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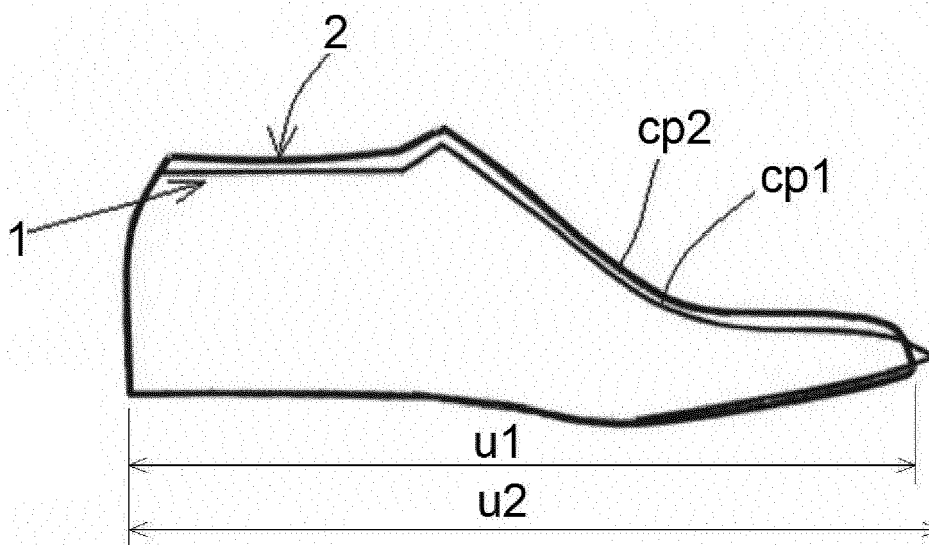
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**KH MA MD TN**(71) Applicant: **Santoni Societa' Per Azioni****20121 Milano (IT)**(72) Inventor: **SANTONI, GIUSEPPE****20121 MILANO (IT)**(74) Representative: **Baldi, Claudio****Ing. Claudio Baldi S.r.l.****Viale Cavallotti, 13****60035 Jesi (Ancona) (IT)**(30) Priority: **03.03.2021 IT 202100004937**(54) **METHOD OF DESIGNING A LAST USED FOR MANUFACTURING AN ARTICLE OF FOOTWEAR WITH REVERSE UPPER PROCESS**

(57) Method of designing and manufacturing a reverse shoe last (1) and a straight shoe last (2) used for manufacturing an article of footwear by means of a process that provides for fixing an upper (4) disposed in reverse position on the reverse shoe last (1) to the midsole; said method firstly providing for designing a shape and/or size of a foot suitable for wearing the footwear to be manufactured and secondly for designing and making a re-

verse shoe last (1) and for designing and making a straight shoe last (2) suitable for being inserted inside the upper (4) when the upper (4) has been turned and disposed in straight position; the peculiarity of the method according to the invention is that the reverse shoe last (1) is designed and made with a length (u1) higher than the length (u2) of the straight shoe last (2).

**FIG. 4C****EP 4 052 603 A1**

## Description

**[0001]** The present patent application for industrial invention relates to a method of designing a last used for manufacturing an article of footwear with reverse upper process. The present invention also relates to a kit comprising said lasts for manufacturing said article of footwear with reverse upper.

**[0002]** In particular, the present invention is designed to be applied in the so-called GOOD YEAR REVERSE technology that is commonly adopted for manufacturing articles of footwear, wherein an upper is pre-mounted in reverse position on a midsole, with the help of a first last defined hereafter as reverse shoe last, and is then shaped in straight position with the help of a second last defined hereafter as straight shoe last. The articles of footwear obtained with the GOOD YEAR REVERSE technology have an extraordinary flexibility and are also extremely elegant.

**[0003]** In order to better understand the problems that afflict the GOOD YEAR REVERSE technology, the description of such a technology will make use of the following figures of the PRIOR ART, wherein:

- Fig. 1 is a schematic side view of a foot suitable for wearing a shoe;
- Figs. 1A and 1B are schematic views of an upper seen from two different angles;
- Fig. 2A is a lateral view of a straight shoe last according to the prior art;
- Fig. 2B is a side view of a reverse shoe last according to the prior art;
- Fig. 2C is a view of the two lasts of Fig. 2A and 2B, mounted one on top of the other;
- Fig. 2D is a view of a midsole according to the prior art;
- Figs. 3A to 3F are schematic views of the steps of a GOOD YEAR REVERSE process that uses the lasts of Figs. 2A and 2B and the midsole of Fig. 2D; in said figures the midsole, the upper and the lasts are all sectioned according to a vertical plane passing through a longitudinal axis of the midsole;
- Fig. 3G is an enlargement of the detail enclosed in the circle G of Fig. 3B;
- Fig. 3H is an enlargement of the detail enclosed in circle H of Fig. 3E;
- Fig. 3I is an enlargement of the detail enclosed in circle I of Fig. 3F.

**[0004]** In order to perform the GOOD YEAR REVERSE process, first of all, it is necessary to provide an upper (4) having an outer face (4a) suitable for being visible, an inner face (4b) and ending flaps (4e). By way of example, the upper (4) is shown in Figs. 1A and 1B.

**[0005]** Then, it is necessary to design and make the straight shoe last (2), the reverse shoe last (1), and the midsole (3).

**[0006]** With reference to Fig. 2A, the straight shoe last

(2) is designed and made in such a way to be suitable for the foot (P) (shown in Fig. 1) that is to wear the finished article of footwear. Said straight shoe last (2) is practically made in such a way as to substantially reproduce the three-dimensional shape of the foot (P).

**[0007]** On the other hand, with reference to Fig. 2B, the reverse shoe last (1) is made starting from the straight shoe last (2), subtracting a thickness in correspondence of the sole, in such a way that the two lasts (1, 2) substantially have the same instep-toe profile (pp1, pp2), but have different heights.

**[0008]** Fig. 2C is a view of the two lasts (1, 2) disposed one on top of the other in such a way as to visually appreciate the differences between the two lasts (1, 2). Practically, they have the same instep-toe profile (pp1, pp2), but a different height. The reason why the height of the reverse shoe last (1) is reduced compared to the straight shoe last (2) will be illustrated in the following description of the different steps of the GOOD YEAR REVERSE process.

**[0009]** Referring to Fig. 2D, a conventional midsole (3) according to the prior art used in the GOOD YEAR REVERSE process is shown.

**[0010]** The midsole (3) comprises a toe (3p), a shank (3f), a heel (3t), an upper face (3a), a lower face (3b), and a perimeter edge (33).

**[0011]** A channel (32) is obtained on the upper face (3a), extending from the shank (3f) to the toe (3p) in parallel direction and always at the same distance (L) from the perimeter edge (33) of the midsole (3). Said distance (L) between the channel (32) and the perimeter edge (33) is comprised between 13 mm and 15 mm.

**[0012]** Therefore, a band (3q) of width equal to said distance (L) is generated between the channel (32) and the perimeter edge (33).

**[0013]** The channel (32) consists in an incision made on the upper surface (3a) of the midsole (3) in order to obtain a flap suitable for being raised to act as support for the stitching of the ending flaps (4e) of the upper (4).

**[0014]** The channel (32) is not provided in correspondence of the heel (3t) because the connection of the ending flaps (4e) in the heel (3t) of the midsole (3) is made by means of an insert (T) that is glued and nailed to the heel (3t) of the midsole (3). It must be noted that, although in Fig. 2D the channel extends from the shank (3f) to the toe (3p) of the midsole (3), nothing prevents the realization of an annular channel (obtained also on the heel of the midsole) on which the ending flaps (4e) of the upper (4) are to be stitched.

**[0015]** With reference to Figs. 3A to 3F, the GOOD YEAR REVERSE process implemented with the lasts (1, 2) shown in Figs. 2A and 2B and the midsole (3) shown in Fig. 2D is described.

**[0016]** With reference to Fig. 3A, first of all, the reverse shoe last (1) is disposed to abut the lower face (3b) of the midsole (3), and is embraced by an upper (4) disposed in reverse position, that is to say with the outer face (4a) facing the reverse shoe last (1).

**[0017]** At this point the ending flaps (4e) of the upper (4) are pulled and folded over the upper face (3a) of the midsole (3), as shown in Fig. 3B.

**[0018]** Then, the ending flaps (4e) are fixed to the upper face (3a) of the midsole (3).

**[0019]** In particular, in correspondence with the portion of the midsole (3) that goes from the shank (3f) to the toe (3p), the ending flaps (4e) of the upper (4) are sewn in correspondence with the channel (32) with a first stitching (c1) (shown in particular in Fig. 3G).

**[0020]** With reference to Fig. 3G, the reason why the reverse shoe last (1) has a lower thickness than the straight shoe last (2) is evident. Such a lower thickness takes into account the fact that a portion (40) of the upper (4) must cover the band (3q) and the perimeter edge (33) of the midsole (3) when the upper (4) is in reverse position.

**[0021]** Then, with reference to Fig. 3C, the reverse shoe last (1) is pulled out. Successively, as shown in Fig. 3D, the upper (4) is turned like a sock.

**[0022]** With reference to Fig. 3D, the straight shoe last (2) is inserted into the upper (4) in such a way as to shape the upper (4) into the desired configuration. In addition, an insert (T) is applied in correspondence with the heel (3t) of the midsole (3), compressing the ending flaps (4e) (disposed in correspondence with the heel (3t)) against the midsole (3).

**[0023]** The insert (T) is glued and nailed to the midsole (3).

**[0024]** With reference to Fig. 3E, the straight shoe last (2) is maintained inside the upper (4) for a suitable time to shape the upper (4).

**[0025]** After the time necessary for the shaping of the upper (4) has elapsed, the straight shoe last (2) is pulled out, as shown in Fig. 3F, thus obtaining the finished shoe.

**[0026]** Although it is currently used by the vast majority of footwear manufacturers, the GOOD YEAR REVERSE technology is not certainly free from drawbacks.

**[0027]** Firstly, such a technology does not allow for sewing an outsole under the midsole (3) because the band (3q), defined between the channel (32) and the perimeter edge (33) is not wide enough for a stitching that connects the outsole to the midsole.

**[0028]** In this regard, only an anti-slip bottom can be applied under the midsole (3) by means of gluing.

**[0029]** The presence of a glued anti-slip bottom considerably impairs the elegance and the aesthetic appearance of the final shoe.

**[0030]** In addition, a glued anti-slip bottom is not reliable over time because it tends to get unglued and detached.

**[0031]** Another drawback of such a technology concerns the fact that, when the straight shoe last (2) is pulled out, the upper (4) tends to get deformed in correspondence with the toe.

**[0032]** In particular, after the straight shoe last (2) is pulled out, the upper (4) in correspondence with the toe tends to yield and deform, severely impairing the aes-

thetics of the finished shoe.

**[0033]** While performing several studies the applicant realized that this last inconvenience is due to the fact that, during the assembly of the upper (4) in reverse position, the toe of the upper (4) is stressed and pulled to the point of yielding and deforming irreversibly. As shown in Fig. 31, such a deformation of the toe of the upper (4) results in the lowering and advancing of the toe of the upper (4), immediately after the straight shoe last (2) is pulled out.

**[0034]** Fig. 3I is to be observed in conjunction with Fig. 3H so as to visually appreciate the deformation suffered by the upper (4) in correspondence with the toe after the straight shoe last (2) is pulled out.

**[0035]** US499571A discloses a method of making a shoe with turned upper that provides for using two lasts with different length.

**[0036]** US1103937A discloses a method of making shoes of the type known as "stitch downs" that provides for using a first last and a second last that differ from each other.

**[0037]** US236170A discloses a method of making a shoe with turned upper.

**[0038]** From the observation of the prior art, the following invention has been conceived to solve the problems of the aforementioned GOOD YEAR REVERSE technology.

**[0039]** Otherwise said, the purpose of the present invention is to devise a new method of designing a last, aimed at obtaining a last that is shaped in such a way as not to stress the upper in correspondence with the toe, thus solving the problem of the anti-aesthetic deformation that occurs in the prior art.

**[0040]** A further purpose of the present invention is to devise a new kit comprising the two lasts that can be used for manufacturing the article of footwear with the reverse upper process.

**[0041]** A final purpose is to devise a process for manufacturing an article of footwear using the GOOD YEAR REVERSE technology that allows an outsole to be sewn to the midsole.

**[0042]** These purposes are achieved in accordance with the invention with the features listed in the appended independent claims 1 and 2.

**[0043]** Advantageous embodiments appear from the dependent claims.

**[0044]** The new method of designing a last according to the invention is defined by claim 1.

**[0045]** For the sake of clarity, the description of such a method is continued with reference to the appended drawings, which have only illustrative and non-limiting value, wherein:

- Fig. 1 is a schematic side view of a foot suitable for wearing a shoe;
- Figs. 1A and 1B are schematic views of an upper seen from two different angles;
- Fig. 2A is a side view of a straight shoe last according

- to the prior art;
- Fig. 2B is a side view of a reverse shoe last according to the prior art;
- Fig. 2C is a view of the two lasts of Figs. 2A and 2B, mounted one on top of the other;
- Fig. 2D is a view of a midsole according to the prior art;
- Figs. 3A to 3F are schematic views of the steps of the GOOD YEAR REVERSE process that uses the lasts of Figs. 2A and 2B and the midsole of Fig. 2D; in said figures the midsole, the upper and the lasts are all sectioned according to a vertical plane passing through a longitudinal axis of the midsole;
- Fig. 3G is an enlargement of the detail enclosed in the circle G of Fig. 3B;
- Fig. 3H is an enlargement of the detail enclosed in circle H of Fig. 3E;
- Fig. 3I is an enlargement of the detail enclosed in circle I of Fig. 3F.
- Fig. 4A is a side view of a straight shoe last according to the invention;
- Fig. 4B is a side view of a reverse shoe last according to the invention;
- Fig. 4C shows the two lasts of Figs. 4B and 4A mounted one on top of the other;
- Fig. 4D is a view of a midsole according to the invention;
- Figs. 5A to 5F are schematic views of the steps of the GOOD YEAR REVERSE process that uses the lasts of Fig. 4A and 4B and the midsole of Fig. 4D; in said figures the midsole, the upper and the lasts are all sectioned according to a vertical plane passing through a longitudinal axis of the midsole;
- Fig. 5G is an enlargement of the detail enclosed in the circle G2 of Fig. 5B;
- Fig. 5H is an enlargement of the detail enclosed in circle H2 of Fig. 5E;
- Fig. 5I is an enlargement of the part enclosed in circle I2 of Fig. 5F;
- Fig. 6 is an axonometric view of a portion of the finished shoe.

**[0046]** Hereafter elements equal or corresponding to those already described will be indicated with the same reference numbers, omitting their detailed description.

**[0047]** The new method of designing a last provides for determining the shape and the size of the foot (P) suitable for wearing the shoe.

**[0048]** Once the shape of the foot (P) has been determined, the straight shoe last (2) (shown in Fig. 4A) is designed and made, it being suitable for being inserted inside the upper (4) when the upper (4) has been turned and disposed in straight position. Said straight shoe last (2) is designed and made in such a way to have substantially the same three-dimensional shape as the foot (P) which is to wear the footwear. The straight shoe last (2) of the invention, which is shown in Fig. 4A, is substantially identical to the straight shoe last (2) of the prior art shown

in Fig. 2A.

**[0049]** Then, the reverse shoe last (1) (shown in Fig. 4B) is designed and made, whereon the upper (4) is suitable for being disposed in reverse position during the fixing to the midsole (3), that is to say while sewing the ending flaps (4e) of the upper (4) to the channel (32).

**[0050]** The reverse shoe last (1) always has a smaller thickness than the straight shoe last (2) and is designed and manufactured in such a way as to have a length (u1) greater than the length (u2) of the straight shoe last (2).

**[0051]** With reference to Fig. 4C, the reverse shoe last (1) and the straight shoe last (2) are designed and realized in such a way to have instep-toe profiles (cp1, cp2) that extend for two different trajectories.

**[0052]** With reference to Fig. 4A and Fig. 4B, an end section (10, 20) can be identified on the instep-toe profile (cp1, cp2) of the reverse shoe last (1) and of the straight shoe last (2), in correspondence with the toe (p1, p2) of the last (1, 2).

**[0053]** A final section (11, 21) can be identified on the sole of the reverse shoe last (1) and of the straight shoe last (2), being joined with the end section (10, 20) of the instep-toe profile (cp1, cp2), in correspondence with the toe (p1, p2).

**[0054]** With reference to Fig. 4B, the end section (10) of the instep-toe profile (cp1) of the reverse shoe last (1) and the final section (11) of the sole of the reverse shoe last (1) define an angle ( $\alpha$ ) comprised between 52° and 62°.

**[0055]** With reference to Fig. 4A, the end section (20) of the instep-toe profile (cp2) of the straight shoe last (2) and the final section (21) of the sole of the straight shoe last (2) define an angle ( $\beta$ ) comprised between 80° and 89°.

**[0056]** Otherwise said, the reverse shoe last (1) ends in a pointed and flattened way whereas the straight shoe last (2) ends in a tapered and more rounded way compared to the reverse shoe last (1).

**[0057]** Therefore, in order to solve the problems that impair the prior art, the applicant focused the attention on the configuration of the reverse shoe last. In fact, the reverse shoe last (1) of the invention is a thinner and more pointed configuration than the reverse shoe last (1) of the prior art.

**[0058]** The new configuration of the reverse shoe last (1) allowed the applicant to solve the aforementioned problem concerning the irreversible deformation of the upper (4) in correspondence with the toe during the assembly of the upper (4) in reverse position.

**[0059]** In fact, the applicant found out that, by using the reverse shoe last (1) of the invention, the toe of the upper (4) (see Fig. 5G) is not subject to stresses capable of irreversibly causing its yielding and deformation. Thus, when the shoe is finished and the straight shoe last (2) is pulled out from the upper (4), the upper (4) remains in erect position and firmly maintains the same shape as the straight shoe last (2) in correspondence with the toe.

**[0060]** In particular, by jointly observing Fig. 5H and

Fig. 51, it can be visually appreciated that the upper (4) maintains the same shape as the straight shoe last (2) in correspondence with the tow, even after the straight shoe last (2) has been pulled out.

**[0061]** In addition to the method of designing the two lasts (1, 2), a further object of the present invention is a kit comprising said reverse shoe last (1) and straight shoe last (2).

**[0062]** Figs. 5A-5F show the process for the realization of an article of footwear with reverse upper, that is to say the GOOD YEAR REVERSE process implemented by the applicant.

**[0063]** The process is basically the same as the one already described in the prior art and therefore it will not be described again in detail.

**[0064]** The process according to the invention differs from the process of the prior art in that it uses the new lasts (1, 2) as described above, and also in that the channel (32) is not parallel to the perimeter edge (33).

**[0065]** More precisely, with reference to Fig. 4D, the channel (32) is made with a distance (L1, L2) from the perimeter edge (33) of the midsole (3) that increases going from the shank (3f) to the toe (3p).

**[0066]** It should be noted that the midsole (3) used in the new process according to the invention has larger dimensions than the midsole used in the prior art. Such a provision allows the channel (32) of the new midsole (3) to have the same profile as the channel (32) of the midsole (3) used in the prior art, and to have a distance from the perimeter edge (33) that increases going from the shank (3f) to the toe (3p).

**[0067]** In particular, from the perimeter edge (33), the channel (32) of the new midsole (3) has:

- a distance (L1) comprised between 20 mm and 22 mm, in correspondence with the toe (3p), and
- a distance comprised between 16 mm and 19 mm in correspondence of the shank (3f).

**[0068]** The increase in the distance (L1, L2) between the channel (32) and the perimeter edge (33) of the new midsole (3), as compared to the distance (L) between the channel (32) and the perimeter edge (33) of the midsole (3) of the prior art, allows for providing a sufficient space for a second stitching (c2) for sewing an outsole (5) to the midsole (3).

**[0069]** Otherwise said, as shown in Fig. 5E, whereas the straight shoe last (2) is disposed inside the upper (4), the outsole (5) is applied on the lower face (3b) of the midsole (3) by means of a second stitching (c2) applied on the upper face (3a), in correspondence with the band (3q) interposed between the upper (4) and the perimeter edge (33).

**[0070]** Although in Fig. 5E the second stitching (c2) is made when the straight shoe last (2) is inserted inside the upper (4), nothing would change for the purposes of the objectives pursued by the present invention if such a second stitching (c2) were made after the straight shoe

last (2) has been pulled out from the upper (4).

**[0071]** With reference to Fig. 6, the provision of the second stitching (c2) around the upper (4) gives an extraordinary elegance to the finished shoe.

**[0072]** In addition, the stitching is extremely more secure and less prone to detachment than a connection using glue.

**[0073]** Numerous variations and modifications of detail can be made to the present embodiment of the invention, within the reach of a skilled person in the art, always within the scope of the invention as expressed by the appended claims.

## 15 Claims

1. Method of designing and manufacturing a reverse shoe last (1) and a straight shoe last (2) used for manufacturing an article of footwear by means of a process that provides for fixing an upper (4) disposed in reverse position on the reverse shoe last (1) to a midsole (3); said method comprising the following steps:

- designing a shape and/or size of a foot (P) suitable for wearing the article of footwear to be manufactured;
- designing and making a reverse shoe last (1) whereon the upper (4) is suitable for being disposed in reverse position during the fixing of the upper (4) to the midsole (3);
- designing and making a straight shoe last (2) suitable for being inserted inside the upper (4) when the upper (4) has been turned and disposed in straight position; wherein said straight shoe last (2) is designed and made in such a way to substantially have the same shape as the foot (P);

wherein said reverse shoe last (1) is designed and made with a higher length (u1) than the length (u2) of the straight shoe last (2);

**characterized in that**

said reverse shoe last (1) and said straight shoe last (2) are designed and made with instep-toe profiles (cp1, cp2) that extend along two different trajectories.

wherein said instep-toe profile (cp1, cp2) of the reverse shoe last (1) and of the straight shoe last (2) comprises an end section (10, 20) in correspondence of the toe (p1, p2) of the shoe last (1, 2); wherein said reverse shoe last (1) and said straight shoe last (2) comprise a sole with a final section (11, 21) in correspondence of the toe (p1, p2); said final section (11, 21) being joined with said end section (10, 20) of the shoe last (1, 2);

wherein said end section (10) and said final section (11) of the reverse shoe last (1) define an angle ( $\alpha$ ) comprised between  $52^\circ$  and  $62^\circ$ ;  
 wherein said end section (20) and said final section (21) of the straight shoe last (2) define an angle ( $\beta$ ) comprised between  $81^\circ$  and  $89^\circ$ .

2. Kit for manufacturing an article of footwear by means of a process that provides for fixing an upper (4) disposed in reverse position to a midsole (3); said kit comprising:

- a reverse shoe last (1) suitable for being used when mounting the upper (4) in reverse position on a midsole (3);
- a straight shoe last (2) suitable for being inserted inside the upper (4) when the upper (4) has been and disposed in straight position; wherein said straight shoe last (2) substantially has the same shape as a foot (P) suitable for wearing the article of footwear to be manufactured;

wherein said reverse shoe last (2) has a higher length ( $u_2$ ) than the length ( $u_1$ ) of the straight shoe last (2);  
**characterized in that**

the reverse shoe last (1) and the straight shoe last (2) have instep-toe profiles (cp1, cp2) that extend along two different trajectories;  
 wherein said instep-toe profile (cp1, cp2) of the reverse shoe last (1) and of the straight shoe last (2) comprises an end section (10, 20) in correspondence of the toe (p1, p2) of the shoe last (1, 2); wherein said reverse shoe last (1) and said straight shoe last (2) comprise a sole with a final section (11, 21) in correspondence of the toe (p1, p2); said final section (11, 21) being joined with said end section (10, 20) of the shoe last (1, 2);

- wherein said end section (10) and said final section (11) of the reverse shoe last (1) define an angle ( $\alpha$ ) comprised between  $52^\circ$  and  $62^\circ$ ;
- wherein said end section (20) and said final section (21) of the straight shoe last (2) define an angle ( $\beta$ ) comprised between  $80^\circ$  and  $89^\circ$ .

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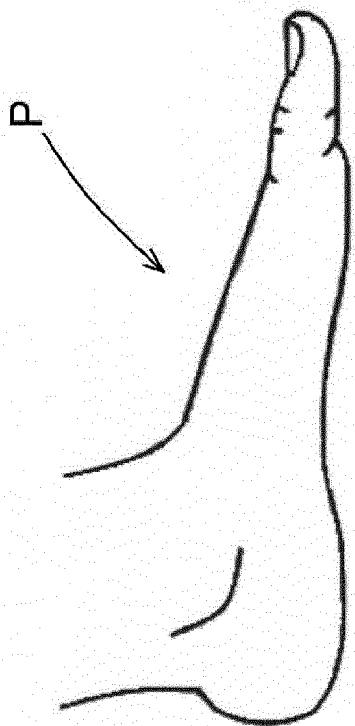


FIG. 1  
PRIOR ART

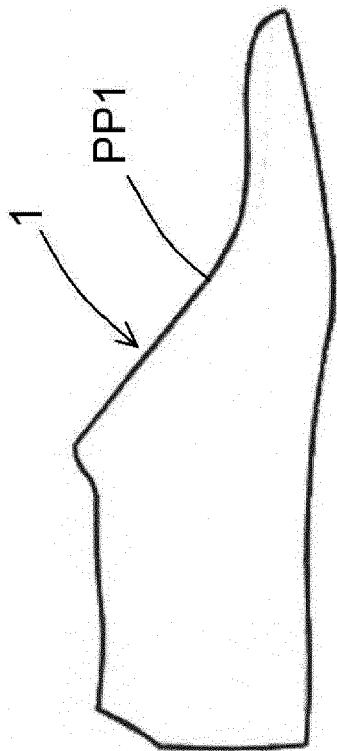


FIG. 2B  
PRIOR ART

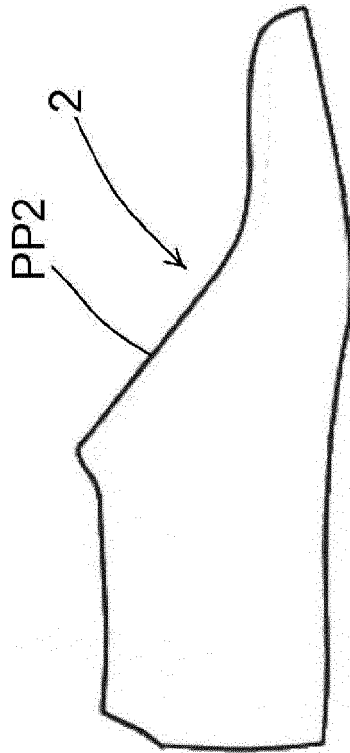


FIG. 2A  
PRIOR ART

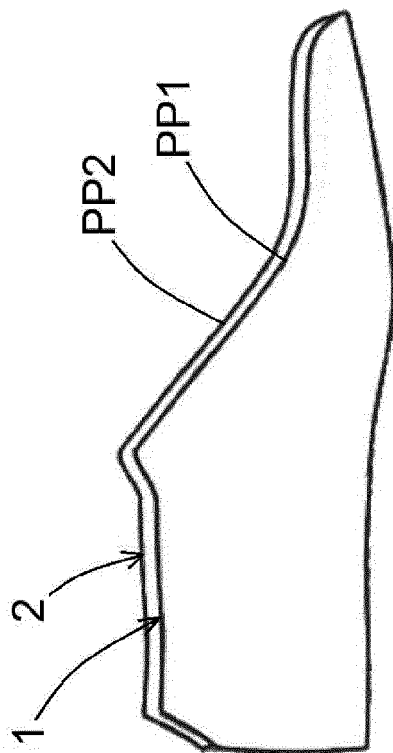


FIG. 2C  
PRIOR ART

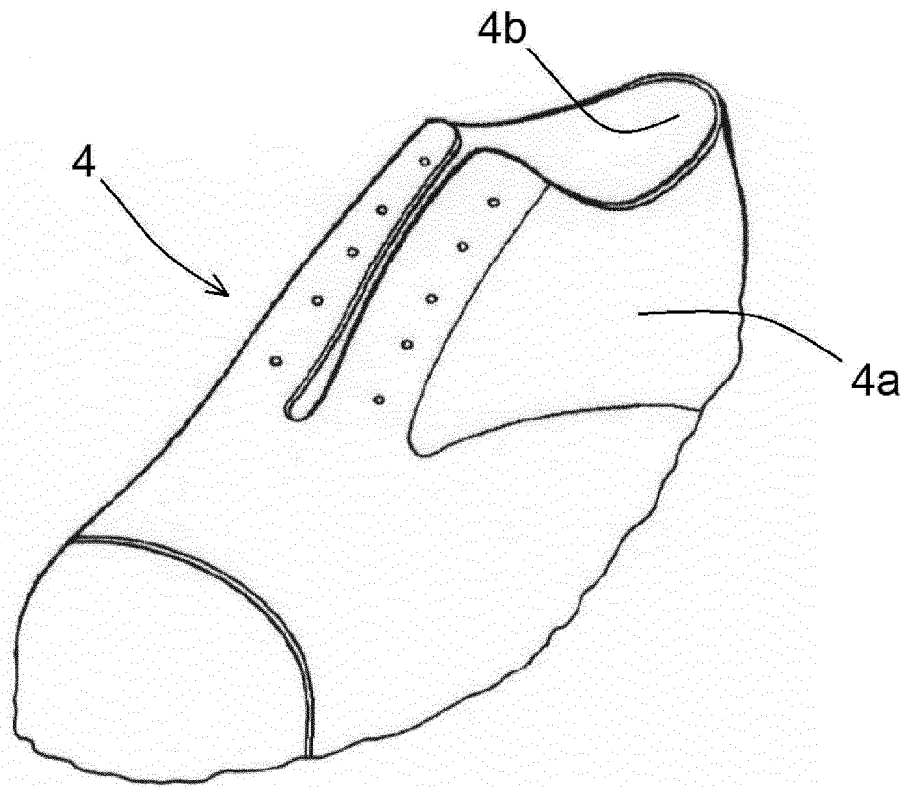


FIG. 1A  
PRIOR ART

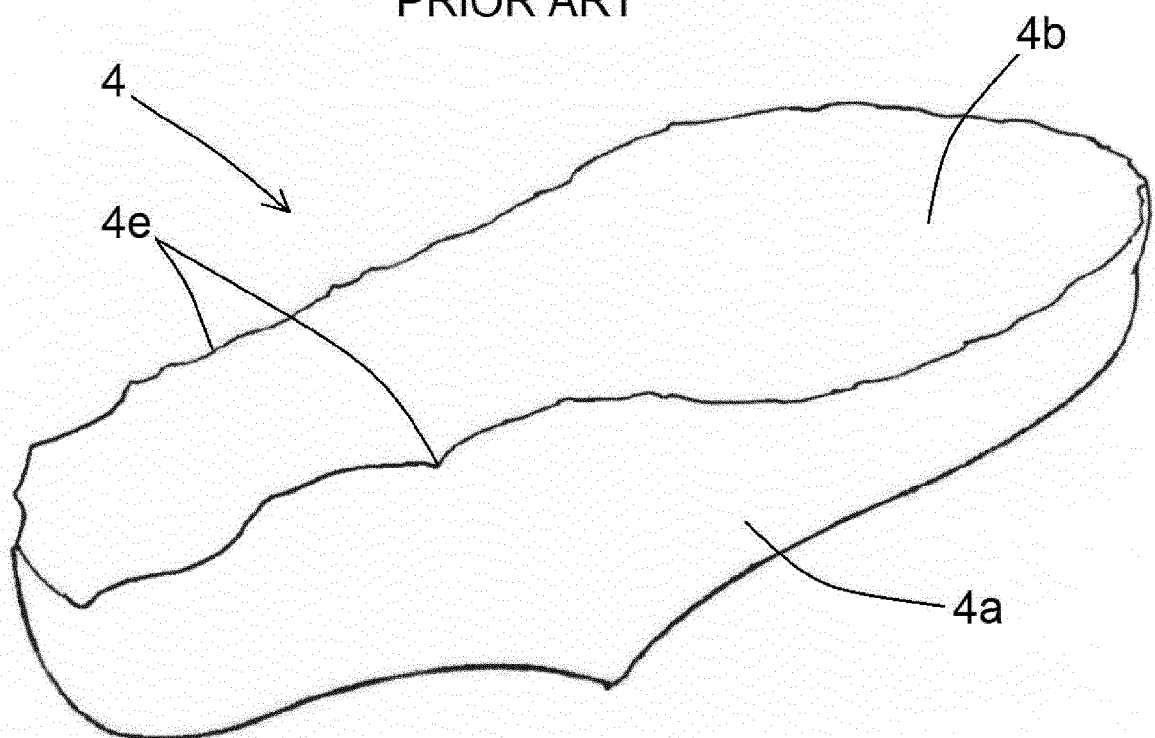


FIG. 1B  
PRIOR ART

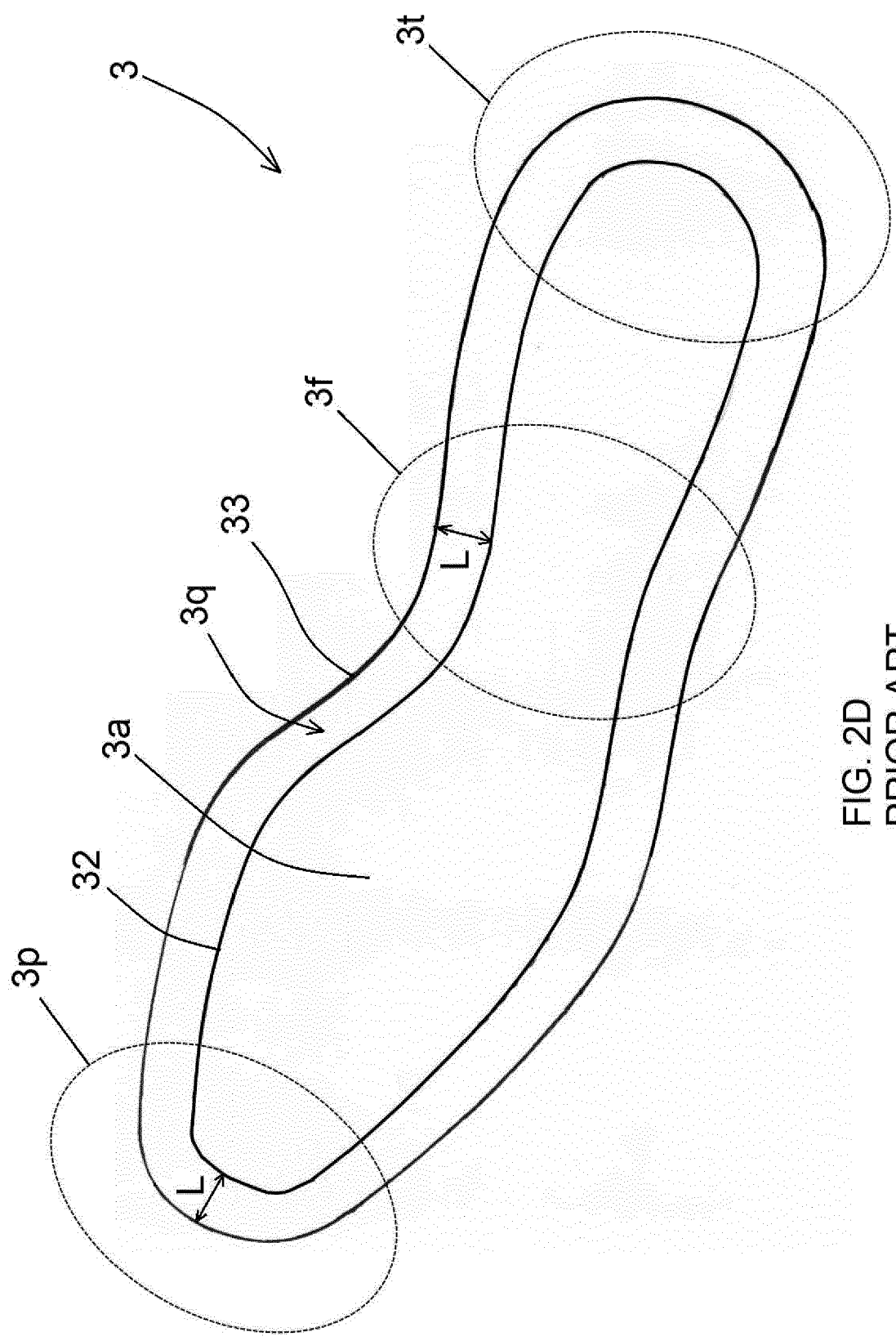
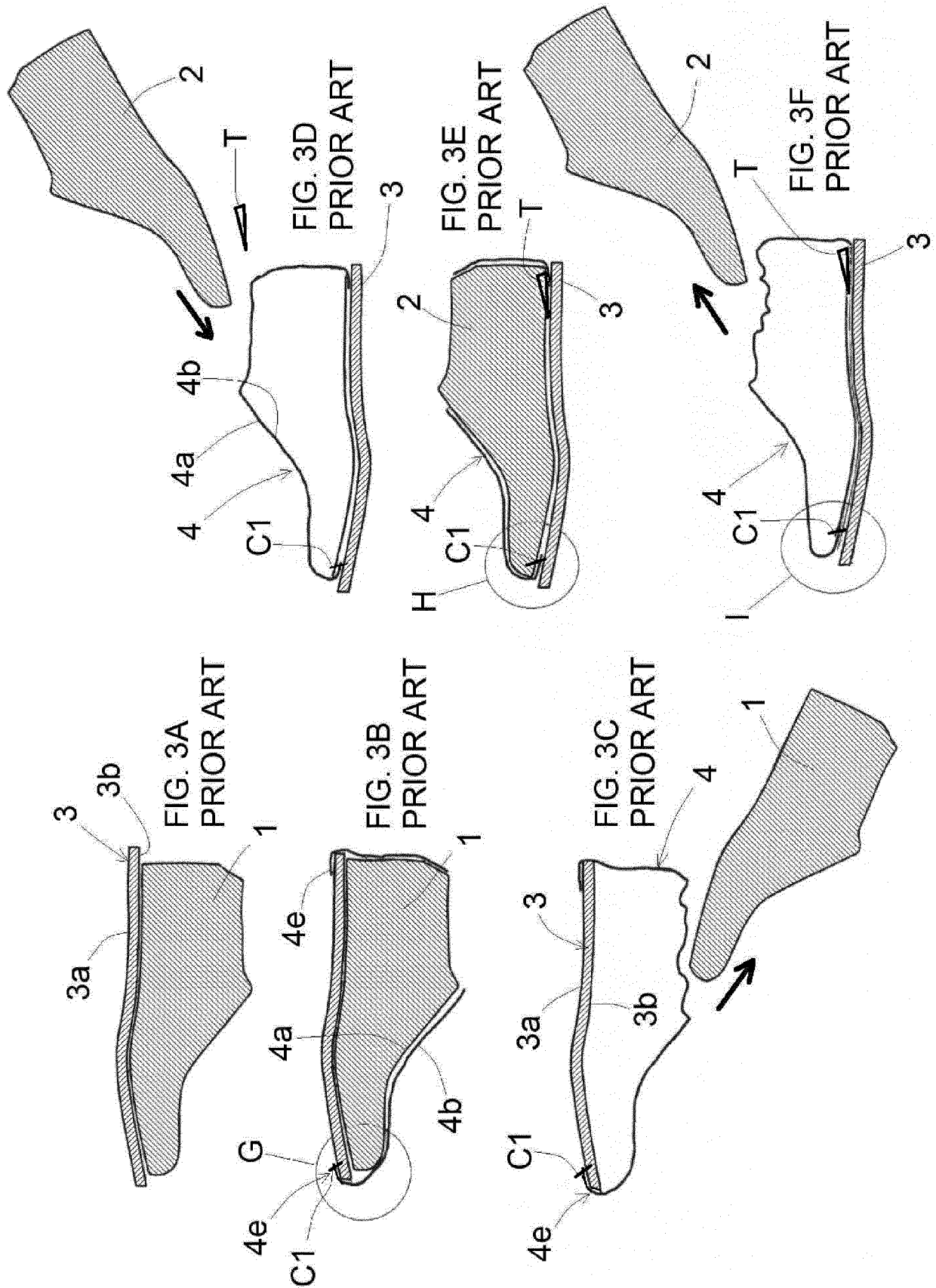


FIG. 2D  
PRIOR ART



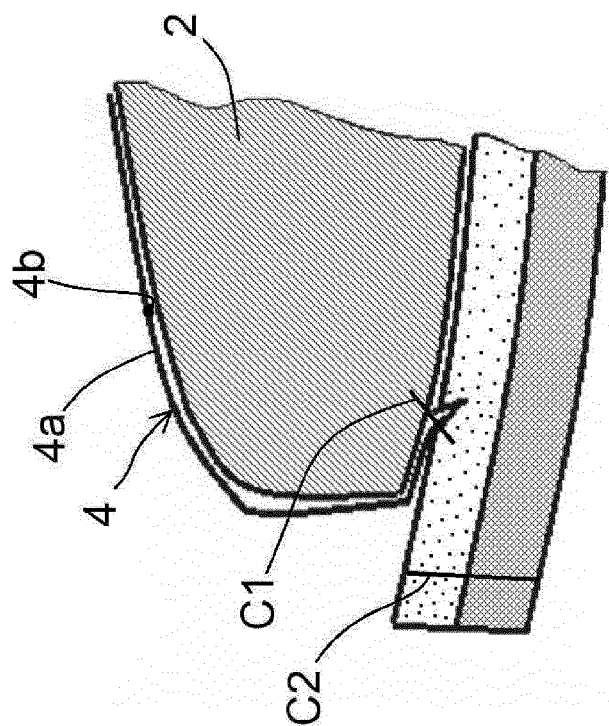


FIG. 3H  
PRIOR ART

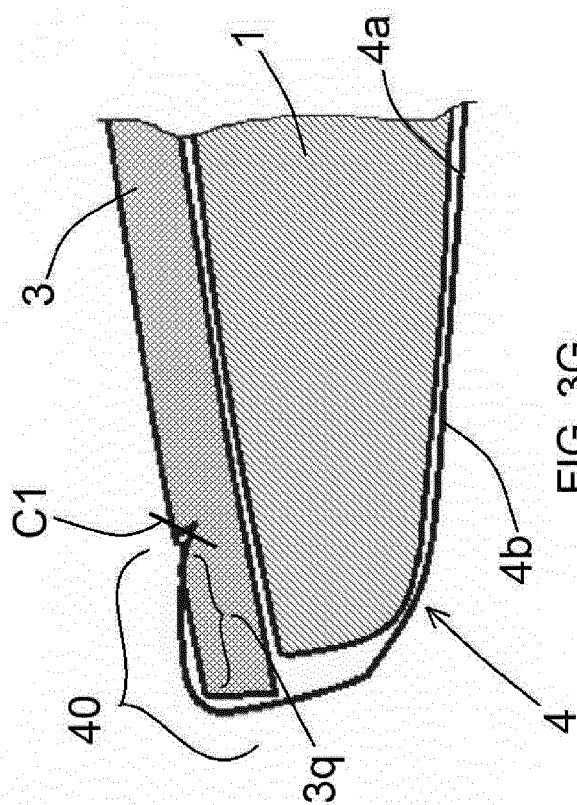


FIG. 3G  
PRIOR ART

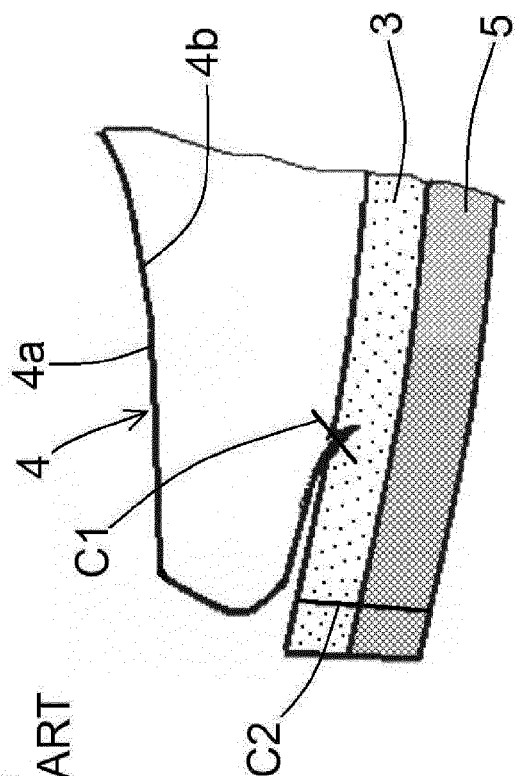
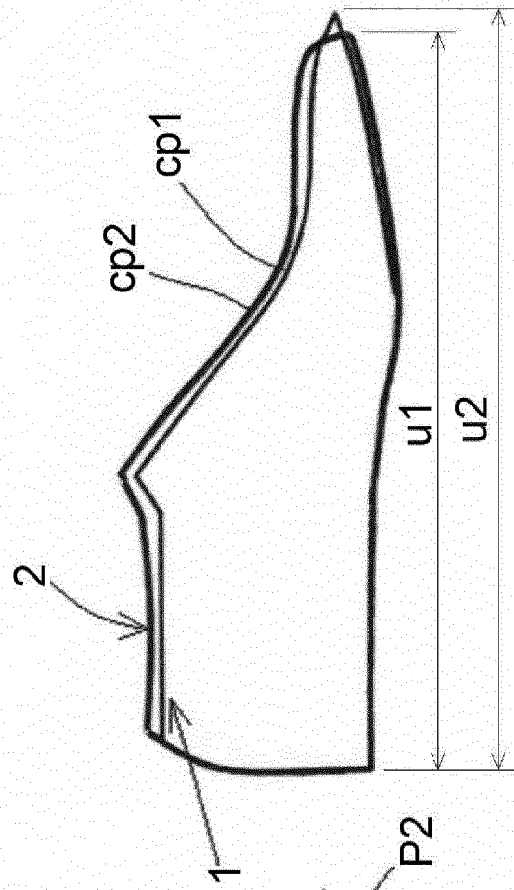
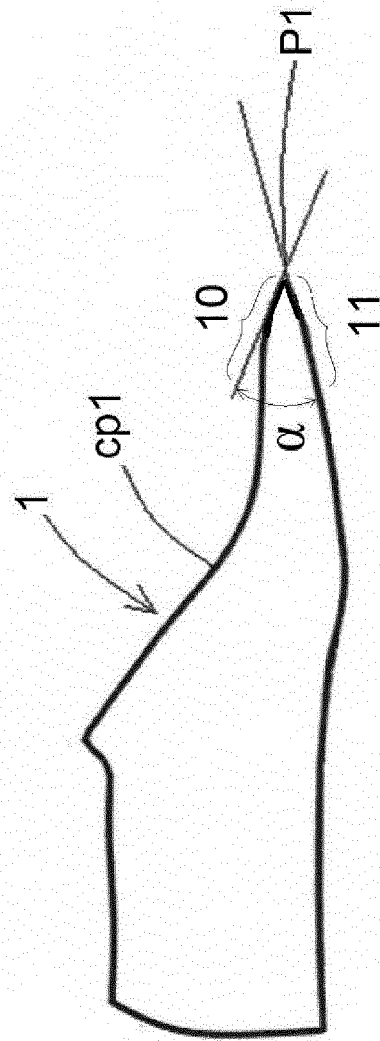
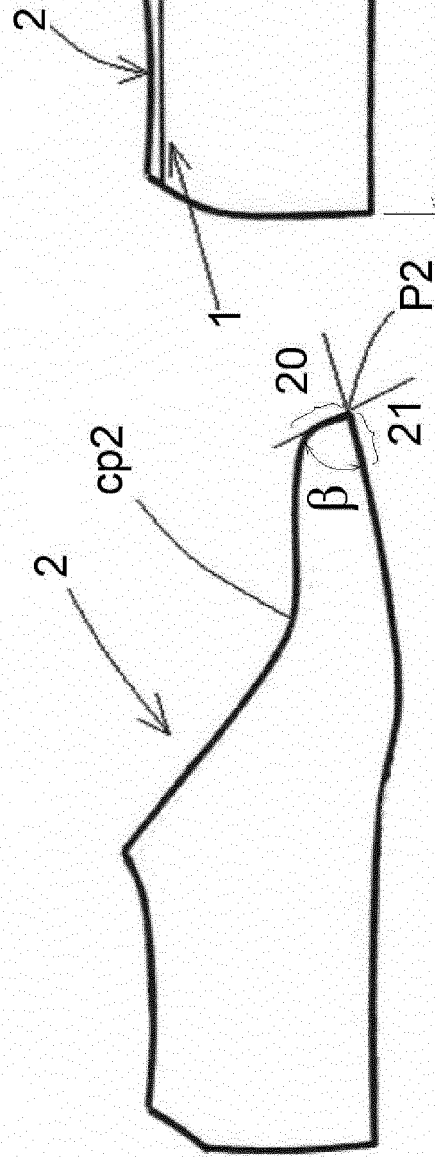


FIG. 3I  
PRIOR ART



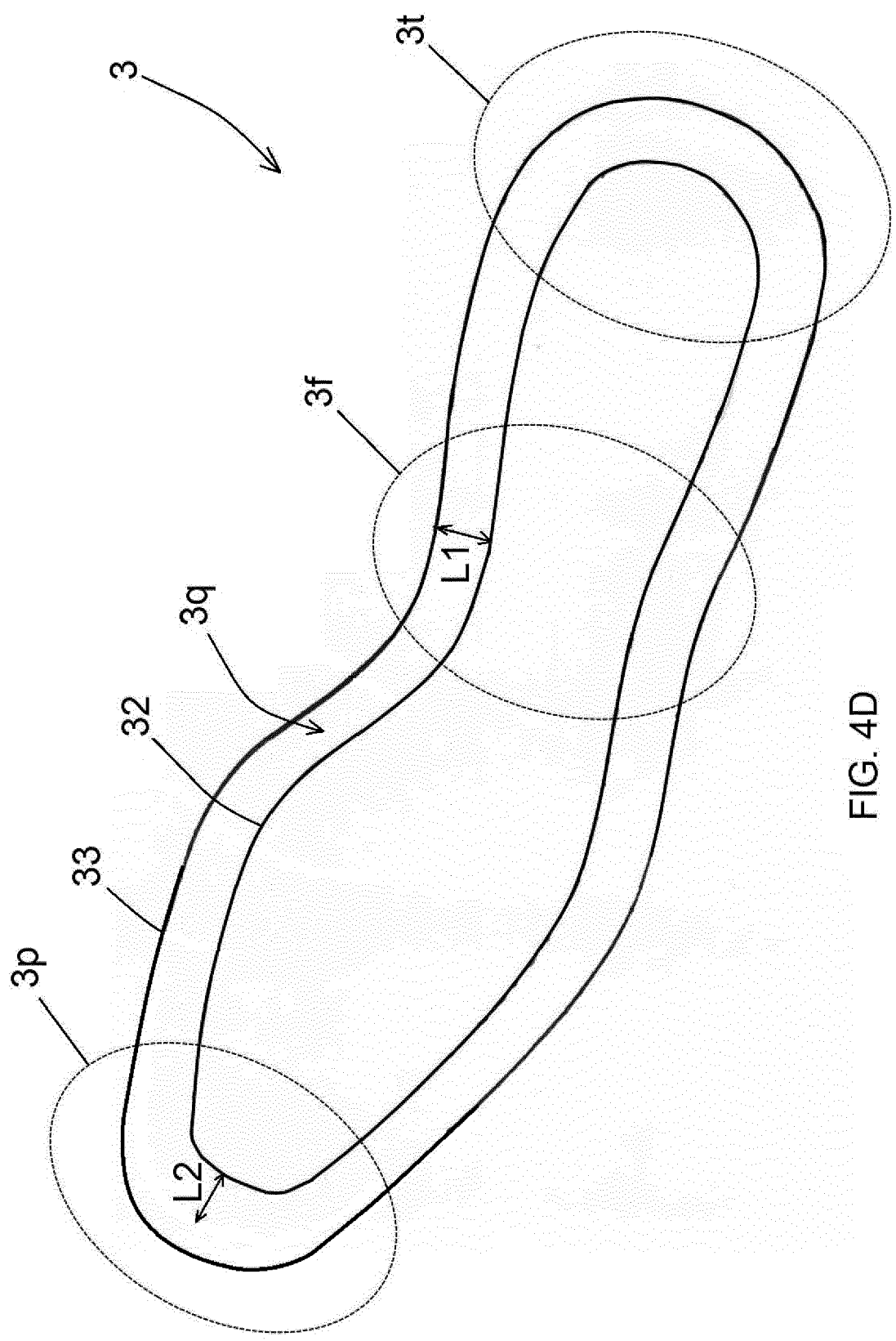


FIG. 4D

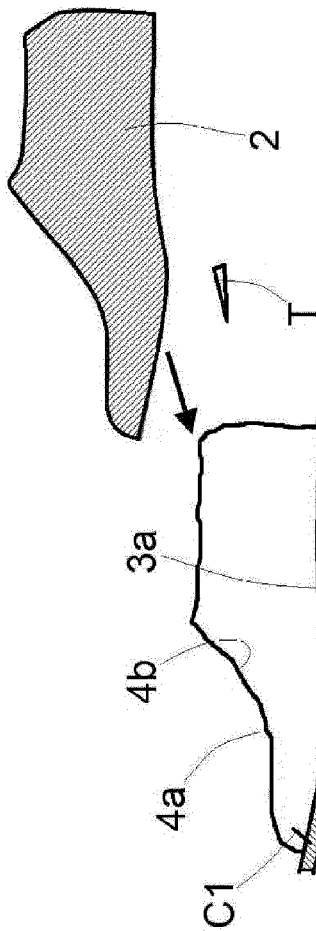


FIG. 5A

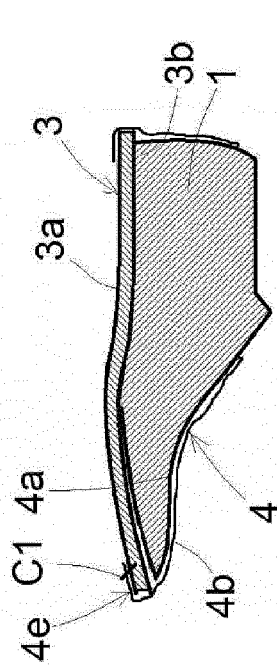


FIG. 5B

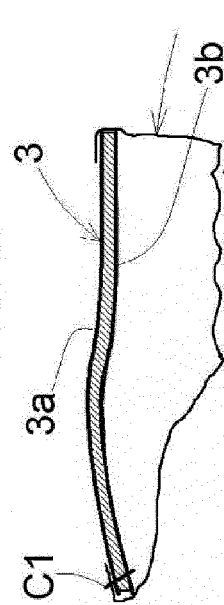


FIG. 5C

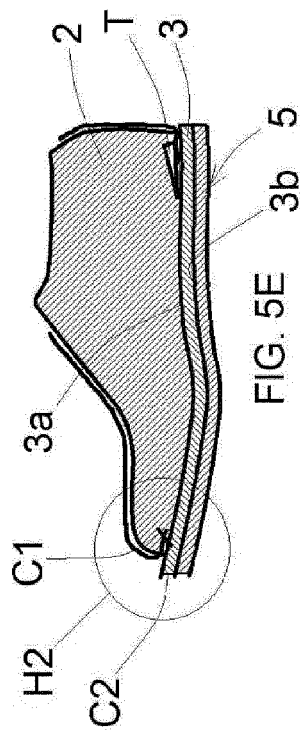


FIG. 5D

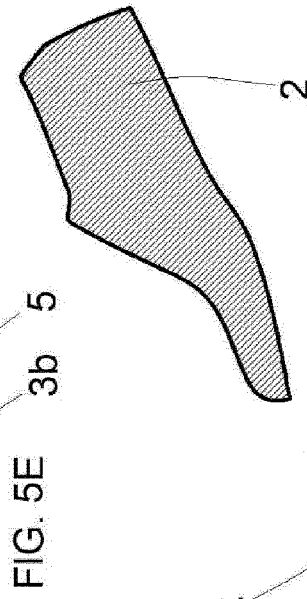


FIG. 5E

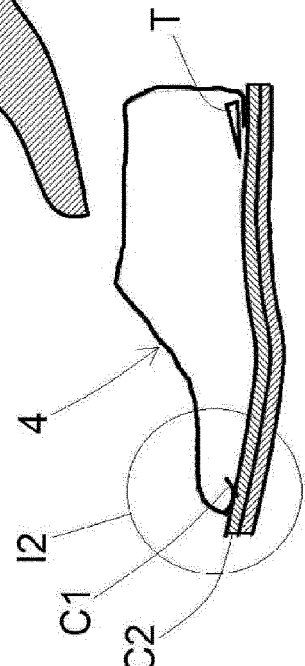


FIG. 5F

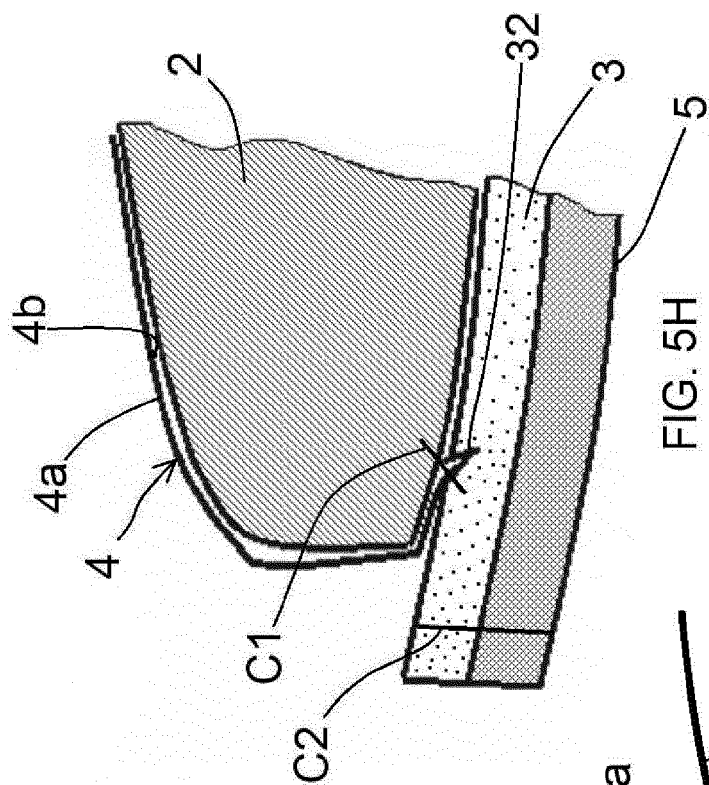


FIG. 5H

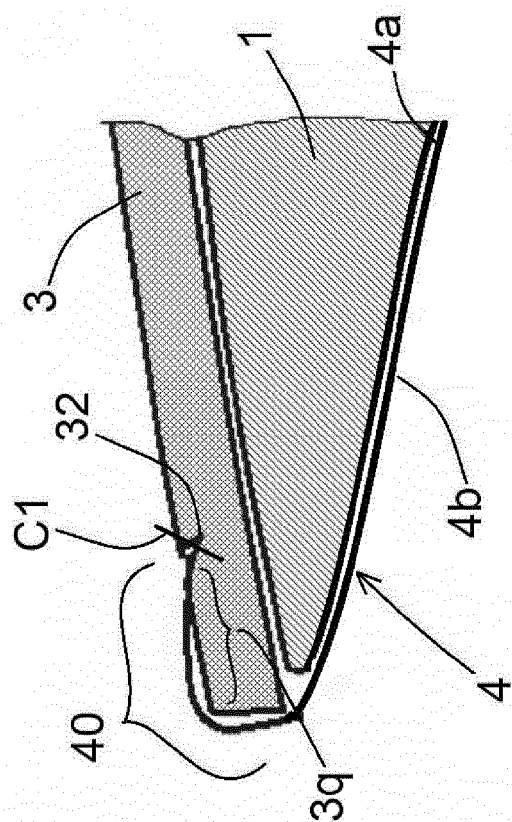


FIG. 5G

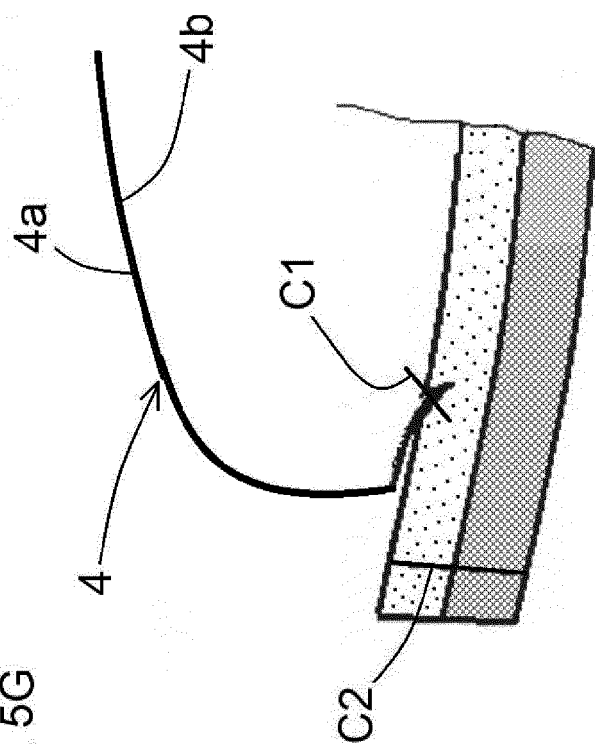


FIG. 5I

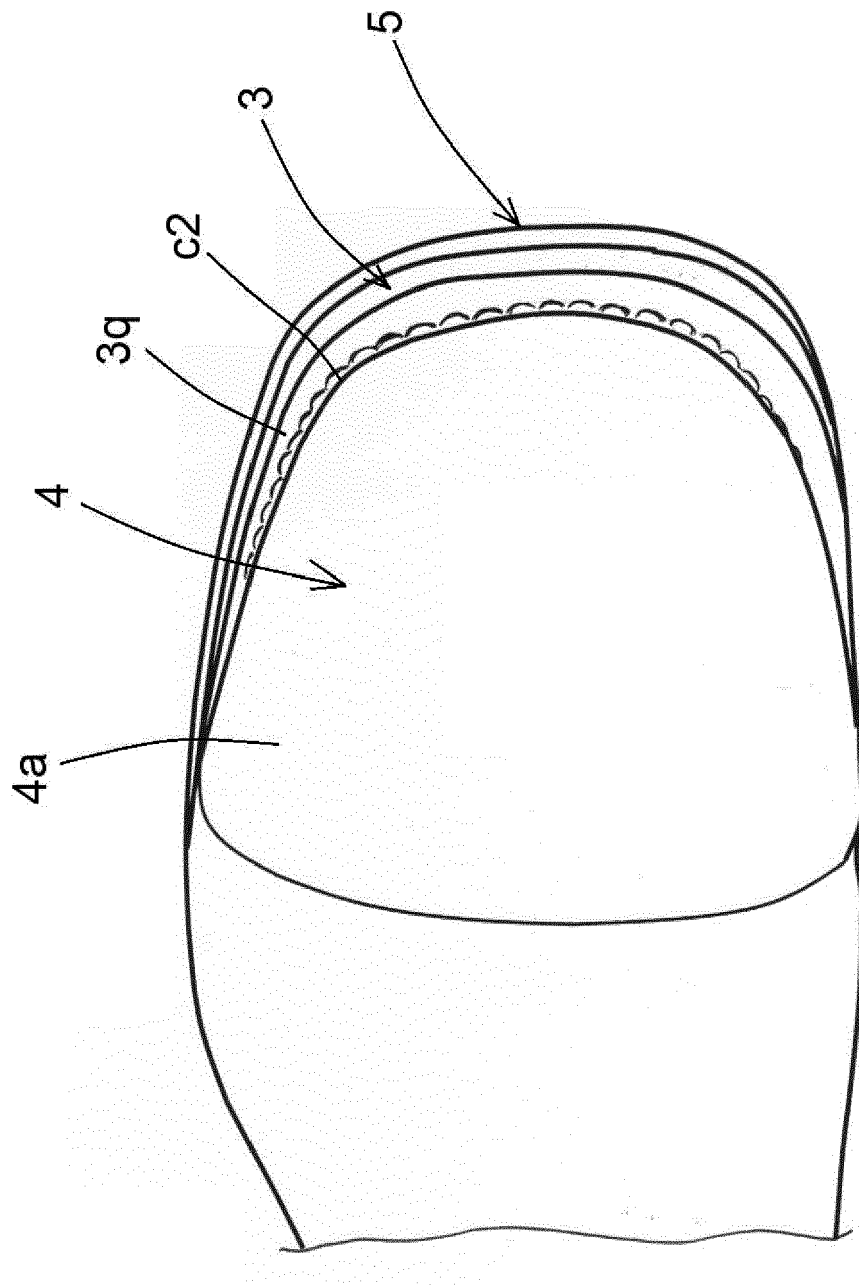


FIG. 6



## EUROPEAN SEARCH REPORT

Application Number

EP 22 15 6680

## DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 499 571 A (ALBERT C. OPPENHEIMER) 13 June 1893 (1893-06-13) * page 1, line 9 - page 2, line 15 * * figures 1-6 * * claim 1 *	1, 2	INV. A43B9/08
A	US 1 103 937 A (BROTHERS ELI [US]) 21 July 1914 (1914-07-21) * page 1, line 12 - page 3, line 12 * * figures 1-10 * * claims 1, 2 *	1, 2	
			TECHNICAL FIELDS SEARCHED (IPC)
			A43B A43C
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		25 May 2022	Espeel, Els
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25-05-2022

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	<b>US 499571</b>	<b>A</b>	<b>13-06-1893</b>	<b>NONE</b>
	-----			
15	<b>US 1103937</b>	<b>A</b>	<b>21-07-1914</b>	<b>NONE</b>
	-----			
20				
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**Patent documents cited in the description**

- US 499571 A [0035]
- US 1103937 A [0036]
- US 236170 A [0037]