

(19)



(11)

EP 3 015 587 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
04.05.2016 Bulletin 2016/18

(51) Int Cl.:
D06F 39/08 (2006.01)

(21) Application number: **14190484.7**

(22) Date of filing: **27.10.2014**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME

- **Gross, Thomas**
21025 Comerio (IT)
- **Schuster, Rainer**
21025 Comerio (IT)
- **Stegemeyer, Ulrich**
21025 Comerio (IT)

(71) Applicant: **Whirlpool Corporation**
Benton Harbor, MI 49022 (US)

(74) Representative: **Guerci, Alessandro**
Whirlpool Europe S.r.l.
Patent Department
Viale G. Borghi 27
21025 Comerio (VA) (IT)

(72) Inventors:
• **Bronn, Tobias**
21025 Comerio (IT)

(54) **Washing machine**

(57) Washing machine (10) comprising a tub (14) having a sump portion (12) with a float (13, 13a) and a drain line (18) downstream the sump portion (12) with a drain pump (20), said float (13, 13a) being configured to prevent communication between the sump portion (12)

and the drain line (18) when a liquid is present therein; downstream said drain pump (20) the drain line (18) is further provided with an anti-return valve (22) having a predetermined leakage.

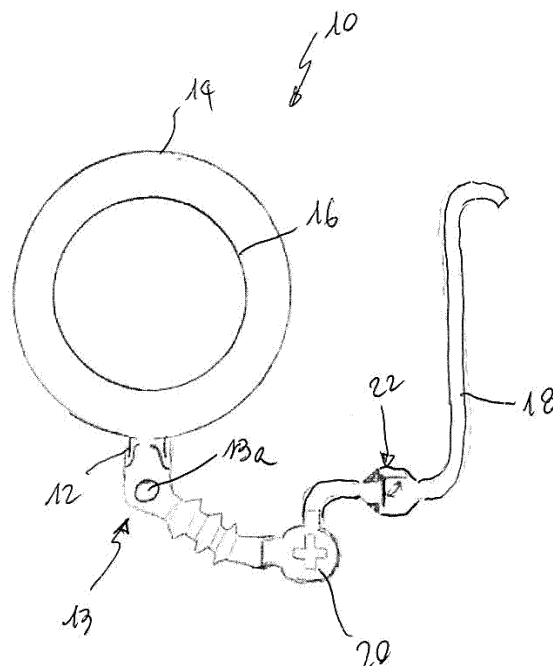


Fig. 3

EP 3 015 587 A1

Description

[0001] The present invention relates to a washing machine comprising a tub having a sump portion with a float and a drain line downwards the sump portion with a drain pump, said float being configured to prevent communication between the sump portion and the drain line when the drain pump is switched off and a liquid is present in the drain line.

[0002] This kind of washing machine is well known in the art, and it is disclosed for instance by US 4821537. Said float, called also eco-ball in the industry, is driven by a back pressure deriving from the presence of washing liquid or water in the drain line after the drain pump has switched off. The purpose of the float is mainly to prevent the dispensed detergent from sinking down into the drain line.

[0003] Even if the above known solution is very effective in creating a tight seal which closes the tub drain tightly, it presents noise problems ("snorkeling" noises) created by the drain pump during draining. If the washer is drained by the drain pump it can happen (if the wash unit and the eco system including the above float is empty while drain pump is still running) that the remaining water inside drain line between pump impeller and exit orifice of the drain line starts to pulse. If this effect happens it can be heard by customers as annoying snorkeling noise.

[0004] Another problem is linked to the use of the above known system with float when a washing liquid circulation system is present (i.e. in washers using the so called re-circulation technology), which drains a washing liquid from the sump portion of the tub and supplies such liquid via a circulating line again in the tub. In this configuration possible foam spits on door glass and laundry are created when the drain pump is switched off. When a washer is drained by the drain pump, water will remain in the drain line between drain pump and the exit orifice of the drain line. When the drain pump is switched off the remaining water (water column) will immediately flow back with speed towards wash unit. In case of a re-circulation where it is possible to have communicating pipes, the water will fill the drain pump and will also flow up the circulating line which is connected to the top of the wash unit. This can be considered as a pressure peak. If now during the spinning where vibrations are present some foam is built up in the empty pump housing the pressure peak will lift up the foam inside the re-circulation hose. That can be visible for customer as undesired foam spite on the door glass or laundry.

[0005] It is an object of the present invention to overcome the above technical problems by a simple and effective solution.

[0006] Such object is reached thanks to the features listed in the appended claims.

[0007] According to a main feature of the invention, by adding a flap valve to the drain line, for instance at the drain pump outlet or in the drain line (close to pump), the pressure peak when drain pump is switched off will be

entirely avoided and there will not be any remaining water inside drain hose that can start to pulse generating undesired noise. The flap valve according to the invention is working more or less like a check valve or flow reducer, and in order to ensure the functionality of the float of the known washer eco system, the flap has a predetermined water leak, for instance created by having one or more very small opening(s) to allow the remaining water to flow back towards wash unit at very low flow and speed to seal the eco system.

[0008] Other advantages of the present invention are the lack of rewetting of laundry when the drain pump is switched off, such rewetting decreasing dramatically rest moisture coefficient. Moreover according to the present invention no siphon is required in the circulating line, which could increase the risk of contaminating laundry with bacteria.

[0009] With the combination of flap valve and predetermined leakage the customer perceived quality is improved in terms of minimizing annoying noise during spinning when drain pump is running into air water condition.

[0010] Further advantages and features according to the present invention will become clear from the following detailed description, provided by way of non-limiting example, with reference to the attached drawings in which:

- Figure 1 shows the present draining system of a washer during the wash process;
- Figure 2 is similar to figure 1 and shows the draining system during a draining phase;
- Figure 3 shows a washer provided with a draining system according to the invention in one first embodiment;
- Figure 4 shows the washer of figure 3 in the draining phase as in figure 2;
- Figure 5 is an enlarged detail of figure 4; and
- Figure 6 shows a second embodiment of a washer according to the present invention.

[0011] With reference to figure 1, a known washer 10 presents a tub 14 having a sump 12 using an eco-ball system 13 (whose float is indicated with reference numeral 13a). In the tub 14 a rotating drum 16 is mounted, and the tub 14 is sealed due to the buoyancy of the float 13a and of difference of water level D between water level A inside the tub 14 and water level B in a drain hose 18. Downstream the eco-ball system 13 a drain pump 20 is mounted, which is figure 1 is shown as idle ("off").

[0012] In figure 2 the same washing machine of figure 1 is shown in a final phase of draining, i.e. when the drain pump 20 is running, the eco-ball system 13 is in an open configuration, there is a sort of air and water mixture in the pump 20 and the water column inside the drain hose 18 starts pulsating and generating annoying noises.

[0013] In figure 3 a washing machine according to the invention is shown, where for similar or identical components the same reference numbers of figures 1 and 2 are used. According to the invention, downstream the drain

pump 20 a flap valve 22 is placed in the drain hose 18 which is opened by the water flow delivered by the drain pump 18 and behaves like a check valve.

[0014] In figure 4 the washing machine 10 according to the invention is shown at the end of the draining phase, i.e. when the tub 14 is empty and no water remains to feed the drain pump 20. Due to the use of the flap valve 22, an uncoupling is realized between the water column inside drain hose 18 and air and water mixture inside the drain pump 20. In this configuration the flap valve 22 is in its closed position, while annoying pulsating noise is prevented. As shown in figure 5, the flap valve 22 present a central small hole 22a of about 3 to 5 mm which allows the water column inside drain hose 18, once the drain pump 20 is switched off, to flow back smoothly to the eco-ball system 13, so that such system is able again to seal the tub 14. Of course even if in the example the controlled leakage of the flap valve 22 is realized by a small hole 22a, there can be used other system, particularly if the flap valve is replaced by a ball valve acting as a check valve (in this case one or more small grooves in the seat of the ball valve could be used as well).

[0015] In figure 6 a second embodiment of the invention is shown, particularly with reference to a washing machine having a circulating line 26 and a circulation pump 28. In this case to the problem of pulsating noise in the drain hose 18 the problem of foam inside the circulating line 26 above rising water column (due to vibration during spinning) is added.

[0016] By using the flap valve 22 or similar non return valve with controlled leakage in the drain hose 18 downstream the drain pump 20 allows a smooth water back flow of washing liquid and a slow equalization of water level in the drain hose 18 and in the circulating line 26. This prevents possible foam spits into the drum 16 or over door glass (not shown) when drain pump 20 is switched off.

[0017] Even if the above example is referred to a horizontal axis washing machine, the technical solution according to the invention may be applied to vertical axis washing machine and to washer-dryers as well.

3. Washing machine according to claim 2, wherein said predetermined leakage is obtained by means of a hole (22a) in the flap valve (22).

5 4. Washing machine according to any of the preceding claims, wherein a circulating line (26) is present with a circulation pump (28), said drain pump (20) being placed downstream the circulation pump (28) in the draining flow direction.

Claims

1. Washing machine (10) comprising a tub (14) having a sump portion (12) with a float (13, 13a) and a drain line (18) downstream the sump portion (12) with a drain pump (20), said float (13, 13a) being configured to prevent communication between the sump portion (12) and the drain line (18) when a liquid is present therein, **characterized in that** downstream said drain pump (20) the drain line (18) is provided with an anti-return valve (22) having a predetermined leakage.
2. Washing machine according to claim 1, wherein the anti-return valve is a flap valve (22).

45

50

55

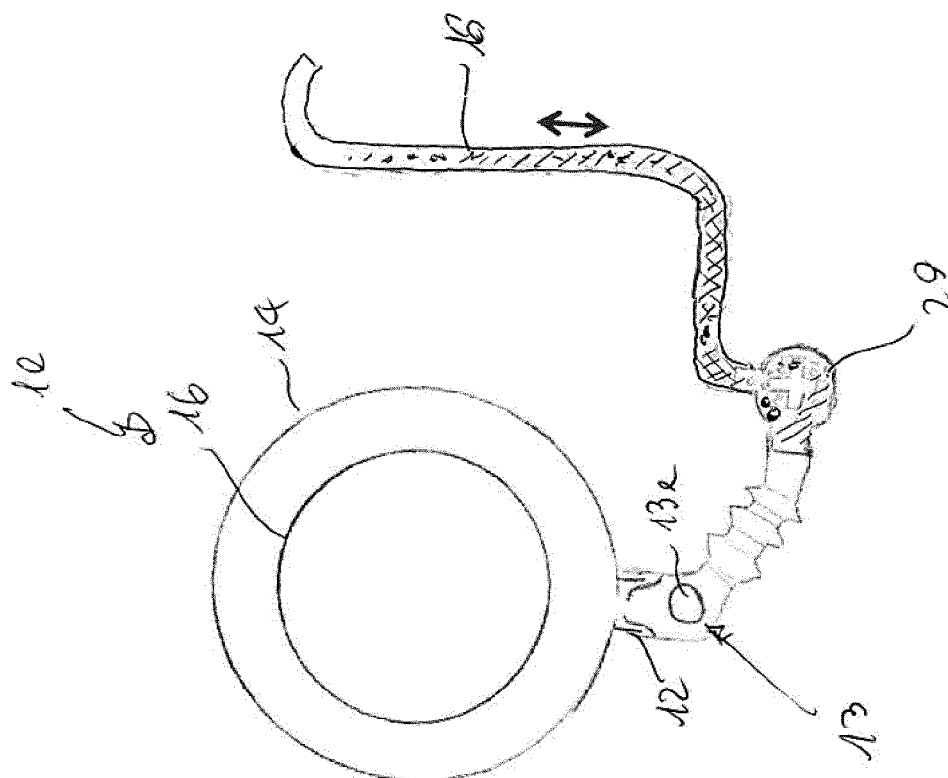


Fig. 2
(PRIOR ART)

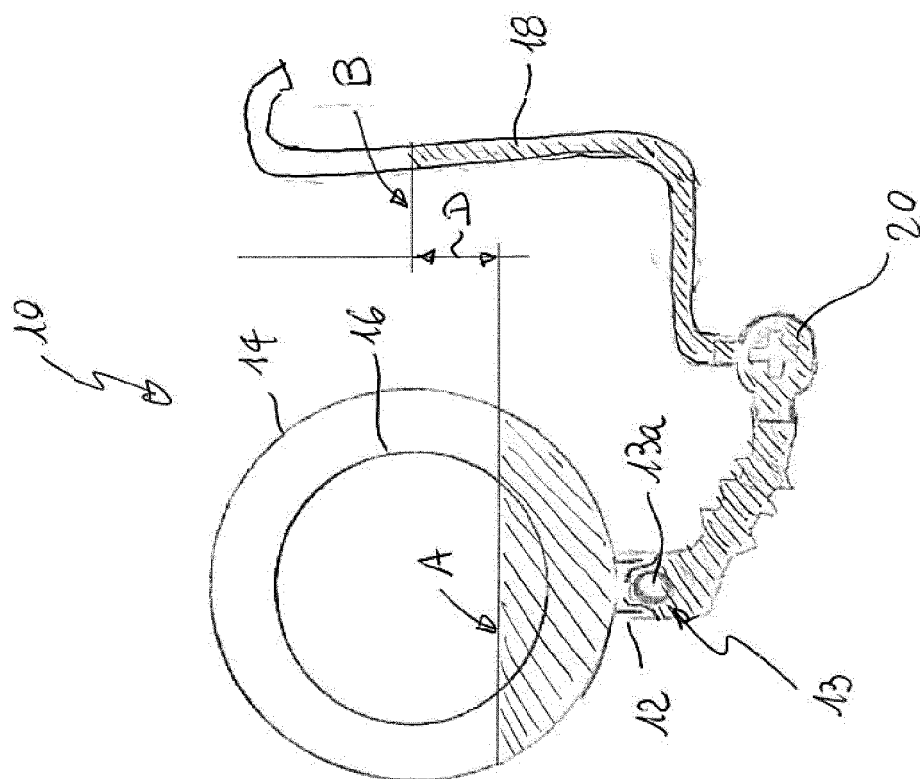


Fig. 1
(PRIOR ART)

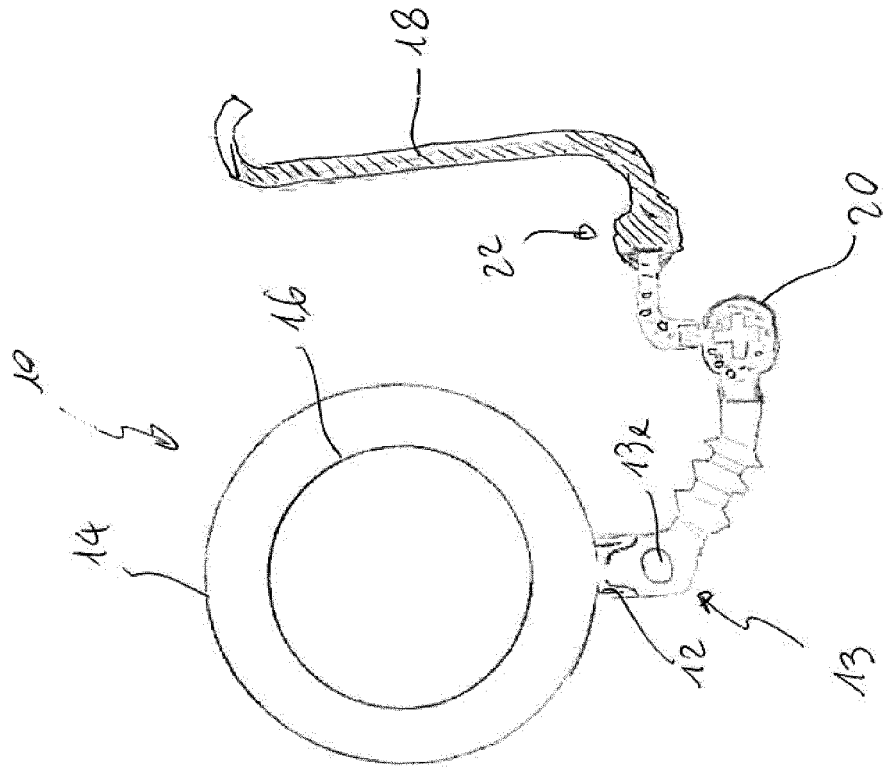


Fig. 4

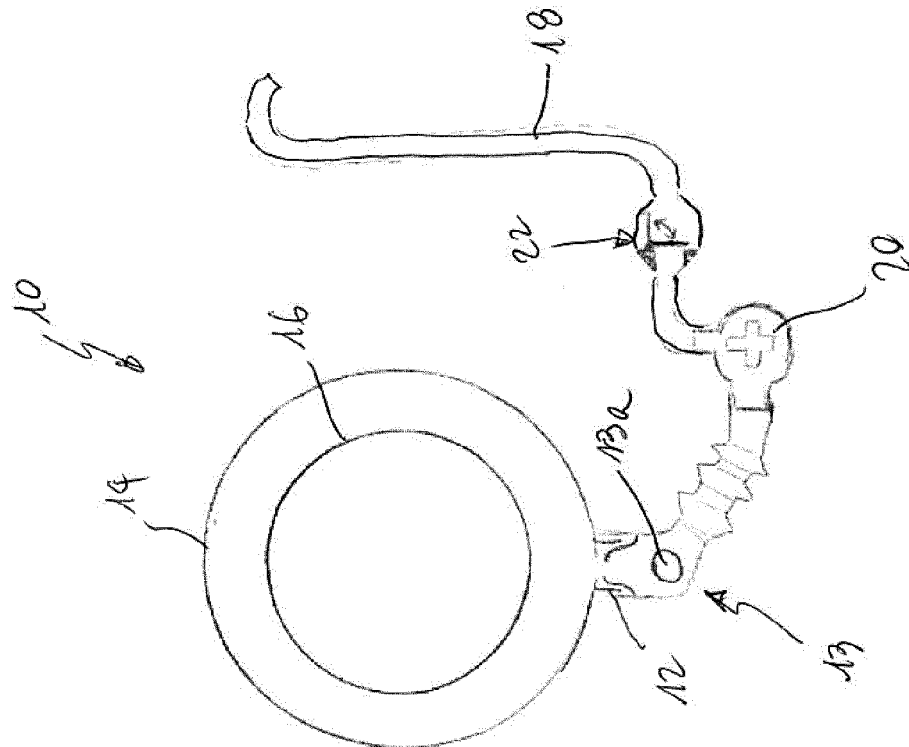
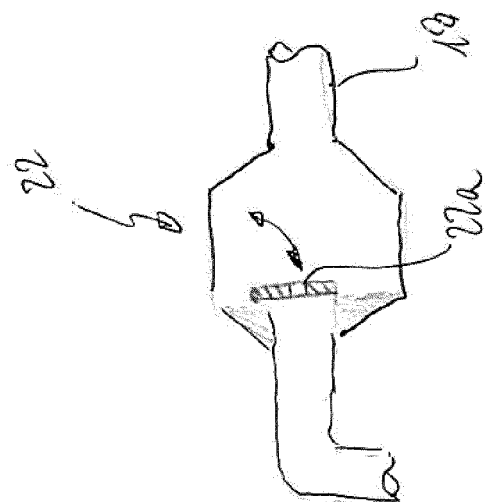
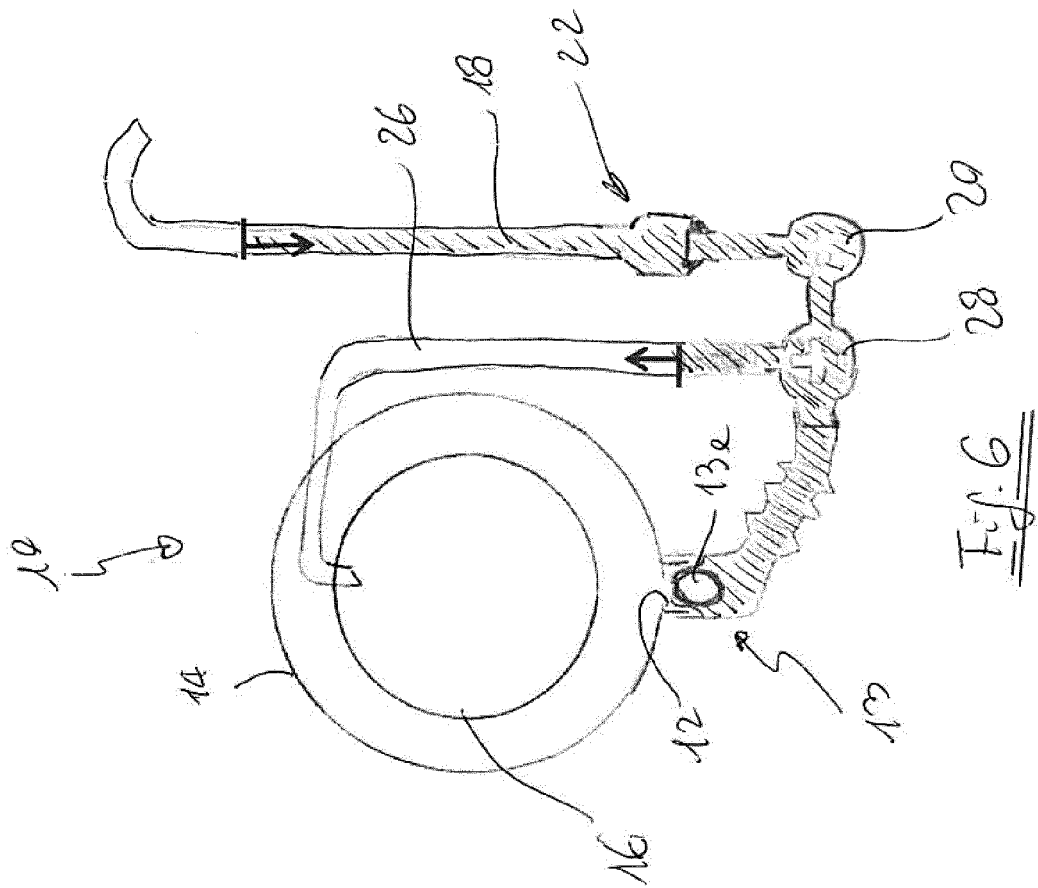


Fig. 3





EUROPEAN SEARCH REPORT

Application Number
EP 14 19 0484

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2006/129159 A1 (INDESIT CO SPA [IT]; BOMBARDIERI GIOVANNI [IT]) 7 December 2006 (2006-12-07)	1-3	INV. D06F39/08
Y	* page 1, lines 1-3; page 3, line 3 - page 5, line 12; claims; figures *	4	
X	DE 43 16 598 A1 (LICENTIA GMBH [DE]) 24 November 1994 (1994-11-24)	1-3	
A	* column 1, line 64 - column 2, line 39; claims; figures *	4	
Y	DE 30 41 594 A1 (BOSCH SIEMENS HAUSGERAETE [DE]) 13 May 1982 (1982-05-13)	4	
A	* claims; figures *	1-3	
			TECHNICAL FIELDS SEARCHED (IPC)
			D06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 17 March 2015	Examiner Clivio, Eugenio
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			

EPO FORM 1503 03.02 (P04C01)

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

EP 14 19 0484

5

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.

17-03-2015

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2006129159 A1	07-12-2006	EP 1899523 A1 WO 2006129159 A1	19-03-2008 07-12-2006
DE 4316598 A1	24-11-1994	NONE	
DE 3041594 A1	13-05-1982	NONE	

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 4821537 A [0002]