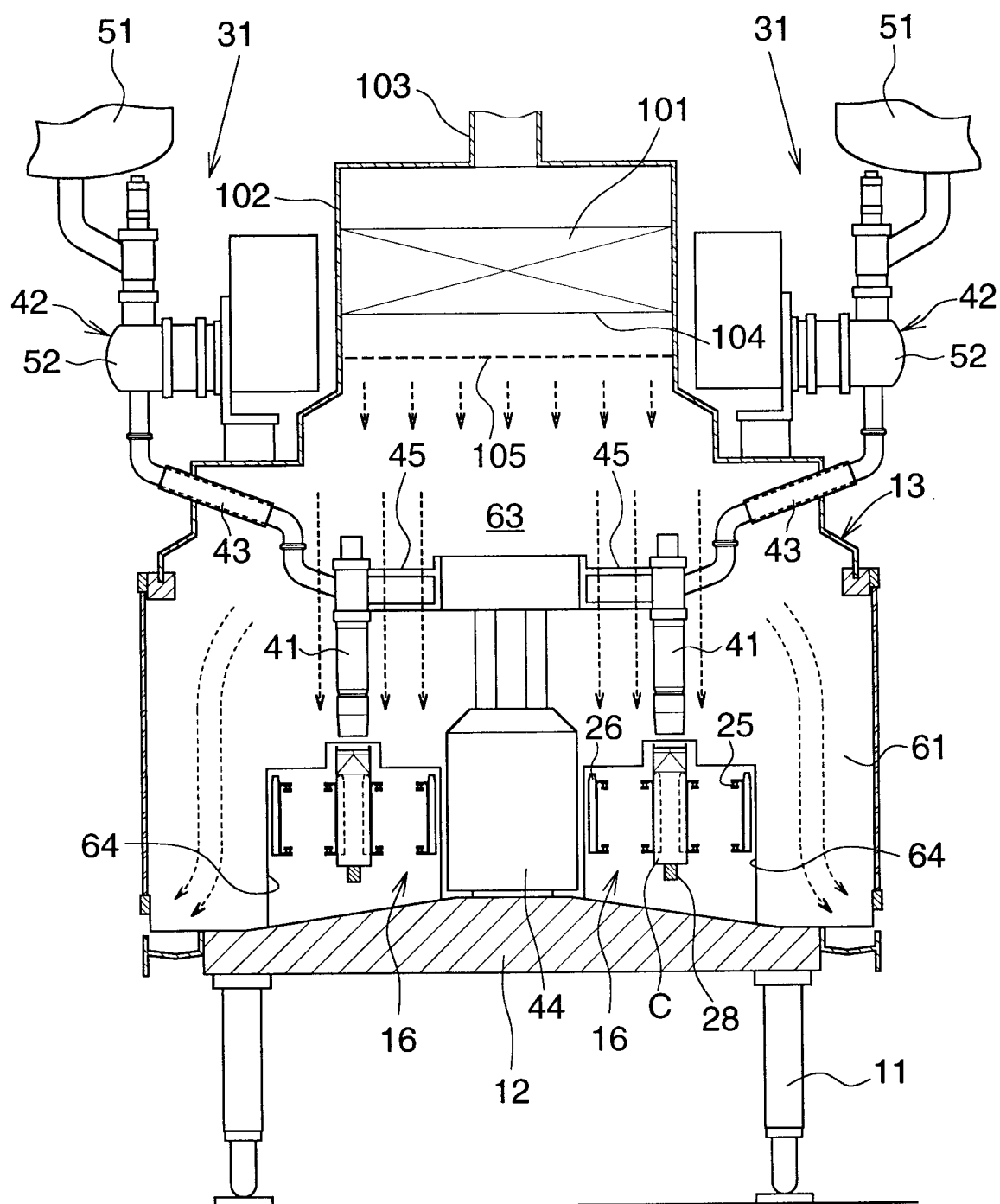
45

50

55



**FIG. 1**



**FIG.2**

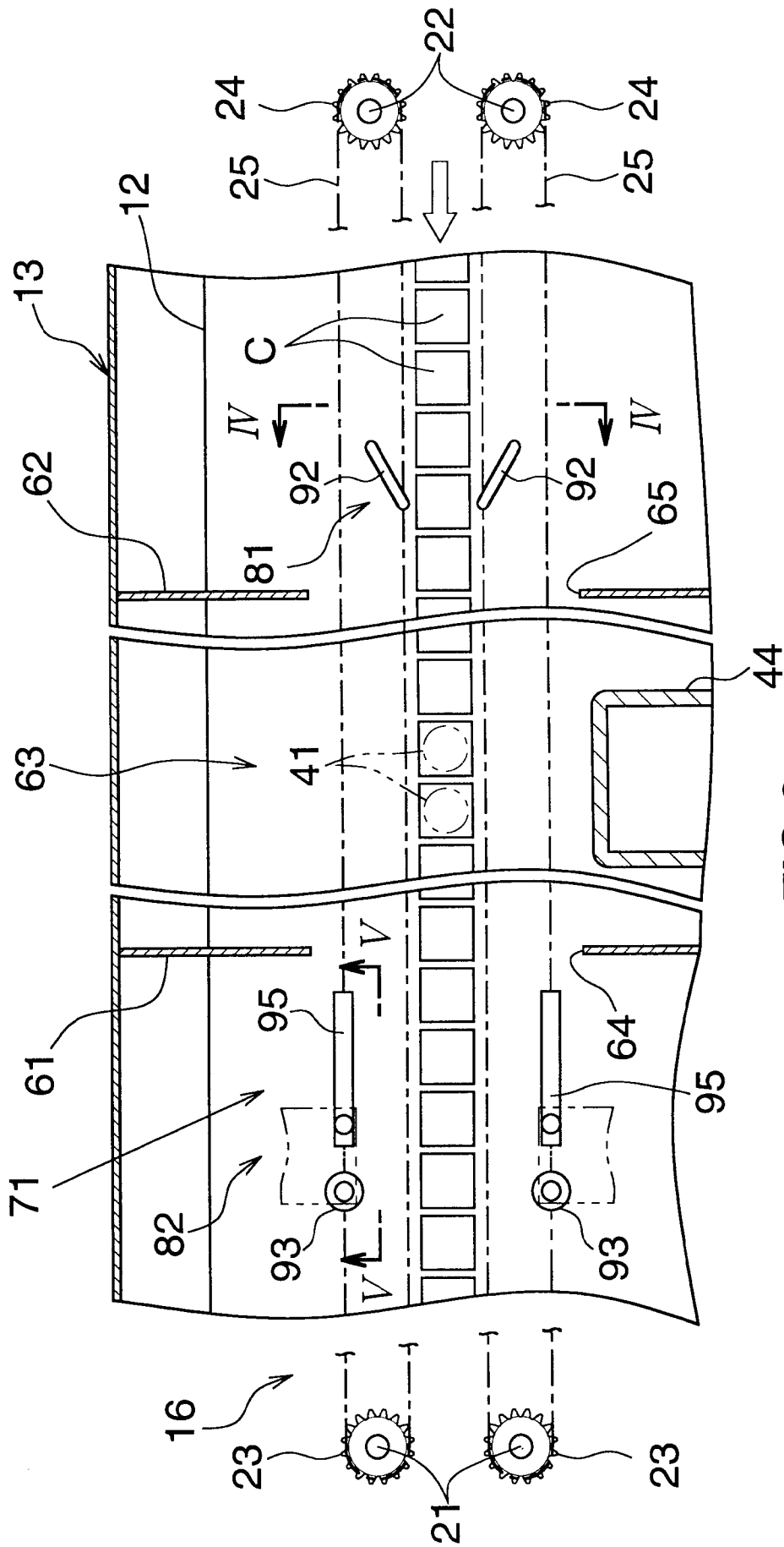
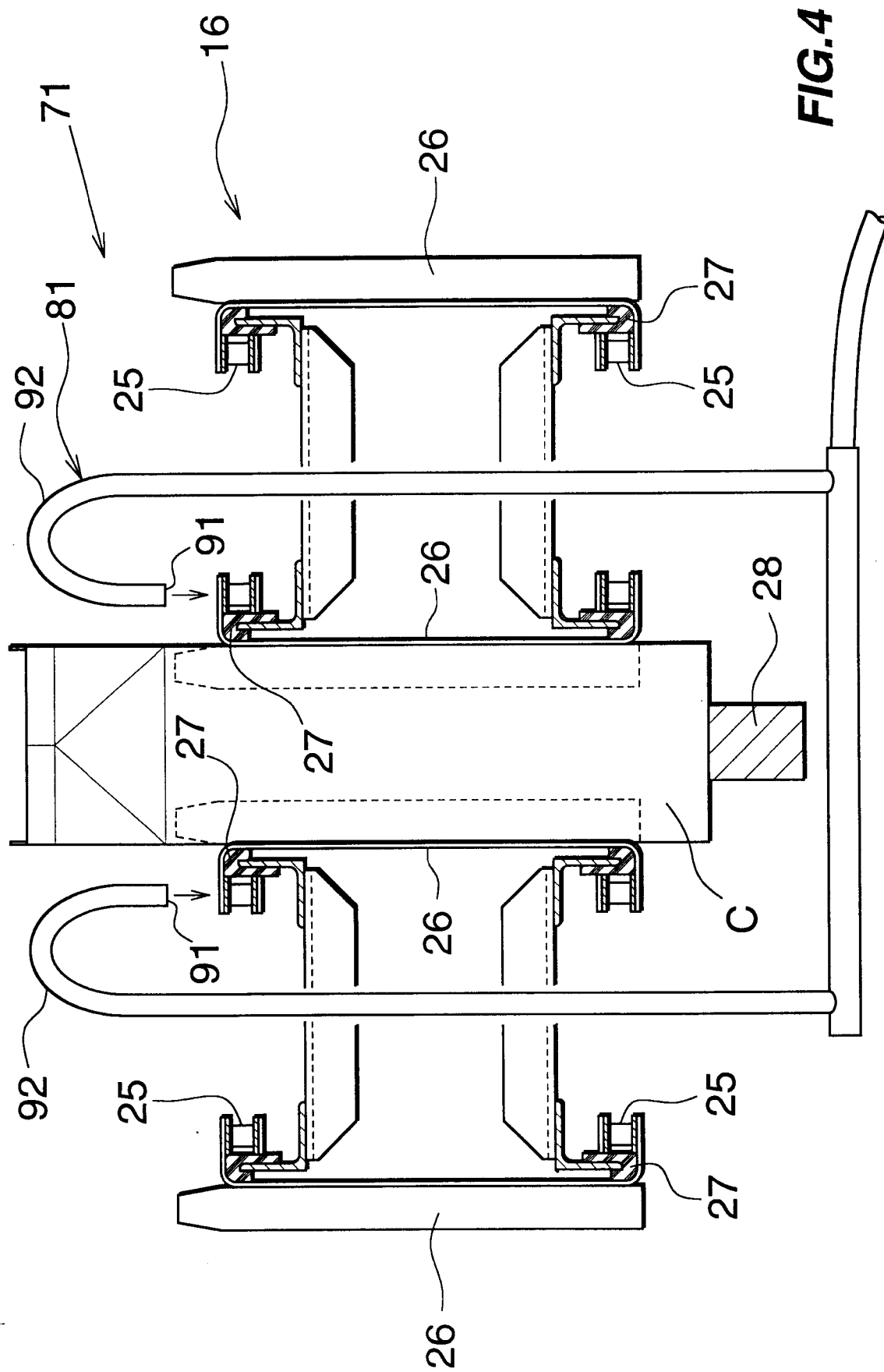
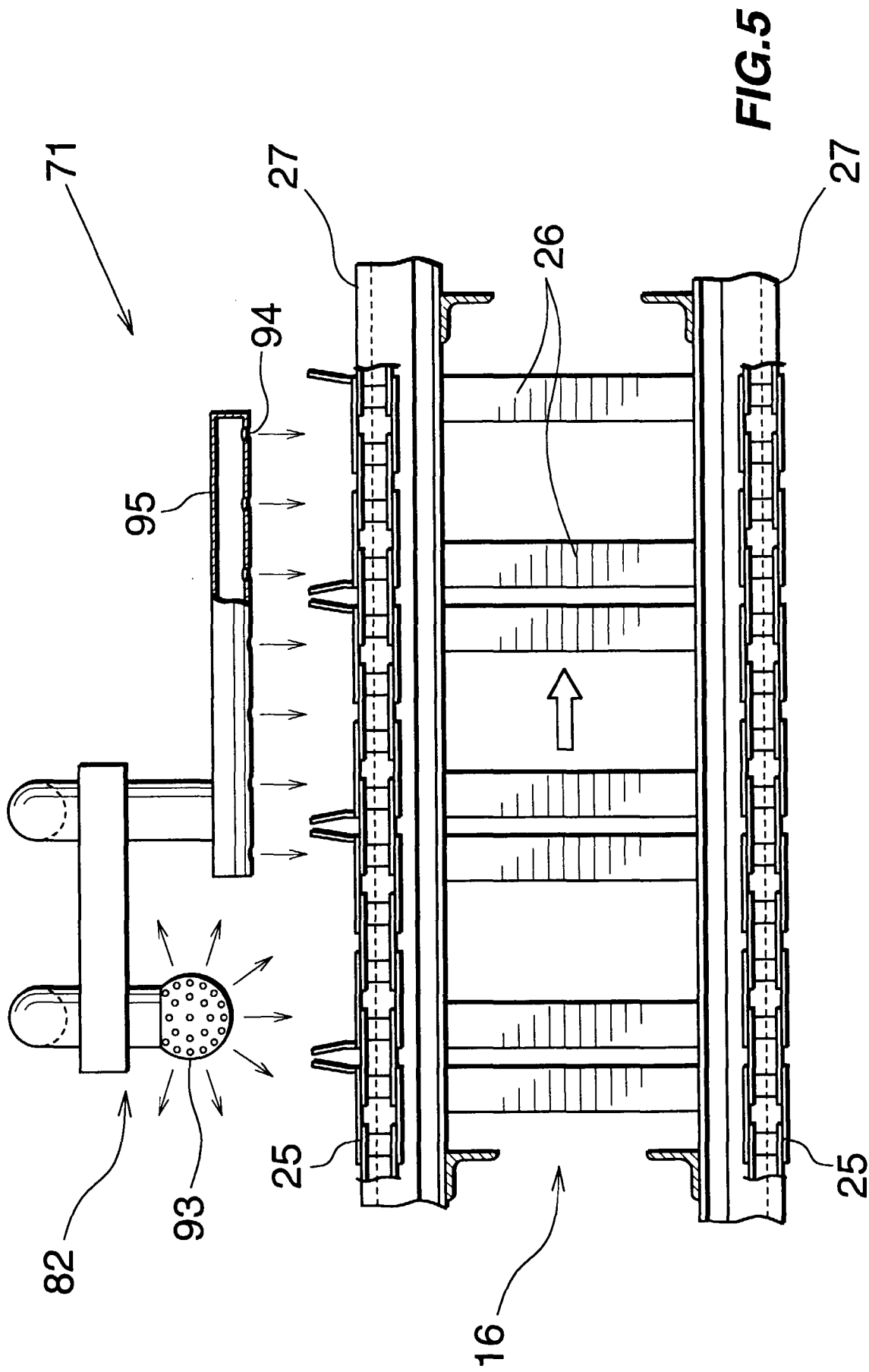


FIG. 3







European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 98 20 2856

| 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 0 237 777 A (BOSCH) 23 September 1987<br>* column 2, line 8 *<br>---                                                      | 1,2                                                | B65B55/02                                    |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 3 828 833 A (HEINZ) 13 August 1974<br>* abstract *<br>* column 3, line 52 - column 4, line 43;<br>figures 1,2. *<br>----- | 1,2                                                |                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                              |                                                    | TECHNICAL FIELDS<br>SEARCHED (Int.Cl.6)      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                              |                                                    | B65B                                         |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                              |                                                    |                                              |
| Place of search<br>THE HAGUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                              | Date of completion of the search<br>5 January 1999 | Examiner<br>Claeys, H                        |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                                                                              |                                                    |                                              |

EPO FORM 1503 03 02 (P04C01)

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

EP 98 20 2856

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.

05-01-1999

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|---------------------|----------------------------|---------------------|
| EP 237777 A                               | 23-09-1987          | DE 3607322 A               | 10-09-1987          |
|                                           |                     | JP 2075849 C               | 25-07-1996          |
|                                           |                     | JP 7098531 B               | 25-10-1995          |
|                                           |                     | JP 62208333 A              | 12-09-1987          |
|                                           |                     | US 4693052 A               | 15-09-1987          |
| US 3828833 A                              | 13-08-1974          | CA 924273 A                | 10-04-1973          |
|                                           |                     | GB 1233688 A               | 26-05-1971          |
|                                           |                     | NL 7006606 A               | 10-11-1970          |