



- (51) International Patent Classification:
A45D 8/34 (2006.01) A45D 8/40 (2006.01)
- (21) International Application Number:
PCT/IB2018/053904
- (22) International Filing Date:
31 May 2018 (31.05.2018)
- (25) Filing Language: Italian
- (26) Publication Language: English
- (30) Priority Data:
102017000066188 14 June 2017 (14.06.2017) IT
- (71) Applicant: POLITECNICO DI MILANO [IT/IT]; Piazza
Leonardo da Vinci, 32, 20133 Milano (IT).
- (72) Inventor: PAOLETTI, Ingrid; Via Vigna, 1, Milano (IT).
- (74) Agent: DI BERNARDO, Antonio et al.; Thinx S.r.l., Pi-
azzale Luigi Cadorna, 10, 20123 Milano (IT).

- (84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- of inventorship (Rule 4.17(iv))

Published:

- with international search report (Art. 21(3))
— in black and white; the international application as filed
contained color or greyscale and is available for download
from PATENTSCOPE

- (81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,
HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP,
KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME,
MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,
SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(54) Title: HAIRSTYLE ACCESSORY

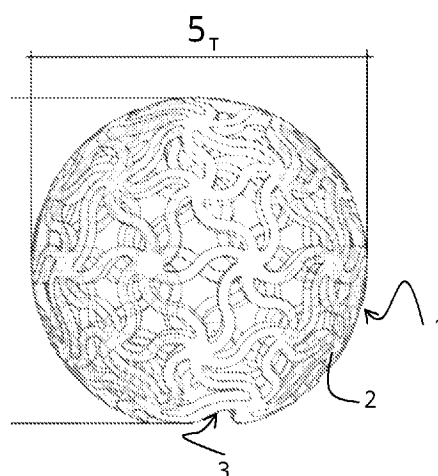


FIG. 1

(57) Abstract: A hairstyle accessory (1), comprising a net structure (2) provided with an opening (3) for inserting a hair bundle, the net structure (2) being composed of a plurality of net meshes and being suitable to hold hair therein. The net structure (2) is made of a single material and each net mesh has a pattern such to give to the net structure auxetic properties.



HAIRSTYLE ACCESSORY

TECHNICAL FIELD

The present invention relates to hairstyle accessories, in particular accessories
5 for tying hair up, e.g. nets for buns.

BACKGROUND

To date, many hairstyle accessories are known, from simple hair clips to more articulated accessories used for complex hairstyles.

A particular type of hairstyle, very commonly used by dancers, is the bun. In
10 this type of hairstyle, a bundle of hair is gathered to form a ball typically positioned at the nape. Due to the position and the mass of hair, to maintain the hairstyle, the use of a net, typically made of nylon or crocheted wool, is known. An example of an accessory able to form and hold in position a bun is described in patent US 3,693,637.

15 A limit of current nets for buns is that they are delicate and do not maintain the shape effectively. For example, dancers perform jumps and dance steps that put strain on the hairstyle, therefore very often as well as the net it is necessary to use hairspray or other products, e.g. hairpins, which help to maintain the shape of the bun. Furthermore, these nets are subject to wear, in particular wear from
20 water.

OBJECTS AND SUMMARY OF THE INVENTION

In light of the above, the problem underpinning the present invention is that of improving existing hairstyle accessories.

25 Within the scope of this problem, an object of the present invention is that of presenting a hairstyle accessory that allows a bun hairstyle to be maintained effectively.

These and other objects of the present invention will become clearer from the following description and appended claims, which form an integral part of the present description.

In accordance with a first aspect thereof, the invention therefore relates to a hairstyle accessory, comprising a net structure provided with an opening for inserting a hair bundle, the net structure being composed of a plurality of net meshes and being suitable to hold hair therein. The net structure is made of a single material, and each net mesh has a pattern such to give to the net structure auxetic properties.

This solution offers the advantage of allowing the uniform expansion of the net in all directions, eliminating any strain in one direction on the material. This allows the shape of the bun to be maintained firmly and effectively.

10 In one embodiment, the net structure has a spherical or ellipsoidal shape, meaning that it lies on a spherical or ellipsoidal surface. These shapes are well suited to a bun hairstyle; furthermore, the spherical, or substantially spherical shape, is suited to a particularly uniform expansion.

Advantageously, the pattern that is repeated is composed of three curved portions connected two by two at a vertex, each one of said three curved portions being composed of a pair of circular arcs having equal length and curvature, but having opposite concavities. This triangular based pattern, called hexachiral (described in the article "Auxetic mechanical metamaterials", H.M.A. Kolken and A.A. Zadpoor, The Royal Society of Chemistry 2017, p. 5111-5129) is well suited to a spherical shape in general as the triangular based optimisation is the one that is most adaptable to the curvature.

According to a preferred solution, in the area proximal to the opening of the net structure, the curved portions have a greater length and comprise arcs (201) having a curvature greater than curved portions arranged in a position distal from the opening. This allows greater stretching of the mesh, therefore a larger expansion and greater resistance in the area of greatest strain.

Advantageously, the net is made with elastomer polymers of different types, e.g. such structure can be made with silicone rubber with (i) hardness ranging from Shore A 8 to Shore A 100, and more preferably with hardness ranging from Shore A 10 to Shore A 40, and (ii) elasticity ranging from 100% to 1000% and more preferably ranging from 300% to 400%.

BRIEF DESCRIPTION OF THE DRAWINGS

Further features and advantages of the present invention will be more evident from the following detailed description of some preferred embodiments thereof, made with reference to the appended drawings.

5 The different features in the individual configurations can be combined with each other as preferred according to the previous description, should it be necessary to avail of the advantages resulting specifically from a particular combination.

In such drawings,

- 10 - figure 1 illustrates a hairstyle accessory according to an embodiment of the present invention;
- figure 2 illustrates a sectional view of the accessory of figure 1;
- figure 3 illustrates the accessory of figure 1 and some details thereof.
- figure 4 illustrates a variant of the accessory of figure 1.

DETAILED DESCRIPTION OF THE INVENTION

15 In the following description, for the illustration of the figures, identical numbers or reference symbols are used to indicate construction elements with the same function. Further, for illustration clarity, some references may not be repeated in all the figures.

20 While the invention is susceptible to various modifications and alternative constructions, some preferred embodiments are shown in the drawings and will be described in detail herein below. However, it is to be understood that there is no intention to limit the invention to the specific embodiment illustrated, rather, on the contrary, the invention intends to cover all the modifications, alternative constructions, and equivalents that fall within the scope of the invention as
25 defined in the claims.

The use of "e.g.", "etc.", "or" indicates non-exclusive alternatives without limitations unless otherwise indicated. The use of "comprises" and "includes" means "comprises or includes but not limited to" unless otherwise indicated.

30 With reference to figure 1, a preferred embodiment of a hairstyle accessory 1 is illustrated.

The hairstyle accessory 1 comprises a net structure 2 with a spherical shape having diameter D_e which, in the example described here, is 55 mm. Obviously, the measurements are not to be interpreted in the limiting sense and the object could be reproduced in different sizes according to the intended use, e.g. it may
5 be possible to produce one accessory for children and one for adults, therefore of different sizes according to the mass of hair to be gathered.

The net structure 2 is made of a single material and has a plurality of meshes characterised by a triangular based pattern 20 that is repeated so as to guarantee auxetic properties, i.e. a negative Poisson coefficient, to the net
10 structure.

With reference to the material, the accessory 1 is made of elastomer and in particular silicone rubbers with (i) hardness ranging from Shore A8 to Shore A100, and more preferably with hardness ranging from Shore A10 to Shore A40, and (ii) elasticity, measured as elongation ability, i.e. return without
15 breaking, ranging from 100% to 1000% and more preferably ranging from 300% to 400%. These materials also offer the advantage of withstanding atmospheric conditions and other elements very well.

In one embodiment, the material used is waterproof, which also allows it to be used under the shower or for water sports, such as swimming.

20 In order to guarantee the auxetic properties, the accessory is made of a single material, i.e. by injection moulding, or compression forming or processing through other known techniques, a single material that may comprise a single element / chemical product or mixture of elements / chemical products, e.g. a mixture of silicone rubbers.

25 The triangular pattern 20, clearly visible in figure 3, is made through three curved portions 200 connected two by two at a vertex of the triangle. Each of the three curved portions 200 is composed of two arcs 201 having equal length but opposite concavity.

In the preferred example described herein, each arc 201 is an arc of a
30 circumference having radius (R_1) 3.5 mm and the total length (L_1) of the curved portion 200 is 14.9 mm.

In the example of figure 1 each curved portion 200 is composed of a strip of material having a square cross section, with dimensions 's' of 2 mm x 2 mm

(Fig.2). It is however clear that curved portions can be provided with cross sections of different sizes and/or shapes. For example, the section could be circular or curved.

5 In order to insert hair into the accessory 1, the latter has an inlet opening 3 whose edges are composed of a plurality of curved portions 201 each belonging to a different pattern of the net structure.

In the example described herein with reference to figures 1 to 3, the mesh has an identical pattern 20 that is repeated along the whole surface of the accessory 1.

10 In one embodiment, illustrated with reference to figure 4, the net structure has a plurality of meshes each still composed by a triangular based pattern composed of three curved portions composed of equal and opposite arcs. However, unlike the example of figures 1-3, in this embodiment the size of the meshes changes. In detail, the length of the curved portions, the curvature of the arcs and the thickness of the material that forms the curved portions may change along the
15 surface of the net structure.

In particular, in the preferred embodiment, the design of the meshes in the region proximal to the opening 3, where the bun is subjected to greater strain, is designed to allow greater elongation of the triangles, therefore a larger expansion. In particular, in the region proximal to the opening 3, the pattern of
20 the mesh is composed of curved portions with a greater length and arcs having a greater curvature with respect to corresponding patterns that are in a distal position with respect to the opening 3. For example, while in the distal position from the opening 3 the curved portions may have the dimensions and curvatures described above with reference to figure 3, in the proximal position
25 to the opening the curved portions may have a length (L2) of 17.9 mm and be composed of arcs having a radius of curvature (R2) of 4.5 mm.

Therefore, in the embodiment of figure 4, the net structure is composed, in actual fact, of different meshes, that have the same triangular based pattern, but different lengths and curvatures of the curved portions.

30 In light of the above, it is clear how the hairstyle accessory described above allows the pre-set objects to be reached, in particular the auxetic net structure allows a uniform expansion of the accessory 1 to be obtained in the radial direction and the hairstyle to be maintained.

It is also clear that many variants can be made to the embodiments described above by way of example of the invention defined in the appended claims.

5 For example, instead of a triangular based pattern, the accessory 1 may comprise a net structure comprising a plurality of meshes each composed of a pattern of another shape that, however, allows the auxetic features of the net structure to be maintained. For example, there may be any pattern, e.g. of the type described in WO2016144406A1.

10 Further, the shape of the accessory does not necessarily have to be spherical, but may also be oval or similar according to the amount of hair to be contained, to allow an optimisation of the hold. However, the spherical or substantially spherical shape is preferred to guarantee the auxetic properties of the accessory.

CLAIMS

1. Hairstyle accessory (1), comprising a net structure (2) provided with an opening (3) for inserting a hair bundle, the net structure (2) being composed of a plurality of net meshes and being suitable to hold hair therein
- 5 characterized in that

the net structure (2) is made of a single material, and each net mesh has a pattern such to give to the net structure auxetic properties.
2. Accessory (1) according to claim 1, wherein the net structure has a spherical or ellipsoidal shape.
- 10 3. Accessory (1) according to claim 1 or 2, wherein the pattern is composed of three curved portions (200) connected two by two at a vertex, each one of said three curved portions (200) being composed of a pair of circular arcs (201) having equal length and curvature, but having opposite concavities.
- 15 4. Accessory (1) according to claim 3, wherein in the region proximal to the opening (3), the curved portions (200) have a greater length and comprise arcs (201) having a curvature greater than curved portions arranged in a position distal from the opening (3).
5. Accessory (1) according to claim 1 or 2 or 3 or 4, wherein each curved portion has a cross-section with a constant shape throughout the length thereof.
- 20 6. Accessory (1) according to claim 1 or 2 or 3 or 4 or 5, wherein each curved portion has a square or circular cross-section.
7. Accessory (1) according to claim 1 or 2 or 3 or 4 or 5 or 6, wherein said material is a polymer of elastomer family, particularly silicone rubber or a mixture of silicone rubbers.
- 25 8. Accessory according to claim 7, wherein the material has hardness ranging from Shore A 8 to Shore A 100.
9. Accessory according to claim 7, wherein the material has hardness ranging from Shore A 10 to Shore A 40.

10. Accessory according to claim 7 or 8 or 9, wherein the material has elasticity, measured as elongation ability, ranging from 100% to 1000%.
11. Accessory according to claim 7 or 8 or 9, wherein the material has elasticity, measured as elongation ability, ranging from 300% to 400%.
- 5 12. Accessory according to any of the preceding claims, wherein the material is waterproof.

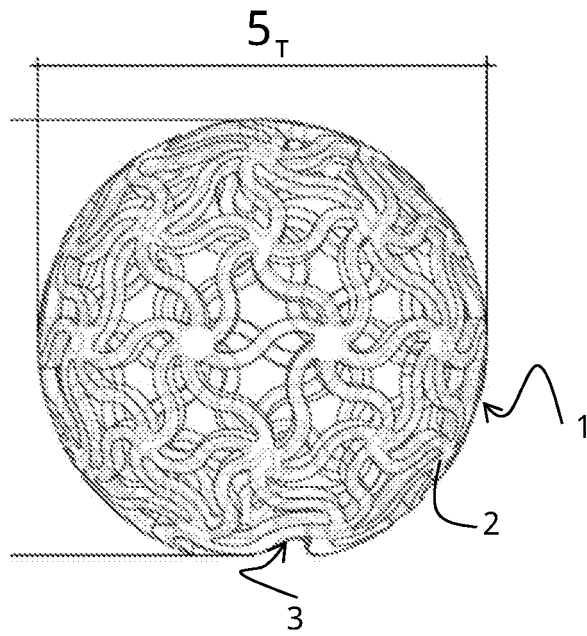


FIG. 1

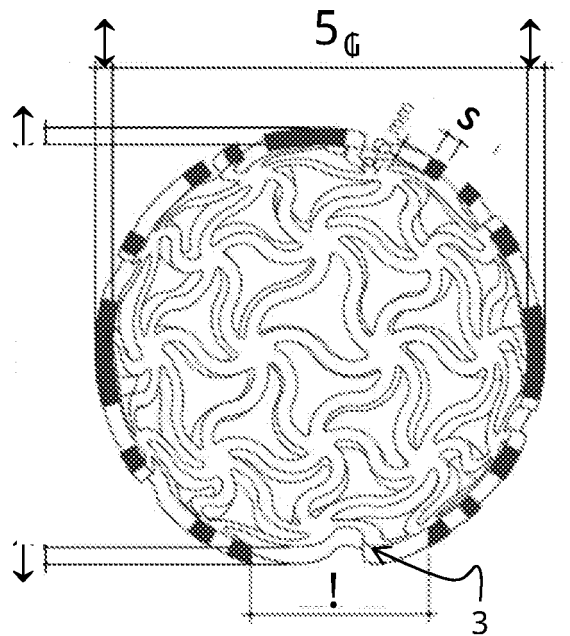


FIG. 2

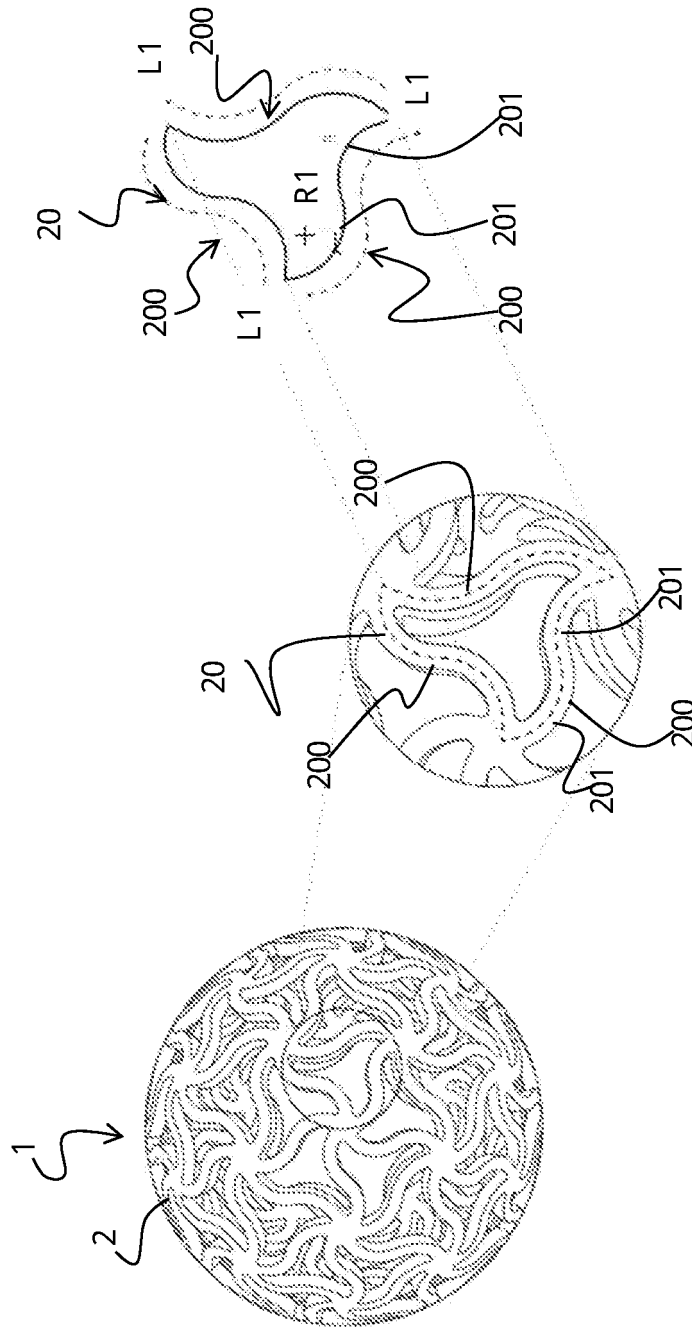


FIG. 3

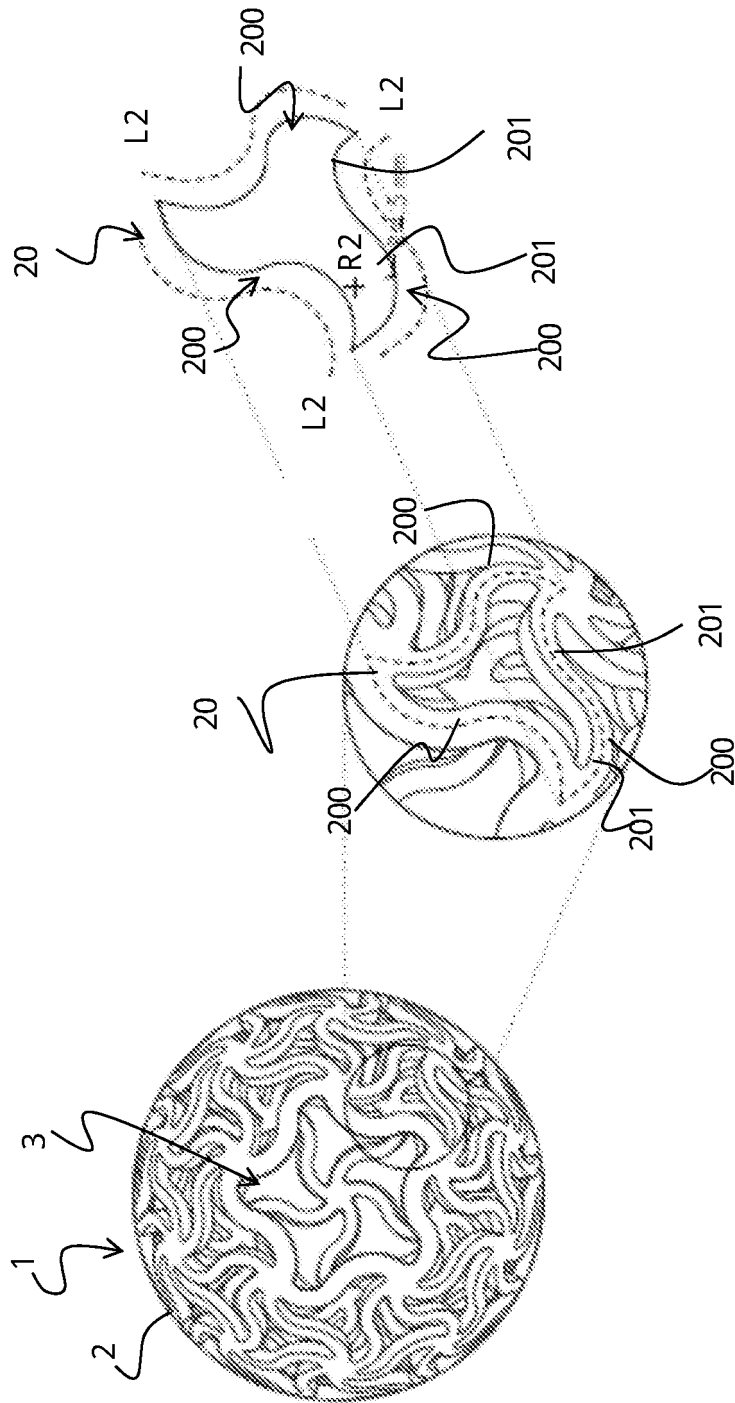


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No PCT/IB2018/053904

A. CLASSIFICATION OF SUBJECT MATTER INV. A45D8/34 A45D8/40 ADD.				
According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED				
Minimum documentation searched (classification system followed by classification symbols) A45D				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched				
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	US 1 467 559 A (PIEPER CHESTER R) 11 September 1923 (1923-09-11) page 1, line 9 - page 2, line 32; figures -----	1,2,5-12		
A	US 2017/035147 A1 (FARRIS BRYAN N [US] ET AL) 9 February 2017 (2017-02-09) figure 6 -----	3,4		
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.				
* Special categories of cited documents : <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </td> <td style="width: 50%; border: none; vertical-align: top;"> "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family </td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family			
Date of the actual completion of the international search 20 July 2018		Date of mailing of the international search report 27/07/2018		
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer van de Beek-Duijker		

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2018/053904

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 1467559	A	11-09-1923	NONE

US 2017035147	A1	09-02-2017	CN 107920628 A 17-04-2018
			EP 3331394 A1 13-06-2018
			US 2017035147 A1 09-02-2017
			US 2017340063 A1 30-11-2017
			WO 2017023524 A1 09-02-2017
