

(19)



(11)

EP 3 795 482 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.03.2021 Bulletin 2021/12

(51) Int Cl.:
B65B 29/02 ^(2006.01) **B65B 7/16** ^(2006.01)
B65B 57/10 ^(2006.01)

(21) Application number: **20197025.8**

(22) Date of filing: **18.09.2020**

(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
Designated Validation States:
KH MA MD TN

• **Gort-Barten, Leslie**
Crawley, West Sussex RH11 7ST (GB)

(72) Inventors:
• **Gort-Barten, Alex**
Crawley, West Sussex RH11 7ST (GB)
• **Gort-Barten, Leslie**
Crawley, West Sussex RH11 7ST (GB)

(30) Priority: **18.09.2019 GB 201913443**

(74) Representative: **JENSEN & SON**
366-368 Old Street
London EC1V 9LT (GB)

(71) Applicants:
• **Gort-Barten, Alex**
Crawley, West Sussex RH11 7ST (GB)

(54) **BEVERAGE CAPSULE MANUFACTURE**

(57) Apparatus for filling a capsule for use in a coffee machine, which capsule has a flange with a gasket. The apparatus comprises gasket detection means 11 for detecting the presence of a gasket on the capsule, capsule

selection means being provided to enable capsules without a gasket to be rejected and capsules with a gasket detected to be packed.

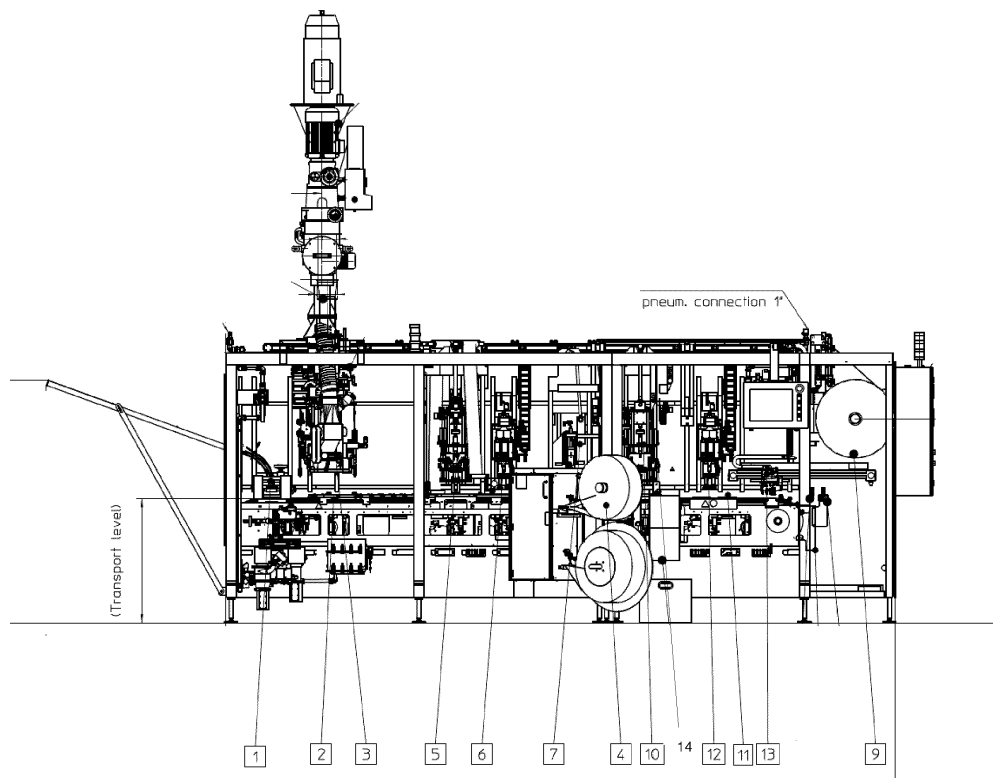


Fig. 1

EP 3 795 482 A1

Description

[0001] The invention relates to a beverage capsule for an espresso machine, in particular for making espresso under high pressure.

[0002] Powered espresso machines are well known. The conventional espresso machine comprises a water chamber, a heating element adapted to heat the water to around 95-98 C, which is then pumped under high pressure of 15 to 19 bar to a filter holder or portafilter. Lower pressure systems also exist. The filter holder typically comprises a handle portion and a holder portion provided with two or three lugs that are adapted to engage in the installed position with the machine brewhead to where the water is pumped. The holder portion is adapted to receive a filter, which is usually a metal bowl with a number of perforations through its bottom. In use, the filter is filled with finely ground coffee and the water is forced through the coffee at the high pressure generated by the pump to produce the espresso coffee which is collected in a cup placed under the filter holder.

[0003] The classic coffee machine suffers from two potential drawbacks. The first drawback is that ground coffee starts to lose its freshness and flavour after a few days and so for the optimum espresso, the user will also need to have a coffee grinder. The other drawback is that the used espresso coffee has to be removed from the filter, which can lead to mess as the grinds are fine.

[0004] This led to the development of ESE coffee pods, which can be used in many espresso machines. Coffee pods are generally individually wrapped to maintain freshness and consist of a small pod made of a perforated filter paper which contains the coffee. The pod is placed in the filter holder and then disposed of after use. Coffee pods are convenient but have to fit the filter holder and be placed correctly otherwise water can leak around the edge.

[0005] This in turn lead to the development of capsule machines. The coffee capsules for these machines are completely sealed. The capsule machines do not use the conventional filter holder. A capsule machine typically has a two part mechanism. The first part receives the capsule and is provided with an extraction surface upon which the capsule rests. The second part is provided with a locking lever which is used to make the first and second parts integral. In use, the second part cuts the upper surface of the capsule to allow water to enter the capsule and percolate down through the capsule, where it exits through the lower surface of the capsule at multiple locations determined by the geometry of the extraction surface. An example of such a machine is disclosed in EP0870457 or WO2005/004683. Capsules in the known capsule coffee machines are, in use, inserted into a capsule cage of the machine which holds the capsule in position so that it may be cut by a cutting member.

[0006] Capsule machines have proved to be commercially very successful as they are very convenient to use and produce a consistent product. However, each man-

ufacturer's coffee machines and capsules are designed to work with the manufacturers own brand. The most popular brand of capsule is Nespresso®, which uses a sealed capsule made of aluminium. In use, the capsule is clamped into position in the machine with a capsule cage part holding the capsule so that it can be cut by typically three prongs to enable water under pressure to enter the coffee capsule.

[0007] Aluminium has the considerable advantage that it is oxygen and water impermeable, which means that the coffee in the capsules has a long shelf life. Aluminium however also suffers from several major drawbacks in that the aluminium is easily deformed during the filling and packing stage and it is difficult and expensive to produce a reliable seal on the capsule rim. The only known seal on the market that works is a silicone elastomer disclosed in EP1654966 despite significant research effort. In these capsules the edge of the aluminium rim is rolled over where the front foil seal is attached. The known solutions such as US2018/215120 and WO2013/029184 to these problems further require an extremely high capital investment beyond most companies.

[0008] The present invention therefore seeks to provide an improved method of manufacture of a coffee capsule.

[0009] According to a first aspect of the invention there is provided apparatus for filling a capsule for use in a coffee machine, which capsule has a generally frusto-conical form with an upper surface and a lower surface, an annular flange being provided at the lower surface, wherein an annular seal is provided on the annular flange comprising a cellulose material such as paper that deforms in use, wherein the apparatus comprises gasket application means, which applies a gasket to the capsule on the flange, wherein the apparatus further comprises gasket detection means for detecting the presence of a gasket on the capsule, capsule selection means being provided to enable capsules without a gasket to be rejected and capsules with a gasket detected to be packed.

[0010] Preferably, the apparatus further comprises capsule filling means, capsule sealing means for applying a foil to close a filled capsule, wherein manipulation means then invert the capsule, the inverted capsule then being moved through the machine to the gasket application means. Preferably the aluminium capsule is pre-formed.

[0011] Further advantageous aspects of the invention can be found in the sub-claims.

[0012] The apparatus advantageously provides a good seal on the capsule which is more easily recycled than the known silicone seals.

[0013] Exemplary embodiments of the invention will now be described with reference to the drawings, in which:

Fig. 1 shows a capsule filling machine.

[0014] Figure 1 shows a capsule filling machine com-

prising stations 1 to 16. In stations 1-6, the empty capsule is fed in from a stack 1, the coffee is ground 2 and then the capsule filled by a doser 3 and then passed to the foil application station 5 to seal the capsule.

#

[0015] The capsule rim has a 12-degree angle applied during the lid foil application at head shaper 6. This angle tightens the lid foil after application, for cosmetic reasons. It also prevents a tangent leading edge, which helps reduce foil peel when capsule pressurises due to coffee degassing.

[0016] The foil seal is cut from the reel at station 4 and the seal is then applied to close the capsule. In an alternative embodiment for producing empty capsules to be filled elsewhere, the gasket is applied to an empty capsule in which case Stations 1 to 6 are not required.

[0017] At capsule rotator station), the capsule is rotated on the main conveyor belt from a lid foil facing up orientation to a lid foil facing down orientation to allow access to the gasket application area.

[0018] At station 9 the gasket material is fed from a reel of material into a die cutter 10, which cuts the gasket material from the material. In a first step a circle is punched from the reel of the material to form the inner circumference of the gasket. The circle of material is then removed using a vacuum tool. The outer diameter is then punched from the material to form the annular gasket. The annular gasket is then pushed downwards onto the capsule rim using compressed air jets 14 to speed up the movement of the gasket into the desired position.

[0019] At station 10 the gasket is applied to the capsule and at station 11 optical presence sensors are used to detect if the capsule has a gasket applied. If any capsule is detected not to have a gasket, that capsule is rejected as without the gasket, the capsule will leak in most capsule coffee machines.

[0020] To ensure the capsule always has a gasket fitted is technically challenging in particular where the gasket is colour matched to the colour of the capsule body.

[0021] There are a number of presence sensors on the market but differentiation of the gasket from the capsule is difficult. A fluorescent compound is included in the gasket material so that a UV light shone upon the capsule will light up differently on the gasket material from the capsule material. In a preferred approach, the fluorescence detector is provided with a sensor that provides a digital reading in response to the fluorescence detected. If the detected fluorescence is above a certain level, the detector will determine that there is a capsule with a seal there. If the reading is below that level the detector determines that there is no gasket and the capsule is rejected by not picking it off the conveyor belt and is directed into a waste bin, without the machine stopping.

[0022] In a further embodiment depending on the reflectiveness / absorption of the material different types of sensors, such as lasers can be used. If the ink used on the gasket does not have the fluorescent component required for detection, a laser could be used to measure

the height from the rim and thereby deduce if a gasket is present or not.

[0023] Capsules are lifted from the transport belt so that they can be independently aligned to the station above or below. This eliminates any position errors on the transport belt that might arise from wear within the machine / inertia / coffee residue etc.

[0024] At station 12 upper and lower heat sealers are located. Heat and pressure is applied to the gasket so it adheres to the capsules using special angled sealing head to match the shape of the capsule and which, to accommodate the 12 degree angle, the gasket sealing heads are also angled to 12 degrees.

[0025] Depending on the gasket material, an adhesive may be required or alternatively pressure and/or heat alone may negate the need for an adhesive. From the perspective of recyclability, this is preferable. In a particularly preferred embodiment, as the pressure and the heat is applied the gasket swages out and tightens around the internal diameter, creating a tight fit over the capsule. The outer diameter also increases, pushing the gasket under the rim of the capsule. Using no adhesive has advantages of being cheaper, easier to apply, store and to comply with food safety. Heat is applied to both sides of the seal.

[0026] In this station the top sealer drops over the aligned gasket and capsule to bond them together. Typically the system runs with a top sealing temperature of between 240-300°C, a bottom temperature of between 180-210°C with a dwell time of 350-450ms. Application of heat from both sides significantly reduces the dwell time in the machine so increasing its capacity and also reduces the likelihood of any heat damage to the seal caused by the direct application of heat from the top side due to the longer dwell time which would otherwise be required. The use of the lower temperature on the bottom sealing side does not cause any damage to the foil.

[0027] If an alternative embodiment in which the gasket is applied to an empty capsule, the heat from the bottom may be in the range from no applied heat up to 170°C in particular in the case where the capsule interior is provided with a food safe coating such as PVC. In the first embodiment heat to seal the gasket is applied from the top and the bottom when the lid foil is already applied to the capsule, so the lower sealer does not come into contact with the PVC liner and stick to it. When the gasket is applied to an empty capsule, the lid is not in place and the lower heater may stick to the PVC liner.

[0028] The force applied to the sealing heads is controlled by a pressure dial on the machine. This pressure is exerted onto a 50.0mm diameter piston. The pressure typically used is in the range of 1 to 6, preferably 2-3 bar.

#

[0029] The pressure applied may be adjusted depending on the type of adhesive / gasket material used.

[0030] The table below shows the range of pressures found on the sealing head at the various inlet pressure settings.

Top Piston Pressure (bar)

bar	MPa	psi
1	9	0.9 130
2	18	1.8 261
3	27	2.7 391
4	36	3.6 521
5	45	4.5 651
6	55	5.4 782

[0031] At station 13 the capsule is picked and placed onto an outlet conveyor belt connected to a cartoning machine so that the capsule can be packed.

6. Apparatus according to Claim 5, wherein the apparatus comprises a top sealer adapted to apply a top sealing temperature of between 240-300°C.
- 5 7. Apparatus according to Claim 5 or Claim 6, wherein a bottom sealer is provided, which provides a bottom sealing temperature of between 180-210°C
- 10 8. Apparatus according to any one of Claims 5 to 7, wherein the capsule has a dwell time of approximately 350-450 ms during the application of heat by the top and/or bottom sealers.

15

Claims

1. Apparatus for filling a capsule for use in a coffee machine, which capsule has a generally frusto-conical form with an upper surface and a lower surface, an annular flange being provided at the lower surface, wherein an annular seal is provided on the annular flange comprising a cellulose material such as paper that deforms in use, **characterised in that** the apparatus comprises gasket application means (10), which applies a gasket to the capsule on the flange, wherein the apparatus further comprises gasket detection means (11) for detecting the presence of a gasket on the capsule, capsule selection means being provided to enable capsules without a gasket to be rejected and capsules with a gasket detected to be packed. 20
2. Apparatus according to Claim 1, wherein the gasket comprises a fluorescent material, the apparatus further comprising illumination means for illuminating the gasket and the detection means comprises a fluorescence detector to detect fluorescence from the gasket. 25 30 35 40
3. Apparatus according to Claim 1 or Claim 2, wherein the apparatus further comprises capsule filling means, capsule sealing means for applying a foil to close a filled capsule, wherein manipulation means then invert the capsule, the inverted capsule then being moved through the machine to the gasket application means. 45
4. Apparatus according to any one of Claims 1 to 3, wherein the capsule rim has a 12-degree angle applied during the lid foil application. 50
5. Apparatus according to any one of Claims 1 to 4, wherein heat is applied to both sides of the foil seal to close the filled capsule. 55

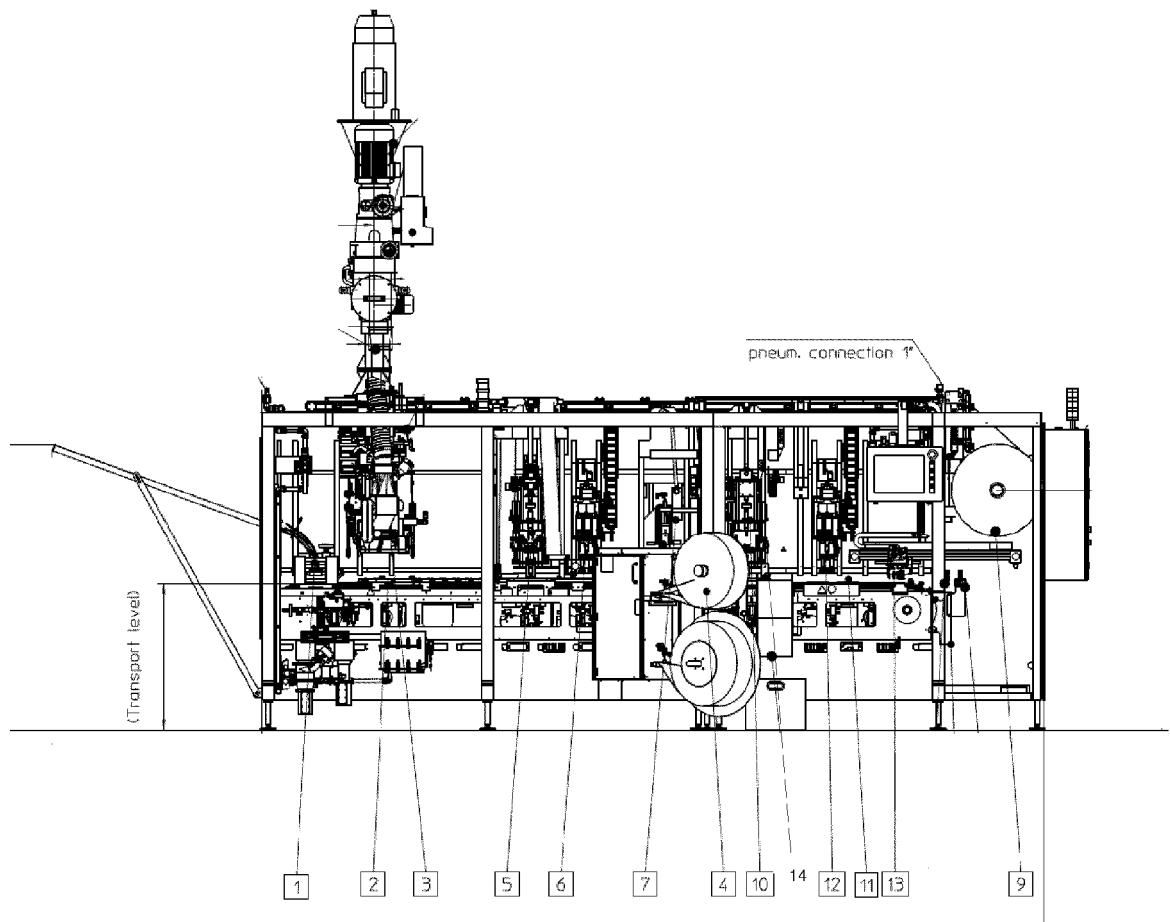


Fig. 1



EUROPEAN SEARCH REPORT

 Application Number
 EP 20 19 7025

5

10

15

20

25

30

35

40

45

50

55

1

EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	EP 2 730 523 A1 (2266170 ONTARIO INC [CA]) 14 May 2014 (2014-05-14)	1,3-8	INV. B65B29/02 B65B7/16 B65B57/10
A	* paragraphs [0040], [0041]; figures 1,2,6 *	2	
Y	WO 2018/019868 A1 (JT INT S A [CH]) 1 February 2018 (2018-02-01) * page 12, line 30 - page 13, line 3 * * page 14, lines 6-19 *	1,3-8	
Y,D	EP 1 654 966 A1 (NESTEC SA [CH]) 10 May 2006 (2006-05-10) * paragraphs [0046], [0051]; figures 6,7 *	1,3-8	
A	US 2015/191303 A1 (KRÜGER MARC [DE] ET AL) 9 July 2015 (2015-07-09) * paragraph [0026] - paragraph [0027]; figures 1,2 *	2	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65B B65D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 December 2020	Examiner Dick, Birgit
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			

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

EP 20 19 7025

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.

18-12-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2730523	A1	14-05-2014	CA 2833096 A1 12-05-2014
		EP 2730523 A1 14-05-2014	
		US 2014141128 A1 22-05-2014	
		US 2017259989 A1 14-09-2017	
WO 2018019868	A1	01-02-2018	CA 3029166 A1 01-02-2018
		CN 109476389 A 15-03-2019	
		EA 201990287 A1 28-06-2019	
		EP 3490891 A1 05-06-2019	
		JP 2019526502 A 19-09-2019	
		KR 20190029713 A 20-03-2019	
		TW 201803466 A 01-02-2018	
		US 2019216128 A1 18-07-2019	
		WO 2018019868 A1 01-02-2018	
EP 1654966	A1	10-05-2006	AP 2200 A 21-01-2011
		AR 055279 A1 15-08-2007	
		AR 075946 A2 04-05-2011	
		AT 347837 T 15-01-2007	
		AT 369062 T 15-08-2007	
		AT 399495 T 15-07-2008	
		AT 419769 T 15-01-2009	
		AU 2005298933 A1 04-05-2006	
		AU 2005298954 A1 04-05-2006	
		AU 2010201295 A1 22-04-2010	
		BR PI0517030 A 30-09-2008	
		BR PI0517296 A 07-10-2008	
		CA 2581293 A1 04-05-2006	
		CA 2584884 A1 04-05-2006	
		CA 2728461 A1 04-05-2006	
		CL 2016002872 A1 03-03-2017	
		CN 101043835 A 26-09-2007	
		CN 101048094 A 03-10-2007	
		CN 101803870 A 18-08-2010	
		CN 102001496 A 06-04-2011	
		CR 9071 A 01-12-2008	
		CR 11312 A 21-04-2010	
		CY 1106861 T1 26-09-2012	
		CY 1107283 T1 21-11-2012	
		CY 1108308 T1 12-02-2014	
		CY 1110103 T1 14-01-2015	
		DE 602004003713 T2 18-10-2007	
		DE 602004008113 T2 15-05-2008	
		DE 602004010435 T2 16-10-2008	
		DK 1654966 T3 19-02-2007	
		DK 1700548 T3 17-09-2007	

EPO FORM P0459

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

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

EP 20 19 7025

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.

18-12-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		DK 1702543 T3	07-01-2008
		DK 1816935 T3	11-05-2009
		DK 1816936 T3	08-09-2008
		DK 2098144 T3	17-02-2014
		EC SP077350 A	26-04-2007
		EP 1654966 A1	10-05-2006
		EP 1700548 A1	13-09-2006
		EP 1702543 A2	20-09-2006
		EP 1816935 A2	15-08-2007
		EP 1816936 A1	15-08-2007
		EP 1929904 A1	11-06-2008
		EP 2098144 A1	09-09-2009
		EP 2210540 A1	28-07-2010
		ES 2277184 T3	01-07-2007
		ES 2292154 T3	01-03-2008
		ES 2297791 T3	01-05-2008
		ES 2309804 T3	16-12-2008
		ES 2317314 T3	16-04-2009
		ES 2442269 T3	10-02-2014
		HK 1091703 A1	26-01-2007
		HK 1112166 A1	29-08-2008
		HK 1112569 A1	12-09-2008
		IL 181703 A	31-10-2011
		IL 204517 A	29-03-2012
		IL 213077 A	28-06-2012
		JP 4861989 B2	25-01-2012
		JP 5057984 B2	24-10-2012
		JP 5261427 B2	14-08-2013
		JP 2008517639 A	29-05-2008
		JP 2008517838 A	29-05-2008
		JP 2010155118 A	15-07-2010
		KR 20070085287 A	27-08-2007
		KR 20100049650 A	12-05-2010
		MA 28939 B1	01-10-2007
		ME P23908 A	10-06-2010
		MY 139254 A	30-09-2009
		NO 338956 B1	07-11-2016
		NO 339140 B1	14-11-2016
		NZ 553635 A	29-10-2010
		NZ 584218 A	29-07-2011
		PE 20060671 A1	29-08-2006
		PE 20100624 A1	10-09-2010
		PL 1654966 T3	31-05-2007
		PL 1700548 T3	31-01-2008
		PL 1702543 T3	30-04-2008
		PL 1816935 T3	30-06-2009

EPO FORM P0459

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

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

EP 20 19 7025

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.

18-12-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		PL 1816936 T3	31-12-2008
		PL 2098144 T3	30-05-2014
		PT 1654966 E	28-02-2007
		PT 1700548 E	01-10-2007
		PT 1702543 E	14-12-2007
		PT 1816935 E	04-02-2009
		PT 1816936 E	04-08-2008
		PT 2098144 E	11-12-2013
		RS 20070155 A	07-08-2008
		RU 2350243 C1	27-03-2009
		RU 2378967 C2	20-01-2010
		SG 156663 A1	26-11-2009
		SI 1654966 T1	30-04-2007
		SI 1700548 T1	31-12-2007
		SI 1816935 T1	30-04-2009
		SI 1816936 T1	31-10-2008
		SM AP200700017 A	23-05-2007
		TN SN07119 A1	02-06-2008
		TW 1306824 B	01-03-2009
		UA 96123 C2	10-10-2011
		US 2006110507 A1	25-05-2006
		US 2007224319 A1	27-09-2007
		US 2009280219 A1	12-11-2009
		US 2012180670 A1	19-07-2012
		WO 2006045515 A2	04-05-2006
		WO 2006045536 A1	04-05-2006
		ZA 200704261 B	25-09-2008

US 2015191303 A1	09-07-2015	AU 2013283166 A1	19-02-2015
		BR 112014032760 A2	27-06-2017
		CA 2877800 A1	03-01-2014
		CN 104411601 A	11-03-2015
		EP 2867142 A1	06-05-2015
		HK 1209395 A1	01-04-2016
		JP 2015527262 A	17-09-2015
		KR 20150040874 A	15-04-2015
		RU 2015102567 A	20-08-2016
		SG 11201408682P A	27-02-2015
		TN 2014000535 A1	30-03-2016
		US 2015191303 A1	09-07-2015
		WO 2014001566 A1	03-01-2014
		ZA 201500251 B	26-10-2016

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

- EP 0870457 A [0005]
- WO 2005004683 A [0005]
- EP 1654966 A [0007]
- US 2018215120 A [0007]
- WO 2013029184 A [0007]