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(71) Applicant *(for all designated States except US)*: IDESCO OY [FI/FI]; Teknologiantie 8, FIN-90570 Oulu (FI).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: ELSILÄ, Martti [FI/FI]; Mataratie 18 D 3, FIN-90580 Oulu (FI). KOIVUSAARI, Seppo [FI/FI]; Postimestarintie 18 A 4, FIN-90160 Oulu (FI). PÄÄKKÖ, Jari [FI/FI]; Hanhikkitie 2 H 1, FIN-90580 Oulu (FI). KALLIOMÄKI, Kalevi [FI/FI]; Kylmäniementie 2, FIN-90540 Oulu (FI). TOPPI, Juha [FI/FI]; Rantakuovintie 2 D, FIN-90540 Oulu (FI).

(74) Agent: TEKNOPOLIS KOLSTER OY; Oy Kolster Ab, Iso Roobertinkatu 23, P.O. Box 148, FIN-00121 Helsinki (FI).

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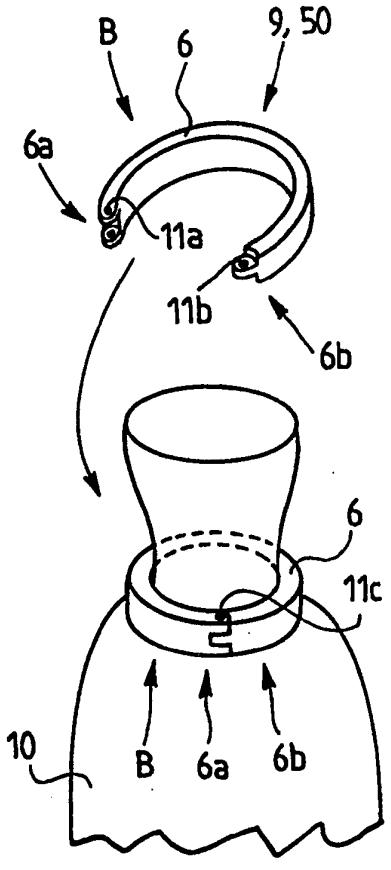
(57) Abstract

The present invention relates to a remote-readable transponder arrangement, which is located in connection with the object (10) that one wants to identify and which can be identified by a separate reading device by means of mutual induction. The transponder arrangement comprises a transponder section (7), which comprises a transceiver unit (3) and a coupling means (4) connected to the transceiver unit; the transponder arrangement further comprising a means (8) which increases the reading area and which is inductively connected to the coupling means; and furthermore, a support structure (6) for the transponder section (7) and for the means (8) for increasing the reading area, which means for increasing the reading area has been arranged in the support structure so as to run along the support structure. The transponder arrangement (B) comprises means (9, 19, 29, 20) for placing the circular support structure (6) provided with the means (8) which increases the reading area on an object in such a manner that this support structure is open, and means (11a-11b, 20) for closing the circular support structure (6) after it has been mounted on the object.



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Remote-readable transponder arrangement

The present invention relates to a remote-readable transponder arrangement, which is located in connection with the object that one wants to identify and which can be identified by a separate reading device by means of mutual induction, said transponder arrangement comprising a transponder section, which consists of a transceiver unit and a coupling means connected to the transceiver unit; the transponder arrangement further comprising a means which increases the reading area and which is inductively connected to the coupling means; and furthermore, a support structure for the transponder section and for the means for increasing the reading area, which means for increasing the reading area has been arranged in the support structure so as to run along the support structure.

The present remote-readable transponder arrangement can be used for identifying moving or immobile things or objects such as gas bottles or similar objects. In the present invention as well as in previously known solutions, a wireless inductive transponder, i.e. a so-called escort memory is used, this transponder being attached to the object to be identified. The transponder arrangement, i.e. the escort memory, comprises a transponder section consisting of a microcircuit and auxiliary components, and a coupling means connected to this transponder section, this coupling means acting as an antenna. The microcircuit of the transponder arrangement, i.e. of the escort memory, may be a programmable "read/write"-type microcircuit or a "read only"-type fixed-code microcircuit, in which case the transponder arrangement is called for instance a code carrier. The term "transponder" comprises both the escort memory and the

code carrier. The actual transponder does not normally comprise a voltage source in order to operate but the transmitter section of the transponder obtains the energy it needs from an inductive interrogation pulse transmitted by the transmitter section of a separate reading device.

At the present time, a marking method where a transponder is placed at the highest point of the cast metal guard protecting the valve of a gas bottle is used in marking gas bottles by a remote-readable escort memory, for instance. In another marking method, a transponder is placed in connection with an unbroken plastic ring, which is placed on the neck of a gas bottle. The disadvantage of these known solutions is that the transponder must always be read from a certain direction, which is determined by the location of the transponder for instance in a ring around the neck of a gas bottle. The problem is especially apparent in metal objects, in which the metal object impedes the inductive reading of the transponder.

In order to increase the reading area of a remote-readable transponder arrangement, it is conceivable to use a so-called flux transformer technique known from the applicant's own Finnish Patent Publication 903,205. In this technique, a means for increasing the reading area, i.e. a so-called flux transformer, is inductively connected to the coupling means of the transponder, said flux transformer comprising a primary coil and a secondary coil, the primary coil being placed physically very close to the coupling means of the transponder arrangement, and the other coil, i.e. the secondary coil, being placed in such a manner that it extends over a larger area, and at least partly into the magnetic field formed by the interrogation pulse of the reading device.

In addition to the reading area being restricted in the known solutions used for marking gas bottles, a significant disadvantage is that placing the unbroken ring provided with a transponder on the neck of a gas bottle is relatively difficult, because it is necessary to remove the guard protecting the valve of the gas bottle in order to be able to place the transponder ring.

A known solution used in connection with gas bottles is described in British Patent Publication 2,077,555. U.S. Patent 5,204,670 describes a transponder used in monitoring the moving of a person, this transponder comprising a conductive loop, which reacts to the breaking of the bracelet of the transponder. These solutions do not, however, comprise a means inductively connected to the coupling means of the transponder, such as a flux transformer coiling, which expands the reading area.

The object of the present invention is to provide a new type of remote-readable transponder arrangement, which avoids the problems associated with the known solutions.

This object is achieved with the remote-readable transponder arrangement of the invention, characterized in that the transponder arrangement comprises means for placing the circular support structure provided with the means which increases the reading area on an object in such a manner that this support structure is open, and means for closing the circular support structure after it has been mounted on the object.

Various advantages are achieved with the remote-readable transponder of the invention. Special advantages are achieved in connection with the marking of a metal object such as a gas bottle, where the

circular transponder arrangement, which is easy to be mounted as open, expands the reading area of the transponder, because the flux transformer structure located in the support structure places itself around the gas bottle in connection with mounting, thus expanding the reading area of the transponder around the metal object. That the transponder arrangement is easy to mount is the result of the fact that due to the open structure of the transponder arrangement, it is no longer necessary for instance to remove the guard of the valve of a gas bottle. To finish the mounting of the transponder arrangement, the support structure of the transponder arrangement is closed by the means comprised by the transponder arrangement either so as to form an entirely unbroken closed ring, or the support structure is closed at least so much that by reducing the openness of the support structure, the transponder arrangement remains reliably on the object.

In the following, the invention will be described in more detail with reference to the accompanying drawings, in which

Figure 1 shows a remote-readable transponder and its reading device as a simplified general view,

Figure 2 shows a first embodiment of the transponder arrangement as a general top view,

Figure 3 shows the mounting of the transponder arrangement according to Figure 2 on the neck of a gas bottle,

Figure 4 shows the positioning of the transponder section in the vicinity of a flux transformer,

Figure 5 shows a second embodiment of the transponder arrangement,

Figure 6 shows a third embodiment of the transponder arrangement,

Figure 7 shows a cross-section of the transponder arrangement,

Figure 8 shows a fourth embodiment of the transponder arrangement,

Figure 9 shows an encapsulated transponder arrangement formed as a closure pin.

Figure 1 shows a remote-readable transponder arrangement and its reading device as a simplified general view. With brief reference to Figure 1, the structure of the identification system is described. The identification system comprises a reading device A, which includes as a coupling means one or more antenna coils 1. Furthermore, the identification system comprises a remote-readable transponder arrangement B, which comprises a transponder section 2, which consists of a transceiver unit 3 implemented for instance by a microcircuit, and a coupling means 4 such as an antenna coil connected to the transceiver unit 3, and auxiliary components such as a capacitor. In order to increase the reading area, the transponder arrangement, i.e. the escort memory also comprises a means 5 which increases the reading area and which is inductively connected to the coupling means 4, this means 5 consisting for instance of a flux transformer, which comprises a primary coil 5a consisting of one or more turns and a secondary coil 5b. The remote reading of the transponder arrangement is based on the mutual induction between the coupling means 1 of the reading device A and the secondary coil 5b of the means 5 for increasing the reading area, as a result of which mutual induction the interrogation pulse of the reading device propagates in the flux transformer 5 to the primary coil 5a, and further via the coupling means 4 to the transponder section 2, the transceiver unit 3 of which responds for instance by an identification code stored in its

microcircuit after having received the interrogation pulse. The most essential aspect of this invention is not, however, related to actual transponder arrangements nor to reading devices and their structures, prior art being thus referred to as far as they are concerned.

Figures 2 and 3 are schematic views of an embodiment of the transponder arrangement B, this embodiment comprising a circular support structure 6, a transponder section 7, and a means 8 (reference numeral 5 in Figure 1) for increasing the reading area, such as a so-called flux transformer 8. The means 8 for increasing the reading area such as a flux transformer coil, and a transponder section 7 such as an encapsulated escort memory component are supported and located in connection with the support structure 6. The means 8 for increasing the reading area, such as a flux transformer coil 8 or some other conductor, is arranged in the support structure 6 so as to run along the suppport structure 6. The transponder section 7, i.e. the escort memory or code carrier in Figures 2 and 3 comprises components shown in Figure 1, i.e. the transceiver unit 3 and the coupling means 4, which are encapsulated so as to form a transponder section in their own housing, which can consist for instance of an epoxy-filled cup.

According to the invention, the support structure comprises means 9 for placing the circular support structure 6 provided with the means 8 which increases the reading area on an object 10, for instance around the neck of a gas bottle 10, in such a manner that this support structure is open; and means 11a - 11c for closing the circular support structure 6 after it has been mounted on the object. It should be pointed out in this connection that the closing of the support structure does not solely refer to the situation where

the support structure ring 6 is entirely closed but also to the embodiment in which the openness of the support structure 6 is reduced so much that the support structure secures the entire support structure unit to the object 10 such as a gas bottle, most preferably around the object 10 according to Figure 3.

The above-mentioned means 9 for placing the circular support structure 6 provided with the means 8 which increases the reading area on the object 10, in such a manner that this support structure is open, consist at their simplest of the flexible wall 9 of the support structure 6 according to Figures 1-3, this flexible wall enabling the support structure 6 to be opened by bending it so open that it can be placed on the object 10, for instance around the neck of a gas bottle. If the stress of the wall of the support structure against the gas bottle 10 is sufficient, the circle of the support structure may remain open to some extent, even if the best possible mounting result and the largest possible reading area (full 360 degrees) are achieved when, as shown in Figure 3, the support structure (and the means 8 for increasing the reading area, such as a flux transformer coil) is totally closed circumferentially for instance by the means 11a - 11b. Both the support structure 6 and the means 8 for increasing the reading area thus form an at least substantially closed ring, which is open in the middle and which can be opened at its circumference.

The means for mounting the transponder arrangement on the object in such a manner that the transponder arrangement is open, and the means for closing the circular support structure 6 after it has been mounted on the object can also be composed in such a manner that the means for mounting the transponder arrangement on the object as open consists of an open

space in the transponder arrangement ring, and the closing means consists of the stress of the wall of the support structure 6 at the point 9, and/or other closing means.

In Figure 3, the closing means 11a and 11b consist of the shaping of the free ends 6a and 6b of the support structure 6, the shaping comprising openings. The closing means 11c consists of an insert pin placed in the openings or recesses 11a, 11b, or other similar means by which the free ends of the support structure 6 can be connected.

With reference to Figure 3, in a preferred embodiment, the means 11c for closing the support structure 6 consists of the transponder section, i.e. the escort memory or code carrier, with its protective means such as an epoxy housing. It is placed between the free ends 6a and 6b of the support structure 6 so as to form a closing means, i.e. a type of closure pin. This embodiment provides a closing mechanism that is easy to manufacture. If the transponder section is integrated as a closing means 11c, there is naturally no further need for another transponder section 7.

Even if the transponder section, i.e. the transponder, would not necessarily act as a closing means like the part 11b in Figure 3, the means 8 for increasing the reading area, such as a flux transformer coil or other wire loop, is in any case connected first to the support structure 6 in the preferred embodiment shown in Figure 4, and the transponder arrangement is then formed as a working unit by mounting the transponder section 7, i.e. the transponder. This embodiment is particularly advantageous when the interconnection of the support structure 6 and the means 8 for increasing the reading area, for instance when the support structure is cast from plastic, is either a hot

step or otherwise such an operation as to its manufacturing technique that it might damage for instance the transponder 7 consisting of a microcircuit. In this preferred embodiment according to Figure 4, the transponder section can be mounted in an inductive connection with the means 8 for increasing the reading area by placing the transponder section 7 in the space 12 formed in the support structure 6 in the vicinity of the means 8 for increasing the reading area. It appears from Figure 4 that the means 8 for increasing the reading area, i.e. the flux transformer, comprises a primary coil 8a and a ferrite core 8c, around which the coil of the flux transformer, i.e. the conductor wire is partly wound. The rest of the flux transformer 8 forms the secondary coil according to Figure 1 (Figure 1, 5b), which runs along the support structure 6, thus forming a large circle, according to Figure 2. Correspondingly, the transponder 7 comprises a ferrite core 7a, around which the coupling means 4, i.e. the antenna coil, of the transponder is partly located, this coupling means being connected to the microcircuit 3, which is secured to the back surface of the ferrite 7a and which constitutes the transceiver unit 3 of the transponder. In the preferred embodiment according to Figure 4, the transponder 7, as retrofitted, secures the primary coil of the flux transformer 8 with its ferrite core to its place, thus making the flux transformer operative.

Figure 5 shows another embodiment of the transponder arrangement, in which the means 8 for increasing the reading area constitutes at least partly a means 19 for opening the support structure 6, i.e. a means 19 for placing the transponder arrangement as open on the object 10. The means 8 for increasing the reading area, such as a copper wire or other conductor, acts as

a bending point, thus enabling the support structure to be opened. In the embodiment of Figures 2- 6, the means 8 for increasing the reading area, i.e. for instance the coil of a flux transformer, is formed of a conductor wire such as a copper wire placed inside the support structure 6, the manufacturing costs thus remaining low. In the preferred embodiment of Figure 5, the bending points 19 resembling springs or hinges are formed in the means 8 for increasing the reading area, i.e. in the conductor wire of the flux transformer coil, these bending points enabling the support structure 6 to be opened in an easier manner. Generally speaking, the means 19 for opening the support structure, i.e. the means 19 for placing the support structure 6 as open on the object, such as the bending points 19, preferably at least partly consist of flexible points of the means 8 for increasing the reading area, these points consisting at their simplest of the conductor section of the means 8 for increasing the reading area, for instance of a flux transformer coil. The bending points 19 are located in the area between successive support structure parts 16 and 26 comprised by the support structure 6, the means 8 thus acting as the connector of the parts 16 and 26 of the support structure 6 apart from increasing the reading area and enabling the support structure to be opened. In Figure 5, the means for closing the support structure consist of similar means as in Figure 2, i.e. for instance of the locking means 11c, which connects the free ends 6a and 6b of the support structure.

To Figure 5 is also added the preferred embodiment in which the means for opening the support structure 6 at least partly consists of a bending point 29, which is formed in the support structure and which is located between the successive support structure

parts 16 and 26 of the support structure 6, this bending point being for instance a hinge means or similar. For instance, the hinge-like bending point 29 reduces the wearing of the means 8 for increasing the reading area at the folding point.

Figure 6 shows a third embodiment of the transponder arrangement, in which the means 20 for opening/closing the support structure 6 consists of a separate piece 20 to be mounted in the support structure 6, which piece in an embodiment comprises the transponder section 7 and the breadth of which is at least 75% of the inner diameter D of the support structure. The support structure can thus be sufficiently opened by means of a structurally easy solution. Figure 6 shows joint surfaces 21 and 22 between the larger part 6 of the support structure and the separate piece 20, the separate piece 20 being supported and secured to the larger part 6 of the support structure at these joint surfaces. Securing may be carried out for instance by securing means, which can be for instance screws, bolts, or for instance locking shapes, which are provided at the joint surfaces 21 and 22. In a preferred embodiment, for instance according to Figure 6, the means 20 for closing the support structure 6 is formed in such a manner that it seals the transponder arrangement in connection with the object 10 such as a gas bottle. The sealing structure can be provided for instance at the joint surfaces 21 and 22. This embodiment improves the reliability of the use of identification systems, and the security of the objects such as gas bottles 10 that one wants to identify, because it is not possible to remove the transponder arrangement from the object without breaking the transponder arrangement. Sealing can also be carried out with the structures 11a - 11c, 6a and 6b.

It is apparent from Figure 6 that in the preferred embodiment, the means 20 for closing the support structure consists of a separate piece 20, which is mounted on the support structure and which comprises at least 20% of the means by which the reading area is increased, i.e. 20% for instance of the copper wire coil by which the reading area is increased around the object on the support structure 6. In Figure 6, the part comprised by the piece 20 of the entire conductor 8, i.e. of the means for increasing the reading area, is denoted by reference numeral 28. In principle, at least a fifth of the support structure 6 is thus opened when the piece 20 is removed. In the embodiment of Figure 6, the support structure consists of the pieces 6 and 20, which are connected to each other at the joint areas 21 and 22. The means for increasing the reading area, for instance a conductor coil, consists of the parts 8 and 28, which are connected to each other at junction points 31 and 32.

As distinct from Figure 6, the smaller separate part of the support structure, such as the part 20, can be such that it only comprises the means for increasing the reading area, in practice a part of it, the larger part of the support structure thus comprising the transponder 7 (an inductively readable transponder) and most of the means 8, which increases the reading area. It should be noticed here that it is mainly a matter of terminology which part is referred to as a separate part. The separate part 20 may comprise either the transponder 7 and part of the means (reference numeral 28) which increases the reading area, or, the separate part may only comprise the means, in practice part of the means, by which the reading area is increased, the transponder being thus placed in the other part of the support structure. The above-mentioned alternatives are

good because it is necessary in them to cut the means 8 for increasing the reading area, such as a conductor coil, at one point only, i.e. at the joint surface 22 at the junction points 31 and 32. As is apparent for instance from Figure 6, it is not necessary to cut the conductor 8 at the junction surface 21, because it does not extend over the joint surface 21.

In a preferred embodiment, with reference to Figures 2 and 5 in particular, the means for opening the support structure, such as the flexible part 9 in the support structure, the bending point 19 in the means for increasing the reading area, or the hinge means 29, forms a point 50 in the structure, from which point the first part 80 of the means 8 for increasing the reading area extends in the support structure towards one end 6a of the support structure, most preferably towards the transponder section 7 and the increasing part 81 located there; and from which point 50, 9, 19, 29 the second part 81 of the means 8 for increasing the reading area extends in the support structure towards the other end 6b of the support structure, and at the same time towards the first part 80 of the means 8 for increasing the reading area.

The structure corresponds to the above-mentioned one also in the case of Figure 6, in which the junction point 22 of the two separate parts 6 and 20 of the support structure forms a point 50, from which the parts 8 and 28 of the means for increasing the reading area extend in opposite directions in such a manner that the part 28 extends through the part 20 towards the joint surface 21 and the transponder 7, which is most preferably located in that direction, and the part 8 also extends towards the joint surface 21, but from an opposite direction.

With reference to Figures 2, 4, 5 or 7, for instance, the means 8 or 38 for increasing the reading area is located with the transponder section 7, preferably at least partly within each other, most preferably in such a manner that the transponder section 7 is located in the area of the closed end (primary coil) of the loop-shaped means 8 or 38 which increases the reading area, this area being located at the end of the support structure 6, for instance at the end 6a. In Figures 2, 5 and 7, the means 8, 38 for increasing the reading area is placed around the transponder, but within it in Figure 4 in such a manner that the coupling means, i.e. the antenna coil 4, of the transponder 7 has a larger circumference than the primary coil 8a of the means 8 for increasing the reading area. With the above-mentioned structures, a strong inductive coupling is achieved. In addition to the above-mentioned ways, an inductive coupling can be carried out by using for instance a ferrite rod, in which the coils are not placed within each other but for instance successively.

Figure 7 shows a cross-section of the transponder arrangement. In the embodiment of Figure 7, the means for increasing the reading area, now denoted by reference numeral 38, consists for instance of a narrow ribbon-like metal part, which is formed for instance as a loop in the support structure 6. In the preferred embodiment of Figure 7, the transponder section 7 such as the transponder 7 is supported against the means for increasing the reading area in the support structure 6, most preferably in such a manner that the transponder section 7 is supported from its housing 70 between the different edges of the means for increasing the reading area. This embodiment simplifies the positioning of the transponder section 7 and protects the transponder section 7.

In a preferred embodiment, according to Figure 7 in particular, the means 38 which increases the reading area and which is for instance loop-like and made of metal forms at least partly the support structure of the transponder arrangement, whereby the means 38 can form a significant part of the support structure if it is sufficiently strong and conductive, being made for instance of steel band, in addition to increasing the reading area. In the embodiment of Figure 7, the external part 6 of the means 38 in the support structure may be even a very thin coating, which insulates the metal or otherwise conductive means 38 from the metal or otherwise conductive object, such as the surface of a gas bottle. In the invention, it is thus important that the support structure or the support structure coating of the transponder arrangement forms, as shown in Figures 2 or 3, or that the support structure comprises, as shown in Figure 7, an insulation between the metal object 10 and the means 8, 38 for increasing the reading area, whereby the structure of the metal object 10 such as a gas bottle does not short-circuit the ends of the means 8, 38, and does not prevent the interrogation pulse of the reading device from propagating along the means 8 or 38 for increasing the reading area to the transponder 7.

As distinct from what has been described above, it is possible that a securing means, for instance, connects the object 10 and the means 8 for increasing the reading area galvanically, but only on the above-mentioned condition that the securing to the object must not short-circuit the ends of the means for increasing the reading area, such as the coil 8.

As far as the method is considered, the invention provides a method for providing the object 10 made of a conductive material, such as a gas bottle 10,

with a remote-readable transponder arrangement. The transponder arrangement is placed in connection with the object in the support structure in such a manner that at least the support structure is open. By reducing the openness of the support structure 6 of the transponder arrangement, the transponder is placed in connection with the object 10. The means 8 which increases the reading area and which is in inductive contact with the transponder section 7 is placed around the object 10 as the openness of the support structure 6 is reduced. By reducing the openness of the support structure 6, the open support structure is formed as an at least substantially entirely closed circle.

Figure 8 shows a fourth embodiment of the transponder arrangement, in which the transponder arrangement comprises a circular support structure 106, a transponder section 107, and also a means 108 for increasing the reading area, this means being formed as a wire loop that extends along the support structure 106. Reference numeral 108a represents the primary coil of the means 108 for increasing the reading area, the rest of the means 108 thus forming a secondary coil. The support structure 106 can be opened for instance by means of a flexible wall 109, but it can also be opened by means of a hinge or some other bending point. The embodiment of Figure 8 deviates from the above-mentioned ones in the respect that the means for increasing the reading area comprises quick connecting means 111a and 111b for closing the means for increasing the reading area and preferably also the circumference of the support structure 106 at the same time. In the embodiment of Figure 8, the quick connecting means 111a, 111b are most preferably so-called Abiko connectors or similar, which are connected to each other. In the embodiment of Figure 8, the means 108 for increasing the

reading area consists of a ribbon-like metal bar like in Figure 7, but the means 108 may also be conductor-like. By suitable quick connecting means, it is also possible to seal the transponder arrangement.

Figure 9 shows the encapsulated transponder section 200 formed as a closure pin or similar locking means as greatly enlarged, it being possible to place this transponder section as a closure pin for instance at the point denoted by reference numeral 11c in Figure 3 between the different sides 6a, 6b of the support structure 6. Reference numeral 700 indicates the actual transponder. In the preferred embodiment of Figure 9, the transponder section comprises means 300 for sealing the support structure. Said means may be implemented for instance by surface shaping such as protuberances 300, by which the transponder section 200 attaches to the shapes (for instance openings 11a, 11b in Figure 2) of the support structure 6 so as to form a locking means (part 11c in Figure 3) in such a manner that the transponder arrangement cannot be opened without breaking it. The above-mentioned way is a simple way of implementing the sealing of the support structure onto the object. The means 300 of the transponder section 200 may also be shaped/placed in such a manner that when the transponder section is mounted bottom first, the transponder section seals the support structure, and when the transponder section is mounted top first, i.e. in an opposite manner, no sealing takes place. Said embodiment reduces the need to use several different structural solutions. In the latter case, the transponder section 200 is mounted most preferably in such a location, for instance in the openings 11a, 11b in Figure 3, that the locking means 200, which is formed by the transponder section and which is placed in its position may be pressed at least partly loose for

instance through the opening 11a from below in such a manner that the locking between the different parts 6a, 6b of the support structure is released.

The wire loop 8, i.e. the means for increasing the reading area, shown for instance in Figures 2 and 5, forms a double loop, which comprises a point in which the ends of the loop are not in galvanic contact with each other. By means of the double loop 8, it is easiest to eliminate the harmful effect that the currents forming on the electrically conductive metal object (a gas bottle) have on the means 8 for increasing the reading area as the transponder is read. It is also possible to use an embodiment in which the means for increasing the reading area forms for instance one closed circle. i.e. one closed loop, around the object in the support structure. This embodiment is simpler as to its manufacture and structure.

Even though the invention has been described above with reference to the examples according to the accompanying drawings, it will be apparent that the invention is not restricted to them but can be modified in various ways within the scope of the inventive idea presented in the appended claims.

Claims

1. A remote-readable transponder arrangement, which is located in connection with the object that one wants to identify and which can be identified by a separate reading device by means of mutual induction, said transponder arrangement comprising
- a transponder section (7), comprising a transceiver unit (3) and a coupling means (4) connected to the transceiver unit,
- a means (8) which increases the reading area and which is inductively connected to the coupling means, and
- a support structure (6) for the transponder section (7) and for the means (8) for increasing the reading area, which means for increasing the reading area has been arranged in the support structure (6) so as to run along the support structure, c h a r a c t e r - i z e d in that the transponder arrangement (B) comprises means (9, 19, 29, 20) for placing the circular support structure (6) provided with the means (8) which increases the reading area on an object in such a manner that this support structure is open, and means (11a-11b, 20, 9) for closing the circular support structure after it has been mounted on the object.

2. A remote-readable transponder arrangement according to claim 1, c h a r a c t e r i z e d in that the means (8) for increasing the reading area at least partly provides a means (19) for opening the support strucuture.

3. A remote-readable transponder arrangement according to claim 2, c h a r a c t e r i z e d in that a bending point (19) is formed in the means (8) for increasing the reading area, and that the bending point (19) is located in the area between the successive

support structure parts (6a, 6b) of the support structure (6).

4. A remote-readable transponder arrangement according to claim 1, c h a r a c t e r i z e d in that the means (29) for opening the support structure at least partly comprises the bending point (29), which is formed in the support structure (6) and which is located between the successive support structure parts (6a, 6b) of the support structure, this bending point being for instance a hinge means or similar.

5. A remote-readable transponder arrangement according to claim 1, c h a r a c t e r i z e d in that the means (20) for closing the support structure comprises a separate part (20) mounted on the support structure, this separate part comprising most preferably the transponder section (7), and the breadth of this part being at least 75% of the inner diameter (D) of the support structure (6).

6. A remote-readable transponder arrangement according to claim 1 or 5, c h a r a c t e r i z e d in that the means for closing the support structure comprises a separate part (20) mounted on the support structure (6), this separate part comprising at least 20% of the means (8, 28) for increasing the reading area.

7. A remote-readable transponder arrangement according to claim 1, c h a r a c t e r i z e d in that the means for closing the support structure comprises a transponder section (11c, 200), which is placed in a protective means comprised by it so as to form a closing means between the ends (6a, 6b) of the support structure (6).

8. A remote-readable transponder arrangement according to claim 1, c h a r a c t e r i z e d in that the means (20, 200) for closing the support structure

is formed in such a manner that it seals the transponder arrangement (B) in connection with the object.

9. A remote-readable transponder arrangement according to claim 1, c h a r a c t e r i z e d in that both the support structure (6) and the means (8) for increasing the reading area form an at least substantially closed ring, which is open in the middle and which can be opened at its circumference.

10. A remote-readable transponder arrangement according to claim 1, c h a r a c t e r i z e d in that the means for opening the support structure, such as the flexible part (9) in the support structure, the bending point (19), a hinge means, or the junction point (22) of the two separate parts of the support structure forms a point in the structure, from which point a first part (80, correspondingly 8) of the means (8) for increasing the reading area extends in the support structure (6) towards one end (6a) of the support structure (6), most preferably towards the transponder section (7) located there; and from which point (50, 19, 29, 22) a second part (81, correspondingly 28) of the means (8) for increasing the reading area extends in the support structure towards the other end (6b) of the support structure.

11. A remote-readable transponder arrangement according to claim 10, c h a r a c t e r i z e d in that the means (8) for increasing the reading area is located in the support structure (6) in relation to the transponder section (7) in such a manner that the transponder section (7) is located in the area of the closed end (8a) of the loop-shaped means (8) which increases the reading area, most preferably at the end (6a) of the support structure.

12. A remote-readable transponder arrangement according to claim 10, c h a r a c t e r i z e d in

that the transponder section (7) is supported against the means (38) for increasing the reading area in the support structure (6).

13. A remote-readable transponder arrangement according to claim 10, c h a r a c t e r i z e d in that the loop-like means (38) for increasing the reading area forms the support structure of the transponder arrangement.

14. A remote-readable transponder arrangement according to claim 10, c h a r a c t e r i z e d in that the transponder section (7) is placed in an inductive connection with the means (8) for increasing the reading area by placing the transponder section in a space (12) formed in the support structure (6) in the vicinity of the means (8, 8a) for increasing the reading area.

15. A remote-readable transponder arrangement according to claim 14, c h a r a c t e r i z e d in that the support structure (6) and the means (8) for increasing the reading area are formed as an integral unit for instance by casting, and that the transponder section (7) is placed later in the support structure (6) as a separate unit.

16. A remote-readable transponder arrangement according to claim 1, c h a r a c t e r i z e d in that the transponder arrangement is intended to be mounted on a narrow point at the height of the neck of a gas bottle (10) which is made of a conductive material.

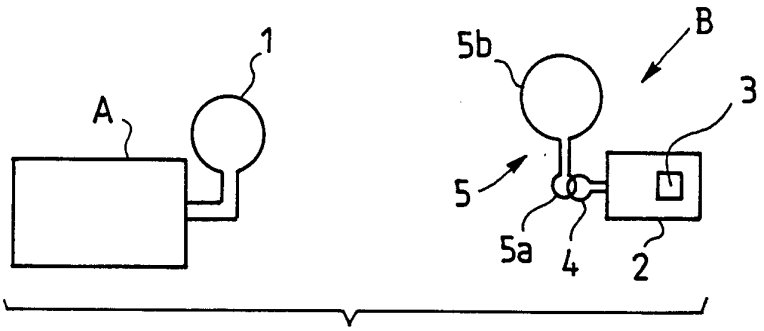

FIG. 1

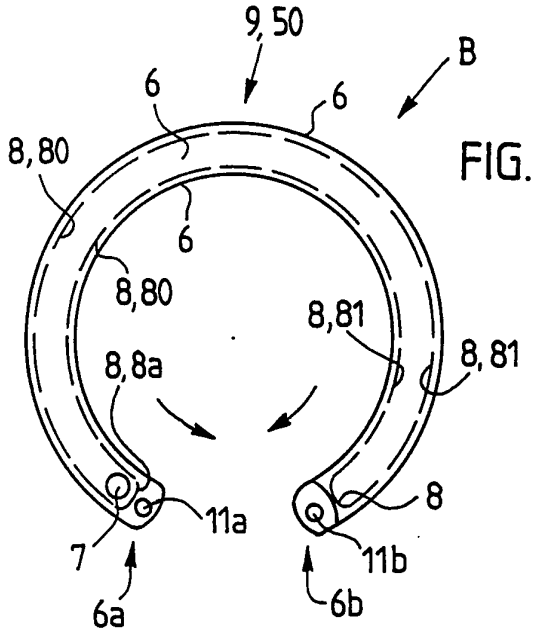

FIG. 2

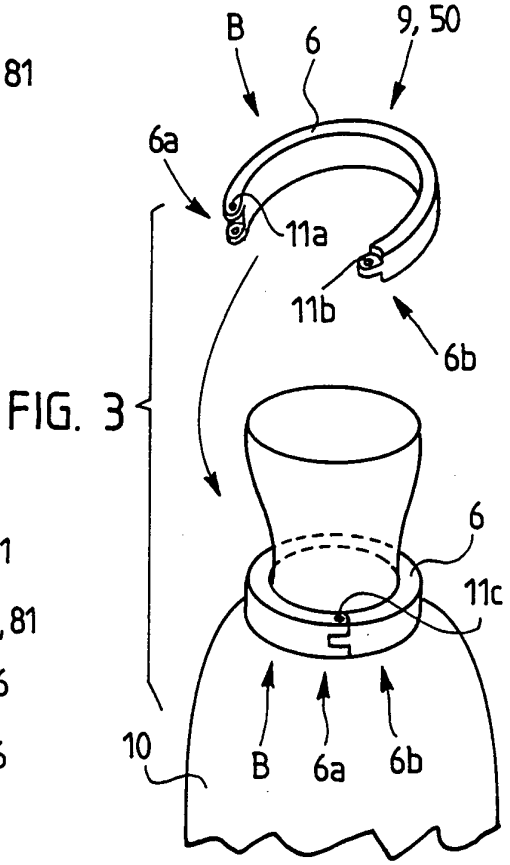

FIG. 3

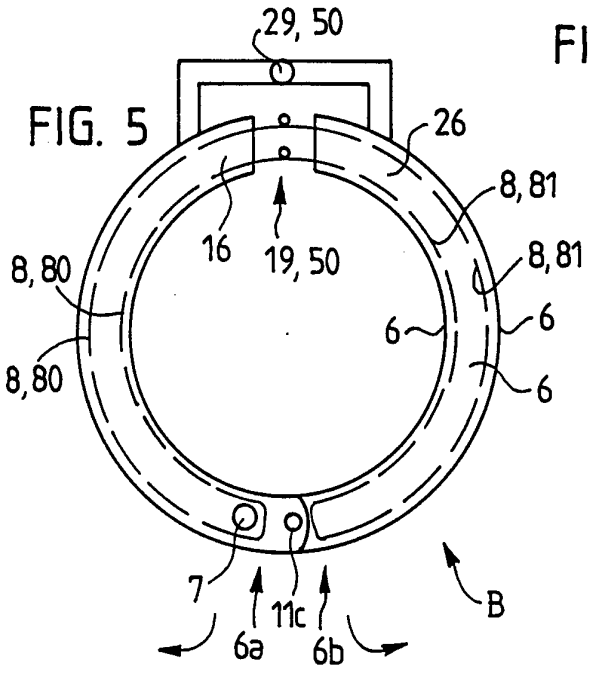

FIG. 5

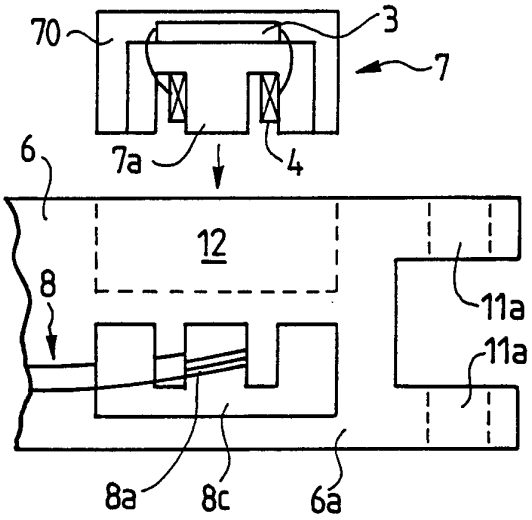

FIG. 4

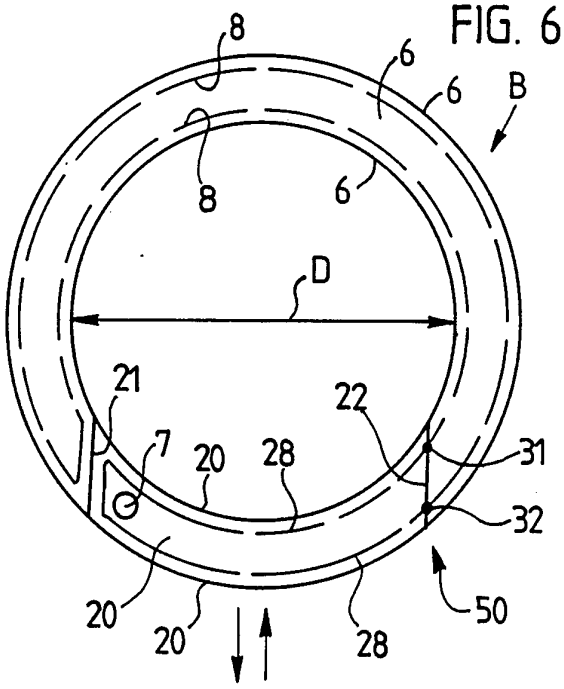

FIG. 6

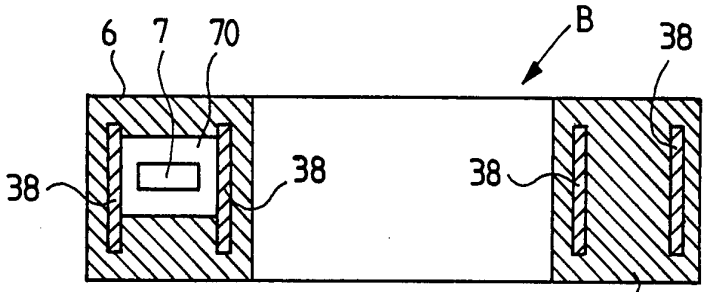

FIG. 7

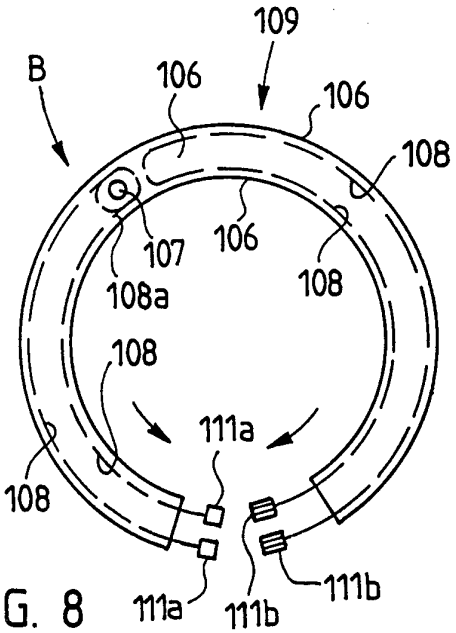

FIG. 8

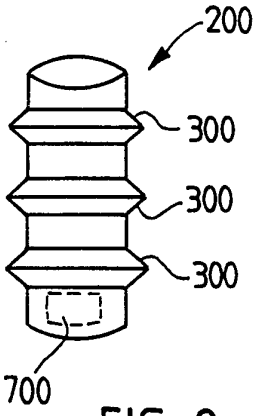

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 94/00536

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04B 5/02, G06K 7/08
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)

IPC6: H04B, G06K

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

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, QUESTEL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB, A, 2077555 (STANDARD TELEPHONES AND CABLES LIMITED), 16 December 1981 (16.12.81), figures 3a-4b, abstract	1-2,7-9,16
A	--	3-6,10-15
Y	WO, A1, 9313494 (GEMPLUS CARD INTERNATIONAL), 8 July 1993 (08.07.93), page 3, line 27 - page 5, line 16, figures 2a,2b, abstract	1-2,7-9,16
A	--	3-6,10-15

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"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
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 May 1995	03 -05- 1995
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Elisabet Åselius Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 94/00536

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	EP, A2, 0586083 (HUGHES MICROELECTRONICS EUROPA LIMITED), 9 March 1994 (09.03.94), column 2, line 50 - column 4, line 35, figures 1-6, abstract --	1-16
A	EP, A1, 0399316 (KM-SCHMÖLE GMBH), 28 November 1990 (28.11.90), abstract --	1-16
A	US, A, 5204670 (VINCENT D. STINTON), 20 April 1993 (20.04.93), figures 1-3, abstract -- --------	1-16

INTERNATIONAL SEARCH REPORT

Information on patent family members

01/04/95

International application No.
PCT/FI 94/00536

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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WO-A1- 9313494	08/07/93	EP-A- 0617816	05/10/94
		FR-A- 2685519	25/06/93
EP-A2- 0586083	09/03/94	NONE	
EP-A1- 0399316	28/11/90	SE-T3- 0399316	
		DE-C- 3916851	25/01/90
		FI-B,C- 91666	15/04/94
US-A- 5204670	20/04/93	EP-A,A,A 0357309	07/03/90
		US-A- 4952928	28/08/90
		US-A- 5369699	29/11/94