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(54) **ACCESSORIZED GARMENT**

(57) Accessory garment (6) comprising in at least one zone (5) at least one aerodynamic accessory (13) which is configured to improve the aerodynamic behavior of the person wearing the garment and which is configured to be removably associated with said zone (5), in correspondence with said at least one zone (5), said garment (6) comprises:  
 - an underlying first magnetic element (12),  
 - a substantially laminar portion (10) which is positioned externally and above said first magnetic element (12),  
 and also wherein said aerodynamic accessory (13) is positioned/positioned externally and above said portion (10) with substantially laminar development and comprises at least a second magnetic element (12'), configured to magnetically engage with said underlying first magnetic element (12), to thus fix/constrain the accessory (13) to the underlying first magnetic element (12) above said portion (10) with a substantially laminar development.

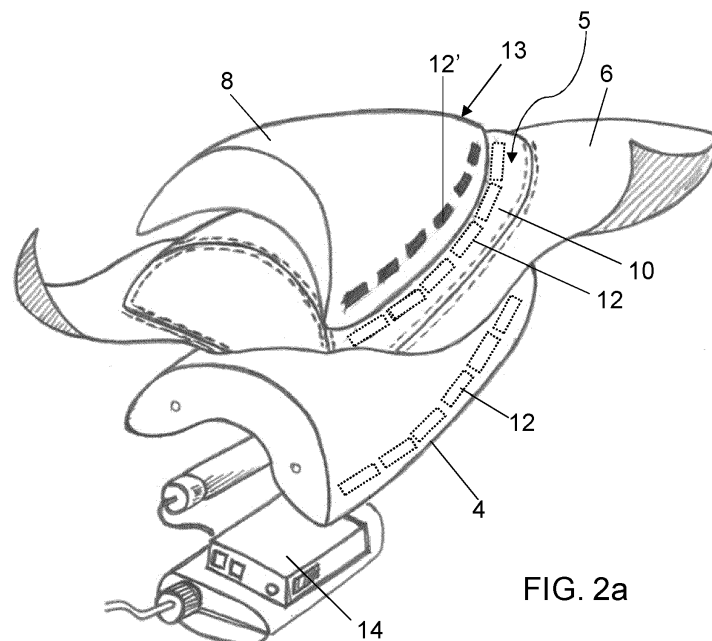


FIG. 2a

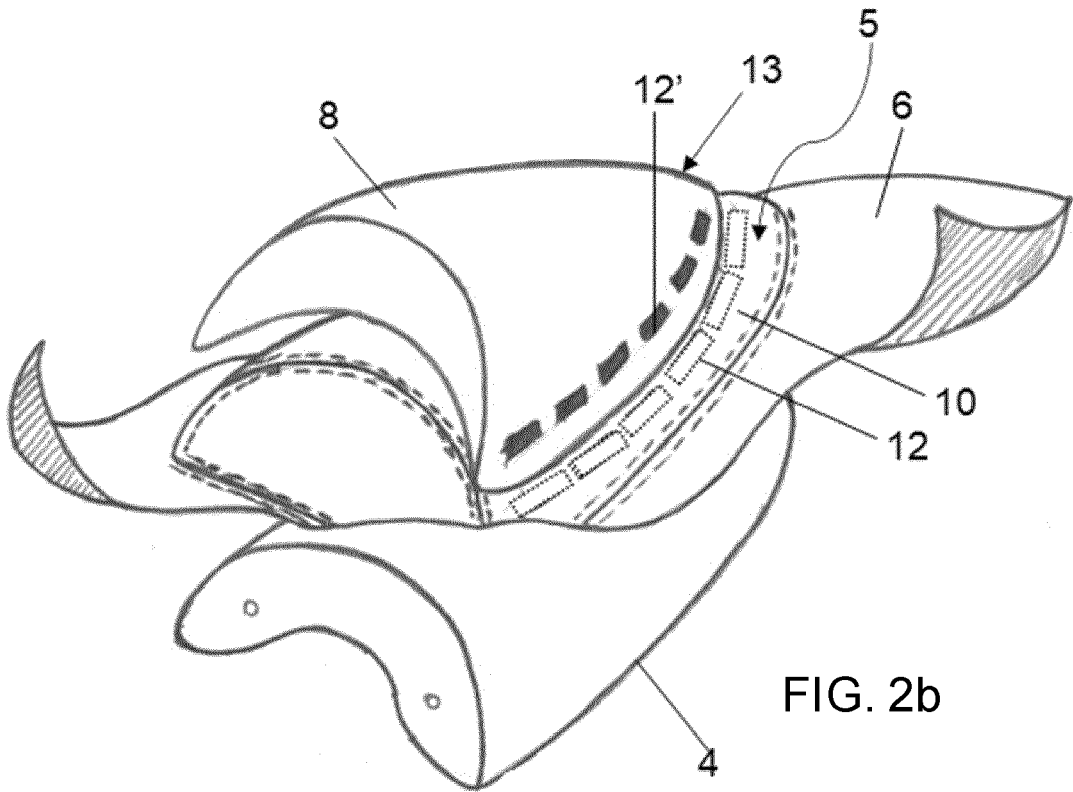


FIG. 2b

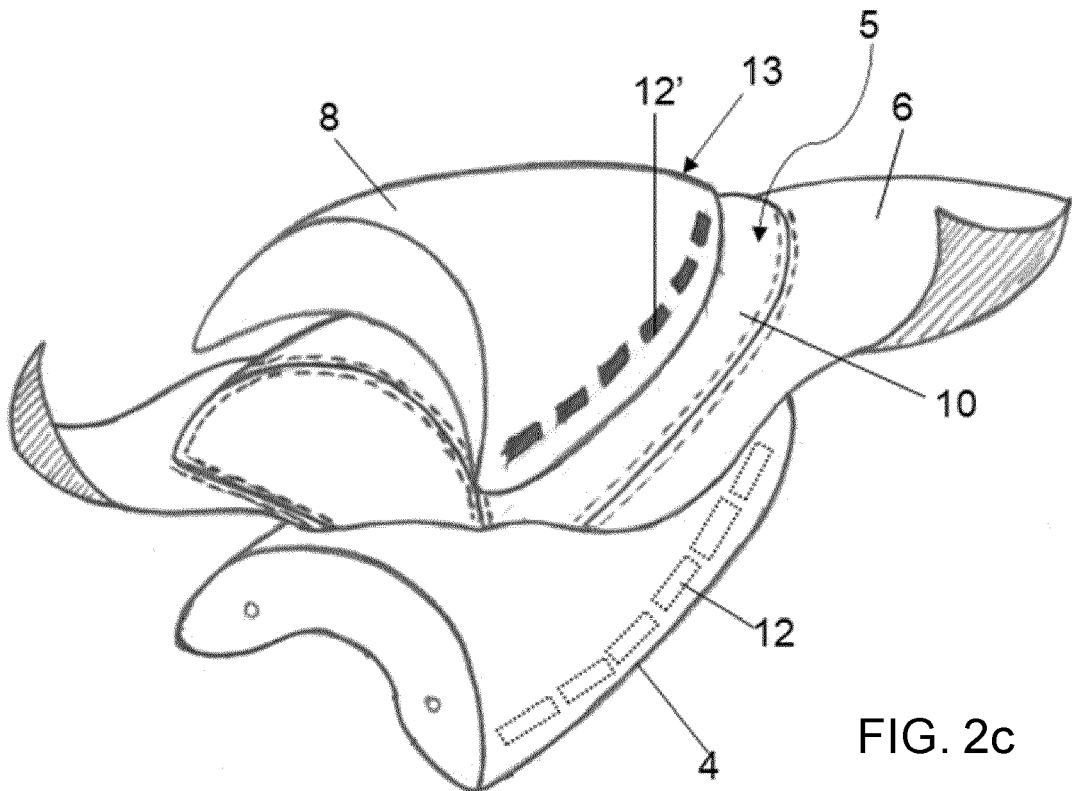


FIG. 2c

## Description

**[0001]** The present invention relates to an accessorised garment, preferably sports, in particular a motorcyclist, cyclist, skier or similar overalls or jacket or trousers.

**[0002]** Sportswear is known, in particular motorcycle jackets, provided in the upper part of the back, between the shoulders, with a bulge, in the motorcycle jargon called "hump", with the purpose of completing the silhouette of the rider with a high aerodynamic penetration profile when this is found "egg-shaped" on the motorcycle.

**[0003]** Since the main function of the hump is essentially aerodynamic, it should be made to measure and applied to the suit in a personalized way for each rider based on both the needs and characteristics of these (the shape and size of the helmet, the riding position, etc.), and of the motorcycle, and the outcome of aerodynamic tests carried out to evaluate and/or predict the race behavior of the rider/motorcycle as a whole. The need for customization of the hump for each pilot requires to adapt the shape of the latter to the body of the pilot, both its position on the suit and this is currently carried out by attempts that involve high costs and experimentation times often incompatible with the timing required in the field. competitive.

**[0004]** Furthermore, from a strictly aerodynamic point of view, there is a need to reduce the distance between the rear edge of the helmet and the front edge of the hump as much as possible, so as to ideally create substantial continuity between them. To this end, the idea of applying a sort of spoiler to the hump behind the helmet essentially having an aerodynamic function and in particular the function of connecting the profile of the helmet with that of the hump is already known.

**[0005]** It is currently known, especially in the competitive field, to create substantial continuity between the helmet and the hump by making the latter tailored to each rider and applying it to the suit in a personalized way based on the needs and characteristics of both the rider himself - such as for example the size of the helmet and the possible conformation of the spoiler of the latter, or the driving position assumed by the latter while driving - both of the vehicle, as well as of the aerodynamic tests previously carried out.

**[0006]** In particular, each hump is made to measure in a single body, which is inserted inside a special pocket obtained and positioned, always in a personalized way, in the garment. However, this solution is not fully satisfactory as the humps are generally made on molds and have standardized shapes and sizes and each time they need to be customized according to the criteria just seen, they require laborious modification of the molds themselves, as well as modification interventions of the position of the hump on the suit, a modification that may require changing the position of the pocket made in the suit and intended to accommodate the hump, or, in some cases, the replacement of the suit with another one with a different hump and/or a different hump applied posi-

tioned. On the other hand, even if a hump of standard dimensions and conformation, destined to be permanently mounted on the garment always and only in a single position, could theoretically be used by more pilots and also in combination with more types of helmets and spoiler, given that its positioning in the rear part of the suit is generally not an obstacle to the rider's movements, it would not be optimized based on the needs and characteristics of each rider and could lead in particular to an undesirable increase in the distance between the helmet and the hump, thus creating turbulence that reduces the effectiveness of the aerodynamic penetration of the pilot in race trim.

**[0007]** This problem does not only concern the hump, but can also affect other accessories that are sometimes applied to the suit with an aerodynamic function. Said accessories with aerodynamic function can be constituted, for example, by flow deviators, or by vortex generators, or by other bodies configured to modify the aerodynamic profile of the pilot in race trim.

**[0008]** In the known solutions, all these accessories are applied directly to the suit or to other accessories applied to the suit and in any case their constraint, which is obtained by means of seams or other fastening means such as screws, studs, rivets, metal staples, etc. and remains stable even in the presence of particular conditions, such as strong wind, impact with the ground or other obstacle.

**[0009]** Not even these solutions have proved to be satisfactory since the stable bond of an accessory to the suit does not allow to modify its position and/or does not allow it to be replaced quickly, unless replacing the complete garment.

**[0010]** Furthermore, this fixed and stable constraint prevents, as we have seen, the customization and/or modification of the aerodynamic configuration of the suit, thus limiting the possibility of achieving the optimal results that sports competitions require.

**[0011]** It must also be said that all the accessories applied to the garment remain firmly bound to it even in the event of an impact with the ground, for example in the event of a fall, and if this should lead to the breakage of the accessory it could also cause injury to the motorcyclist.

**[0012]** WO2007/116377 discloses a motorcycle suit comprising a hump-shaped rear aerodynamic appendage. In particular, this appendage is formed by a first portion which is permanently fixed externally to the suit and, within this first portion, a body having a convex outer surface is then removably engageable. Moreover, inside said body there are means for the heat exchange, for example a Peltier cell, which are then connected with a plurality of peripheral cooling elements which are inserted in special pockets present on the motorcycle suit, and this in order to cool specific portions of the body of the motorcyclist wearing said suit. In this solution, the body housing the heat exchange means is provided exclusively with screws, positioned on the edge of the body itself,

for fixing in corresponding threaded seats provided in said first portion.

**[0013]** JPH02131517U discloses a solution with a padded element which is associated exclusively by means of hooking means of the velcro type on a motorcycle suit. More in detail, male-type hooking means, for example hook-like, are provided on the padded element, which are intended to engage with female-type ring hooking means which are provided on the suit.

**[0014]** JPH0612420U describes a solution in which an aerodynamic element is associated with the suit exclusively by means of a particular fabric tape.

**[0015]** WO2021/052413 discloses an aerodynamic appendage to be fixed on a sports garment at the leg of the motorcyclist. In particular, hooking/unhooking means are provided on the flap and designed to cooperate with corresponding hooking/unhooking means provided on the garment. In particular, these attachment/release means comprise Velcro, hinges, automatic buttons or straps. Alternatively, the flap can be permanently attached to the garment by gluing or stitching.

**[0016]** The object of the invention is to propose a garment, in particular a suit or jacket or trousers for a motorcyclist, cyclist, skier or the like, which allows to overcome - at least in part - the aforementioned drawbacks present in the known solutions.

**[0017]** Another object of the invention is to propose a garment provided with accessories that can be both reliably tied to the garment and easily separated from it in case of need.

**[0018]** Another object of the invention is to propose a garment whose shape can be customized in a simple, quick and inexpensive way.

**[0019]** Another object of the invention is to propose a garment provided with accessories whose application and replacement is quick and easy.

**[0020]** Another object of the invention is to propose a sports garment provided with accessories which, in particular in the context of sports competitions, allow a rapid development from the aerodynamic point of view.

**[0021]** Another object of the invention is to propose a garment that allows to limit the consequences on the user in the event of a fall.

**[0022]** Another object of the invention is to propose an accessory garment, to which electrical and/or reliable instrumentation can be applied.

**[0023]** Another object of the invention is to propose an accessorized garment that can be customized quickly, without requiring its replacement in the event that modifications of the type and position of accessories applied thereto are required.

**[0024]** Another object of the invention is to propose a garment to which accessories can also be applied in positions not traditionally foreseen.

**[0025]** Another object of the invention is to propose a garment with accessories and a method which allow to adjust its aerodynamic profile in a simple and rapid manner.

**[0026]** Another object of the invention is to propose an accessory garment that is simple and economical to make.

**[0027]** Another object of the invention is to propose a garment that can be produced, at least in part, in series and quickly and efficiently.

**[0028]** Another object of the invention is to propose a garment which allows to obtain an overall pleasant aesthetic effect and which gives the observer the sensation of being faced with a high quality solution, both from an aesthetic and functional point of view.

**[0029]** Another object of the invention is to propose a garment which has high functional standards and at the same time affordable, thus allowing the possibility of its widespread diffusion.

**[0030]** Another object of the invention is to propose a garment which is an improvement and/or alternative to traditional solutions.

**[0031]** Another object of the invention is to propose a garment with an alternative characterization, both in functional and implementation terms, with respect to traditional ones.

**[0032]** All these purposes, whether considered alone or in any combination thereof, and others which will result from the following description, are achieved, according to the invention, with an accessorized garment, in particular a motorcyclist, cyclist overalls or jacket or trousers, skier or the like, having the characteristics indicated in claim 1, and with a method for determining the correct accessory and/or its correct position on the garment having the characteristics indicated in claim 15.

**[0033]** The present invention is further clarified hereinafter in some of its preferred embodiments, reported for purely illustrative and non-limiting purposes with reference to the attached drawings, in which:

Figure 1 shows a perspective view of a detail of a first embodiment of the sports garment equipped according to 'invention,

Figures 2a-2c show the detail of fig. 1 in an exploded perspective view in which the first magnetic elements 12, provided below the laminar portion 10, are shown in broken line,

Figure 3 shows a partially exploded side view of a detail of a second embodiment of the accessorized sports garment according to the invention,

Figure 4 shows a side view of the detail of fig. 3 with the aerodynamic element applied to the hump,

Figure 5 shows a perspective view of a detail of a third embodiment of the accessorized sports garment according to the invention,

Figure 6 shows a perspective view of a detail of a variant of the third embodiment of

the accessorized sports garment according to the invention, Figures 7a, 7b show in perspective view, respectively exploded and assembled, a detail of a fourth embodiment of the accessorized sports garment according to the invention, Figure 8a, 8b respectively show in perspective and side views a detail of a fifth embodiment of the accessorized sports garment according to the invention, Figure 9 shows in perspective view a detail of a sixth embodiment of the accessorized sports garment according to the invention.

**[0034]** The present invention relates to an accessorized garment, preferably sporty, indicated as a whole with the reference number "6" - for example a motorcyclist, cyclist, skier or similar overalls, jacket or trousers - which is provided in at least one of its zone 5 of at least one aerodynamic accessory 13 which is configured/aimed at improving, alone or in combination with other elements, the aerodynamic behavior of the person wearing the garment. Said zone 5 being provided with first magnetic elements 12 cooperating with corresponding second magnetic elements 12' applied to said accessory 13, to thus allow to magnetically and removably associate said accessory 13 to said zone 5.

**[0035]** In particular, in correspondence with said at least one zone 5, the garment 6 according to the invention comprises:

- an underlying first magnetic element 12,
- a substantially laminar portion 10 which is positioned externally and above said first magnetic element 12.

**[0036]** The accessory 13 with an aerodynamic function is positioned/positioned externally and above the substantially laminar portion 10 and comprises at least one second magnetic element 12', configured to magnetically engage with said underlying first magnetic element 12, to thus fix/constrain the accessory 13 to the underlying first magnetic element 12 above said substantially laminar portion 10.

**[0037]** Conveniently, said first magnetic element 12 is made of magnetic metal material, preferably ferromagnetic, while said second magnetic element 12' is made of magnetized material (ie a magnet), or vice versa, and said first magnetic element 12 is made of magnetized material (ie a magnet) while said second magnetic element 12' is made of magnetic metal material, preferably ferromagnetic.

**[0038]** Preferably, at least one pair of magnetic elements 12, 12' is provided which are stably mounted and/or fixed respectively to the portion 10 of the garment and to the accessory 13. Preferably, said magnetic elements 12, 12' have a substantially flattened shape, in

order to facilitate their bonding and have a sufficiently large surface and a volume sufficient to ensure the stability of the mutual bond when they are coupled together.

**[0039]** Advantageously, said magnetic elements 12, 12' are made of magnetic material with a high magnetic field flux per unit of volume and are preferably made of metal alloys comprising neodymium or, alternatively, other magnetic materials, such as cobalt, iron and the samarium. Alternatively, they may comprise a non-magnetic substrate and a ferromagnetic or antiferromagnetic coating. Preferably, said magnetic elements 12, 12' have a Curie temperature higher than the maximum temperature that can be reached in conditions of use. Furthermore, in the case in which the fixing of the first magnetic element 12 to the portion 10 and/or to a support body 4 and/or the fixing of the second magnetic element 12' to the accessory 13 requires heating procedures (for example hot glues), it is desirable that the Curie temperature of the materials forming the magnets is higher than the temperatures that can be reached during these heating procedures, and more specifically is higher than 150°C or preferably higher than 250°C.

**[0040]** Preferably, the garment 6 according to the invention is a garment that is worn over any other garments (for example an underwear) and above which no further garments are in any case worn. Basically, the accessories 13 are applied in the outermost garment 6 which is intended to be worn by a subject, in particular to perform a sporting gesture or in any case an activity in movement/running.

**[0041]** Conveniently, the present invention will be described below mainly in its embodiment in which the garment is a motorcycle suit, however it is understood that this garment could also be any other garment usable in any context in which, during its performance of a certain gesture, the wearer moves at high speed in an uncovered position, that is, in contact with the air he is passing through.

**[0042]** Conveniently, said at least one zone 5 of the garment 6 in correspondence with which the accessory 13 with an aerodynamic function is associated can comprise, for example, the rear zone of the garment which - once it is worn - covers the upper part of the back up to the zone between the shoulders of the wearer, but it could be defined in other zones of the trunk, or in correspondence of the arms, forearms, elbows, shoulders or hands, or it can be defined in correspondence of the hips, buttocks, legs (both at the level of the femur and the tibia/fibula), knees or feet.

**[0043]** Conveniently, the two magnetic elements 12 and 12' are configured to be magnetically connected to each other through the substantially laminar portion 10.

**[0044]** Preferably, the accessory 13 comprises a part in ferromagnetic or magnetized material and/or is made at least in part in ferromagnetic or magnetized material, to thus allow magnetic attraction/attachment with a magnet, or a ferromagnetic portion, mounted (or intended to be mounted) below a portion 10 of said garment 6, to

thus allow the union/attachment of said accessory to said garment 6. Preferably, the second magnetic element 12' is mounted, incorporated, integrated or co-molded to the interior of said aerodynamic accessory 13.

**[0045]** Conveniently, the laminar portion 10 forms part of said garment. Conveniently, the substantially laminar portion 10 comprises a portion of an article, preferably of leather (natural and/or synthetic) and/or fabric (i.e. obtained by weaving threads) and/or non-woven fabric, and/or or in similar materials, with an extension of the thickness that is much less than that of the other two dimensions (length and width). In particular, the substantially laminar portion 10 comprises a first surface which faces inwards and towards the underlying first magnetic element 12, and a second surface which faces outwards and towards the second magnetic element 12' of the accessory 13.

**[0046]** Preferably, the underlying first magnetic element 12 is in contact with the internal surface of said substantially laminar portion 10. Conveniently, said substantially laminar portion 10 externally covers said underlying first magnetic element 12.

**[0047]** Conveniently, the first magnetic element 12 is positioned below a corresponding portion 10 of the motorcycle garment, while the accessory 13 on which it is mounted or incorporated, the second magnetic element 12' is positioned above said portion 10 (ie on the surface of the latter facing outwards). In particular, in this case, the accessory 13 provided with said second magnetic element 12' is associated with the first magnetic element 12 in correspondence with the portion 10 which covers/covers the latter and is magnetically fixed to the first magnetic element 12 by means of a force of magnetic attraction which passes through said portion 10.

**[0048]** Basically, the accessory 13 can be associated with the garment by means of magnetic attraction - defined by said second magnetic element 12' cooperating with the first magnetic element 12 - which act through the portion 10 a substantially laminar development of the garment itself.

**[0049]** Conveniently, the substantially laminar portion 10 is clamped between the accessory 13 which is provided with the second magnetic element 12' and the underlying first magnetic element 12 which is positioned below the portion 10.

**[0050]** Conveniently, at least one first magnetic element 12 it can be mounted and/or incorporated and/or fixed directly below or inside the substantially laminar portion 10 (see Fig. 2b). Conveniently, at least a first magnetic element 12 can be mounted and/or incorporated on a support body 4 which is intended to be fixed below the portion 10 (see Fig. 2c). Conveniently, as shown in fig. 2a, at least a first magnetic element 12 can be mounted and/or incorporated and/or fixed directly below or inside the substantially laminar portion 10 and also at least one further first magnetic element 12 can be mounted and/or incorporated on a support body 4 which is intended to be fixed below the portion 10.

**[0051]** Conveniently, said at least one first magnetic element 12 is positioned below the portion 10 without being fixed to the latter. Preferably, the first magnetic element 12 - alone or incorporated/mounted in a support body 4 - can be fixed below the portion 10 with traditional fixing means, for example it can be inserted inside a pocket or it can be fixed by gluing or stitching, or by traditional mechanical parts such as automatic buttons or other.

**[0052]** Advantageously, in a possible embodiment, in addition to the magnetic connection means defined by the first magnetic element 12 cooperating with the second magnetic element 12', further fastening means (not shown) of the accessory 13 to the garment 1 can be provided. In any case, according to the present invention, said further fixing means - if provided - are in addition to the magnetic connection means defined by the first magnetic element 12 cooperating with the second magnetic element 12'. Conveniently, said further fastening means comprise mechanical coupling means, preferably by interlocking or through the use of fastening members. Conveniently, said further fixing means can be integrated and form part of the aerodynamic accessory 13 and/or of the laminar portion 10 or of the support body 4 of the first magnetic element 12, and/or comprise separate elements/members which engage directly within the accessory 13 and/or the support body 4, and/or comprise separate elements which engage with corresponding counter-elements fixed/grafted or integral with the accessory 13 and/or the support body 4. Preferably, said further means fixing devices can comprise, for example, screws and bolts configured to be associated/integrated with the accessory 13 and to engage in suitable seats integral with the garment 10, and/or vice versa, and/or can comprise interlocking means which can have suitable male elements and corresponding female counter-elements. Conveniently, said further fastening means can be provided in the sub-zones where a greater tightness of the bond is required (in particular for reasons of fluid dynamics) of the accessory 13 with the garment 10, while the magnetic connection means 12 and 12' can be provided in correspondence with the sub-zones where a lower tightness of the bond of the accessory 13 with the garment 10 is required (in particular for reasons of fluid dynamics), compared to a greater speed and ease of positioning of the accessory 13. Preferably, said additional fastening means can comprise traditional quick mechanical coupling means, preferably clips, rivets, buttons (for example mushroom-shaped), velcro, zip, etc. Preferably, the quick coupling means can be mounted on the portion 10.

**[0053]** The solution according to the present invention is particularly advantageous since the application of the aerodynamic accessory 13 is extremely easy and rapid since it is sufficient to select and approach the aerodynamic accessory 13 to the portion 10 of the garment below which the same first magnetic element 12 is always provided, without thus having to open or modify the garment from time to time. Furthermore, the method of ap-

plication according to the present invention makes it possible to avoid having to press the accessory 13 against the garment 6 - and therefore against the body - of the pilot (as instead in the case of using fastening means with only the velcro snap buttons), making it easier and more comfortable.

**[0054]** Furthermore, before the application of the aerodynamic accessory 13 or once it has been removed - for example before or after the performance of the sporting gesture - the portion 10 of the garment 6 is externally completely free and visible (since the first magnetic element 12 is positioned below said portion 10), and therefore can receive advertising and/or identifying writings of sponsors. Basically, unlike known solutions with Velcro only in which, when the accessory is not applied to the garment, the receiving part of the fastening means always and inevitably remains visible from the side of the garment, the present invention is particularly advantageous in that, when the accessory 13 is not applied to the garment 6, the means provided for the attachment of said accessory are not visible from the outside, thus not causing any substantial aesthetic modification to the external surface of the garment itself.

**[0055]** Conveniently, the aforementioned portion 10 of the garment 1, which is gripped between the first magnetic element 12 and the second magnetic element 12 integrated/mounted/made in the aerodynamic accessory 13, can comprise one or more layers, preferably made of natural or synthetic, or in fabric or other suitable coating used to make motorcycle clothing. Preferably, the portion 10 of the garment 6 can be made entirely or in part of elastic material.

**[0056]** Conveniently, in a possible and preferred embodiment, in particular for the purpose of precisely adjusting, for aerodynamic needs, the position of the aerodynamic accessory 13 with respect to the portion 10 of the garment, or with respect to an underlying body 4 integral with said garment, it may be advantageous to interpose spacers between the cooperating magnetic elements 12, 12' which, thanks to their thickness, allow the distance between said magnetic elements to be adjusted. Conveniently, the spacers can be associated with the underlying first magnetic element 12 and/or with the second magnetic element 12' which is fixed/incorporated/made in the accessory 13.

**[0057]** In aerodynamic tests it is possible to carry out different tests with different spacers, in order to determine the correct distance between the aerodynamic accessory 13 with respect to the suit 6, or to an underlying support body integral with the suit 6, in that particular context of use. Alternatively, said spacers can be adjustable, for example through the use of mechanisms operated by micrometric screws and traditional in themselves. Preferably, the spacers have negligible magnetic permeability.

**[0058]** Conveniently, in a possible embodiment, above or in addition to said (first) accessory 13 - which is provided with said second magnetic element 12' for the mag-

netic connection to the first magnetic element 12 provided below the substantially laminar portion 10 - a further accessory (not shown) can be provided which is provided with a further second magnetic element for magnetic connection to said (first) accessory.

**[0059]** The present invention also relates to a method for defining the correct configuration and/or position of an aerodynamic accessory 13 on a sports garment 6 characterized in that at least one accessory 13 is removably applied to a garment 6, as described above, and/or to an accessory previously applied to said garment, tests are carried out to evaluate the aerodynamic behavior of the garment thus equipped in conditions of use, said accessory 13 is replaced with another one having different aerodynamic characteristics and/or the position of said accessory 13 is modified on said garment, and the tests are repeated until no further improvement in the aerodynamic behavior of the garment is obtained and/or the desired aerodynamic behavior is achieved. Conveniently, the aforementioned tests are carried out during the carrying out or simulation (for example by means of a wind tunnel) of a sporting gesture or in any case of an activity in motion/running by the person wearing the garment 6 equipped with the accessory 13 and, in particular, during said tests the characteristics and/or the aerodynamic efficiency and/or the aerodynamic profile of the garment thus equipped are detected/measured and/or evaluated.

**[0060]** Preferably, in a possible embodiment, the aerodynamic accessory can comprise the so-called "hump", that is, that localized protuberance which protrudes from the rear and upper part of a sports garment, in particular of a motorcyclist suit or jacket, and more specifically between the shoulders of these. Conveniently, by way of example in Figures 1 and 2, a garment will be described below in which the aerodynamic accessory consists of a part 8 of the hump 2, however it is understood that any other type of accessory could be provided which is configured in so as to have aerodynamic function. Conveniently, in a possible embodiment, the aerodynamic hump 2 comprises two bodies, of which the first 4 is stably linked to the garment 6 while the second 8 can be removably linked to the first by means of said magnetic elements 12 and 12'.

**[0061]** Advantageously, the hump 2 can be of the type described in the Italian patent application IT10201900003315, the content of which is intended to be incorporated herein in its entirety and incorporated by reference. In particular, it can be formed by two bodies to be constrained together. It can be formed by two bodies, of which a first lower body 4 of standard conformation, stably applied to the suit 6 below the laminar portion 10 - for example in natural or synthetic leather or fabric - and then covered by the same portion 10, and a second upper body 8, which is applied to the first, is made for that specific use and therefore adapted to the build of the motorcyclist, to his running attitude and to the shape of his helmet 14, and therefore adapted to customize the hump

as a whole.

**[0062]** Unlike the provisions of patent application IT 102019000003315, according to which the two bodies of the hump are stably constrained together, the present invention provides that the two bodies 4,8 which form the hump 2 are constrained to each other in a removable manner thanks to the use of permanent magnets 12,12' applied in corresponding positions in both bodies. They are endowed with ferromagnetic or antiferromagnetic properties and that is able to maintain the magnetization for sufficiently long times. More in detail, in correspondence with zone 5, the first magnetic elements 12 are positioned below the portion 10, while the second magnetic elements 12' are incorporated/mounted and/or made in the body 8 which defines the accessory 13. Conveniently, the first magnetic elements 12 - although positioned below the portion 10 - can be mounted on said portion 10 and/or can be mounted on the body 4 which is intended to be positioned below the portion 10.

**[0063]** More particularly they are provided for the coupling between the two bodies 4,8 at least two pairs of magnets 12,12' incorporated in the material that forms each of these or in any case fixed stably in these or in the coating material associated with each of these. Preferably they have a considerably flattened shape, so as to facilitate their attachment to the body that houses them and have a sufficiently large surface and a volume sufficient to ensure the stability of the mutual bond when they are coupled together.

**[0064]** They are made of magnetic material with a high magnetic field flux per unit of volume and are preferably made of metal alloys including neodymium or, alternatively, other magnetic materials, such as cobalt, iron and samarium. Alternatively, they may comprise a non-magnetic substrate and a ferromagnetic or antiferromagnetic coating. It is also advisable that they have a Curie temperature higher than the maximum temperature that can be reached under conditions of use. Furthermore, in the event that the fixing of the magnetic elements 12,12' to the relative bodies 4,8 to be removably constrained to each other requires heating procedures (for example hot glues), it is appropriate that the Curie temperature of the materials that form the magnets is higher than the temperatures that can be reached during these heating procedures, and more specifically is higher than 150°C or preferably higher than 250°C.

**[0065]** If the two bodies 4,8 forming the hump 2 are made by 3D printing (with molten wire or by selective sintering) or by other methods of additive manufacturing, the magnetic elements 12,12' can be directly incorporated inside the bodies themselves. In this case it is advisable that they have a Curie temperature higher than the maximum temperature that can be reached, even locally, during the manufacturing process of said bodies.

**[0066]** Alternatively, if it is provided that the magnetic elements 12, 12' are bound to the bodies 4,8 which form the hump 2 after these have been made, the magnetic elements can be bound to said bodies in a stable manner,

for example by means of interlocking, or by means of the use of glues.

**[0067]** As an alternative to the application of the first magnetic element 12 to the garment 6 by means of glue, it is also provided for its application thereto by insertion into pockets provided therein, and possibly by sewing them to the garment itself.

**[0068]** Furthermore, since the electronic components 14 for the control and command of the airbag associated with the garment 6 can advantageously be accommodated in the lower body 4 of the hump and since the operation of this electronic component could be altered by the presence of these magnetic elements 12,12', the invention provides for the use of suitable magnetic screens, which eliminate or at least attenuate their influence on these electronic components.

**[0069]** For this purpose it is also provided that if said magnetic elements 12, 12' are fixed to said bodies 4,8, the latter may comprise within them a homogeneous distribution of particles of material with high magnetic permeability, for example mu-metal.

**[0070]** Alternatively, the housing seats of said magnetic elements 12, 12' can be coated with sheets of material with high magnetic permeability.

**[0071]** On the other hand, in the case of magnetic elements housed in pockets formed in the garment 6, the pockets themselves can be sewn, entirely in part, with threads made of a material with high magnetic permeability.

**[0072]** In some situations, and in particular for the purpose of precisely adjusting, for aerodynamic requirements, the position of the upper body 8 with respect to the lower body 4 of the hump 2, it may be advantageous to interpose between the cooperating magnetic elements 12,12' of the two bodies 4, 8 of the spacers (not shown) which, thanks to their thickness, allow to adjust the distance between said magnetic elements.

**[0073]** In the aerodynamic tests it is possible to carry out different tests with different spacers, in order to determine the correct distance between the two bodies 4,8 in that particular context of use. Alternatively, said spacers can be adjustable, for example through the use of mechanisms operated by micrometric screws and traditional in themselves.

**[0074]** In any case it is preferable that the spacers have negligible magnetic permeability.

**[0075]** Naturally, the characteristics of the magnetic elements 12,12' and of the spacers are defined in such a way that the magnetic elements themselves are able to exert the sufficient attraction force to keep the two bodies 4,8 of the hump 2 coupled in any condition of use, but at the same time insufficient to keep them coupled in case of impact of the motorcyclist against an obstacle, and indeed, in this case, to allow the detachment of the upper body 8 of the hump 2 from the lower body 4 to prevent possible trauma to the motorcyclist.

**[0076]** Conveniently, the present invention also provides for a particular method of use of the garment 6



provided with hump 2, in order to define the most correct aerodynamic configuration of the motorcyclist (and in general of the wearer of the sports garment according to the invention), configuration that takes into account the physical characteristics of the rider, his build, the conformation of his helmet and his attitude during the race.

**[0077]** This method uses a set of several upper bodies 8 of hump 2, different from each other but suitable for being coupled with the same lower body 4, in turn stably applied to the suit or jacket 6; and also uses a series of different spacers, which can be interposed between the magnetic elements 12, 12' which hold the upper body 8 together with the lower body 4 of the hump 2 through the laminar portion 10 of the garment 6.

**[0078]** The first phase of the method involves carrying out a first aerodynamic test (in the wind tunnel or on the track) using a non-customized hump 2, that is a hump with a standard upper body 8.

**[0079]** Subsequently, after carrying out the aerodynamic measurements, the method involves repeating the test by replacing the upper body 8 with another, predictably suitable for improving the aerodynamic performance of the hump 2.

**[0080]** The tests are repeated several times, replacing the upper body 8 of the hump 2 each time, with a different one and/or possibly interposing spacers between the two bodies 4,8 and checking if the aerodynamic response improves or worsens.

**[0081]** The tests are repeated several times, and at each test the upper body 8 and/or the spacers, predictably suitable to improve the results that can be obtained, are chosen until no further improvement is obtained. This situation is significant in the achievement of the most efficient degree of customization. The replacement of the upper body 8 and/or of the spacers can take place by trial and error or, preferably, on the basis of predefined criteria or also on the basis of the experience of the person carrying out the tests.

**[0082]** From what has been said it is clear that the sports garment equipped according to the invention is considerably more advantageous than similar sports clothing and in particular:

- allows to customize the garment based on the characteristics of the wearer, in order to obtain optimal behavior in all conditions of use,
- it allows to modify the aerodynamic characteristics of the worn garment in an extremely quick and easy way between one test and the next, without subjecting the athlete to long and laborious adaptation operations,
- it allows to use the hump with all its features and performances obtainable with the most advanced models of traditional hump.

**[0083]** What has now been indicated in relation to the specific realization of the hump in two complementary bodies which together form a single customized aerody-

amic element on the rider, can also be used to obtain other customized aerodynamic improvements in sports clothing.

**[0084]** For example, an aerodynamic accessory 13 defined by an element 16 can be applied to the upper part of a hump of the traditional type or also of the type according to the invention, or in any other part of the garment 6, of the type described for example in Italian patent application IT 10201900006523, the content of which is to be understood herein in its entirety and incorporated by reference. In particular, the accessory 13 is an aerodynamic element 16 which positions itself in correspondence with a zone defined between an aerodynamic hump and the rear zone of a helmet worn on the head by the person wearing the garment. More in detail, said accessory 13 consists of an aerodynamic connecting element to be applied to the hump 2 near its front edge facing the rear edge of a helmet 14.

**[0085]** Also in this case the aerodynamic element 16, which allows to obtain all the advantages already indicated in the prior patent application, is equipped in its lower surface facing the upper surface of the hump 2, with second magnetic elements 12' cooperating with similar magnetic elements 12 provided below the portion 10 of the garment 6 to ensure a stable but quickly removable link between the two in order to allow easy replacement of the aerodynamic element 16 with another having different characteristics.

**[0086]** What has already been explained in relation to the characteristics, performances, materials and methods of use of the second body of the hump in relation to the first body 8 also applies to the aerodynamic element 16 in relation to the hump 2, which can be made in one or also in two elements as already described.

**[0087]** Another embodiment of a different accessory 13, which is applicable to the hump or to any other (not necessarily protruding) part of the garment 6, may consist of a plurality of appendages or fins 18, which develop in direction substantially perpendicular to the surface of the hump 2, have an aerodynamic shape and have the function of generating in its downstream zone a better distribution of the air flow in correspondence with the hump 2. Conveniently, said accessory 13 consists of at least one appendage 18 essentially aerodynamic shape to be applied in the desired zone of the garment 6 or in the hump 2 applied thereto. Conveniently, said accessory 13 consists of a plurality of essentially aerodynamic-shaped appendages 18, mounted on a single support 20 which can be removably applied by means of said magnets 12, 12' to said garment 6 or to said hump 2.

**[0088]** As shown in the figures, these aerodynamics appendages 18, which can be applied individually to the hump 2 (see fig. 5) or can be constrained to a common support band 20 (see fig. 6), intended to be in turn constrained to the hump 2, are described in the Italian patent application IT 102019000020428, the content of which is understood to be herein fully referred to and incorporated by reference.

**[0089]** Also in this case, the bond between the individual appendages 18 and the hump 2 and/or the bond between the support band 20 and the hump 2 can be advantageously obtained with magnetic elements 12, 12' of the type already described and which act through the laminar portion 10 of the garment 6.

**[0090]** The present invention may relate, in addition to accessories applicable to the hump 2 of a sports garment 6, to accessories applicable to the garment in zones other than the hump, zones which can be protruding or even non-protruding.

**[0091]** Another embodiment of the present invention relates to aerodynamic appendages of the type already referred to in their application to the hump, but applicable in zones of the garment different from the zone of application of the hump. In particular, one or more appendages can be fixed to an orthogonal support intended to be tied to the suit in predefined zones, for example in the arms, shoulders, elbows, forearms and/or legs, hips or ankles, and thanks to their characteristics they can improve the overall attitude of the racing driver.

**[0092]** In all the applications described above, the same characteristics of the magnets already indicated are provided for the magnets applied to the hump, even if not expressly indicated for each embodiment.

**[0093]** The solution according to the present invention differs from WO2007/116377, JPH02131517, JPH0612420 and WO2021/052413 in that none of these describes an accessory garment in which a substantially laminar portion is clamped between an underlying magnetic element, positioned below of said portion, and an accessory, which is positioned above said portion and which is provided with a second magnetic element for the removable magnetic connection with said first element through said portion of the garment. This solution is particularly advantageous as it avoids having to press the accessory on the garment, and therefore on the body of the wearer, in order to associate/apply the accessory to the garment, and moreover, when the accessory is not applied to the garment, the corresponding portion of the garment is externally completely free and visible, and therefore it is aesthetically more pleasing and above all it can receive advertising and/or identification of sponsors.

**[0094]** The present invention has been illustrated in some of its preferred embodiments, but it is understood that executive variations may be applied to them in practice, without however departing from the scope of protection of the present patent for industrial invention.

## Claims

1. Accessory garment (6) comprising in at least one zone (5) at least one aerodynamic accessory (13) which is configured to improve the aerodynamic behavior of the person wearing the garment and which is configured to be removably associated with said

zone (5), **characterized in that**, in correspondence with said at least one zone (5), said garment (6) comprises:

- an underlying first magnetic element (12),
- a substantially laminar portion (10) which is positioned externally and above said first magnetic element (12),

and also **characterized by** the fact that said aerodynamic accessory (13) is positioned/placed externally and above said portion (10) with substantially laminar development and comprises at least a second magnetic element (12'), configured to magnetically engage with said underlying first magnetic element (12), to thus fix/constrain the accessory (13) to the underlying first magnetic element (12) above said portion (10) with a substantially laminar development.

2. Garment according to claim 1, **characterized in that** said first magnetic element (12) is made of magnetic metal material, preferably ferromagnetic, while said second magnetic element (12') is made of magnetized material, or vice versa.
3. Garment according to one or more of the preceding claims, **characterized in that** said first magnetic element (12) and/or said second magnetic element (12') are based on neodymium and/or cobalt and/or iron and/or samarium.
4. Garment according to one or more of the preceding claims **characterized in that** said first magnetic element (12) and/or said second magnetic element (12') are made of an alloy containing neodymium.
5. Garment according to one or more of the preceding claims **characterized in that** said first magnetic element (12) is fixed directly to said substantially laminar portion (10).
6. Garment according to one or more of the preceding claims **characterized in that** said first magnetic element (12) is mounted or incorporated in a support body (4) which is positioned below said portion (10) with a substantially laminar development.
7. Garment according to one or more of the preceding claims, **characterized in that** said first magnetic element (12) is housed inside a pocket defined in said garment (6) in correspondence with said portion (10).
8. Garment according to one or more of the preceding claims, **characterized in that** said second magnetic element (12') is mounted or incorporated or co-molded inside said aerodynamic accessory (13).

9. Garment according to one or more of the preceding claims, **characterized in that** said laminar portion (10) is part of said garment and comprises a portion of an article, preferably of leather and/or fabric and/or non-woven fabric, and/or in similar materials, with an extension of the thickness that is much less than that of the other two dimensions. 5
10. Garment according to one or more of the preceding claims **characterized in that** said first magnetic element (12) and/or said second magnetic element (12') comprises an internal substrate made of non-magnetic material and a surface coating made of magnetic material. 10
11. Garment according to one or more of the preceding claims, **characterized in that** it comprises at least one spacer element, preferably a plurality of spacer elements, to be interposed between said first magnetic element (12) and said second magnetic element (12'), to thus vary the distance between said magnetic elements (12, 12'). 15
12. Garment according to one or more of the preceding claims **characterized in that** said aerodynamic accessory (13) consists of: 20
- an aerodynamic hump (2), and/or
  - a body (8) defining a part of an aerodynamic hump, and/or 25
  - an aerodynamic element (16) positioned at a defined zone between an aerodynamic hump and the rear zone of a helmet worn on the head by the person wearing the garment,
  - an aerodynamic appendage, flap or fin (18) to be applied on the hump or on any other part of said garment, for example in correspondence with the back, arms or forearms, or legs. 30
13. Garment according to one or more of the preceding claims, **characterized in that**, in addition to said magnetic connection means defined by the first magnetic element (12) cooperating with the second magnetic element (12'), further fixing means are provided of the accessory (13) to the garment (1), said further fastening means comprising mechanical coupling means, preferably by interlocking or through the use of fastening members, and/or mechanical means for quick coupling. 35
14. Garment according to one or more of the preceding claims, **characterized in that** it is shaped like a suit or jacket or trousers for a motorcyclist, cyclist, skier or the like. 40
15. Method of using a garment (6) according to one or more of the preceding claims for determining the correct accessory (13) and/or its correct position on the garment (6) **characterized in that** at least one accessory is removably applied provided with a second magnetic element (12') in correspondence with a portion (10) of said garment (6) which covers an underlying first magnetic element (12), tests are carried out to evaluate the aerodynamic behavior of the garment thus prepared and equipped in conditions of use, said accessory (13) is replaced with another one having different aerodynamic characteristics and/or the position of said accessory (13) is modified and the tests are repeated until no further improvement in the aerodynamic behavior of the garment and/or the desired aerodynamic behavior has been achieved. 45

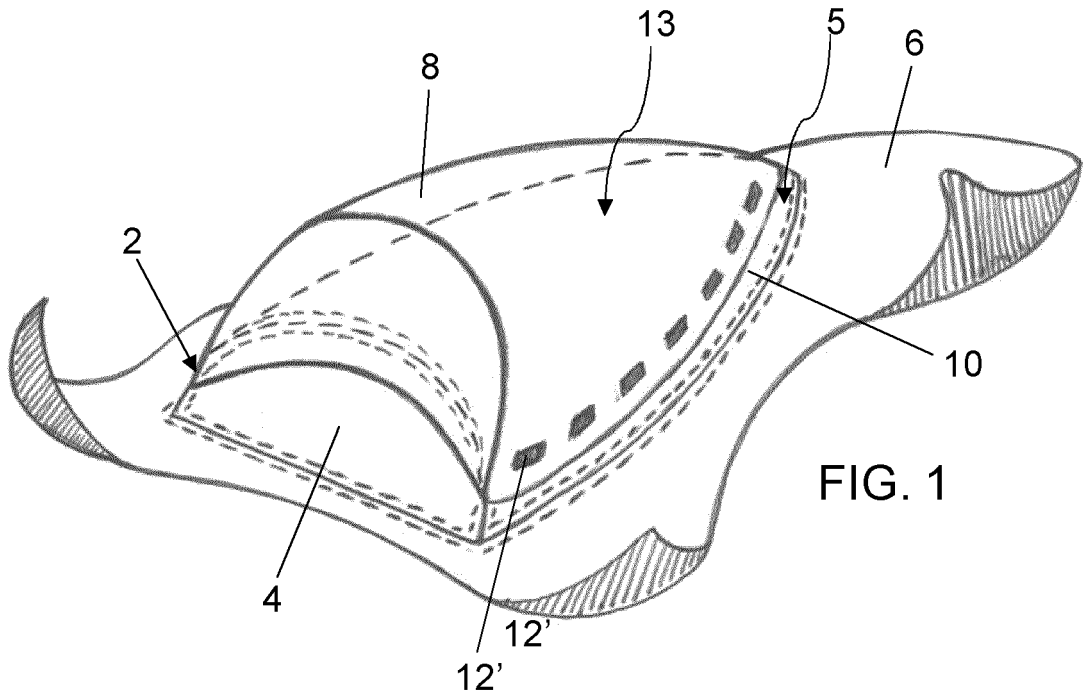


FIG. 1

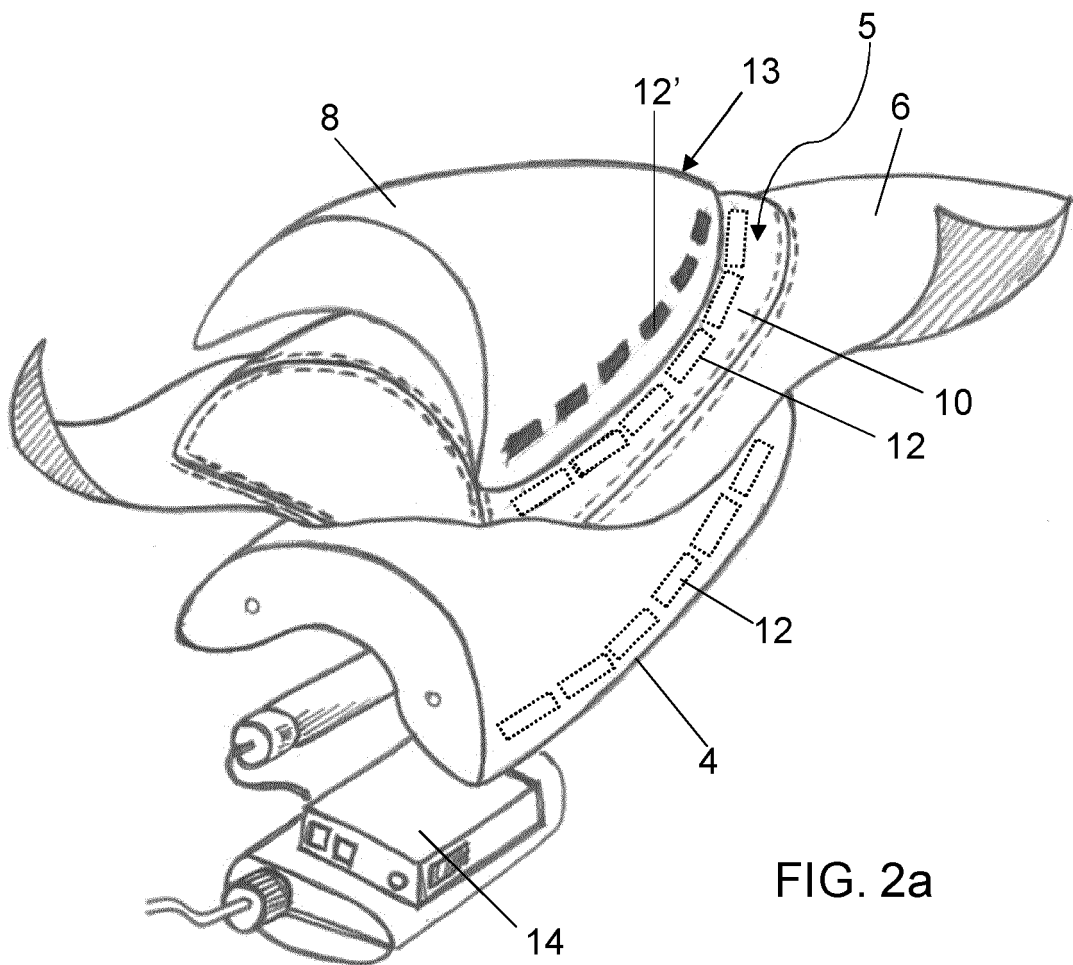


FIG. 2a

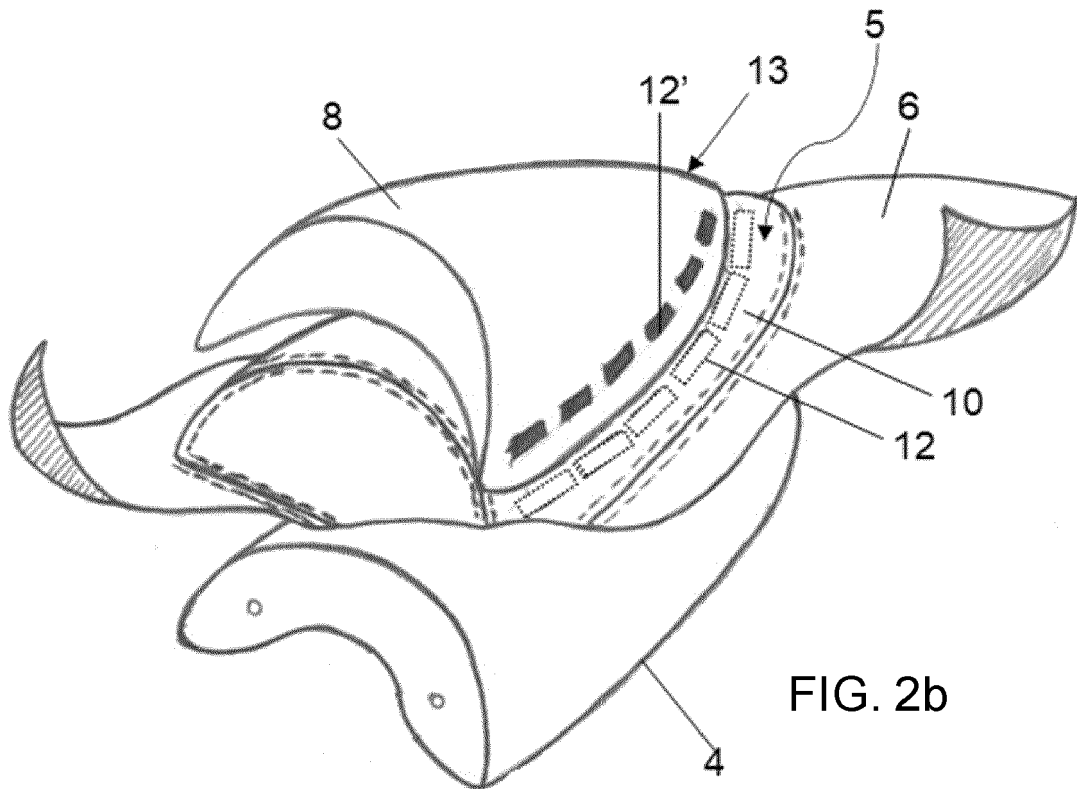


FIG. 2b

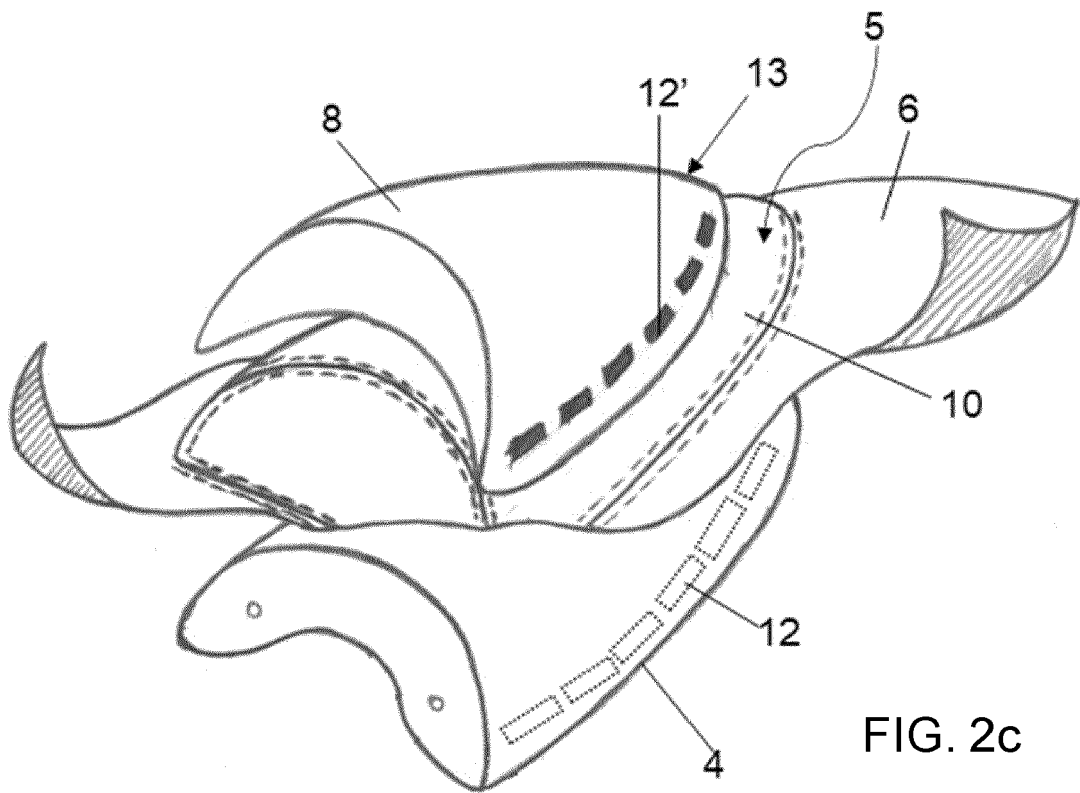


FIG. 2c

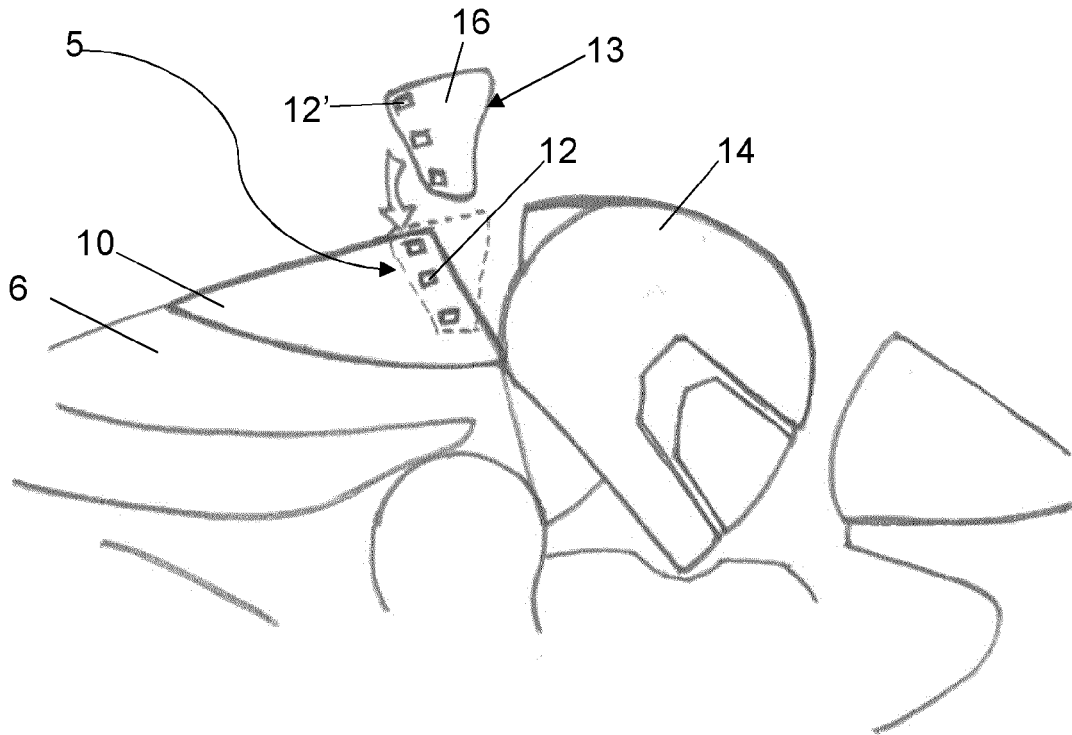


FIG. 3

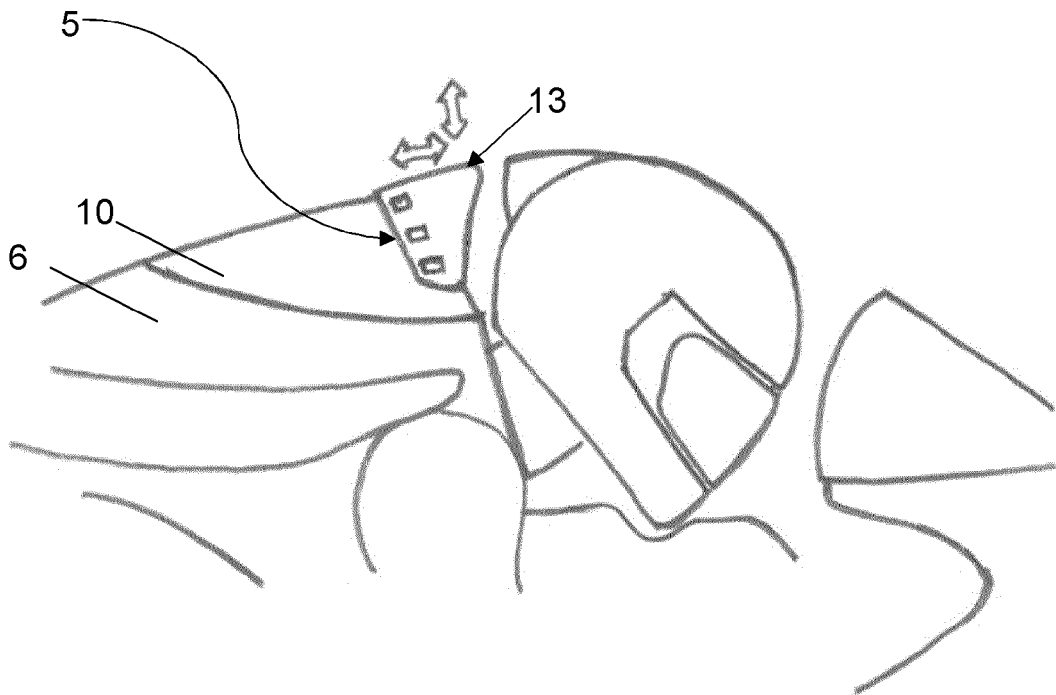


FIG. 4

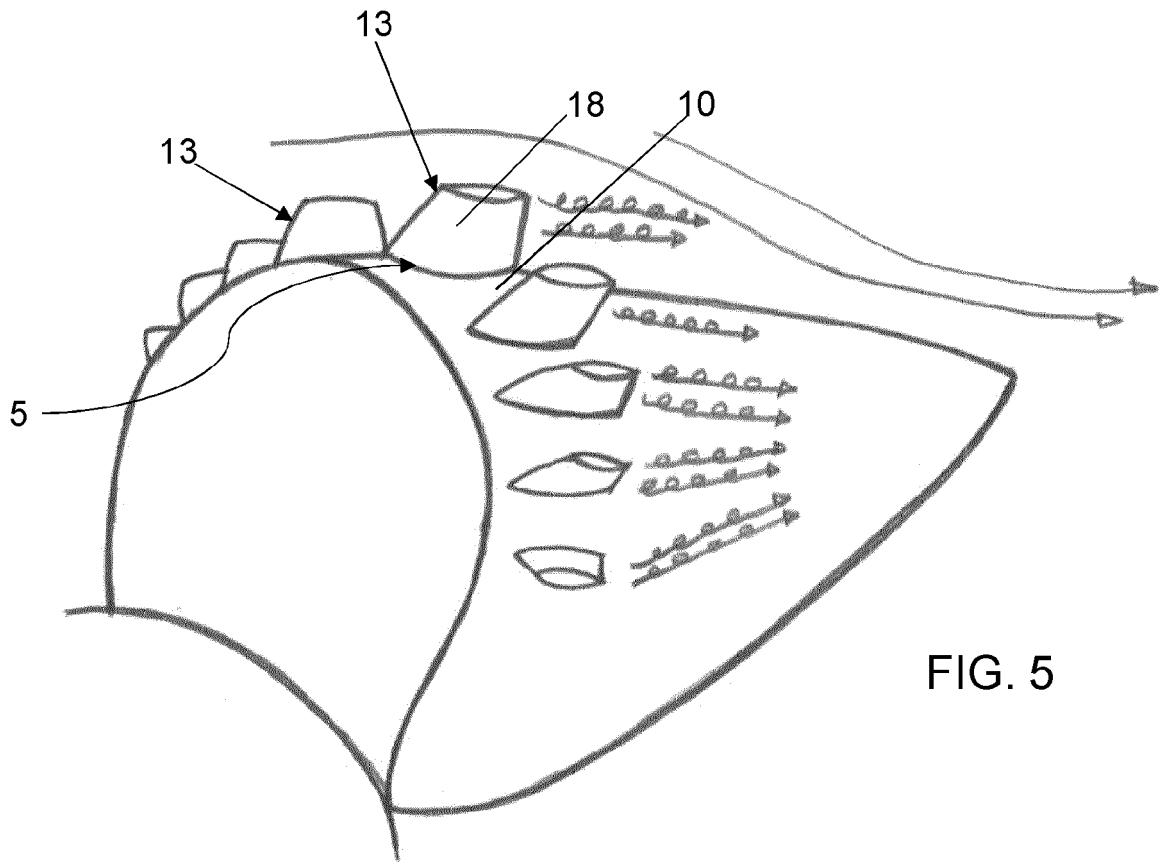


FIG. 5

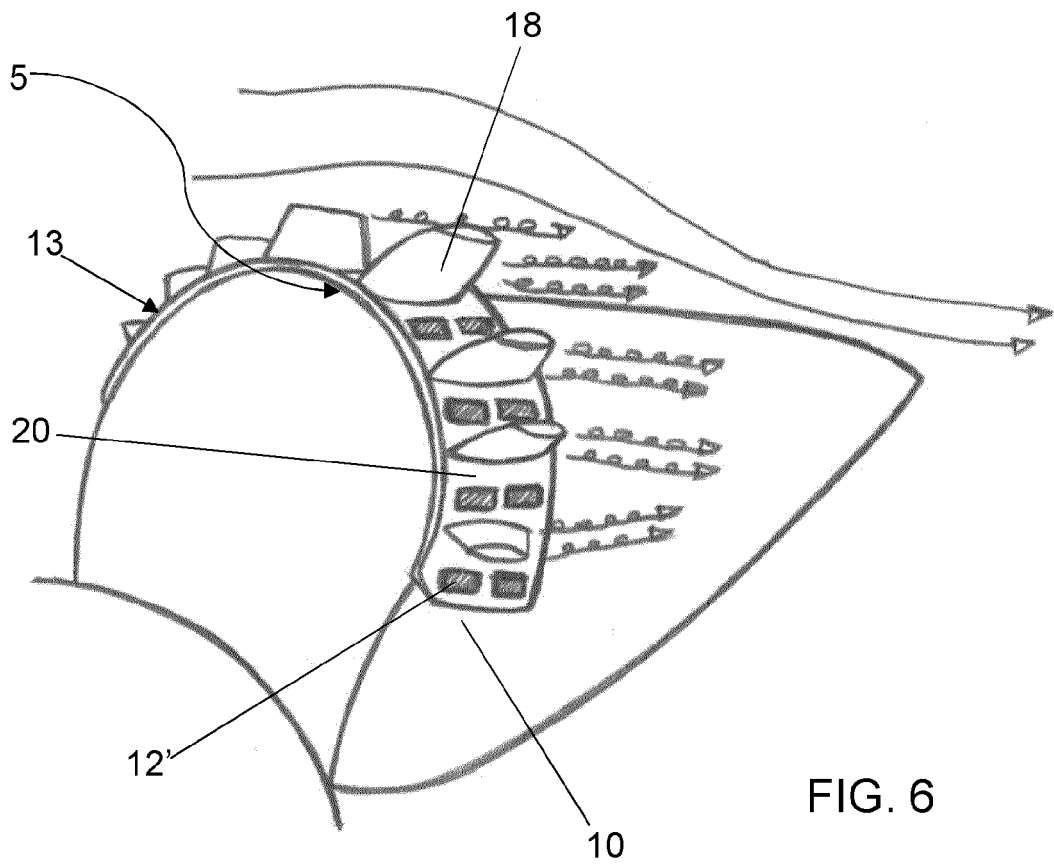
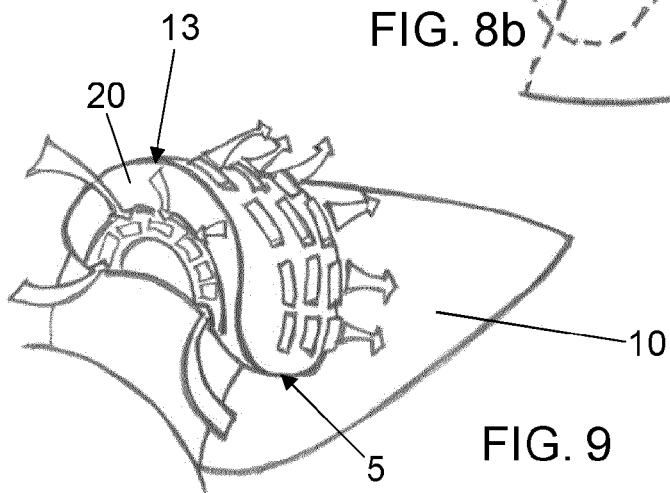
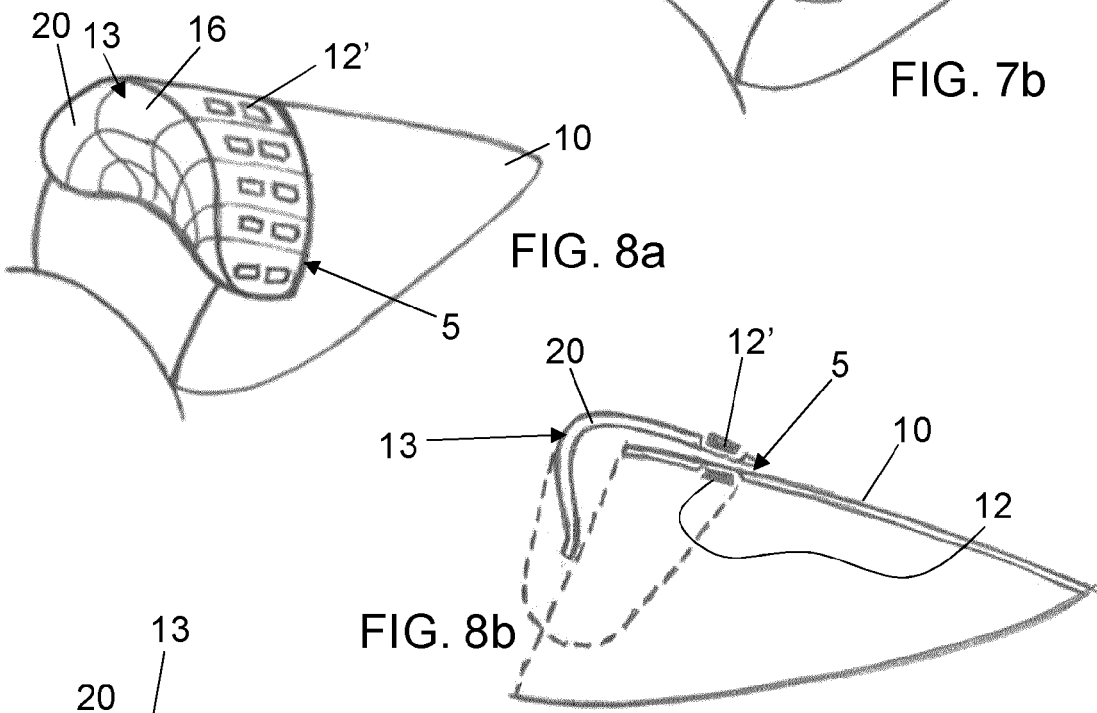
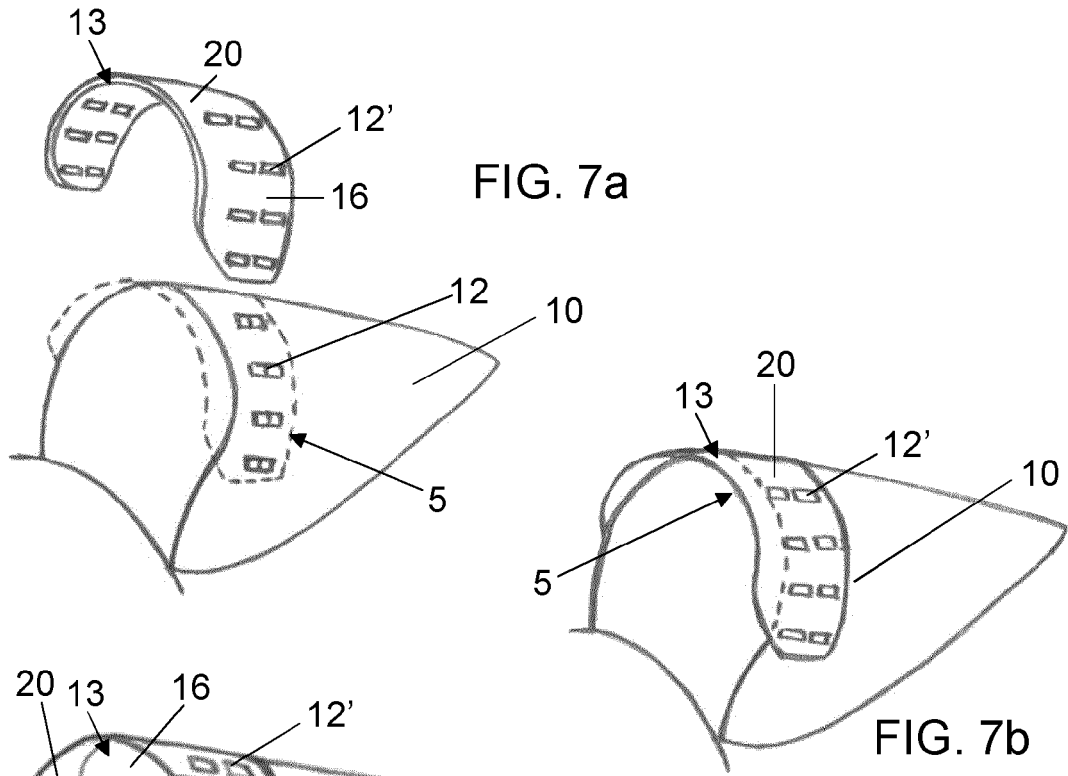


FIG. 6







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The Hague		28 October 2021	da Silva, José
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