



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.01.2010 Bulletin 2010/02

(51) Int Cl.:
A43B 13/14 (2006.01) **A43B 13/30** (2006.01)
A43B 13/38 (2006.01) **A43B 13/41** (2006.01)
A43B 21/02 (2006.01) **A43B 21/20** (2006.01)

(21) Application number: **08305397.5**

(22) Date of filing: **11.07.2008**

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

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(54) **High heel shoe and method for manufacturing a high heel**

(57) The high heel shoe (10) is made of a sole assembly (30), a shank (15) and a high heel (20) that comprises an inner core (40) and a wrapping (42), wherein the inner core essentially consists of a mixture of thermoplastic material and shredded pieces of tintured carbon fibre twill of length 0.5-5.0 mm, preferably 2.0-4.0 mm and the wrapping (42) comprises carbon fibre. The inner core (40) is shaped into a mould. The wrapping (42) may include at least one layer of prepreg tintured carbon fibre twill.

The thermoplastic material of the inner core (40) may be thermoplastic polyurethane resin foam and said mixing contains 3-35 wt%, preferably 5-20 wt% carbon fibres.

A high heel shoe is provided with a heel having higher impact resistance and better absorption of vibrations. A lower weight is also provided through use of such carbon fibre reinforced plastic and the wrapping (42) renders the heel (20) unbreakable under the pressure of human weight.

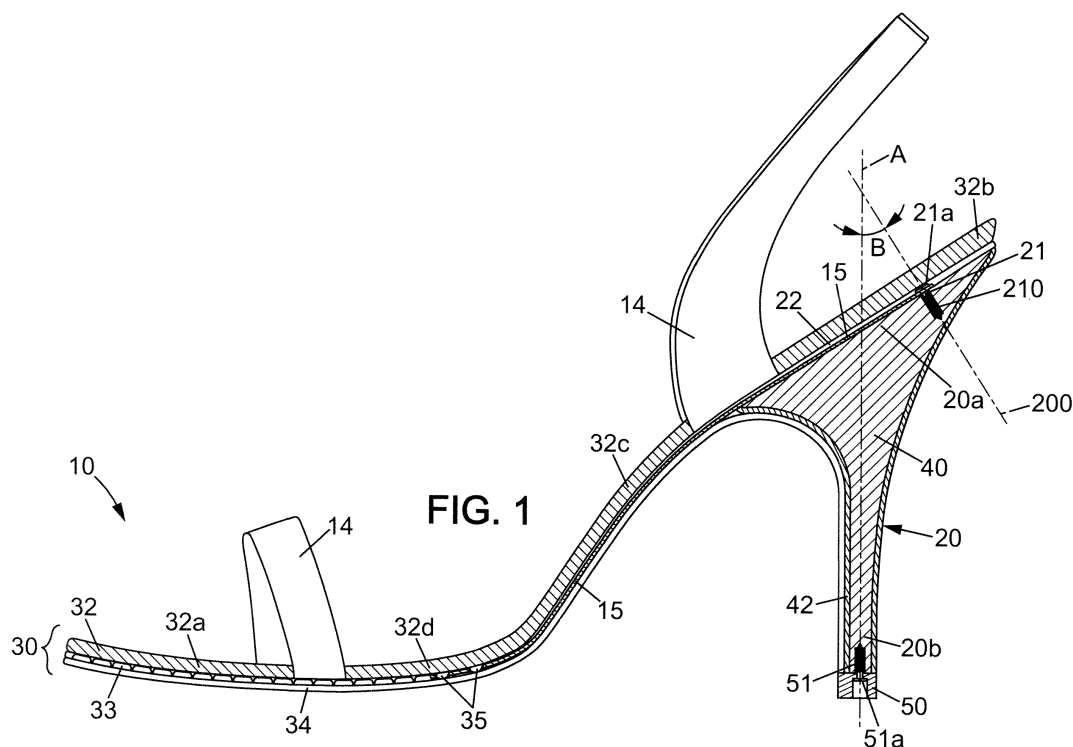


FIG. 1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to high heel footwear and methods of producing a high heel shoe. More particularly, the invention relates to women's high heel shoes having a stiletto heel.

BACKGROUND OF THE INVENTION

[0002] An increasing number of women shoes and boots comprise a stiletto heel, which has a wider portion atop at the heel seat level and is narrower at its tip, as it reaches the ground. A stiletto heel typically has a diameter at ground-level of less than 1 cm (about 0,4 inch). Stiletto heels enable to create height. For instance, stiletto heels may vary in height from 2.5 cm (about 1 inch) up to 14 cm (about 5.5 inches). It is generally accepted in the medical world that a 4.5 centimeters heel (about 1,8 inches) is the recommended height for the well-being and comfort of users.

[0003] The main structure of a high heel shoe is typically made of the following components:

- Thermoplastic resin heel (with or without a metal rod inside);
- Thermoplastic resin heel lift;
- Steel/fibreboard/cork shank;
- Leather/rubber insole;
- Leather/rubber outer sole;
- Polyurethane foam out sole;
- Counter, collar, tip and straps of various materials.

[0004] It is a known practice to use thermoplastic polyurethane, polyethylene or polyamide resin to make a resistant heel, sometimes with a thin stainless steel straight rod moulded inside to increase its resistance. Its production is fast, industrial and cost efficient. However this solution is far from break proof and unsatisfactory for end consumers. The higher and thinner the heel, the more brittle it is. Polyurethane, polyethylene and polyamide resin in their solid form are all high conductors of vibrations and by using such material for heels, it may cause the wearer foot pains, injuries, leg strains and backaches. When the heel lift of the stiletto impacts the ground, it creates a strong shock because all of the user's weight is forced onto a very small surface at great speed. This occurs every time a step is taken and the heel's resistance is thus challenged. The vibrations resulting from this shock travel from the heel tip through the heel to the foot, then the leg, and onto the back. With extensive use, it thus can cause serious back damage such as arthritis and lordosis.

[0005] The heel of women's high heel shoes can also be made of wood. It is less resistant than resin but more comfortable because it is lighter and more shock absorbent. However, its production is slow, handmade and cost-

ly.

[0006] Therefore, a great need exists for high heel shoes of simple, lighter construction, with greater breakage resistance, very strong fixture devices, more comfort and with medical benefits such as shock and vibration absorption, without affecting the aesthetic qualities of stiletto heels, primarily given by their thinness.

SUMMARY OF THE PRESENT INVENTION

[0007] Embodiments of the present invention provide a high heel shoe including a sole assembly, a high heel and supporting means associated to the waist of the shoe, such as a shank, characterized by a high heel with an inner core and a wrapping, whereby such inner core essentially comprises a mixture of thermoplastic material and carbon (graphite) fibre and such wrapping essentially comprises carbon (graphite) fibre or aluminium and carbon (graphite) fibre.

[0008] By virtue of this arrangement, a high heel shoe is provided with a heel having a greater breakage resistance and better absorption of shocks and vibrations. A lighter weight is also attained by use of such carbon (graphite) fibre reinforced plastic and such wrapping renders the heel unbreakable under the pressure of human weight.

[0009] Furthermore, by using carbon fibre and such wrapping, there is no longer a need to mould a long steel rod inside the heel to increase its resistance and the heel is therefore relieved from the rod's unnecessary weight.

[0010] According to another feature, the thermoplastic material essentially consists of thermoplastic polyurethane resin foam or thermoplastic polyurethane resin and such mixture contains 3-50 wt%, preferably 5-20 wt% carbon fibre. The proportion of carbon fibre can be more than 5 wt% to improve shock absorbance and add strength, while the wrapping forms a very thin and very light layer around the high heel's inner core to provide optimal breakage resistance. The thermoplastic polyurethane resin provides very high physical strength, high wear resistance and elasticity. Its density may vary from 50-1000 Kg/m³ and low-density polyurethane is preferred to make the lightest possible heel. The said two kinds of material can be mixed together and made into a heel by shredding tintured carbon fibre twill into small pieces cut in length of 0.5-5.0 mm, preferably 2.0-4.0 mm prior to the mixing. The resultant material benefits from the advantageous characteristics of both polyurethane and carbon fibre, including but not limited to high elasticity, high tear strength, high toughness, high breakage resistance and more lightness.

[0011] According to another feature, said thermoplastic material is an epoxy-thermoplastic resin. The epoxy resin foam has a lower density and minimizes conduction of vibrations in comparison to a conventional thermoplastic polyurethane resin.

[0012] According to another feature, said wrapping contains at least one layer of tintured carbon fibre twill.

Thanks to the properties of carbon in graphite fibres, shocks and the resulting vibrations from such shocks can be absorbed. Vibrations can be absorbed below the wider portion of the heel and are not transmitted to the user thus limiting physical damages for the user.

[0013] According to another feature, the wrapping weighs 50-500 g/m² and preferably 100-300 g/m². Accordingly, the weight of the heel is increased by an insignificant amount due to the intrinsic light property of such material and the resultant high heel shoe demands less physical effort and is more comfortable to wear.

[0014] According to another feature, the high heel comprises a heel lift made of a mix of resilient material, preferably rubber, or thermoplastic polyurethane in the form of resin or foam and tintured carbon fibre twill shredded into small pieces cut in length of 0.5-5.0 mm, preferably 2.0-4.0 mm. Such heel lift has at least one fixture element inserted in a detachable manner into a hollow of the high heel's inner core. Through use of carbon fibre in the heel lift, vibrations can be better absorbed and user's comfort is enhanced. Such lift also has excellent anti-slippery properties as well as high abrasion resistance.

[0015] According to another feature, the high heel features a wider portion, named heel seat, in contact with the sole assembly and a thinner portion, named heel tip, whereby said wider portion has at least two inserts fitted into its inner core and whereby said inserts are located only in such wider portion, thus enabling fixture of the shank to the heel with screws. By virtue of this arrangement, the shank can be attached to the heel with a fixture that is much stronger and more stable than a one-point fixture.

[0016] According to another feature, each of said insert extends along an axis forming an angle comprised between 15° and 50° relative to a longitudinal axis of the high heel's thinner portion. Accordingly, the inserts and corresponding short screws do not need to be fixed vertically and the inner core defines a homogenous large area atop the high heel that efficiently absorbs the vibrations following a shock. By virtue of this arrangement, the screw heads have as much surface contact as possible with the shank ensuring a strong and stable fixture.

[0017] According to another feature, the shank may consist of an elongated inner portion made of metal, preferably aluminium, or a thin layer of polyurethane covered by at least one layer of tintured carbon fibre material, said shank featuring an enlarged portion in contact with the wider part of the high heel and provides at least two apertures each allowing sufficient space for one screw to go through, thus ensuring maximum surface contact of the screw heads to the shank with optimum binding as a consequence. Said apertures are laterally spaced inasmuch as possible apart from each other to optimize binding. For instance, the shank can be T-shaped at the end that is in contact with the high heel's wider portion. The two-point or three-point fixture optimizes binding of the shank to the heel and avoids any lateral or upward

movements of either part. Fixture of the shank and the heel does not loosen and thus it ensures lateral stability and support for the external foot arch and guarantees that the heel will not collapse under human weight with extensive use.

[0018] One object of the present invention is also to provide a simple method of producing a comfortable and resistant high heel suitable for a high heel shoe.

[0019] Accordingly, it is further proposed according to the invention a method of producing a high heel for a high heel shoe having a sole assembly and a high heel, a shank being preferably provided, **characterized in that** the method comprises the following steps:

- shaping and/or treating a mixture of thermoplastic resin and carbon fibre into a mould to obtain a high heel inner core having a definitive shape with a wider and a thinner end;
- wrapping said inner core at least between said wider end and said thinner end, or partially wrapping such surface by using at least one layer of material including but not limited to carbon fibre.

[0020] As the composite heel material is prepared via compounding thermoplastic resin, such as polyurethane resin foam, and carbon fibre as basic materials, vibrations can be efficiently absorbed and improved comfort is obtained for the user. Such absorbance effect due to carbon fibre exists in the core and in the wrapping.

[0021] According to another feature, said wrapping includes:

- covering the high heel's inner core by at least one layer of prepreg tintured carbon fibre twill; and
- curing said at least one layer of prepreg tintured carbon fibre twill.

[0022] According to another feature, the thermoplastic resin is chosen amongst polyurethane epoxy foams, is heated at high temperature, then mixed with a certain proportion of shredded tintured carbon fibre twill at determined length and carbon weight, then poured into a shell made of a certain number of layers of prepreg tintured carbon fibre twill which have already been heated and are therefore hard. This manufacturing process uses silicone moulds with a technique commonly known as "sock moulding". Cost of the moulds is thus considerably lower than moulds used for injection moulding.

[0023] According to another feature, said mixture of the heel's inner core made of thermoplastic resin and carbon is first moulded into an aluminium cast and said prepreg wrapping may be placed afterwards once said heel's inner core has hardened. Said inner core and said wrapping are then reheated together and the said wrapping adheres to said heel's inner core, thus binding together the two components making said high heel.

[0024] According to another feature, the thermoplastic resin is mixed with shredded pieces of tintured carbon

fibre twill of length 0.5-5.0 mm, preferably 2.0-4.0 mm. Homogenous mixing may be easily obtained when using such shredded pieces.

[0025] Other features and advantages of the invention will become apparent to those skilled in the art with the description that follows, given by way of a non-limiting example, with reference to the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026]

FIG. 1 is a side cut view of a high heel shoe according to a preferred embodiment of the invention;
 FIG. 2A is a top cut view down to the out sole showing the shank of the high heel shoe of Fig. 1;
 FIG. 2B is a top view of a shank suitable for a left shoe;
 FIG. 3 and 4 are respective side cut views of a high heel shoe model such as in Fig. 1, differing in size;
 FIG. 5 and 6 are respective top cut views down to the out sole of the respective shoes of FIG. 3 and Fig. 4.

DETAILED DESCRIPTION OF THE INVENTION

[0027] In the various figures, the same references are used to designate identical or similar elements.

[0028] As shown in figures 1 and 2, the shoe 10 is a sling-back sandal which essentially includes straps 14, a shank 15 (also called shank-stiffener), a high heel 20 and a sole assembly 30. Other types of shoes may include an upper covering the toe region (not shown) and a counter to support the heel of the wearer's foot (not shown). The sole assembly 30 comprises an outsole 32, an inside sole 33, and an outer sole 34. In a conventional manner, the outsole 32 is configured with the foot-shape profile of the shoe, with a toe end 32a, a heel end 32b, an arch profile 32c corresponding to the natural curvature of the foot's arch, and a forepart 32d established between the toe end 32a and the arch profile 32c. Shock absorbers 35 may be placed between (and through) the shank 15 and the inner sole 33, under the forepart 32d of the outsole 32.

[0029] The shoe 10 is provided with generally conventional or convenient construction for the type of shoe desired, such as an open upper for the sandal-type shown, with one or more straps 14 for securing the shoe to the wearer's foot. The shoe 10 can be provided in any style desired, including but not limited to, an upper (not shown) for a partially or substantially closed high heel shoe, or an upper for either a low or a high heel boot. The upper (not shown) is made from any suitable material to obtain any desired fashion or appearance of the shoe. The outer sole 34 is typically made from leather, imitation leather, resilient plastic or rubber material, but can be made from any other material suitable for outsoles.

[0030] The sole assembly 30, counters, collars, tips

and straps 14 of the shoe 10 will not be described in detail since they do not concern the present invention.

[0031] With reference to figures 1, 2A and 2B, the heel 20 is secured to a heel portion (also called heel seat) of the sole assembly 30 via a rear end 15a of the shank 15. The heel 20 may be secured to the sole assembly 30 by an appropriate use of the shank 15 and screws 21 as shown in the preferred embodiment. The heel 20 is fixed with the support shank 15, and the heel seat is then covered with a desired material forming a specific rear inner sole 22 or part of the inner sole 33. The heel's forepart may optionally be covered by the outer sole 34.

[0032] Typically, the ratio between the height of the heel 20 and its diameter at the ground is at least 3:1. The heel can be provided in any height desired, such as, but not limited to, 4.5-12.0 cm. As shown in figure 1, the heel 20 comprises a heel lift 50 provided with at least one screw 51 or similar fixation element. In a preferred embodiment of the invention, the screw 51 is inserted in a detachable manner into a hollow of an inner core 40 of the heel 20. This inner core 40 is a molded piece made of thermoplastic material, preferably reinforced thermoplastic material. As illustrated, the screw head 51a may be located in a lower recess of the heel lift 50 and not in contact with the ground. A filling piece, (not shown) made of the same resilient material as the heel lift 50, may be located under the screw head 51a. The heel lift 50 is made of a mix of resilient material, preferably polyurethane resin, and fibre shredded pieces of tintured carbon fibre twill of length 0.5-5.0 mm, preferably 2.0-4.0 mm. The heel lift 50 may be produced by injection moulding a thermoplastic resin containing pulverized material having a high tensile strength and low weight, preferably carbon fibre. The illustrated lift 50 is trapezoidal or rectangular at its cross-section but the cross-sectional shape thereof is not limited to this shape.

[0033] In a preferred embodiment, the heel 20 comprises carbon fibre in the inner core 40, in at least one wrapping element 42 laterally covering the inner core 40, in the shank 15 and optionally in the heel lift 50. Furthermore, the inner core 40 comprises a main portion without any screw, post or similar fixation element. Accordingly, use of carbon fibre and presence of such main portion enable efficient absorption of shocks and resulting vibrations. The inner core 40 is made of thermoplastic polyurethane resin epoxy foam or regular thermoplastic polyurethane resin mixed with shredded pieces of tintured carbon fibre twill of length 0.5-5.0 mm, preferably 2.0-4.0 mm. In the exemplary embodiment of figure 1, 3 and 4, this inner core 40 is wrapped in one or several layers of prepreg tintured carbon fibre twill of which the basis weight can vary. The wrapping element 42 may be a woven carbon fibre fabric impregnated with an epoxy-thermoplastic resin or other suitable impregnating material. The inner core 40 is moulded to make the desired shape.

[0034] The resin epoxy foam or resin is mixed with shredded pieces of tintured carbon fibre twill of length 0.5-5.0 mm, preferably 2.0-4.0 mm in the range from 3-50

wt%, preferably 3-35 wt%, and more preferably 5-20 wt%. This mix produces a very light product with very low vibration conductivity. The inner core 40 is efficiently protected from breakage and vibration absorbability is further enhanced by the wrapping element 42. The heel 20 is more shock absorbent through effect of carbon fibre and becomes unbreakable under the pressure of human weight. The wrapping element 42 may be a coiling of appropriate material, such as, but not limited to, at least one fibre carbon strand, at least one band of twill incorporating carbon fibre.

[0035] High resistance of the heel is also immune to any external shock. There is no need to insert a steel rod to increase resistance and the heel 20 is therefore relieved from this unnecessary weight. The heel illustrated in figure 1 is a 10 cm common high heel 20 with a regular shape. The inner core 40 is wrapped in two layers of tintured carbon fibre twill with a basis weight of 193g/m². In this example, the inner core 40 with the wrapping element 42 thus weighs 14g, which is particularly light. More generally, the wrapping element 42 may weigh 50-500 g/m², preferably 100-300 g/m².

[0036] As shown in figure 2A, the heel seat may be covered by one or several layers of carbon composite material 44, for instance a layer of prepreg serge based on carbon fibre. This layer 44 prevents transmission of vibrations toward the user's heel. Phenolic resin or similar thermosetting resins may be used as additive in the layer 44.

[0037] As illustrated in figures 1, 3 and 4, there is no need to insert a long steel screw to fix the shank 15 to the heel 20. Fixation of the shank 15 in the high heel shoe 10 is permitted through at least two relatively short fixation means such as screws 21 having a flattened screw head 21a. The screws 21 are engaged into the wider portion 20a of the heel inner core 40 and remain distant from the high heel's thinner portion 20b, to which the heel lift 50 is fixed.

[0038] With reference to figures 2A and 2B, the shank 15 comprises a narrow intermediate portion and an enlarged first end 15a having at least two apertures 16 that are laterally spaced from each other, each traversed by one screw 21 or similar fixing means. At the second end, the shank 15 splits into two, making a semi-circular shape forming a fork f. The fork shape has several advantages because three points of stability are provided (two points of stability in the forepart, the third being the heel lift) and this ensures lateral stability of the foot at the main inflexion point during the walking and secures the user's heel. Even when the user stands still, the necessary effort to keep in equilibrium is far less strenuous since there is support across the external foot arch. For manufacturing reasons, the semi-circular shape forming a fork f may be filled across resulting in further support for the metatarsal heads of the foot and greater strength still. At the two ends of the semi-circular shape of the shank, there are two circular holes 17 cut out into it. In each of the holes 17 fits exactly a shock absorber 35. Such shock absorber

35 may be a half-globe shaped piece made of silicone rubber or latex or similar resilient material. The flat surface of the half-globe shaped piece overrides by a slight amount in order to keep the piece in place into the hole 17. The two shock absorbers 35 can be left loose since they are pressed from the top and bottom by the respective soles 32, 34 of the sole assembly 30. Those shock absorbers 35 provide extra cushioning at those two points.

[0039] Instead of shock absorbers 35, another possibility (not shown) is to have one piece made of silicone, rubber or latex or similar resilient material from, atop and covering fork segment 15b to, atop and covering fork segment 15c, fixed to shank 15 with protruding shapes where holes 17 are located so as to fit exactly into such holes, thus maintaining this piece appropriately fixed to the shank 15 and in place. By virtue of this arrangement, the entire area that is under pressure from the metatarsal heads of the foot, at the level of the ball of the foot, would be covered.

[0040] The respective forked segments 15b, 15c of the shank 15 are located under the first and between the fourth and fifth metatarsal heads because it is both points that request most support. Another reason is that by being as spread apart as possible across the width of the forefront of the shoe, a great deal of lateral stability is gained. Also such forked ends of shank 15 form, with the heel, a support triangle which naturally follows the foot's natural pressure areas. Thanks to this support, equilibrium and comfort of the user is improved. At standstill, the wearer's full weight is therefore spread between her two feet over six points instead of four, or two support triangles, one for each foot. As a result, the shank 15 is subjected to a more homogeneous sharing out of weight and risks of breakage are advantageously and significantly reduced. Of course, several positions adjacent to metatarsal heads may be adopted for the fork ends to form an appropriate supporting triangle.

[0041] As shown in figures 2A and 2B, the split second end of the shank 15 may extend wider in a transversal direction than does the first enlarged end 15a. The second end provided with transversal extension d2 of the fork f is located in the area of the arch profile 32c, next the fore part 32d, while the first end 15a provided with the transversal extension d1 is located adjacent to the heel end 32b. For instance the shank 15 is more than 10cm long (for instance 16cm) and d1 and d2 are respectively 15-40mm and 40-70mm long. In the exemplary embodiment of the figure 2B, the two segments 15b, 15c of the fork f may be orientated to the right to improve the support effect for a left foot. Symmetrically in a shoe suitable for a right foot (not shown), the fork f may be orientated to the left side of the shoe. As shown in figures 5-6, two screws 150 may be used to adjust the position of fork f.

[0042] More generally, the intermediate portion of the shank 15 may be provided with a longitudinal median plane, the fork f and eventually the first end 15a being

arranged asymmetrically. By combining at least two support surfaces and the enlarged first end 15a, the shank 15 forms an embedded system for providing lateral stability. The thickness of the shank 15 may be constant (between 0,1cm and 0,4cm for example), excepting the fork f with a reduced thickness. The shank 15 thus may have a slight gradual elasticity towards the ends of the fork f. The local reduction of thickness may be obtained, for instance through use of a thinner layer of epoxy resin or of aluminium. Consequently, the metatarsal heads of the user's foot would still benefit from a strong lateral stability without constraining, in any way possible, the necessary flexion of this area of the shoe during the walking.

[0043] In a preferred embodiment, the shank 15 includes an elongated thin inner metallic piece, such as aluminium, covered by at least one layer of tintured carbon fibre material. The metallic piece is enlarged to form the first end 15a of the shank 15. Such first end 15a enables an efficient rear fixation of the shank 15. The screws 21 are laterally spaced from each other as shown in figures 2A and 2B, to avoid any lateral or upward movements, of either part, of the shank 15 from the heel seat onto which it is fixed. Thickness of the metallic piece is for example half a millimetre and weight of the shank 15 may be decreased to 4g for the shank 15 through use of carbon fibre layers. Thinness of such shank 15 (2mm for instance) is an advantage for shoe production when the inner and outer soles 22, 32 have to be stitched and glued together.

[0044] With reference to figure 1, the heel's wider portion 20a comprises at least two inserts 210 fitted into the inner core 40 of the high heel 20. These inserts 210 may be cylindrical steel or carbon pieces, located in said high heel wider portion 20a only. The screws 21 are respectively introduced into the inserts 210, which are anchored in the inner core 40. The inserts 210 are preferably carbon pieces weighing together less than one gram, which is particularly light. In the exemplary embodiment of the figures, inserts 210 have a length of one centimeter and a width of seven millimeters. Other suitable fixation means may replace inserts 210, such as, but not limited to, threaded cavities into the inner core 40, elements with female and/or male forms. As a result, linear translation of the screws 21 or other analog-fixture element engaged with the enlarged first end 15a of the shank 15 is prevented.

[0045] As shown in figures 3-6, the same shank 15 may be used for different shoes sizes for either a right shoe or of a left shoe. In one of the bigger sizes, screws 21 are located in a first position adjacent the heel end 32b. With a smaller shoe size, screws 21 are inserted in a second position at the opposite of the first position, in the heel seat. As shown in figures 3-6, position of the fork f and the two corresponding supporting surfaces is not modified when changing shoe size and a good stability is thus obtained with exactly the same shank 15. Referring now to figure 1, each of said inserts 210 extends

along an axis 200 forming an angle B comprised between 15° and 50° relative to a longitudinal axis A of the high heel thinner portion 20b. In other words, each of the screws 21 is inclined and the respective screw heads 21a are slightly maintained parallel to the enlarged first end 15a of the shank 15. Engagement and clamping of the first end 15a of the shank is improved through this geometric position of the screw 21. In another embodiment (not shown), inclination of the heel seat may be also modified.

[0046] The wider portion 20a of the heel in contact with the sole assembly 30 is sufficiently large to receive the inserts 210 for the smallest women shoe sizes, for instance European size "34" as in figures 3 and 4, and for the largest women shoe sizes, for instance European size "43" as in figures 4 and 6. These examples of shoes 10a, 10b are not limitative and high heel shoes of bigger and smaller sizes may be obtained.

[0047] In the heel seat, two inserts 210 of 1cm in length and 0,7cm wide, lined up on the breadth of the heel seat, are moulded in the heel 20 and allow to hereby receive flat screws 32 in stainless steel fixing the shank 15 to the heel 20. Such light and resistant inserts 210 enable efficient fixing of the shank and can support the weight of any person, even in shoes having a stiletto heel of important height. This fixing avoids the use of a long soaked steel screw and two or three nails to fix the shank 15 to the heel 20 and to the outsole 32. All these elements are high conductors of vibrations and provide a poor fixture of the shank to the heel 20. Moreover, weight reduction is of at least 10 g.

[0048] The heel 20 for a high heel shoe 10 may be produced by mixing thermoplastic resin and material including carbon fiber twill, such material including but not limited to shredded pieces of tintured carbon fibre twill of length 0.5-5.0 mm, preferably 2.0-4.0 mm into a mould to form the high heel's inner core 40. In one preferred embodiment of the invention, the thermoplastic resin is chosen amongst polyurethane epoxy foams and is cast onto a determined amount of carbon fibre into the mould.

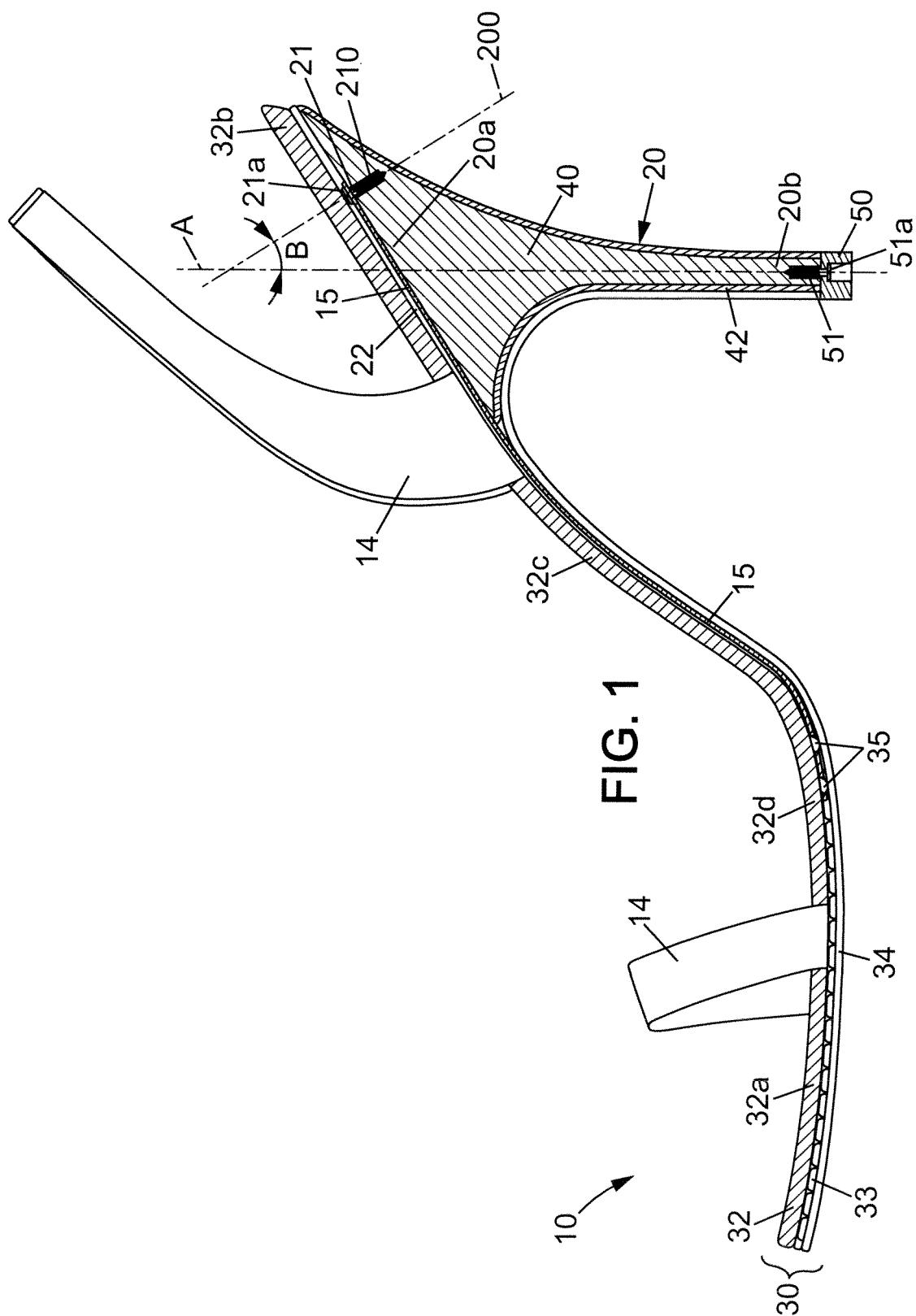
[0049] The shape of the inner core 40 is obtained during this operation, with the wider end 20a and the thin end 20b. A preform may be prepared and cured into final shape. A step of wrapping or coiling inner core 40 may be performed to cover and protect the inner core 40. Such wrapping is performed on the full lateral surface or on the thinner, weaker part of the inner core 40. At least one layer of material including carbon fibre is used to form the wrapping element 42. A metallic layer, containing for instance aluminium and/or one of its alloys, may form an intermediate wrapping layer. After being wrapped or coiled around the inner core 40, the wrapping or coiling element may be cured to improve its resistance. A high lateral impact resistance as well as a high global resistance is obtained for the heel 20. The heel lift 50 is fixed into the inner core 40 after the step of wrapping.

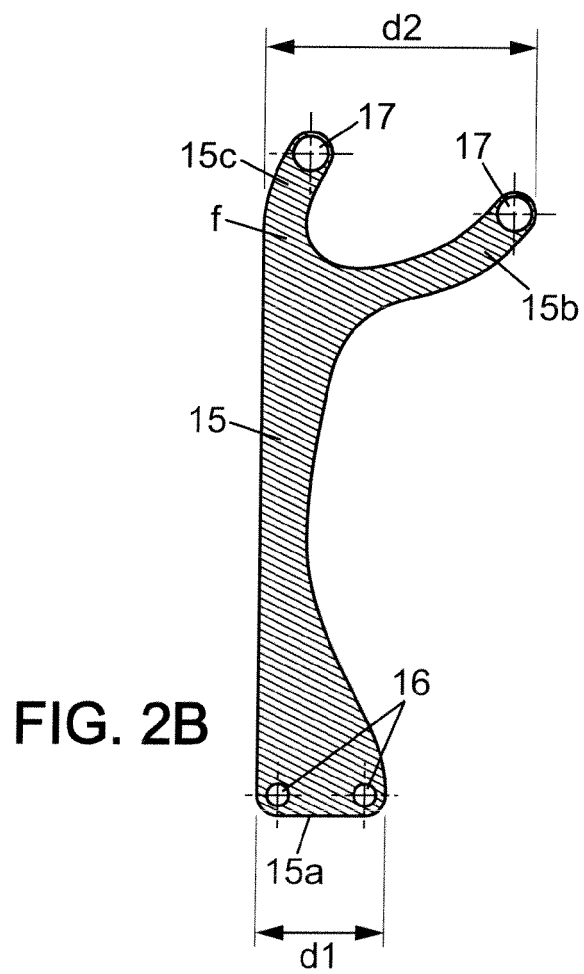
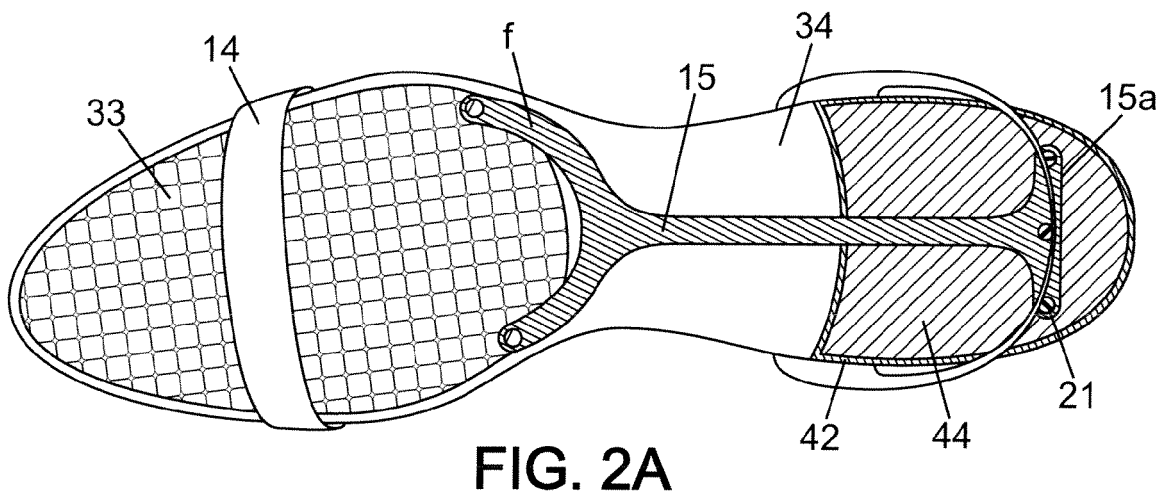
[0050] The present invention has been described in connection with the preferred embodiments. These em-

bodiments, however, are merely for example and the invention is not restricted thereto. It will be understood by those skilled in the art that other variations and modifications can easily be made within the scope of the invention as defined by the appended claims, thus it is only intended that the present invention be limited by the following claims. For instance, the invention may be implemented in any shoes having a high heel, for instance boots. Furthermore, the heel lift as described is only a preferred option and may be replaced by any component suitable for ground contact.

Claims

1. A high heel shoe (10) comprising a sole assembly (30) and a high heel (20), **characterized in that** the high heel (20) comprises an inner core (40) and a wrapping (42), **and in that** said inner core (40) comprises a mixing of thermoplastic material and carbon fibre and said wrapping (42) comprises carbon fibre.
 2. The high heel shoe of claim 1, wherein the thermoplastic material essentially consists in thermoplastic polyurethane resin foam and said mixing contains 3-50 wt%, preferably 5-20 wt% shredded pieces of tintured carbon fibre twill of length 0.5-5.0 mm, preferably 2.0-4.0 mm.
 3. The high heel shoe of claim 1 or 2, wherein said thermoplastic material is an epoxy-thermoplastic resin.
 4. The high heel shoe of the claims 1-3, wherein said wrapping (42) contains at least one layer of prepreg tintured carbon fibre twill.
 5. The high heel shoe of one of the claims 1-4, wherein said wrapping (42) weighs 50-500 g/m² and preferably 100-300 g/m².
 6. The high heel shoe of one of the claims 1-5, wherein the high heel (20) comprises a heel lift (50) made of a mix of resilient material, preferably thermoplastic resin, and shredded pieces of tintured carbon fibre twill of length 0.5-5.0 mm, preferably 2.0-4.0 mm, the heel lift (50) comprising at least one fixation element (51) inserted in a detachable manner into a hollow of said inner core (40) of the high heel (20).
 7. The high heel shoe of one of the claims 1-6, comprising a shank (15), and wherein the high heel (20) comprises a wider portion (20a) in contact with the sole assembly (30) and a thinner portion (20b), said high heel wider portion (20a) comprising at least two inserts (210) fitted into said inner core (40) of the high heel (20), said inserts (210) being located in said high heel wider portion (20a) only and enabling
- fixing of the shank (15) through screws (21).
8. The high heel shoe of claim 7, wherein each of said inserts (210) extends along an axis (200) forming an angle (B) comprised between 15° and 50° relative to a longitudinal axis (A) of the high heel thinner portion (20b).
 9. The high heel shoe of one of the claims 1-6, comprising a shank (15) that includes an elongated inner metallic portion, preferably aluminium, covered by at least one layer of tintured carbon fibre material, said shank (15) comprising an enlarged portion (15a) in contact with the high heel (20) and provided with at least two apertures (16) each traversed by one screw (21) and laterally spaced each other.
 10. A method of producing a high heel (20) for a high heel shoe (10) having a sole assembly (30) and a high heel (20), **characterized in that** the method comprises the following steps:
 - shaping and/or treating a mixture of thermoplastic resin and carbon fibre pieces into a mould to obtain a high heel inner core (40) having a definitive shape with a wider end and a thinner end;
 - wrapping said inner core (40) at least between said wider end and said thinner end or in part, by using at least one layer (42) of material including carbon fibre.
 11. The method of claim 10, wherein said wrapping comprises:
 - covering the high heel inner core (40) by at least one layer of prepreg tintured carbon fibre twill; and
 - curing said at least one layer of prepreg tintured carbon fibre twill.
 12. The method of claim 10 or 11, wherein the thermoplastic resin is chosen amongst polyurethane epoxy foams and is cast onto an amount of carbon fibre into the mould.
 13. The method of one of the claims 10-12, wherein said thermoplastic resin is mixed with shredded pieces of tintured carbon fibre twill of length 0.5-5.0 mm, preferably 2.0-4.0 mm.





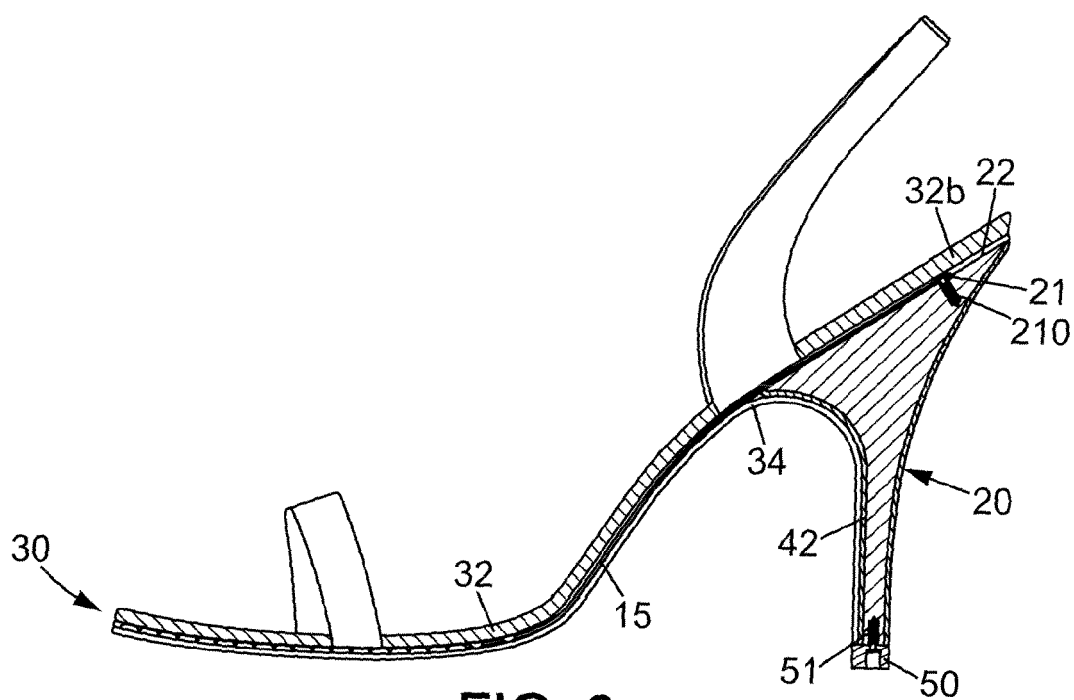


FIG. 3

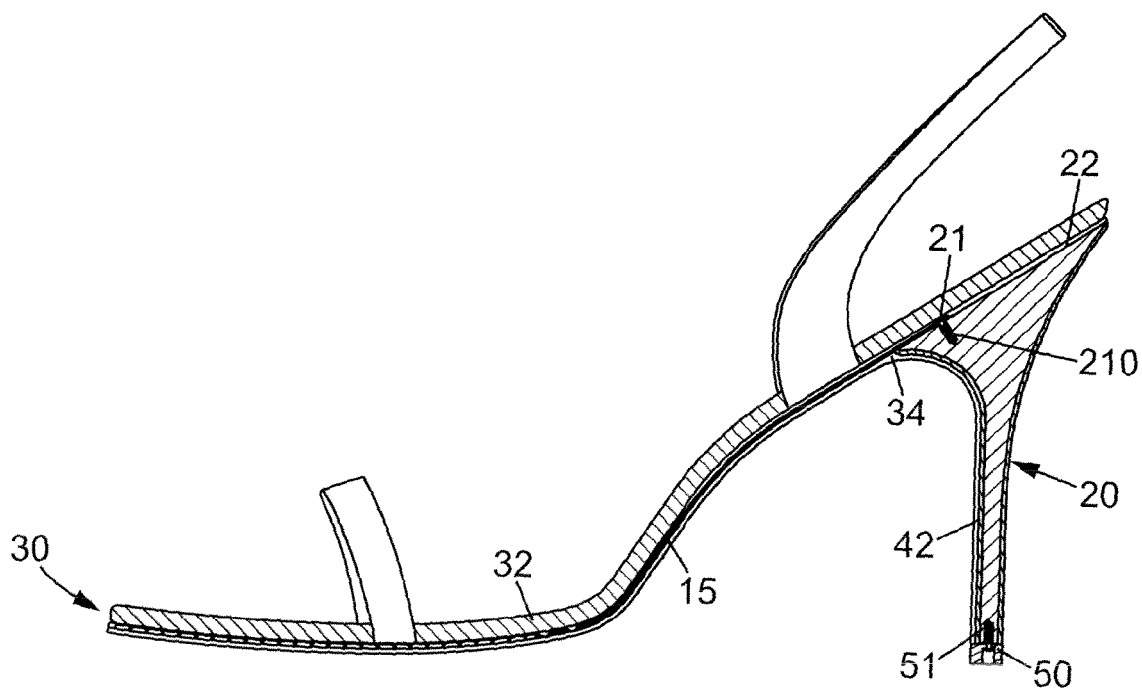
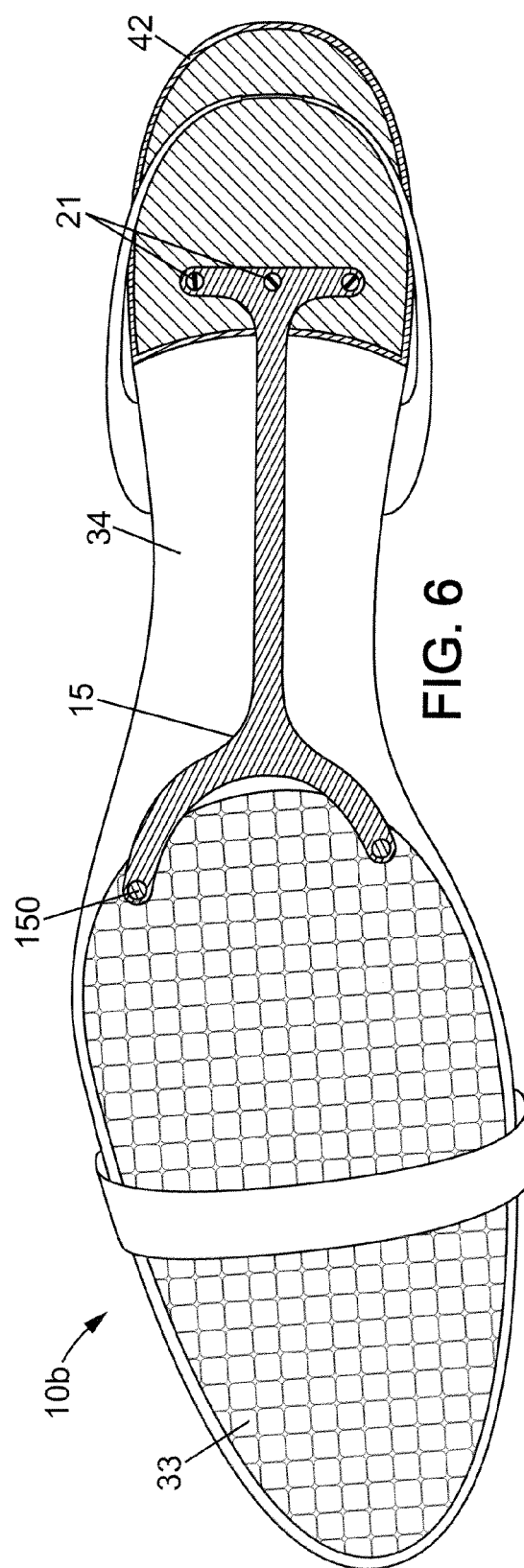
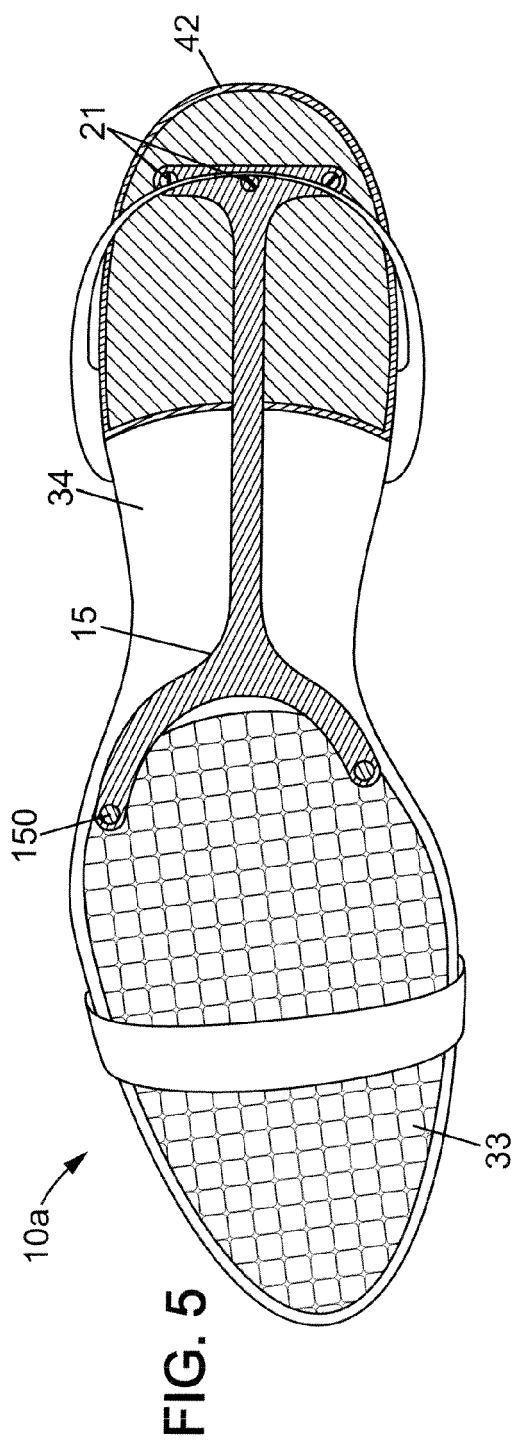


FIG. 4





EUROPEAN SEARCH REPORT

Application Number
EP 08 30 5397

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	FR 1 268 604 A (PARACHINI) 4 August 1961 (1961-08-04) * the whole document *	1,3,10	INV. A43B13/14 A43B13/30 A43B13/38
A	US 5 603 170 A (HIRAI GIICHI [JP]) 18 February 1997 (1997-02-18) * column 3, line 1 - column 4, line 45 *	1,2,6, 10,12,13	A43B13/41 A43B21/02 A43B21/20
A	FR 2 017 441 A (SEMPERIT AG) 22 May 1970 (1970-05-22) * the whole document *	1,3,10	
A	FR 2 851 131 A (KYRIASIS JEAN STELIOS [FR]) 20 August 2004 (2004-08-20) * the whole document *	1,10	
			TECHNICAL FIELDS SEARCHED (IPC)
			A43B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26 November 2008	Examiner Cianci, Sabino
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	

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EPO FORM 1503 03.82 (P04C01)

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

EP 08 30 5397

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
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26-11-2008

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
FR 1268604	A	04-08-1961	NONE	
US 5603170	A	18-02-1997	NONE	
FR 2017441	A	22-05-1970	AT 296082 B	25-01-1972
			BE 738505 A	16-02-1970
			CH 494547 A	15-08-1970
			DE 1944722 A1	12-03-1970
			GB 1229344 A	21-04-1971
			NL 6913094 A	09-03-1970
			US 3593437 A	20-07-1971
FR 2851131	A	20-08-2004	NONE	