Abstract Title: Stretchable identity band

A Band 10 comprises a first protective portion 12 housing an electronic tag (16, fig 2) and a second portion 14 forming a band to be worn by a person. The tag (16) is preferably a RFID tag and the band is made of a stretchable so that it may be placed on the wrist of a user without requiring a buckle or clasp, the band material may be an elastomeric material such as silicon rubber and the protective portion may be made of metal or nylon.

Fig. 3
**Stretchable Band**

**Field of the Invention**
The present invention relates to a band, preferably an identity band, in which electronic circuitry such as a chip or tag is installed.

**Background**
Silicone rubber wristbands have in recent years been used by charities, good causes and in relation to promotional events. Those kinds of bands are cheap to mass produce, and because of their ability to stretch, are convenient to put on and take off and are comfortable to wear.

It has recently become desirable to form silicone wristbands or the like having electronic chips or tags permanently installed therein. However, electronic devices are particularly susceptible to damage from forces produced through stretching.

**Summary of the invention**
According to one aspect of the present invention, there is provided a band, preferably suitable for wearing by a person, the band comprising a first, protective portion including an electronic device and a second portion.

The second portion is preferably stretchable and the first, protective portion is preferably less stretchable than the second portion. Preferably the first, protective portion does not readily stretch or deform.

Thereby, even when the band is stretched, for example when it is stretched to be put over the hand of a user to wear on his/her wrist, only the second portion stretches to a substantial extent and thus any forces due to stretching exerted on the electronic device in the first portion are low.

The second portion is preferably sufficiently stretchable and resilient to be stretched over the wrist, or other part, of a user, to return towards its original shape and to be held in place on the wrist or other part of the user by tension, without requiring a clasp, buckle or other dedicated attachment device.
The first and second portions are preferably formed of different materials. The different materials are preferably selected to provide at least one of a desired stretchability, resilience and hardness for each of the first and second portions. The electronic device is preferably embedded in the material of the first portion.

The first and/or second portions of the band may be formed of an elastomer material such as rubber, in particular silicone rubber. The material may be vulcanizable rubber, non-vulcanizable rubber or various other types of elastomers. Examples of these materials are Synthetic Polyisoprene, Butyl Rubber, Polybutadiene, Styrene-butadiene, Nitrile rubber, Hydrogenated Nitrile Rubbers, Chloroprene Rubber, EPM (ethylene propylene rubber, a copolymer of ethylene and propylene) and EPDM rubber (ethylene propylene diene rubber, a terpolymer of ethylene, propylene and a diene-component), Epichlorohydrin rubber (ECO), Polyacrylic rubber (ACM, ABR), Silicone rubber (SI, Q, VMQ), Fluorosilicone Rubber (FVMQ), Fluoroelastomers (FKM, and FEPM), Perfluoroelastomers (FFKM), Polyether Block Amides (PEBA), Chlorosulfonated Polyethylene (CSM), Ethylene-vinyl acetate (EVA), Thermoplastic elastomers (TPE), Thermoplastic Vulcanizates (TPV), Thermoplastic Polyurethane (TPU), Thermoplastic Olefin (TPO), the proteins resilin and elastin and Polysulfide Rubber.

In addition to the protection provided to the electronic device by the protective portion, in the preferred embodiment a tightly knit piece of nylon, or other material, is included that does not stretch in any direction and covers the electronic device. The piece of nylon, or other material, is very thin, for example less than half a millimetre, and as immobile as possible without disrupting operation of the electronic device.

The first portion may comprise a metal frame surrounding the electronic device in order to protect the electronic device from forces, which are produced when the band is stretched. In that case the first and second portions may be formed of the same material. The metal frame is preferably an open frame that does not prevent radio, microwave or other electromagnetic communication with the electronic device.

Preferably the first, protective portion occupies a first region around the circumference of the band, and the second portion occupies a second region around the circumference of the band. The first and second portions may be substantially non-overlapping in a radial direction. Alternatively the first portion may be embedded within at least part of the second portion.
The electronic device may be an electronic tag, such as an RFID tag. The electronic
device preferably comprises a device identifier and the band may be useable as an
identity device. The electronic device preferably comprises an antenna and
communication circuitry. Preferably the electronic device does not comprise or
connect to a battery. The electronic device may operate using parasitic power.

Most commonly the band may be suitable for wearing around a user’s wrist, but
alternatively the band may suitable for wearing around one or more of the user’s
ankle, neck, finger or head or other part of the body.

According to a second aspect of the invention, there is provided a process for
forming bands as disclosed herein.

The process preferably involves preparing a mould, arranging a silicone rubber
material in the mould, arranging an electronic device in a portion of the mould,
performing heat and/or pressure treatment on the rubber to form a band, and
allowing the formed band to cool and removing it from the mould.

Any feature in one aspect of the invention may be applied to other aspects of the
invention, in any appropriate combination. In particular, apparatus features may be
applied to method features and vice versa.

**Brief description of the drawings**

Various aspects of the invention will now be described by way of example only and
with reference to the embodiments shown in the accompanying drawings in which:-
Figure 1 is a perspective view of a band;
Figure 2 is a cross sectional view of a portion of the band of Figure 1; and
Figure 3 illustrates a stretched state of the band of Figure 1.

**Detailed description**

Figure 1 is a perspective view of a band of the present invention. The band 10 has
a stretch portion 14 and a protective portion 12. The band 10 is suitable for wearing
on, for example, a user’s wrist and has a circumference of approximately 200mm, a
width of approximately 15mm and a thickness of approximately 3.5mm. The
protective portion 12 has a length of approximately 30mm (indicated by an arrow on
Figure 1 and 2), and consequently the stretch portion 14 has a length of
approximately 170mm when in a natural non-stretched state. In this case, the stretch portion 14 and the protective portion 12 are both formed of silicone rubber. However, the compositions of the materials used to form the stretch portion 14 and the protective portion 12 are different. The stretch portion 14 is formed of a composition that when set will stretch analogous to a standard silicone wristband. The protective portion 12 is formed of a silicone composition that when set does not readily stretch or deform. The two portions are fused together during the manufacture process and are formed to have the same width and thickness. In the preferred embodiment, the protective portion 12 is a reinforced portion.

Figure 2 is a cross sectional view of the protective portion 12 along the circumferential length of the band 10 of Figure 1. An RFID tag 16 including its antenna is encased inside the protective portion 12 during the manufacture process. The RFID is communicable with RFID readers outside of the wristband. In the current example the RFID is formed according to ISO 14443 A, however other kinds of RFID tags may be used.

The biggest threat to an electronic unit if it were to be embedded in a conventional silicone rubber band is the wear and tear on the electronic unit because of the stretching movement every time a user puts the band on and takes it off.

Figure 3 shows the effect on the band 10 when stretched. In Figure 3 two states are shown: (i) the band 10 in a normal unstretched state, and (ii) when the band 10 is stretched, for example, to allow a user to pass his or her hand through so that the band 10 can be worn on the wrist. It is apparent from the figure that length of the stretch portion 14 increases significantly when a force is applied to the band 10. However, the protective portion 12, which is formed of a non-readily deformable silicone, does not stretch or deform due to the same force. Thus, the likelihood of damage being sustained due to stretching forces of the rubber silicone band 10 to the RFID tag 16 inside of the protective portion 12 is greatly reduced because large amounts of stretching or deforming of the protective portion 12 do not occur.

In the preferred embodiment, the materials chosen for the two portions 12 and 14 are able to fuse to each other during the manufacturing process to leave no obvious signs or join marks.
In addition to the protection provided to the RFID tag 16 by the protective portion 12, in the preferred embodiment a very tightly knit small piece of nylon is included that does not stretch in any direction and covers both the RFID tag 16 and antenna. The nylon piece is very thin, for example less than half a millimetre, and very tightly knit to be as immobile as possible without disrupting radio signals.

In an alternative embodiment, the protective portion 12 comprises a metal frame around the electronic device, that protects the electronic device from forces arising from stretching of the band. In this case, as the protection is provided by the metal frame, the two portions 12 and 14 may be formed of the same material. If desired the two portions 12 and 14 may be formed of different materials as described above in addition to the usage of the metal frame.

Through use of the band 10 of the present invention, an electronic device such as a RFID tag can be carried by a user in a convenient and user friendly fashion while ensuring that the likelihood of damage to the electronic device is minimized.

A manufacturing process for forming devices like that shown in Figure 1-3 is described below.

Firstly, a mould is prepared. The mould is in the shape of a band. Any suitable size, shape and form of the mould may be used, dependent on the desired size, shape and form of the band to be produced.

The mould is filled with a silicone rubber composition. It is important to note that two differing compositions of silicone rubber are employed in the preferred embodiment and they are usually arranged in distinct sections of the mould. A first section is filled with a composition of silicone rubber that when the moulding process has been completed will be stretchable. The first section is generally the larger of the two sections. A second section, which is generally the smaller of the two sections, is filled with a composition of silicone rubber that when the moulding process has been completed will allow a lesser amount of stretching or other deformation.

The rubber compositions are selected from any suitable composition of rubber. The band may be formed of vulcanizable rubber, non-vulcanizable rubber or various other types of elastomers. Examples of these materials are Synthetic Polyisoprene, Butyl Rubber, Ploybutadiene, Styrene-butadiene, Nitrile rubber, Hydrogenated Nitrile
Rubbers, Chloroprene Rubber, EPM (ethylene propylene rubber, a copolymer of ethylene and propylene) and EPDM rubber (ethylene propylene diene rubber, a terpolymer of ethylene, propylene and a diene-component), Epichlorohydrin rubber (ECO), Polyacrylic rubber (ACM, ABR), Silicone rubber (SI, Q, VMQ), Fluorosilicone Rubber (FVMQ), Fluoroelastomers (FKM, and FEPM), Perfluoroelastomers (FFKM), Polyether Block Amides (PEBA), Chlorosulfonated Polyethylene (CSM), Ethylene-vinyl acetate (EVA), Thermoplastic elastomers (TPE), Thermoplastic Vulcanizates (TPV), Thermoplastic Polyurethane (TPU), Thermoplastic Olefins (TPO), the proteins resilin and elastin and Polysulfide Rubber.

An RFID tag is inserted into the second section so that it is completely covered by the silicone rubber composition.

The mould is sealed and heat treatment is applied thereto, allowing the first and second sections fuse together. The silicone rubber is then allowed to set. Usually the two compositions of silicone rubber are selected to have similar moulding requirements such as moulding temperature and setting time, and to be fusible.

The moulded band is extracted from the mould and allowed to cool.

It will be understood that the invention has been described above purely by way of example, and modifications of detail can be made within the scope of the invention.

Each feature disclosed in the description, and (where appropriate) the drawings may be provided independently or in any appropriate combination.
CLAIMS

1. A band comprising a first, protective portion including an electronic device and a second portion.

2. A band according to Claim 1, suitable for wearing by a person.

3. A band according to Claim 1 or 2, wherein the electronic device is an electronic tag.

4. A band according to Claim 3, wherein the electronic tag is an RFID tag.

5. A band according to any preceding claim, wherein the electronic device comprises a device identifier.

6. A band according to any preceding claim, wherein the band is useable as an identity device.

7. A band according to any preceding claim, wherein the second portion is stretchable and the first, protective portion is less stretchable than the second portion.

8. A band according to any preceding claim, wherein the first, protective portion does not readily stretch or deform.

9. A band according to any preceding claim, wherein the second portion is sufficiently stretchable and resilient to be stretched over the wrist, or other part, of a user, to return towards its original shape and to be held in place on the wrist or other part of the user by tension, without requiring a clasp, buckle or other dedicated attachment device.

10. A band according to any preceding claim, wherein the first and second portions are formed of different materials.

11. A band according to any preceding claim, wherein the electronic device is embedded in the material of the first portion.
12. A band according to any preceding claim, wherein the first and/or second portion of the band is formed of an elastomer material.

13. A band according to Claim 12, wherein the elastomer material comprises rubber.

14. A band according to Claim 12 or 13, wherein the elastomer material comprises silicone rubber.

15. A band according to any preceding claim, further comprising a tightly knit piece of nylon, or other material, that does not stretch and covers the electronic device.

16. A band according to any preceding claim, further comprising a metal frame surrounding the electronic device.

17. A band according to Claim 16, wherein the metal frame is an open frame.

18. A band according to any preceding claim, wherein the first, protective portion occupies a first region around the circumference of the band, and the second portion occupies a second region around the circumference of the band.

19. A band according to any preceding claim, wherein the first and second portions are substantially non-overlapping in a radial direction.

20. A band according to any of Claims 1 to 18, wherein the first portion is embedded within at least part of the second portion.

21. A band according to any preceding claim, wherein the electronic device comprises an antenna and communication circuitry.

22. A band according to any preceding claim, wherein the electronic device does not comprise or connect to a battery.

23. A band according to any preceding claim, wherein the electronic device operates using parasitic power.
24. A band according to any preceding claim, suitable for wearing around a user's wrist or around at least one of a user's wrist, ankle, neck, finger or head.

25. A process for forming a band according to any of Claims 1 to 24.

26. A process according to Claim 25, comprising preparing a mould, arranging a silicone rubber material in the mould, arranging an electronic device in a portion of the mould, performing heat and/or pressure treatment on the rubber to form a band, and allowing the formed band to cool and removing it from the mould.
Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

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<tr>
<th>Category</th>
<th>Relevant to claims</th>
<th>Identity of document and passage or figure of particular relevance</th>
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<td>X</td>
<td>1-6, 10, 11, 21-25</td>
<td>GB 2442809 A (RF21D LTD) See whole document.</td>
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<tr>
<td>X</td>
<td>1-6, 8, 10, 11, 15, 18, 21-25</td>
<td>WO 2005/057238 A2 (PREC DYNAMICS) See whole document.</td>
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<tr>
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<td>GB 2398454 A (PAXTON ACCESS) See whole document.</td>
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<td>&quot;SYNOTAG&quot; range of RFID wristbands [online] available from <a href="http://www.synometrix.com/china_taiwan_rfid_bracelets.shtml">http://www.synometrix.com/china_taiwan_rfid_bracelets.shtml</a> (the way back machine has a version of this page dated 28 march 2007)</td>
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P  Document published on or after the declared priority date but before the filing date of this invention.
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Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC:

Worldwide search of patent documents classified in the following areas of the IPC
A44C: G09F

The following online and other databases have been used in the preparation of this search report
EPODOC, WPI, Internet

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