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(54) Title: ASSEMBLY OF A STRAP AND A BUCKLE

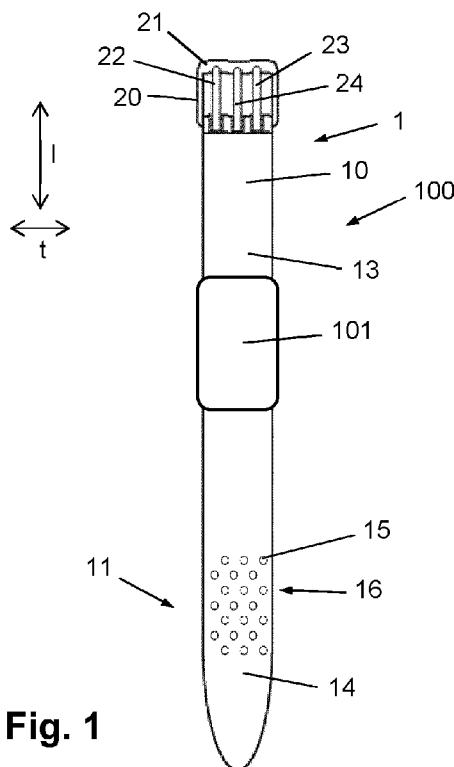


Fig. 1

(57) Abstract: In a strap-buckle assembly (1) for arranging and holding at an appropriate position on a user's body an electronic device (101) including at least one sensor for sensing a body-related parameter, the buckle (20) comprises at least two prongs (22, 23, 24) and the strap (10) is provided with a pattern (11) of holes (15) comprising groups (16) of at least two prong receiving holes (15). Each of the groups (16) has a different positioning on the strap (10) in a longitudinal direction for defining different engagement positions of the buckle (20) on the strap (10) in the longitudinal direction. The prong receiving holes (15) of adjacent groups (16) have a different positioning on the strap (10) in a transversal direction, wherein a transversal positioning of the at least two prongs (22, 23, 24) in the buckle (20) is adjustable.

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Assembly of a strap and a buckle

FIELD OF THE INVENTION

The invention relates to an assembly of a strap and a buckle, for arranging and holding at an appropriate position on a user's body an electronic device including at least one sensor for sensing a body-related parameter, the strap being suitable to be arranged around a
5 body part, the buckle being connected to the strap, and the buckle being adapted to engage with the strap at one of a number of appropriate engagement positions on the strap for realizing a releasable loop shape of the strap.

The invention furthermore relates to a healthcare appliance, comprising an electronic device including at least one sensor for sensing a body-related parameter assembly,
10 and an assembly of a strap and a buckle as mentioned in the preceding paragraph, for arranging and holding the electronic device at an appropriate position on a user's body.

BACKGROUND OF THE INVENTION

A practical example of an electronic device including at least one sensor for
15 sensing a body-related parameter is a so-called health watch, i.e. a device which is intended to be worn like a watch on a user's wrist. Known embodiments of a health watch are equipped with one or more biomedical sensors such as a heart rate sensor or a glucose sensor. Also, a health watch may comprise one or more other types of sensor, for example, an accelerometer or the like for monitoring a user's movements. In general, a health watch helps
20 a user in keeping track of her/his health and fitness in a convenient way and without a need of consulting with a doctor.

In the field of health watches and other electronic devices which are intended to be worn on the body for sensing one or more body-related parameters, which range of devices will hereinafter be referred to as health monitoring devices, close positioning of the
25 one or more sensors which are incorporated in the device to the body is a relevant issue. The fact is that a closer positioning of a sensor to the body involves a better performance of the sensor, i.e. a more reliable functioning of the sensor. In this respect, it is noted that the invention is particularly associated with the field of health monitoring devices which are used with an assembly of a strap and a buckle for closing the strap as a means for placing the

device on a user's body and keeping it in the right position, which assembly will hereinafter be referred to as strap-buckle assembly.

It appears in practice that an application of a strap-buckle assembly for the purpose of arranging and holding at an appropriate position on a user's body a health monitoring device involves a risk that the positioning of the device is not optimal, in which case measurements performed by the at least one sensor of the device yield inaccurate/unreliable results or no results at all. In this respect, it is noted that it is known in the art to use algorithms in a health monitoring device for compensating for missing input.

10 SUMMARY OF THE INVENTION

It is an object of the invention to provide an assembly of a strap and a buckle which is designed for guaranteeing such positioning of a health monitoring device on a user's body that the at least one sensor which is part of the device is enabled to perform measurements in an accurate and reliable manner, so as to yield useful results, preferably without missing anything of the input as desired, regardless the exact shape and size of the body part which is to be surrounded by the strap, so as to be suitable for use by any type of user, independent of her/his physical appearance in terms of size and shape.

The invention provides a strap-buckle assembly for arranging and holding at an appropriate position on a user's body an electronic device including at least one sensor for sensing a body-related parameter, the strap being suitable to be arranged around a body part, the buckle being connected to the strap, and the buckle being adapted to engage with the strap at one of a number of appropriate engagement positions on the strap for realizing a releasable loop shape of the strap, wherein the strap is provided with a pattern of holes, wherein the buckle comprises at least two prongs, wherein the pattern of holes of the strap comprises groups of at least two prong receiving holes, each of the groups of prong receiving holes being adapted to receive the at least two prongs of the buckle, and each of the groups of prong receiving holes having a different positioning on the strap in a longitudinal direction for defining different engagement positions of the buckle on the strap in the longitudinal direction, wherein the prong receiving holes of adjacent groups have a different positioning on the strap in a transversal direction, and wherein the at least two prongs are movably arranged in the buckle, allowing for adjustment of a positioning of the prongs in the transversal direction.

Like conventional strap-buckle assemblies, the strap-buckle assembly according to the invention relies on a presence of holes in the strap on the one hand, the holes

having different longitudinal positions on the strap, and a presence of a prong in the buckle on the other hand, the prong being adapted for insertion in one of the holes, particularly the hole which is the most appropriate for arranging the strap around a body part in such a way that the strap is not too tight and not loose. The invention involves the use of a special type of buckle, namely a buckle which is equipped with at least two prongs, the strap comprising groups of prong receiving holes in the same number as the prongs. In order to allow for different loop sizes of the strap and an associated variable use of the strap-buckle assembly, the groups of prong receiving holes are arranged at different longitudinal positions on the strap, as a result of which a number of possible engagement positions of the buckle on the strap in the longitudinal direction are defined.

Two special features of the invention reside in the fact that according to the invention, the prong receiving holes of adjacent groups have a different positioning on the strap in a transversal direction, and the fact that the at least two prongs are movably arranged in the buckle, allowing for adjustment of a positioning of the prongs in the transversal direction. For the sake of completeness, it is noted that the indication of two directions in the strap as being a longitudinal direction and a transversal direction needs to be understood for its normal meaning. Thus, the longitudinal direction is a direction along the loop to be made by means of the strap, i.e. a direction along a length of the strap, and the transversal direction is a direction which is transverse to the longitudinal direction, i.e. a direction along a width of the strap. The definition of the two directions with reference to the strap is similarly applicable to the buckle in the position in which it is connected to the strap, wherein it is noted that the buckle is connected to the strap at an end of the strap in many practical cases.

By having different transversal positions of the prong receiving holes of adjacent groups, i.e. groups which are successive groups in the longitudinal direction, it is achieved that a distance in the longitudinal direction between adjacent groups, which is referred to as pitch, can be smaller than when the transversal positions of the prong receiving holes of adjacent groups would be the same. A smaller pitch involves a smaller distance between successive engagement positions of the buckle on the strap, and thus involves an improved possibility of realizing an optimal way of arranging the strap around a body part. The fact is that when the strap is arranged around a body part in an appropriate way, the strap is not too tight and not too loose around the body part, as mentioned earlier. In other words, the arrangement of the strap around a body part is optimal when a certain tension is allowed to act in the strap in the longitudinal direction, which tension has a value which is suitable for providing a user with both a feeling of convenience caused by the strap pressing only lightly

against the body part and a feeling of reliability caused by the strap not shifting on the body part. The extent to which the strap is capable of withstanding forces acting in the longitudinal direction when the strap is arranged around a body part with a certain tension for having the optimal arrangement which is not too tight and not too loose is closely related to the presence
5 of material of the strap between one prong receiving hole and another in the longitudinal direction. When the invention is applied, and the pitch is smaller than in conventional cases, the distance between one prong receiving hole and another in the longitudinal direction may still be long enough, because the prong receiving holes of one group are not succeeded by the prong receiving holes of an adjacent group when following the strap in the longitudinal
10 direction, as a consequence of the difference in transversal positioning of the prong receiving holes of adjacent groups.

The fact that the buckle of the strap-buckle assembly according to the invention is equipped with at least two prongs instead of at least one prong contributes to the capability of the strap-buckle assembly to let the strap of the assembly snugly surround a
15 user's body part. The reason is that when a combination of just one prong and a pattern of just one prong receiving hole per longitudinal position on the strap would be applied, the prong receiving hole cannot have a central transversal position in all of the various longitudinal positions as a result of the requirements of the invention. Thus, a strap would be obtained in which a single prong receiving hole would be located offset from a central
20 transversal position, at various longitudinal positions on the strap. If the prong of the buckle would be put in engagement with such a prong receiving hole, a distribution of forces in the strap in the transversal direction would be asymmetrical, causing the strap to be tilted away from the user's body part to some extent along a portion of a side of the strap which is not directly engaged by the buckle in that situation. In order to guarantee secure engagement of
25 the buckle to the strap and a distribution of forces in the strap in the transversal direction which is symmetrical or close to symmetrical, at least to an extent which is sufficient for avoiding a tilting effect on the strap as a result of the engagement, the invention involves an application of at least two prongs in the buckle and groups of at least two prong receiving holes in the strap.

30 On the basis of an interpretation of the special features of the invention, it can be found that application of the invention allows for an improvement of the resistance of the strap to tearing. In particular, when the invention is put to practice, the pitch of the strap may be made as small as possible while maintaining a certain level of resistance to tearing of the strap, or both the pitch of the strap may be decreased and the resistance to tearing of the strap

may be increased. When it comes to decreasing the pitch in designing a strap-buckle assembly, limitations are related to factors like the type of material of the strap, the type of material of the buckle, the size and the shape of the prongs of the buckle, the size and the shape of the prong receiving holes, and the number of the prongs.

5 Due to the movable arrangement of the at least two prongs in the buckle, it is possible to adjust the transversal positions of the prongs to the transversal positions of the prong receiving holes in any possible engagement position of the buckle on the strap. All that a user needs to do when closing the strap-buckle assembly around a body part is to check whether the prongs are in such a position that they can be readily inserted in the prong
10 receiving holes of a group defining an engagement position of the buckle on the strap as desired, and to adjust the transversal positioning of the prongs only in case the transversal positioning of the prongs appears to deviate from the transversal positioning of the prong receiving holes.

 When it comes to the movable arrangement of the at least two prongs in the
15 buckle, a first possibility existing within the framework of the invention is that the prongs are jointly movable, and a second possibility existing within the framework of the invention is that the prongs are individually movable. Both the first and the second possibility are applicable in case a transversal distance between the prong receiving holes of the various groups is the same for the various groups. However, if the transversal distance between the
20 prong receiving holes is not the same for all of the various groups, only the second possibility is applicable. In any case, in view of ease of use of the strap-buckle assembly according to the invention, it is advantageous if the movable arrangement of the at least two prongs in the buckle is of such a nature that a user is allowed to adjust the transversal direction of the prongs as desired by only performing a single action, and is not required to displace the
25 prongs one by one.

 In a practical embodiment, the buckle comprises a prong carrier shaft extending in the transversal direction, wherein the at least two prongs of the buckle are arranged so as to be slidable on the prong carrier shaft in the transverse direction. Such a configuration allows for realizing a fixed longitudinal positioning and an adjustable
30 transversal positioning of the prongs in the strap-buckle assembly, wherein there is no need for an application of complex measures. In this configuration, the prong carrier shaft of the buckle may be provided with recessed portions for predetermining at least two different transversal positions of the at least two prongs of the buckle on the prong carrier shaft, in which case it is possible to realize various appearances of the buckle as far as the transversal

positioning of the prongs is concerned in a simple and reliable manner. Also, it may be practical if the buckle is connected to the strap through the prong carrier shaft.

When it comes to the appearance of the groups of prong receiving holes and the distribution of the groups on the strap, numerous possibilities exist within the framework of the invention, provided that the prong receiving holes of adjacent groups have a different positioning on the strap in the transversal direction, as mentioned earlier. For example, the pattern of holes of the strap may comprise at least two types of groups of prong receiving holes at different transversal positions on the strap, the groups of prong receiving holes of the at least two types being provided on the strap in an alternating fashion in the longitudinal direction.

Additionally or alternatively, it may be so that the groups of prong receiving holes are the same as far as the mutual positioning of the prong receiving holes in the group is concerned and only differ as far as the positioning of the prong receiving holes in the transversal direction is concerned. On the other hand, a pattern of prong receiving holes of the strap is feasible in which one of two alternating groups comprises two prong receiving holes having a more central positioning in the transversal direction, and in which the other of the groups comprises two prong receiving holes having a positioning which is more to the side edges of the strap in the transversal direction. As mentioned earlier, in the first case, i.e. the case in which the groups are the same as far as the mutual positioning of the prong receiving holes in the group is concerned, an embodiment of the buckle in which the at least two prongs of the buckle are jointly movable can be applied, whereas in the latter case, it is practical if the prongs are individually movable. In either case, it may be so that the prong receiving holes of each of the groups are arranged in a row extending in the transversal direction, i.e. have similar positions in the longitudinal direction.

According to another practical option, the groups of prong receiving holes may be arranged at a regular mutual distance in the longitudinal direction, in other words, the pitch may be constant along the strap. Whether the pitch is constant or variable along the strap, the pitch may be 4 mm or smaller, preferably even 3 mm or smaller, more preferably 2 mm or smaller. This may also be the case if the strap is made of a suitable elastomer material such as silicone or thermoplastic polyurethane, providing the strap with certain elastic properties and contributing to the strap's ability to closely follow a user's body part. In a general sense, it may be preferred to choose a pitch which is as small as possible in the context of a given size of the prongs of the buckle and a given type of material of the strap,

which may be an elastomer material as mentioned, but which may also be another type of material, such as leather.

The pattern of holes of the strap may comprise other holes besides the prong receiving holes, particularly holes serving another purpose than the prong receiving holes, optionally an aeration purpose and/or a decoration purpose and/or a strap flexibility enhancing purpose. Any of the holes in the strap may have any suitable size, and any suitable shape, for example, a circular or oval shape, or a diamond shape. The pattern of holes of the strap may comprise holes of different sizes and/or different shapes, whatever is suitable for realizing proper receipt of the prongs of the buckle and possible additional functionalities.

The cross-section of the prongs of the buckle may have any suitable size, and any suitable shape, in relation to the size and the shape of the prong receiving holes of the strap.

The invention relates to a strap-buckle assembly as described in the foregoing, and also relates to a healthcare appliance comprising an electronic device including at least one sensor for sensing a body-related parameter assembly, and also comprising such a strap-buckle assembly, for arranging and holding the electronic device at an appropriate position on a user's body. In particular, in the healthcare appliance as mentioned, the electronic device is arranged on the strap or integrated in the strap. The at least one sensor of the electronic device may be a biomedical sensor, as mentioned earlier, such as a heart rate sensor or a glucose sensor, and may be a sensor receiver or a sensor transmitter, whatever is appropriate in an actual situation.

The above-described and other aspects of the invention will be apparent from and elucidated with reference to the following detailed description of embodiments of a strap-buckle assembly which is particularly suitable for use with an electronic device including at least one sensor for sensing a body-related parameter. The embodiments are just a few examples out of numerous possible embodiments existing within the framework of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be explained in greater detail with reference to the figures, in which equal or similar parts are indicated by the same reference signs, and in which:

Figure 1 diagrammatically shows a healthcare appliance, comprising a health watch and a strap-buckle assembly according to a first embodiment of the invention;

Figure 2 illustrates how the healthcare appliance is worn on a user's wrist;

Figure 3 diagrammatically shows a portion of a strap which is part of the strap-buckle assembly according to the first embodiment of the invention;

Figure 4 diagrammatically shows a buckle which is also part of the strap-buckle assembly according to the first embodiment of the invention, and which is connected to an end of the strap, wherein furthermore an adjoining portion of the strap is shown;

Figures 5 and 6 illustrate engagement of the buckle on the strap at two different engagement positions;

Figure 7 illustrates a pattern of holes of a strap of a strap-buckle assembly according to a second embodiment of the invention;

Figures 8 and 9 diagrammatically show a front view and a back view, respectively, of a strap-buckle assembly according to a third embodiment of the invention, the buckle being engaged with the strap;

Figure 10 diagrammatically shows a back view of the buckle and portions of the strap, the buckle being engaged with the strap;

Figure 11 diagrammatically shows a front view of the buckle and an adjoining portion of the strap.

DETAILED DESCRIPTION OF EMBODIMENTS

Figures 1 and 2 show a health care appliance 100 comprising a health watch 101 and a strap-buckle assembly 1 according to a first embodiment of the invention, which comprises a strap 10 and a buckle 20. In general, the strap-buckle assembly 1 is designed for arranging and holding at an appropriate position on a user's body an electronic device including at least one sensor for sensing a body-related parameter. The health watch 101 is one out of many possible examples of such an electronic device, and it is noted that the invention is in no way limited to use with a certain type of such an electronic device. In figure 1, the health watch 101 is only diagrammatically indicated, and the health watch 101 will not be further elucidated in this text for the reasons that health watches are generally known in the art and that the invention is not about the health watch as such. The invention covers any possible association between the health watch 101 and the strap-buckle assembly 1. The health watch 101 may be connected to the strap 10 in any suitable manner, wherein the connection may be of a releasable nature if so desired. The health watch 101 may be arranged on the strap 10 or integrated in the strap 10, whatever is appropriate in a certain case.

The strap 10 has an elongated appearance, as can be seen best in figure 1, and is provided with a pattern 11 of holes. The buckle 20 is connected to an end of the strap 10 and comprises a frame 21 and a number of prongs 22, 23, 24. In the shown example, the number of prongs 22, 23, 24 is three, which does not alter the fact that the invention is in no way limited to this particular number. According to the invention, the number of prongs 22, 23, 24 is at least two, and may be three, four or even more, whatever is appropriate in a practical situation, depending, among other things, on a width of the strap 10.

The frame 21 of the buckle 20 may have any suitable shape. In the shown example, the frame 21 has a generally rectangular shape and consequently comprises four interconnected straight portions. Furthermore, in the shown example, one of those frame portions has both a function in realizing the connection of the buckle 20 to the strap 10 and a function in carrying the prongs 22, 23, 24. In view of the latter function, the frame portion concerned will hereinafter be referred to as prong carrier shaft 25. Figure 4 illustrates a possibility according to which the connection of the buckle 20 to the strap 10 is established on the basis of a configuration in which the strap 10 is provided with eyes 12 and in which the prong carrier shaft 25 extends through the eyes 12. A frame portion opposite to the prong carrier shaft 25 is arranged so as to allow free ends of the prongs 22, 23, 24 to rest on that frame portion, which will hereinafter be referred to as prong support shaft 26 in view thereof. The buckle 20 may be at least partially made of a metal material or a suitable plastic material, for example.

Figure 1 shows the strap-buckle assembly 1 in an opened condition. In figure 2, it is shown how the health watch 101 may be arranged on a user's wrist 102 by means of the strap-buckle assembly 1. Putting the strap-buckle assembly 1 and the health watch 101 associated therewith in an appropriate position around the wrist 102 involves an action of putting the strap-buckle assembly 1 from the opened condition to a closed condition in which the strap 10 is shaped like a loop. Figures 5 and 6 illustrate how the strap 10 and the buckle 20 are engaged with each other in the closed condition. In general, it is advantageous if the design of the buckle 20 is such that the buckle 20 is capable of following the user's wrist 102 in the closed condition of the strap-buckle assembly 1, so that the user's skin is protected from irritation and incision, which implies a slightly curved overall appearance of the buckle 20 in the longitudinal direction and an application of rounded edges in the design of the buckle 20.

For the purpose of putting the strap-buckle assembly 1 from the opened condition to a closed condition around her/his wrist 102, a user is supposed to take the

following steps: placing the strap-buckle assembly 1 in an appropriate position on the wrist 102, in which position a buckle portion 13 of the strap 10 carrying the buckle 20 at the end thereof, which is depicted in figure 1 so as to extend at the top side of the health watch 101, and an insertion portion 14 of the strap 10, which is depicted in figure 1 so as to extend at the bottom side of the health watch 101, extend on either side of the wrist 102, bending both portions 13, 14 around the wrist 102 and inserting the insertion portion 14 of the strap 10 through the frame 21 of the buckle 20, pulling at the end of the insertion portion 14 of the strap 10 so that the strap 10 tightens around the wrist 102 until a convenient arrangement of the strap 10 around the wrist 102 is obtained in which the strap 10 is not too tight and not too loose, making the prongs 22, 23, 24 engage with holes in the insertion portion 14 of the strap 10 which are at the best position for receiving the prongs 22, 23, 24 in that convenient arrangement, and allowing the prongs 22, 23, 24 to fall on the prong support shaft 26 so that a portion of the insertion portion 14 of the strap 10 is locked inside the buckle 20.

For the purpose of putting the strap-buckle assembly 1 from the closed condition to the opened condition, a user is supposed to manipulate the insertion portion 14 of the strap 10 so as to pull it back through the frame 21 of the buckle 20 to some extent. In the process, the prongs 22, 23, 24 are lifted from the prong support shaft 26, so that it is possible to pull the strap 10 off the prongs 22, 23, 24 and to thereby release the engagement between the strap 10 and the buckle.

It follows from the foregoing that in many aspects, the strap-buckle assembly 1 according to the invention is comparable to known strap-buckle assemblies which are commonly used with watches, especially known strap-buckle assemblies in which the buckle is equipped with more than one prong. However, the strap-buckle assembly 1 according to the invention has two distinguishing features which are related to the design of the pattern 11 of holes of the strap 10, particularly of holes of the insertion portion 14 of the strap 10, on the one hand and to the arrangement of the prongs 22, 23, 24 in the buckle 20 on the other hand, as will now be explained.

In figure 3, a detail of the insertion portion 14 of the strap 10 is shown. All of the holes of the pattern 11 of holes of that shown example are suitable to be used for receiving the prongs 22, 23, 24 of the buckle 20. In the following, holes of this type will be referred to as prong receiving holes 15. The prong receiving holes 15 are arranged in groups 16. Each group 16 is adapted to allow for simultaneous insertion of all of the three prongs 22, 23, 24 through the strap 10. In view thereof, each group 16 comprises a row of three prong receiving holes 15, the row extending in a transversal direction of the strap 10, substantially

perpendicular to a longitudinal direction of the strap 10, and the holes 15 of each row being arranged at a regular mutual distance. For the sake of clarity, in figure 1, the transversal direction is indicated by means of a double-headed arrow t, and the longitudinal direction is indicated by means of a double-headed arrow l.

5 The groups 16 of prong receiving holes 15 are located at various longitudinal positions, so as to define engagement positions of the buckle 20 on the strap 10 at various longitudinal positions on the strap 10. Figure 3 clearly illustrates the fact that according to the invention, prong receiving holes 15 of adjacent groups 16 are arranged at different transversal positions. Hence, it is achieved that when an imaginary longitudinal line is drawn from a
10 prong receiving hole 15 of one of the groups 16, there is no prong receiving hole 15 of an adjacent group 16 which is on that line. In the shown example, the groups 16 are all the same as far as the mutual positioning of the prong receiving holes 15 in the group 16 is concerned, but the transversal positioning of the prong receiving holes 15 of adjacent groups 16 is different. In fact, in the shown example, the pattern 11 of holes of the strap 10 comprises two
15 types of groups 16 of prong receiving holes 15 which are arranged in an alternating fashion on the strap 10, at a regular mutual longitudinal distance. Thus, a kind of staggered appearance of the pattern 11 of holes of the strap 10 is obtained. In this way, it is achieved that it is both possible to use a relatively soft and flexible elastomer material such as silicone or thermoplastic polyurethane in the strap 10, and to have the various engagement positions
20 of the buckle 20 on the strap 10 at relatively small distances, without a risk of the strap 10 tearing in the longitudinal direction at the position of the prong receiving holes 15. Thus, by deviating from a normal, default pattern 11 of holes in which prong receiving holes 15 of successive groups 16 are arranged at similar transversal positions, fine adjustment possibilities of the closed condition of the strap-buckle assembly 1 are realized, wherein it is
25 also possible to have an improved lifetime of the strap 10.

 The prongs 22, 23, 24 are movably arranged in the buckle 20, so that the transversal positioning of the prongs 22, 23, 24 may be adjusted to the transversal positioning of the prong receiving holes 15 of a group 16 which is addressed in a certain situation. In particular, in the shown example, the prongs 22, 23, 24 are slidably arranged on the prong
30 carrier shaft 25, wherein the prongs 22, 23, 24 are furthermore rotatable about the prong carrier shaft 25. Advantageously, the prongs 22, 23, 24 are jointly movable in the buckle 20, wherein the prongs 22, 23, 24 extend from a sliding bushing 27 encompassing the prong carrier shaft 25, which sliding bushing 27 may be arranged so as to surround the prong carrier shaft 25 entirely, although this is not essential within the framework of the invention. On the

basis of the movable arrangement of the prongs 22, 23, 24 as mentioned, it is both possible to insert the prongs 22, 23, 24 through prong receiving holes 15 which are present more to one side edge of the strap 10 and to insert the prongs 22, 23, 24 through prong receiving holes 15 which are present more to another side edge of the strap 10, as illustrated by figures 5 and 6, as the prongs 22, 23, 24 can always be put in one of the two transversal positions which are appropriate for engagement with the prong receiving holes 15 of any of the groups 16. In a preferred embodiment, measures are taken for enabling the buckle 20 to hold the prongs 22, 23, 24 in two predetermined transversal positions which are adapted to the transversal positions of the prong receiving holes 15 of the two types of groups 16, wherein it is practical if it is easy for a user to release the prongs 22, 23, 24 from such a predetermined transversal position and change to the other predetermined transversal position if so desired, for example, simply by exerting only a small force on the prongs 22, 23, 24 in the transversal direction. An example of such measures involves a design of the prong carrier shaft 25 with recessed portions at appropriate positions.

A longitudinal distance between adjacent groups 16 of prong receiving holes 15 is preferably 4 mm or less, and may even be as small as 3 mm or less, for example, 2.5 mm or 2 mm, while the strap 10 may be made of a relatively soft plastic material as mentioned earlier. Such a small distance allows for fine adjustment of the loop of the strap 10 associated with the closed condition of the strap-buckle assembly 1, so that it is possible to realize optimal positioning of the health watch 101 associated with the strap-buckle assembly 1 on the user's wrist 102, i.e. positioning of the health watch 101 in which the at least one sensor of the health watch 101 is at such a close range of the wrist 102 that the sensor is allowed to accurately and reliably perform its function. In this respect, it is noted that in conventional situations, the longitudinal distance between adjacent engagement positions on the strap 10 is normally not shorter than 6 mm.

Within the framework of the invention, numerous possibilities with respect to the design of the pattern 11 of holes in the strap 10 exist. Figure 7 relates to a second embodiment of the strap-buckle assembly according to the invention and shows one example of an alternative to the design as explained in the foregoing. According to this example, the pattern 11 of holes does not only comprise prong receiving holes 15, but also holes 17 which are not intended for cooperation with the buckle 20, but which serve an aeration purpose, for example. In the shown example, the other holes 17 have a central positioning in the transversal direction, while being arranged at a regular mutual distance in the longitudinal direction. The prong receiving holes 15 are provided in groups 16 of two types, each group

16 comprising two prong receiving holes 15. Hence, the alternative pattern 11 of holes is suitable for cooperation with a buckle 20 which is equipped with only two prongs (not shown). The groups 16 of prong receiving holes 15 according to the two different types are arranged in an alternating fashion in the longitudinal direction, so that adjacent groups 16 are never of the same type, which is the same as in the example described earlier. However, in this alternative case, the mutual positioning of the prong receiving holes 15 in the group 16 is different for the two types. In one type of group 16, the prong receiving holes 15 are arranged at a shorter distance with respect to each other than the prong receiving holes 15 in the other type of group 16, while in both groups 16, the prong receiving holes 15 are arranged in a mirror-symmetrical fashion with respect to an imaginary central longitudinal line on the strap 10. Hence, the prong receiving holes 15 of the first group 16 have a more central positioning on the strap 10 in the transversal direction, whereas the prong receiving holes 15 of the latter group 16 have a positioning which is more at the side edges of the strap 10. The pattern 11 of holes as shown in figure 7 has a regular appearance and provides a pleasant look, which does not alter the fact that in principle, aspects like the distance between groups 16 in the longitudinal direction may be variable along the length of the strap 10.

In the embodiment of figure 7, each of the two prongs of the buckle 20 is movable in the transversal direction so that it is possible to set one of the two predetermined positions of the prongs in that direction, in which predetermined positions the prongs are capable of being inserted into the prong receiving holes 15 of a group 16. Switching between predetermined positions of the prongs only requires pressing the prongs more closely together, in the direction of a central transversal position, or pulling the prongs apart, in the opposite direction, whatever the case may be. Thus, in that case, the prongs are not jointly movable in the buckle, which does not alter the fact that it is advantageous for the prongs to be linked in such a way that when one prong is moved, the other prong automatically moves along in a mirror-symmetrical fashion with respect to the imaginary central longitudinal line on the strap 10.

Figures 8-11 relate to a strap-buckle assembly 3 according to a third embodiment of the invention. Figures 8 and 9 illustrate the fact that the pattern 11 of holes of the strap 10 comprises three portions, namely a first portion 11a arranged near a free end of the insertion portion 14, comprising prong receiving holes 15, a second portion 11b arranged in the insertion portion 14, comprising holes 17 having a function in realizing aeration and optimal flexibility of the strap 10, and a third portion 11c arranged in the buckle portion 13, which is comparable to the second portion 11b. In particular, in the shown example, the first

portion 11a of the pattern 11 of holes comprises two types of groups 16 of prong receiving holes 15 which are arranged in an alternating fashion on the strap 10, at a regular mutual longitudinal distance, as already described in respect of the strap-buckle assembly 1 according to the first embodiment of the invention. Each of the groups 16 of prong receiving holes 15 has a row of three prong receiving holes 15, and the buckle 20 is provided with three prongs 22, 23, 24 for engagement with the prong receiving holes 15. As already explained in the foregoing with respect to the strap-buckle assembly 1 according to the first embodiment of the invention, the prongs 22, 23, 24 are movable in the transverse direction so that it is possible for a user to adapt the position of the prongs 22, 23, 24 to the position of the prong receiving holes 15 in a particular group 16 when it is desired to let the prongs 22, 23, 24 engage with those prong receiving holes 15.

A notable feature of the strap-buckle assembly 3 according to the third embodiment of the invention resides in the fact that the prongs 22, 23, 24 extend from a common bridge part 28 which is slidably and rotatably coupled to the prong carrier shaft 25 through two eyes 29, which may come in a fully closed form or in a form for partially yet effectively surrounding the prong carrier shaft 25. An advantage of this configuration, which is particularly applicable to prongs 22, 23, 24 which are jointly movable in the transverse direction, is that there is room for the eyes 12 of the strap 10 through which the prong carrier shaft 25 extends to be as wide as possible in the transverse direction, which contributes to the strength of the connection of the buckle 20 to the strap 10, and which reduces the chance of tearing of the eyes 12 of the strap 10. In particular, when this configuration is compared with the possibility of having the prongs 22, 23, 24 arranged on a sliding bushing 27 as explained earlier, which sliding bushing 27 extends along a considerable portion of the width of the prong carrier shaft 25, it is found that there is more room for the eyes 12 of the strap 10 through which the prong carrier shaft 25 extends, wherein it is possible to have an additional eye 12 at a central position.

The eyes 29 for coupling the common bridge part 28 of the prongs 22, 23, 24 to the prong carrier shaft 25 do not necessarily need to be provided at end portions of the bridge part 28 which are outmost end portions in the transverse direction. By having a configuration in which the eyes 29 are positioned more towards a central longitudinal axis of the combination of the bridge part 28 and the prongs 22, 23, 24, as can be seen in figures 10 and 11, it is possible to have some more material at the eyes 12 of the strap 10 as present at the side edges of the strap 10, so as to have sufficient strength of those eyes 12 and to thereby avoid tearing of those eyes 12.

In respect of the holes 15, 17 of the strap 10 of the strap-buckle assembly 3 according to the third embodiment of the invention, it is noted that the holes 15, 17 are widened at the back side thereof, as can be seen best in figure 10. In the case of the holes 17 of the second portion 11b and the third portion 11c of the pattern 11 of holes, such design contributes to the functionality of the holes 17, which in this case comprises an aeration functionality and a functionality of contributing to the flexibility of the strap 10, as mentioned earlier.

Figure 11 clearly illustrates a practical option of providing the prong support shaft 26 with slightly recessed portions 26a, 26b, 26c at actual prong support positions on the prong support shaft 26. Advantageously, a dimension of each of the recessed portions 26a, 26b, 26c in the transverse direction is chosen so as to have delimitations at positions which are appropriate in view of the two options in respect of the positioning of the prongs 22, 23, 24 in the transverse direction, as determined by the pattern 11 of prong receiving holes 15. Basically, at the position of the prong carrier shaft 25, the two possible extreme transverse positions of the prongs 22, 23, 24 are delimited by the eyes 12 of the strap 10 in the design of the strap-buckle assembly 3 according to the third embodiment of the invention, the configuration of the eyes 12 being chosen in view of the delimiting function as envisaged.

The embodiments of the strap-buckle assembly 1, 3 according to the invention as discussed in the foregoing are especially suitable to be arranged around a user's wrist 102. That does not alter the fact that in a general sense, the strap-buckle assembly 1, 3 according to the invention is suitable to be arranged around a user's body part, which body part may be a wrist 102, but may alternatively be the user's chest, for example. It goes without saying that a length of the strap 10 is adapted to a circumference of the body part in question in practical cases.

The invention is aimed at having a proper arrangement of an electronic device 101 including at least one sensor for sensing a body-related parameter at an appropriate position on a user's body, which is an arrangement in which the sensor is close enough to the body to be able to perform its function in an accurate and reliable manner. Preferably, an elastic material is used in the strap 10 of the strap-buckle assembly 1, 3 according to the invention. Also, it is preferred to have a pattern 11 of holes 15, 17 in the strap 10 comprising as many prong receiving holes 15 as practically possible in both the transversal direction and the longitudinal direction, in which case forces acting in the strap 10 when the strap 10 is in the closed condition, especially at the positions of the very prong receiving holes 15 through which the prongs 22, 23, 24 of the buckle 20 are inserted, are distributed as much as possible

and are locally as low as possible. As explained in the foregoing, the gist of the invention is found in the fact that the transversal positioning of prong receiving holes 15 of adjacent groups 16 is different, which is an actual practical possibility when the strap-buckle assembly 1, 3 is equipped with a buckle 20 in which the transversal positioning of the prongs 22, 23, 24 is adjustable. For the sake of completeness, it is noted that the wording “adjacent groups 16” as used in this text should be understood such as to imply groups 16 which are generally configured such as to extend in the transverse direction, so that the groups 16 can be denoted as being adjacent to each other when seen in the longitudinal direction.

It will be clear to a person skilled in the art that the scope of the invention is not limited to the examples discussed in the foregoing, but that several amendments and modifications thereof are possible without deviating from the scope of the invention as defined in the attached claims. It is intended that the invention be construed as including all such amendments and modifications insofar they come within the scope of the claims or the equivalents thereof. While the invention has been illustrated and described in detail in the figures and the description, such illustration and description are to be considered illustrative or exemplary only, and not restrictive. The invention is not limited to the disclosed embodiments. The drawings are schematic, wherein details that are not required for understanding the invention may have been omitted, and not necessarily to scale.

Variations to the disclosed embodiments can be understood and effected by a person skilled in the art in practicing the claimed invention, from a study of the figures, the description and the attached claims. In the claims, the word “comprising” does not exclude other steps or elements, and the indefinite article “a” or “an” does not exclude a plurality. Any reference signs in the claims should not be construed as limiting the scope of the invention.

Elements and aspects discussed for or in relation with a particular embodiment may be suitably combined with elements and aspects of other embodiments, unless explicitly stated otherwise. Thus, the mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

The term “comprise” as used in this text will be understood by a person skilled in the art as covering the term “consist of”. Hence, the term “comprise” may in respect of an embodiment mean “consist of”, but may in another embodiment mean “contain/include at least the defined species and optionally one or more other species”.

The invention can be summarized as follows. In a strap-buckle assembly 1, 3 for arranging and holding at an appropriate position on a user's body an electronic device 101 including at least one sensor for sensing a body-related parameter, the buckle 20 comprises at least two prongs 22, 23, 24 and the strap 10 is provided with a pattern 11 of holes comprising 5 groups 16 of at least two prong receiving holes 15. Each of the groups 16 has a different positioning on the strap 10 in a longitudinal direction for defining different engagement positions of the buckle 20 on the strap 10 in the longitudinal direction. The prong receiving holes 15 of adjacent groups 16 have a different positioning on the strap 10 in a transversal direction, wherein a transversal positioning of the at least two prongs 22, 23, 24 in the buckle 10 20 is adjustable.

CLAIMS:

1. Assembly (1, 3) of a strap (10) and a buckle (20), for arranging and holding at an appropriate position on a user's body an electronic device (101) including at least one sensor for sensing a body-related parameter, the strap (10) being suitable to be arranged around a body part (102), the buckle (20) being connected to the strap (10), and the buckle
- 5 (20) being adapted to engage with the strap (10) at one of a number of appropriate engagement positions on the strap for realizing a releasable loop shape of the strap (10),
- wherein the strap (10) is provided with a pattern (11) of holes (15, 17),
 - wherein the buckle (20) comprises at least two prongs (22, 23, 24),
 - wherein the pattern (11) of holes (15, 17) of the strap (10) comprises groups
- 10 (16) of at least two prong receiving holes (15), each of the groups (16) of prong receiving holes (15) being adapted to receive the at least two prongs (22, 23, 24) of the buckle (20), and each of the groups (16) of prong receiving holes (15) having a different positioning on the strap (10) in a longitudinal direction for defining different engagement positions of the buckle (20) on the strap (10) in the longitudinal direction,
- 15 - wherein the prong receiving holes (15) of adjacent groups (16) of prong receiving holes (15) have a different positioning on the strap (10) in a transversal direction, and
- wherein the at least two prongs (22, 23, 24) are movably arranged in the buckle (20), allowing for adjustment of a positioning of the prongs (22, 23, 24) in the
- 20 transversal direction.
2. Assembly (1, 3) according to claim 1, wherein the buckle (20) comprises a prong carrier shaft (25) extending in the transversal direction, and wherein the at least two prongs (22, 23, 24) of the buckle (20) are slidably and rotatably arranged on the prong carrier
- 25 shaft (25).
3. Assembly (1, 3) according to claim 2, wherein the buckle (20) is connected to the strap (10) through the prong carrier shaft (25).

4. Assembly (1, 3) according to claim 2 or 3, wherein the at least two prongs (22, 23, 24) of the buckle (20) are arranged on a common bridge part (28) which is slidably and rotatably coupled to the prong carrier shaft (25).

5 5. Assembly (1, 3) according to any of claims 1-4, wherein the at least two prongs (22, 23, 24) of the buckle (20) are jointly movable in the buckle (20).

6. Assembly (1, 3) according to any of claims 1-3, wherein the at least two prongs (22, 23, 24) of the buckle (20) are individually movable in the buckle (20).

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7. Assembly (1, 3) according to any of claims 1-6, wherein the pattern (11) of holes (15, 17) of the strap (10) comprises at least two types of groups (16) of prong receiving holes (15) at different transversal positions on the strap (10), the groups (16) of prong receiving holes (15) of the at least two types being provided on the strap (10) in an alternating fashion in the longitudinal direction.

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8. Assembly (1, 3) according to any of claims 1-7, wherein the groups (16) of prong receiving holes (15) are the same as far as the mutual positioning of the prong receiving holes (15) in the group (16) is concerned and only differ as far as the positioning of the prong receiving holes (15) in the transversal direction is concerned.

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9. Assembly (1, 3) according to any of claims 1-8, wherein the prong receiving holes (15) of each of the groups (16) of prong receiving holes (15) are arranged in a row extending in the transversal direction.

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10. Assembly (1, 3) according to any of claims 1-9, wherein the groups (16) of prong receiving holes (15) are arranged at a regular mutual distance in the longitudinal direction.

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11. Assembly (1, 3) according to any of claims 1-10, wherein a distance in the longitudinal direction between adjacent groups (16) of prong receiving holes (15) is at most 4 mm, preferably at most 3 mm, more preferably at most 2 mm.

12. Assembly (1, 3) according to any of claims 1-11, wherein the strap (10) is made of an elastomer material.

13. Assembly (1, 3) according to any of claims 1-12, wherein the pattern (11) of holes (15, 17) of the strap (10) comprises other holes (17) besides the prong receiving holes (15), the other holes (17) serving another purpose than the prong receiving holes (15), optionally an aeration purpose and/or a decoration purpose and/or a strap flexibility enhancing purpose.

10 14. Healthcare appliance (100), comprising an electronic device (101) including at least one sensor for sensing a body-related parameter, and an assembly (1, 3) of a strap (10) and a buckle (20) according to any of claims 1-13, for arranging and holding the electronic device (101) at an appropriate position on a user's body, wherein the electronic device (101) is arranged on the strap (10) or integrated in the strap (10).

15

15. Healthcare appliance (100) according to claim 14, wherein the at least one sensor of the electronic device (101) is a biomedical sensor, optionally a heart rate sensor or a glucose sensor.

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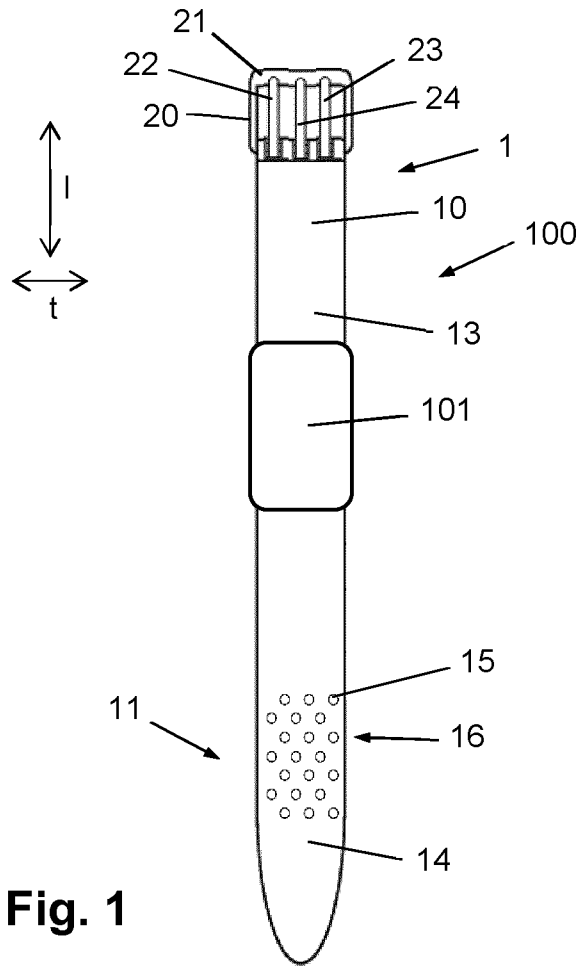


Fig. 1

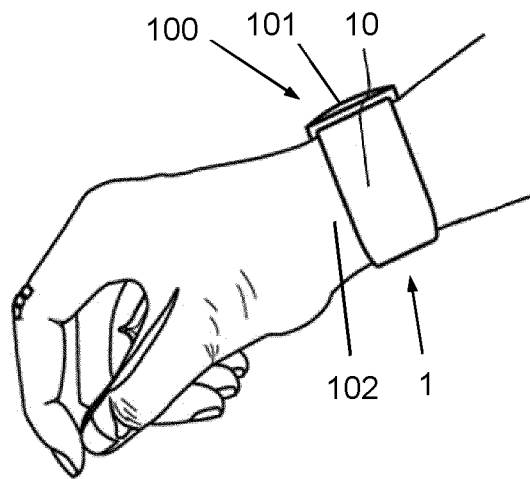


Fig. 2

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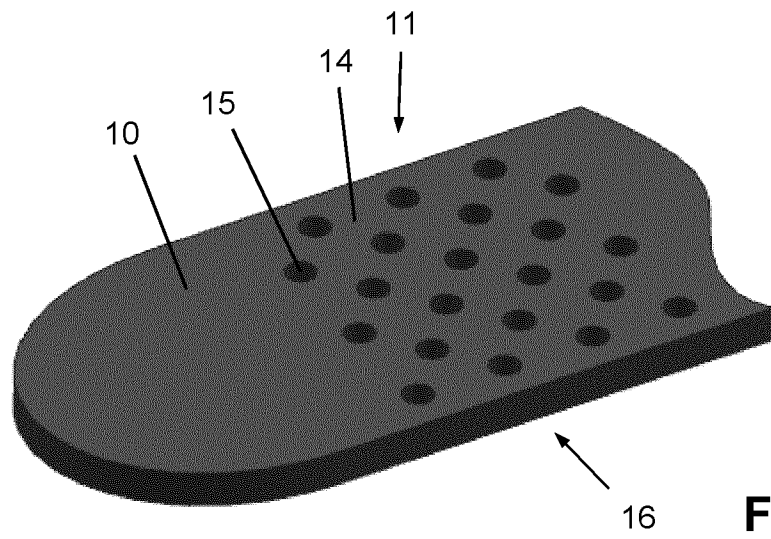


Fig. 3

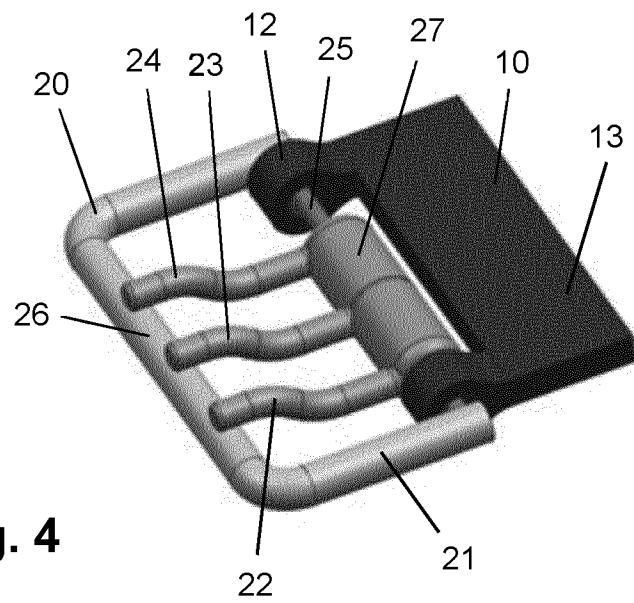


Fig. 4

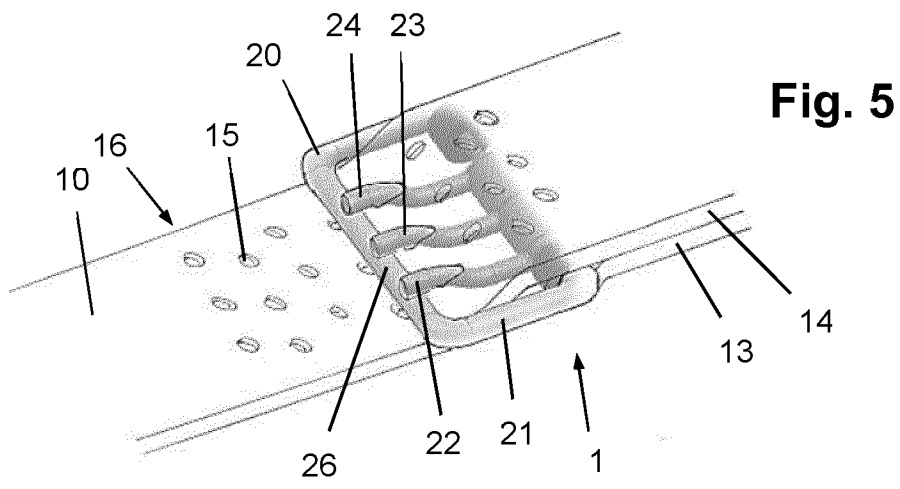


Fig. 5

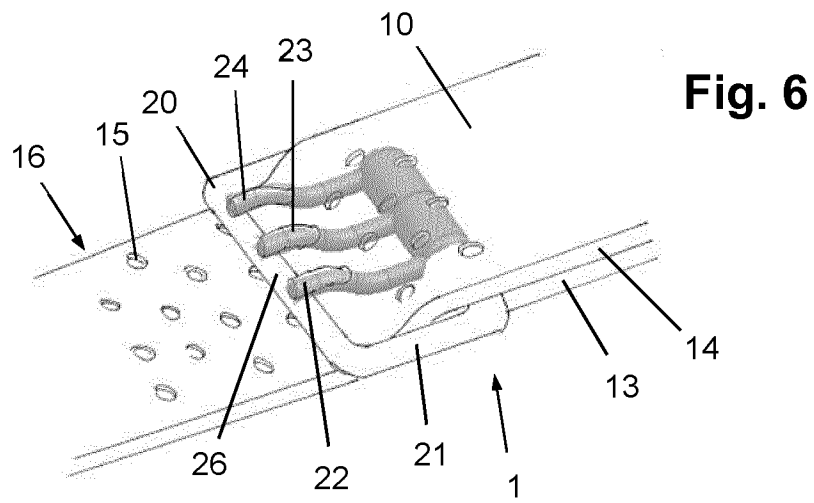


Fig. 6

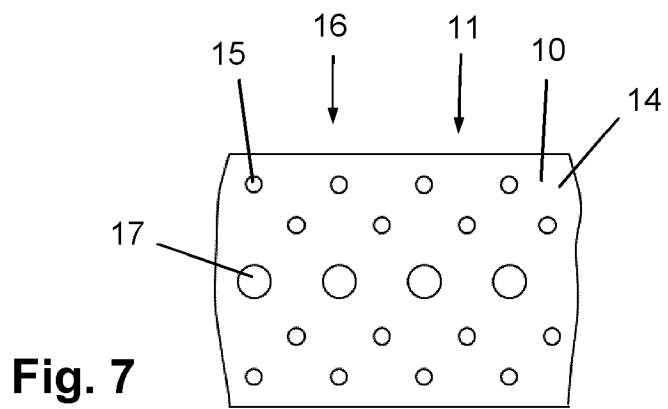


Fig. 7

Fig. 8

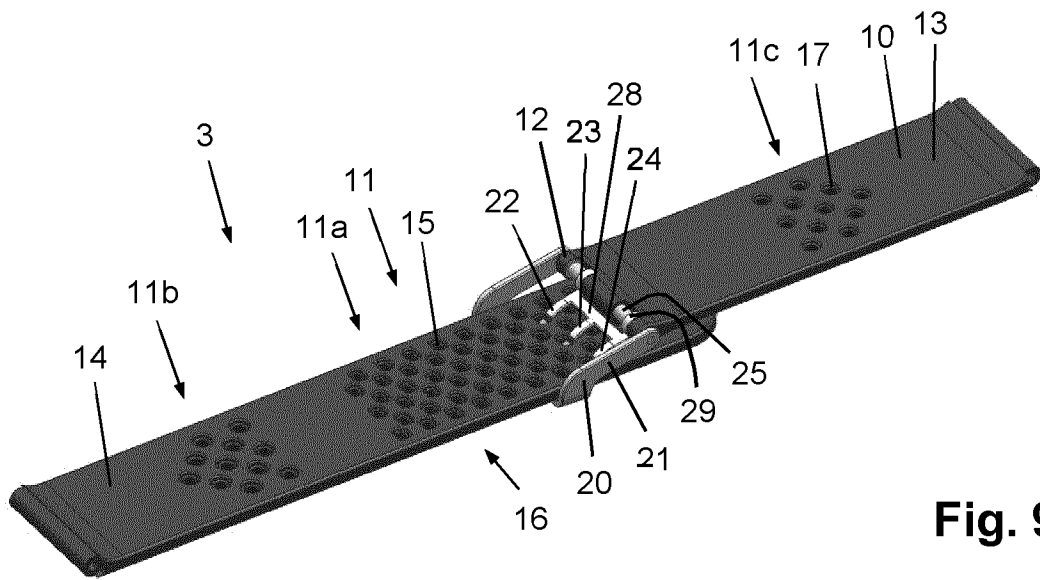
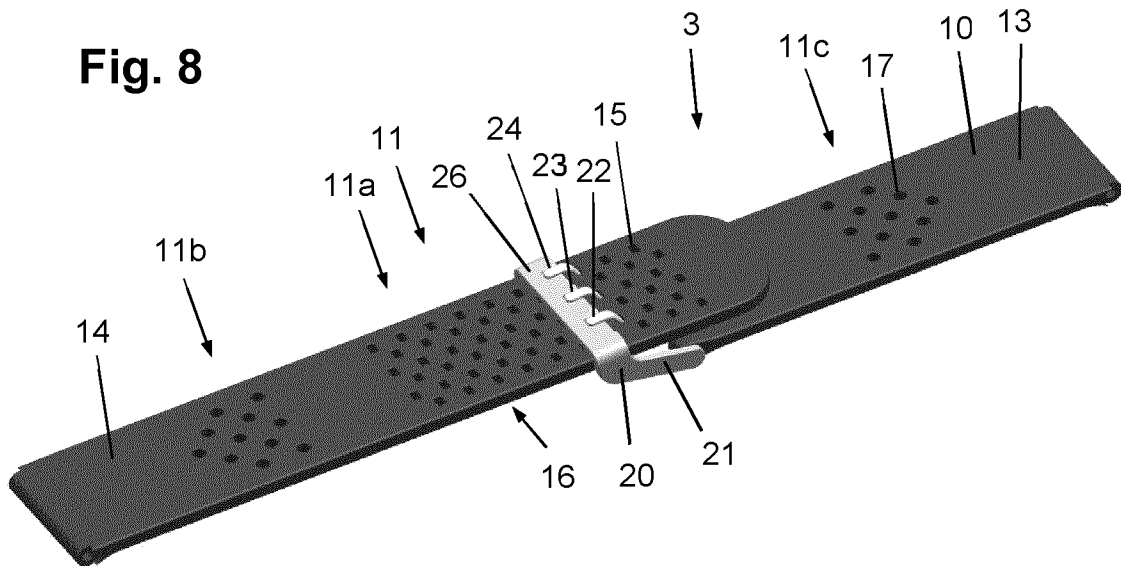


Fig. 9

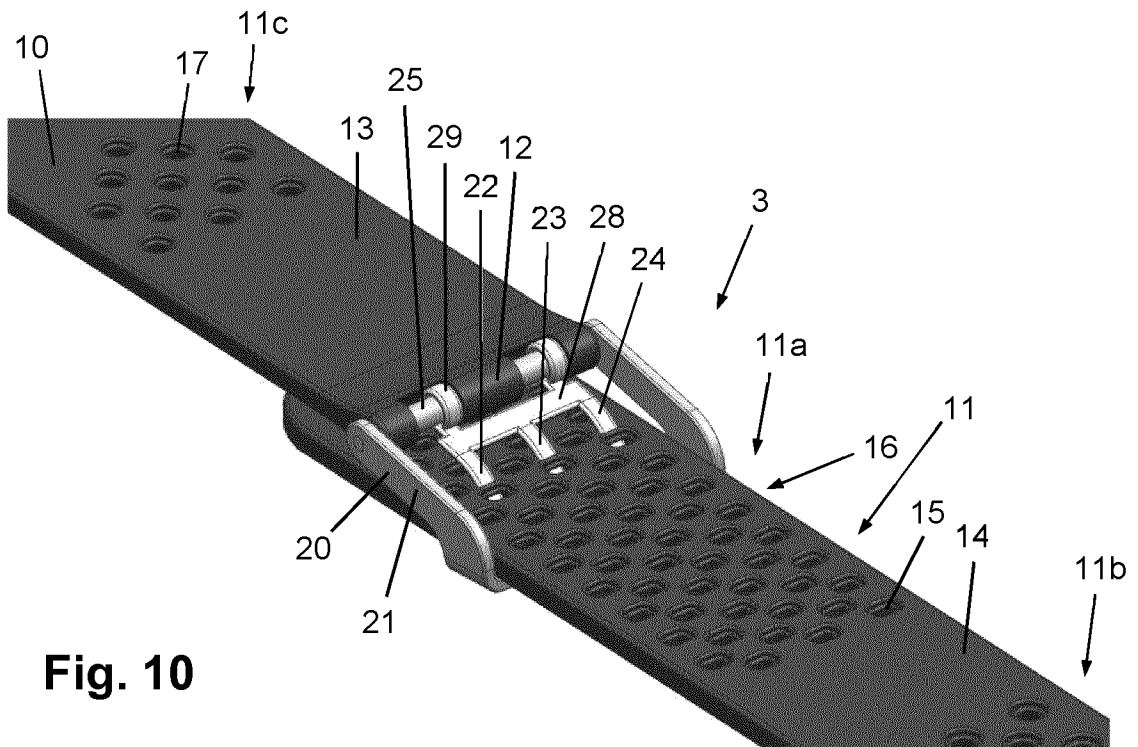


Fig. 10

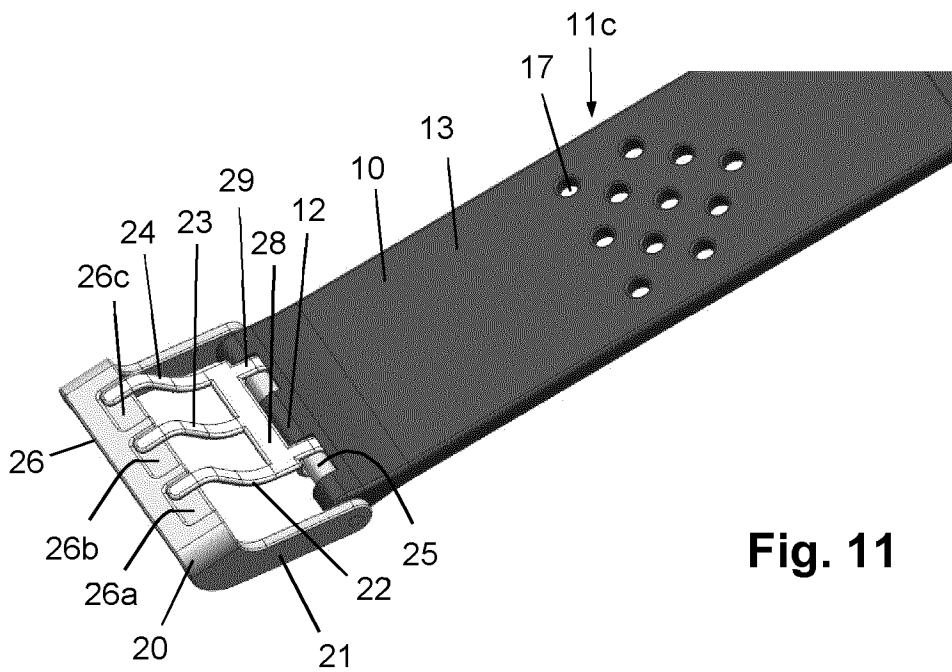


Fig. 11

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/050096

A. CLASSIFICATION OF SUBJECT MATTER
 INV. A61B5/00 A44B11/24
 ADD.
 According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
 Minimum documentation searched (classification system followed by classification symbols)
 A61B A44B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 EPO-Internal, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US D 726 056 S1 (RIDDIFORD MARTIN [GB] ET AL) 7 April 2015 (2015-04-07) the whole document	1-15
Y	JP 2011 190559 A (HASHIMOTO YUKI; HANASAKA KENICHI; TANAKA YUYA; NAKA HISAE) 29 September 2011 (2011-09-29) abstract; figures 1-4	1-15
A	US 2015/272458 A1 (MAGNIEZ CLEMENT ALBERT ANNE [GB] ET AL) 1 October 2015 (2015-10-01) the whole document	1-15
A	FR 1 538 591 A (AUCHERE) 6 September 1968 (1968-09-06) the whole document	1-15

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search 22 March 2017	Date of mailing of the international search report 30/03/2017
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Abraham, Volkhard
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/EP2017/050096

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