

(22) Date of filing: **05.06.2017**

(72) Inventors:

- **BOTTER, Roberto**
37032 Monteforte d'Alpone (VR) (IT)
- **QUARESIMA, Alberto**
Valeggio sul Mincio (VR) (IT)
- **FRACCARO, Giampaolo**
Verona (VR) (IT)
- **BOSCO, Leonardo**
37137 Verona (VR) (IT)

(74) Representative: **De Giorgi, Michele et al**
Barzanò & Zanardo Roma S.p.A.
Via Piemonte, 26
00187 Rome (IT)

(A) which, in use, is parallel to the anteroposterior direction of a user foot, so that said lower face (13) is concave and that said upper face (12) is convex; said operating portion (11) consisting of an elastically deformable material so that the curvature of said operating portion (11) is invertible for storing elastic potential energy as a result of a stress exerted by the user's forefoot during walking, running or jump.

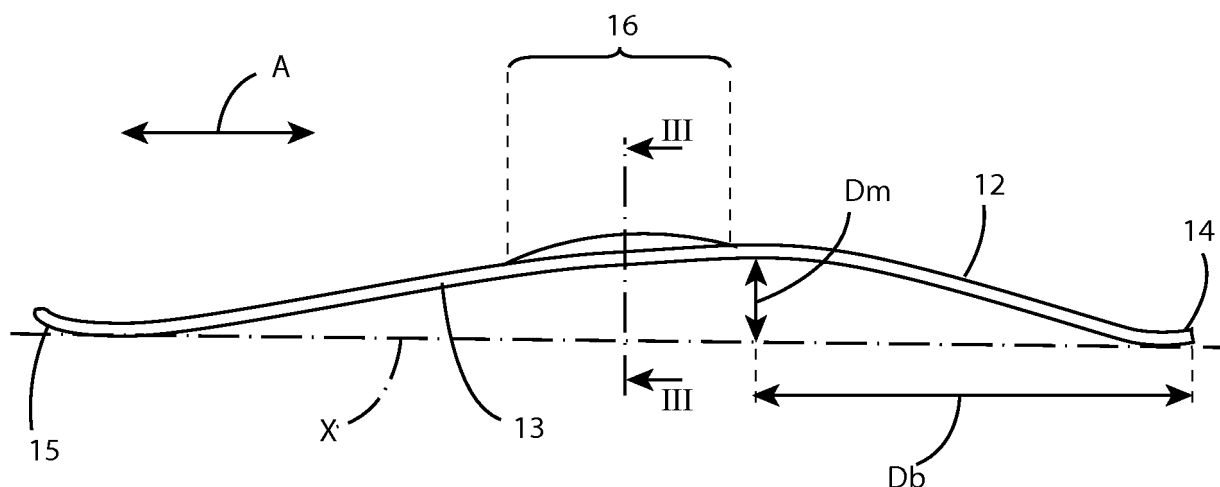


Fig. 2

Description

[0001] The present invention relates to a component for footwear and footwear that comprises it.

[0002] In particular, the present invention relates to a component apt for realizing an insole or a midsole and designed or intended to be integrated into a sole for footwear to facilitate the user's movement during walking or running or jumping.

[0003] Therefore, the present invention is in the field of footwear production.

[0004] Nowadays, in the field of footwear designed to facilitate the walking of the user for orthopedic or sports motives, it is known to insert in the sole an elastic insert capable of elastically deforming during the phase of resting the foot on the sole, to subsequently cede (yield) the elastic energy accumulated in its own deformation, so as to facilitate the walking of the user.

[0005] An example of such footwear is described in the European patent application EP1857005.

[0006] In this, a dampening insole is described having a curved portion that defines, in use, a concave portion towards the ground, which extends from the metatarsophalangeal joint to the heel.

[0007] A sole that comprises this component for footwear is shaped so as to introduce a concavity on the side of the sole, when at rest, so that when the user places the foot on the ground and applies weight on it, the component for footwear assumes a flat configuration, storing elastic energy that is released when the foot is lifted again.

[0008] In this way, this sole and the component for footwear which comprises it, permit to facilitate walking, reducing the energy required by the user.

[0009] However, this known solution has some disadvantages and inconveniences.

[0010] In fact, it requires that the sole, at rest, assumes a concave configuration with the posterior edge of the heel protruding downwards.

[0011] This implies a greater consumption of that part of the footwear during walking and a consequent loss of expected functionality.

[0012] Moreover, this form of sole implies a greater chance of stumbling and thus reduces the safety of use of such footwear with respect to the conventional footwear.

[0013] The underlying problem of the present invention is to facilitate walking or running or jumping without compromising the comfort and safety of use.

[0014] The main task of the present invention is to provide a component for footwear and footwear that comprises it that poses a solution to this problem by solving the aforementioned disadvantages of the footwear described above.

[0015] Within the scope of this task, it is an object of the present invention to provide a component for footwear and a footwear that comprises it that provide greater comfort in the use of the footwear.

[0016] Another object of the present invention is to provide a component for footwear and a footwear comprising it that is structurally simple, easy to implement and easy to use in the manufacture of footwear.

[0017] Yet another object of the invention is to propose a component for footwear and footwear that comprises it that permits, during use, to maintain a more natural posture of the feet with respect to other known solutions.

[0018] This task, as well as these and other objects that will best appear in the following, are achieved by a component for footwear and a footwear that comprises it, according to claim 1 attached.

[0019] Detail features of a component for footwear and a footwear that comprises it, according to the invention, are described in the dependent claims.

[0020] Further features and advantages of the invention will become more apparent from the description of a preferred, but not exclusive, embodiment of the component for footwear and footwear comprising it, according to the invention, illustrative and non-limiting in the accompanying drawings, in which:

- figure 1 illustrates a simplified scheme of footwear comprising a component for footwear according to the present invention
- figure 2 illustrates a component for footwear according to the present invention sectioned according to a longitudinal plane;
- figure 3 illustrates the shoe component of figure 2 sectioned according to plane III-III of figure 2.

[0021] With particular reference to the figures cited above, generally indicated by 10 a component for footwear preferably apt to constitute an insole, a midsole or similar element, comprising an operating portion 11 engageable by the forefoot of a user, which has an upper face 12 apt to receive the resting of the user's forefoot and a lower face 13 apt to be covered by a sole 14.

[0022] The operating portion 11 develops along a longitudinal direction A which, in use, is parallel to the anteroposterior direction of the user's foot.

[0023] The component for footwear 10, according to the present invention, has a particular peculiarity in that, along this longitudinal direction A, the operating portion 11 develops along a trajectory B which is curved such that the lower face 13 is concave and the upper face 12 is convex.

[0024] In addition, the operating portion 11 is made of an elastically deformable material such that the curvature of the operating portion 11 is invertible to store elastic potential energy as a result of the stress exerted by the user's forefoot during walking, running or jumping.

[0025] By "forefoot", it is meant the portion of the foot that extends longitudinally from the anterior extremity of the toe tip to the metatarsophalangeal joint.

[0026] The material with which the operating portion is

made is preferably a composite material that advantageously, at least one layer of carbon fibers preferably unidirectional with direction parallel to the principal direction and at least one layer of aramid fibers, advantageously in the form of a fabric, superimposed on the layer of Carbon fibers.

[0027] More preferably, comprises two layers of aramid fiber fabrics among which a plurality of said carbon fiber layers are provided.

[0028] Preferably, however, the component of footwear 10 or at least its operating portion 11 has a substantially constant thickness and preferably comprised between 1 and 3 mm.

[0029] In the preferred embodiment, but not exclusive, as described below, the component of footwear 10 is entirely constituted by the operating portion 11, in which case the operating portion is shaped to define a support for the entire sole of the user that can be rested directly or, preferably indirectly, being the operative portion 11 covered for example by a lining or by an insole.

[0030] However, they fall within the scope of the present inventions of insoles which are not integrally constitute of the operating portion 11 but comprise them together with an auxiliary part which may be in material different with respect to that of the operating portion realized and which will be complementary to the latter to define a support for the entire sole of the user's foot.

[0031] In practice, a component for footwear 10 according to the present invention has a curvature towards the support zone of the user's forefoot so that, when the user rests it on the ground, the component for footwear deforms by assuming a substantially flat development.

[0032] Starting from such configuration, if the user flexes his foot by raising the heel with the toes resting on the ground so as to make movements such as walking, running or jumping, the component for footwear deforms due to the action of the footwear which is advantageously structured to maintain the component of footwear attached to the sole of the user's foot.

[0033] Thus, the operating portion assumes, during the movement above mentioned, a curvature opposite to the initial in correspondence of the metatarsophalangeal joint.

[0034] When the user then begins to raise the foot to lift it so as to complete the step, the elastic reaction of the component of footwear tends to re-assume its initial configuration and, pivoting on its front edge, helping the foot of the user in lifting movement and advancing contributing thus to the work spent by the user to walk.

[0035] As mentioned above, from the structural point of view, the operating portion 11 is configured along the longitudinal direction A so as to extend throughout the length of the sole of the user's foot to which the component of footwear 10 is intended.

[0036] Moreover, the operating portion 11 extends advantageously along the trajectory B, between a front edge 14 and a rear edge 15 and is provided solely on a side of plane X tangent to the lower face 13 in corre-

spondence to the edges 14, 15.

[0037] The maximum distance Dm of the lower face 13 from said plane preferably has a value comprised between 2.5% and 7.5% of the extension of the component of footwear 10 along the longitudinal direction A.

[0038] The lower face 13 assumes said maximum distance at a distance Db from the front edge 14, considered along the longitudinal direction A, having a value between 30% and 40% of said linear extension, and preferably equal to 35% of the latter.

[0039] The component of footwear 10 increases the comfort of use of a footwear that comprises it, if along the longitudinal direction A is curved in correspondence to the edges 14, 15 so as to give the upper face 12 locally concave to adapt to the anterior extremity of the toes of the feet and at the posterior extremity of the heel respectively.

[0040] Preferably, the upper face 12, cross-sectional view according to a plane perpendicular to the trajectory B, which in figure 2 can be represented with the plane parallel to the plane of section III-III, is concave for at least a first portion C of trajectory B where said first portion C corresponds to a first zone of the operating portion 11 which is apt to receive at least the user's phalanges.

[0041] Preferably, in order to increase the capacity of elastic response of the component of footwear 10 and, with it, the assistance which the latter can provide to the walking, the operating portion 11 has a stiffening zone which is positioned in such a way that, in use, it is engaged by a part of the foot sole adjacent to the metatarsophalangeal joint, towards the heel.

[0042] This stiffening zone 16 has a curvature greater of the curvature of the operating portion along the longitudinal direction, in a way such that in correspondence to this stiffening zone 16, the lower face has a concavity greater and the upper face has a greater convexity.

[0043] In other words, advantageously, for a second portion D of the trajectory B, the upper face 12, view according to said section, has a convex central part 17 which is placed between two concave lateral parts 17a and 17b.

[0044] This second portion D preferably extends in a second zone of the operating portion 11 which is apt to support a part of the sole of the user's foot adjacent to the metatarsophalangeal joint towards the heel.

[0045] In general, the material or materials for making the component of footwear 10 or at least the operating portion 11 will be selected so as to exhibit substantially purely elastic behavior in view of the stresses and flexural deformations that the component of footwear 10 undergoes during walking depending on the type of user and the use to which the footwear is intended which comprises this component for footwear 10.

[0046] In Specific, the experimenting of a component for footwear made according to the present invention has proven that particular efficiency in assistance to walking, running or jumping is achieved by making the component for footwear 10 or at least its operating portion 11 in a

material having a module Of elasticity substantially comprises between 83,000 MPa and 85,000 MPa and preferably substantially equal to 84,000 MPa.

[0047] The tensile breaking load for an optimum material for making the operating portion 11 is advantageously equal to or greater than 840 N / mm².

[0048] This elasticity and breaking load module can be determined by means of an ISO 527 tensile test with AM-SLER test machine with full-scale 100 kN and a LONOS TEST data acquisition system.

[0049] Clearly this also forms part of the present invention, a footwear comprising a component for footwear 10 which is configured as described above and a sole 200 attached to the lower face 13 of the component for footwear 10 and configured in a way not to counteract the flexion of the component for footwear 10 during use, for example by providing a dip 210.

[0050] It is thus clear that a component for footwear and footwear that comprises it, according to the present invention, achieve the above-mentioned task and purposes.

[0051] The invention thus conceived is susceptible of numerous modifications and variations, all of which fall within the scope of the enclosed claims.

[0052] In addition, all details may be replaced by other technically equivalent elements.

[0053] In practice, the materials used, as well as the shapes and dimensions of the contingents, may be varied according to the contingent requirements and state of the art.

[0054] Where the constructive features and techniques mentioned in the following claims are followed by signs or reference numbers, such signs or reference numbers have been assigned with the sole purpose of increasing the intelligibility of the claims themselves and, consequently, they do not constitute way of limiting the interpretation of each element identified, purely by way of example, from such signs or reference numbers.

Claims

1. Component for footwear (10) for a footwear including an operating portion (11) engageable by the forefoot of a user, said operating portion (11) having an upper face 12 adapted to receive and support the user's forefoot and one lower face (13) adapted to be covered by a sole (200), said component for footwear (10) being **characterized in that** said operating portion (11) extends along a curved trajectory (B) along a longitudinal direction (A) which, in use, is parallel to the anteroposterior direction of a user's foot, in a way that said lower face (13) is concave and that said upper face (12) is convex; said operating portion (11) consisting of an elastically deformable material so that the curvature of said operating portion (11) is invertible for storing elastic potential energy as a result of a stress exerted by the

user's forefoot during walking, running or jumping.

2. Component for footwear (10) according to claim 1 **characterized in that** it consists in said operating portion (11) which is configured to extend along said longitudinal direction (A), for the whole length of the sole of the user's foot to which for said footwear component (10) is dedicated.
3. Component for footwear (10) according to one of the previous claims, **characterized in that** said operating portion (11) extends, along said trajectory (B), between a front edge (14) and a rear edge (15), said operating portion (11) extending to one side only of a plane that is tangent to said lower face (13) in correspondence with said edges (14, 15).
4. Component for footwear (10) according to claim 2 **characterized in that** the maximum distance of said lower face (13) from said plane has a value between 2.5% and 7.5% of the linear extension of said component for footwear (10) measured along said longitudinal direction (A).
5. Component for footwear (10) according to claim 3 **characterized in that** said lower face (13) has said maximum distance at a distance from said front edge (14), along said longitudinal direction (A), having a value between 30% and 40%, and preferably equal to 35%, of said linear extension.
6. Component for footwear (10) according to one of claims 2-4, **characterized in that**, along said longitudinal direction (A), said component for footwear (10) is curved in correspondence with said edges (14, 15) so as to have said upper face (12) locally concave to fit the front end of the toes and the rear end of the heel, respectively.
7. Component for footwear (10) according to one of the previous claims, **characterized in that** said upper face (12), seen on a cross sectional view with respect to a plane perpendicular to said trajectory (B), is concave at least along a first portion (C) of said trajectory (B) wherein said first portion (C) corresponds to a first area of said operating portion (11) adapted to receive and support at least the user's phalanges.
8. Component for footwear (10) according to claim 6 **characterized in that** for a second portion (D) of said path (B), said upper face (12), having said second section, has a convex central part (17) which is placed between two lateral concave parts; a second area of said operating portion (11) which is adapted to receive and support a part of the plant of the user's foot adjacent to the metatarsophalangeal joint, towards the heel, extends along said second portion (D).

9. Component for footwear (10) according to one of the previous claims, **characterized in that** said operating portion (11) has a predominantly resilient behavior and consists of a material having a modulus of elasticity substantially comprised between 83000 MPa and 85000 MPa and preferably substantially equal to 84000 MPa. 5
10. A footwear comprising a component for footwear (10) that is configured according to one of the previous claims, and a sole (14) fixed to the lower face (13) of said component for footwear (10) and which is configured so as to not counteract the flexion of said component for footwear (10) during use. 10

15

20

25

30

35

40

45

50

55

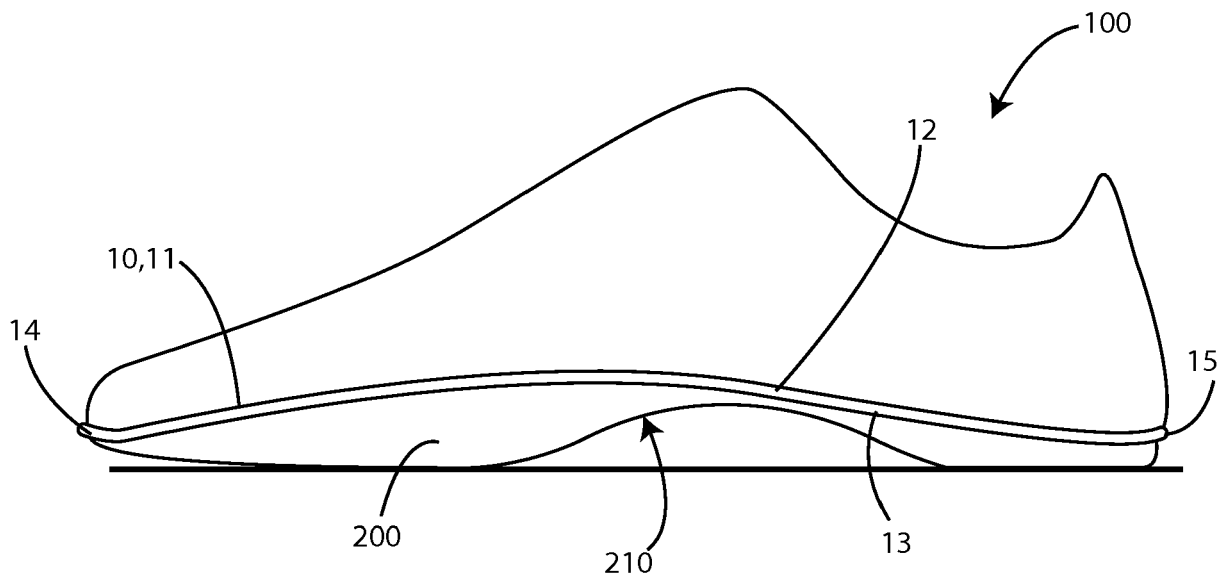


Fig. 1

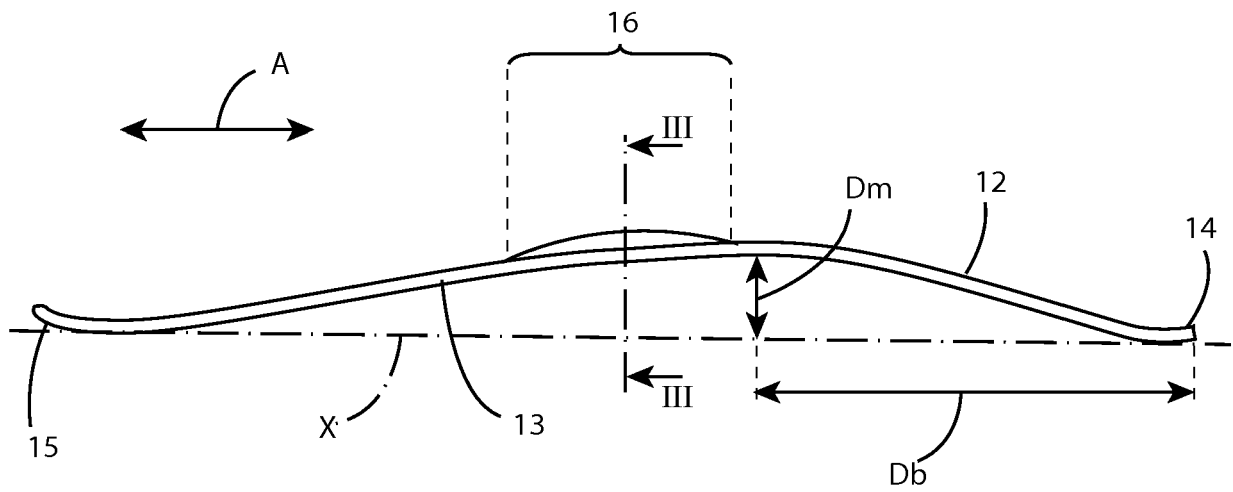


Fig. 2

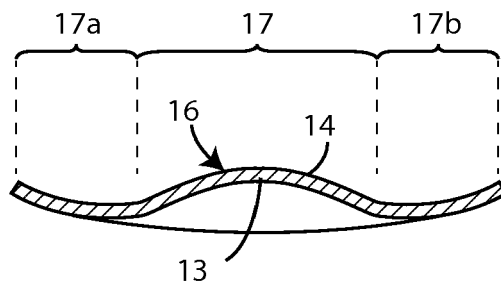


Fig. 3

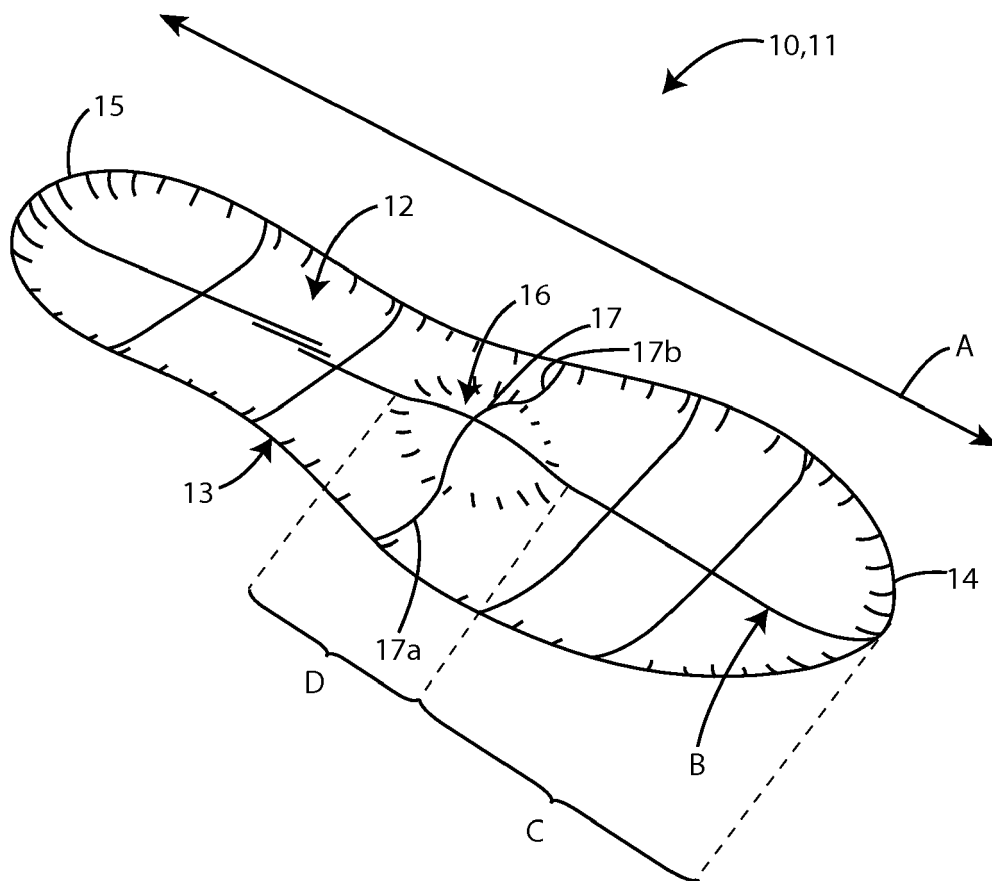


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 17 17 4433

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	EP 1 857 005 A1 (OTTE M CHRISTOPHE [LU]) 21 November 2007 (2007-11-21)	1-7,9,10	INV. A43B13/18 A43B13/14 A43B7/14
A	* paragraphs [0001], [0027], [0030]; figures 4-6 *	8	
X	AT 397 336 B (STAUDINGER ADOLF [AT]) 25 March 1994 (1994-03-25)	1-7,9,10	
A	* page 1, lines 12-15; figure 1 *	8	
A	EP 2 111 770 A1 (OTTE M CHRISTOPHE [LU]) 28 October 2009 (2009-10-28)	1-10	
A	DE 20 2008 002681 U1 (CHOLEWA UWE [DE]) 21 May 2008 (2008-05-21)	1-10	TECHNICAL FIELDS SEARCHED (IPC) A43B
A	* figures 1-5; examples *	1-10	
A	US 4 897 938 A (OTSUKA AKIRA [JP]) 6 February 1990 (1990-02-06)	1-10	
A	* column 3, lines 20-26; figures 2-4 *	1-10	
A	FR 891 679 A (PIERRE CEYRAT) 15 March 1944 (1944-03-15)	1-10	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 September 2017	Examiner Chirvase, Lucian
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 03.82 (P04C01)

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

EP 17 17 4433

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.

28-09-2017

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1857005 A1	21-11-2007	AT 450165 T EP 1857005 A1	15-12-2009 21-11-2007
AT 397336 B	25-03-1994	NONE	
EP 2111770 A1	28-10-2009	NONE	
DE 202008002681 U1	21-05-2008	NONE	
US 4897938 A	06-02-1990	DE 3790246 T1 EP 0287662 A1 GB 2198330 A JP H0341 B2 JP H0427841 B2 JP S62261302 A JP S63117704 A US 4897938 A WO 8706804 A1	21-04-1988 26-10-1988 15-06-1988 07-01-1991 12-05-1992 13-11-1987 21-05-1988 06-02-1990 19-11-1987
FR 891679 A	15-03-1944	NONE	

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 1857005 A [0005]