



(11) **EP 2 048 738 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
15.04.2009 Bulletin 2009/16

(51) Int Cl.:
H01Q 7/06 ^(2006.01) **H01Q 7/08** ^(2006.01)
H01Q 1/22 ^(2006.01)

(21) Application number: **08166210.8**

(22) Date of filing: **09.10.2008**

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

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(30) Priority: **09.10.2007 NL 1034493**

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(54) **Magnetic ferrite antenna**

(57) The invention relates to an antenna, in particular an antenna of a detection system for detecting labels, such as identification labels, provided with a resonant circuit which responds when introduced into an electromagnetic interrogation field, the antenna being provided with an antenna coil which is provided with multiple turns, **characterized in that** the antenna is further provided with a ferrite core, the turns being wound around the ferrite core in the form of a helix, and optionally a connection cable which is electrically connected with the antenna coil, wherein the antenna is further provided with at least one capacity which is electroconductively connected with the antenna coil and which, with the antenna coil, forms an LC circuit for tuning the antenna to at least one particular frequency at which the antenna, in use, functions as a magnetic ferrite antenna.

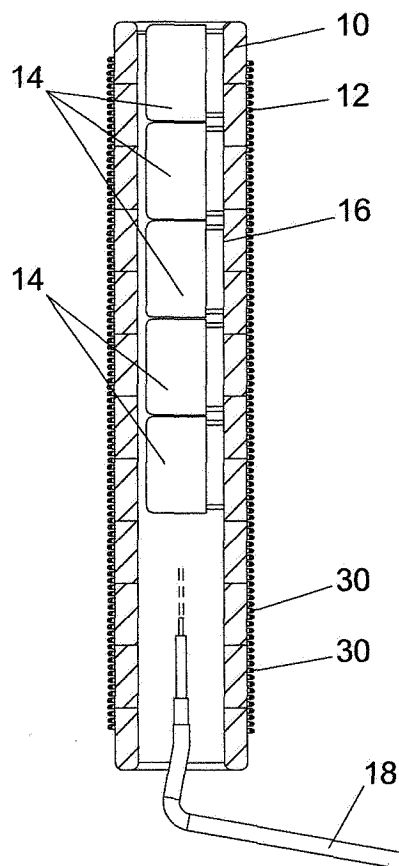


FIG. 2

Description

[0001] The invention relates to an antenna, in particular an antenna of a detection system for detecting labels, such as identification labels, provided with a resonant circuit, which responds when introduced into an electromagnetic interrogation field, the antenna being provided with an antenna coil which is provided with multiple turns.

[0002] The invention further relates to a detection system for detecting labels comprising a resonant circuit which responds when introduced into an electromagnetic interrogation field, such as an identification label, the system being provided with such an antenna and a transmitting and receiving device which is connected with the connection cable of the antenna for generating an electromagnetic interrogation field in a detection zone and for detecting a label which responds when located in the interrogation field.

[0003] A ferrite antenna is known per se. In use, such a ferrite antenna is connected through a connection cable with a transmitting and/or receiving device and the ferrite antenna is tuned to at least one desired frequency through inclusion of a tuning capacity between the connection cable and the transmitting and receiving device. A disadvantage is that the tuning capacity must then be available between the antenna cable on one side and the transmitting and receiving device on the other.

[0004] The object of the invention is to provide a magnetic ferrite antenna which, in principle, does not require being, at least substantially, tuned using a capacity situated between the connection cable and the transmitting and receiving device, and which moreover allows the antenna to be made of compact design if so desired. The antenna according to the invention is accordingly characterized in that the antenna is further provided with at least one capacity which is electroconductively connected with the antenna coil and which, with the antenna coil, forms an LC circuit for tuning the antenna to at least one particular frequency between 10 kHz and 500 kHz, at which frequency the antenna, in use, functions as a magnetic ferrite antenna. Thus the invention provides a magnetic ferrite antenna which is tuned to at least one particular frequency. An advantage is that the magnetic ferrite antenna, in use, can be connected directly to a transmitting and receiving device to obtain a detection system for detecting labels. Here, it is generally not necessary to tune the magnetic ferrite antenna further. In particular, however, it may be that a detection system which is provided with such an antenna is further provided with at least one capacity and/or at least one self-induction for fine-tuning the antenna, which at least one capacity and/or at least one self-induction is connected near an end of the connection cable connected with the transmitting and receiving device with the connection cable and/or the transmitting and receiving device. As the antenna is tuned to function, in use, as a magnetic ferrite antenna, it may moreover be made of compact design, if so desired. This is because a length of a turn of a mag-

netic ferrite antenna is generally smaller than a wavelength associated with the antenna. This wavelength in turn is co-determined by the tuning of the antenna.

[0005] According to a preferred embodiment of the antenna, it holds that the ferrite core is made of hollow design, with the at least one capacity being included in a space enclosed by the ferrite core. In this way, the antenna can be made particularly compact because on the one hand as a result of the use of the ferrite core the length of the individual turns can be relatively small and functionally corresponds to a much larger turn which is not wound around a ferrite core and because on the other hand the at least one capacity can be included in the ferrite core and hence requires no extra space for the antenna. In particular, it holds here that the antenna is provided with multiple capacities which are electroconductively connected with the antenna coil.

[0006] Preferably, it holds that the capacities are mutually connected in parallel and/or in series. In this way, a very compact and robust antenna can be obtained which moreover is already tuned to a particular frequency. In use, an axial axis of the helix can for instance be set up vertically, while yet an electromagnetic interrogation field is generated on which labels, for instance worn by an animal, can be detected. This is in contrast to an antenna of a detection system known per se for detecting labels in for instance a cowshed where the antenna comprises a relatively large loop, for instance 50 x 100 cm, which is incorporated in a floor of the shed. In particular, it holds furthermore that the ferrite core is composed of multiple ring cores and/or multiple discs. This provides as an advantage that the ferrite core can be manufactured much more economically than when the ferrite core is designed in one piece. This also provides the advantage that the ferrite core will break less easily than when the ferrite core is made in one piece. If the ferrite core is designed in one piece and breaks at least at an arbitrary non predetermined point, this can have an unknown influence on the tuning of the antenna. The ferrite core which is composed of multiple ring cores and/or multiple discs does not have this disadvantage. Preferably, the ferrite core is composed of multiple ring cores, so that the ferrite core is of hollow design. Preferably, it holds that the ring cores and/or the discs are stacked in an axial direction of the ferrite core. Further, it holds preferably that the ring cores and/or the discs are stacked directly onto each other. Then there is no intermediate space between the ring cores and/or the discs. Preferably, it holds further that the ring cores and/or the discs mutually have at least substantially the same dimensions.

[0007] A detection system according to the invention is characterized in that the system is provided with an antenna and a transmitting and receiving device which is connected with the connection cable of the antenna for generating an electromagnetic interrogation field in a detection zone and for detecting a label which responds when located in the interrogation field. It preferably holds here that a wavelength of the transmitted electromagnet-

ic interrogation field is greater than the length of a circumference of a turn of the antenna coil. More particularly, it holds here that the wavelength of the transmitted electromagnetic interrogation field is greater than the length of the circumference of each of the turns of the antenna coil.

[0008] Preferably, it holds furthermore that the system is further provided with at least one capacity and/or self-induction for fine tuning the antenna. Customary frequencies of the antenna and/or the system according to the invention are in the range of 10-500 kHz, in particular in the range of 120-140 kHz.

[0009] The invention will presently be further elucidated with reference to the drawing. In the drawing:

Fig. 1 shows a possible embodiment of a detection system according to the invention which is provided with a possible embodiment of a magnetic ferrite antenna according to the invention; and

Fig. 2 shows a cross section of a magnetic ferrite antenna according to Fig. 1.

[0010] In Fig. 1 reference numeral 1 designates a detection system for detecting identification labels 2 which comprise a resonant circuit which responds when introduced into an electromagnetic interrogation field. The identification labels are known per se and are for instance used for identifying animals. Such a label may for instance be designed as an ear stud or a bolus.

[0011] The system is provided with a transmitting and receiving device 4 and a magnetic ferrite antenna 6 connected with the transmitting and receiving device. Using the detection system, an electromagnetic interrogation field can be generated in a detection zone 8 for detecting the label 2 located in a detection zone 8. The label responds when located in the electromagnetic interrogation field, for instance by transmitting an identification code which is stored in the label 2. This may involve an absorption system as well as a transmission system.

[0012] The antenna 6 is provided with a ferrite core 10 which is of hollow design in this example. Furthermore, the antenna 6 is provided with an antenna coil 12 which is provided with multiple turns, circular in this example, which are wound around the ferrite core in the form of a helix. As the turns are wound around a ferrite core, each turn functionally corresponds to a turn which, not wound around a ferrite core, will have a much greater circumference. As a result, the ferrite core antenna can be made of more compact design than an antenna that would not be provided with such a ferrite core.

[0013] The antenna 6 is further provided with a number of capacities 14 which are included in a hollow space 16 enclosed by the ferrite core 10 and which are electroconductively connected with the antenna coil 12. The antenna coil 12 and the capacities 14 then form an LC circuit. The capacities are here used for tuning the antenna to a particular transmission and reception frequency. This frequency is such that the antenna 6, in use, will function

as a magnetic ferrite antenna. This brings with it that an electromagnetic signal transmitted with the antenna has a wavelength that is greater than a length of a turn of the antenna. For this reason, too, at a given wavelength the antenna can be made of compact design. The ferrite antenna is further provided with a connection cable which on one side is electroconductively connected with the antenna coil and which on the other side is connected with the transmitting and receiving device 4.

[0014] With the transmitting and receiving device 4 an electromagnetic signal is generated which is supplied via the connection cable 18 to the antenna coil 12. The antenna coil 12 has been tuned using the capacities 14, such that it is tuned to the frequency of the electromagnetic transmitted signal that is generated by the transmitting and receiving device. Furthermore, it holds here that the wavelength of the electromagnetic signal that is transmitted is greater than the length of a single turn of the antenna coil. As a result, the antenna coil functions as a magnetic antenna. Customary frequencies of the antenna are in the range of 10-500 kHz, in particular in the range of 120-140 kHz.

[0015] What is special about the antenna is that in the example it has also been tuned with at least one capacity 14, in this example a number of capacities 14. Even so, the antenna can still be made of compact design in that the capacities 14 are included in the hollow space of the ferrite core. In this example, the capacities are mutually connected in parallel and electroconductively connected with the antenna coil 12. In this example, it holds furthermore that the lengths of the circumference of all individual turns of the antenna are at least substantially equal to each other. The number of turns used may vary. For instance, 10 to 300 turns may be used. However, other numbers are also possible. Further, it holds in the example that the detection system is further provided with a capacity and/or self-induction 20 for fine-tuning. This at least one capacity and/or at least one self-induction 20 is situated between the transmitting and receiving device 4 and the connection cable 18. More particularly, it holds that the capacity and/or self-induction is connected with the connection cable and/or the transmitting and receiving device near an end of the connection cable that is connected with the transmitting and receiving device.

[0016] In use, the relatively compact antenna 6 may for instance be set up vertically in an animal house for detecting animals. It is also possible, however, that the antenna is used for other purposes, such as for instance in shoplifting systems which also detect labels, in the form of antitheft labels.

[0017] The invention is not in any way limited to the embodiment outlined above. For instance, the magnetic ferrite antenna may further be provided with a housing 22, which is indicated in broken lines in Fig. 1 and in this example is designed in the shape of an elongate cylinder. The housing is manufactured from a material, such as for instance a plastic, that is transmissive of electromagnetic radiation of the desired frequency. Also, the ferrite

core 10 may be composed of multiple (in this example 12) stacked ring cores 30 jointly forming the ferrite core. Also, the ferrite core may be of non-hollow, that is, solid design. The ferrite core may then be composed of a number of stacked disc-shaped ferrite cores. As appears from the drawing, it then holds in this example that the ring cores and/or the discs are stacked in an axial direction of the ferrite core. It also appears from the drawing that in this example the ring cores and/or the discs are stacked onto each other. Then there is no intermediate space present between the ring cores and/or the discs. Further, it appears from the drawing that in this example the ring cores and/or the discs mutually have at least substantially the same dimensions.

[0018] If the ferrite core is of non-hollow design, the at least one capacity of the antenna will be disposed at a position outside the ferrite core.

[0019] In the example, the antenna 6 is provided with multiple capacities 14. These capacities may also be connected in series or may also be connected in series and in parallel. It is also conceivable, however, that the antenna is provided with a single capacity 14. The capacity 14 and/or the capacities 14 may be tuned such that the capacity of the connection cable 18 is taken into account. The connection cable 18 and the capacities 14 (and/or the single capacity 14) then form a tuning capacity for tuning the antenna 6 to a desired frequency. Such variations are each understood to fall within the scope of the invention.

Claims

1. An antenna, in particular an antenna of a detection system for detecting labels, such as identification labels, provided with a resonant circuit which responds when introduced into an electromagnetic interrogation field, wherein the antenna is provided with an antenna coil having multiple turns, **characterized in that** the antenna is further provided with a ferrite core, the turns being wound around the ferrite core in the form of a helix, and optionally a connection cable which is electrically connected with the antenna coil, wherein the antenna is further provided with at least one capacity which is electroconductively connected with the antenna coil and which, with the antenna coil, forms an LC circuit for tuning the antenna to at least one particular frequency between 10 kHz and 500 kHz, at which frequency the antenna, in use, functions as a magnetic ferrite antenna.
2. An antenna according to claim 1, **characterized in that** the ferrite core is made of hollow design, with the at least one capacity being included in a space enclosed by the ferrite core.
3. An antenna according to claim 1 or 2, **characterized in that** the antenna is provided with multiple capacities which are electroconductively connected with the antenna coil.
4. An antenna according to claim 3, **characterized in that** the capacities are mutually connected in parallel and/or in series.
5. An antenna according to claim 3 or 4, **characterized in that** the antenna is further provided with a housing in which the antenna coil, the ferrite core and the at least one capacity are included.
6. An antenna according to any one of the preceding claims, **characterized in that** the lengths of the circumferences of the individual turns of the antenna coil are at least substantially equal to each other.
7. An antenna according to any one of the preceding claims, **characterized in that** the ferrite core is composed of multiple ring cores and/or multiple discs.
8. An antenna according to claim 7, **characterized in that** the ring cores and/or the discs are stacked in an axial direction of the ferrite core.
9. An antenna according to claim 8, **characterized in that** the ring cores and/or the discs are stacked onto each other.
10. An antenna according to any one of claims 7-10, **characterized in that** the ring cores and/or the discs mutually have at least substantially the same dimensions.
11. A detection system for detecting labels, such as identification labels, which comprise a resonant circuit which responds when introduced into an electromagnetic interrogation field, wherein the system is provided with an antenna according to any one of the preceding claims and a transmitting and receiving device which is connected with the connection cable of the antenna for generating an electromagnetic interrogation field in a detection zone and for detecting a label which responds when located in the interrogation field.
12. A detection system according to claim 11, **characterized in that** a wavelength of the transmitted electromagnetic interrogation field is greater than the length of a circumference of a turn of the antenna coil.
13. A detection system according to claim 12, **characterized in that** the wavelength of the transmitted electromagnetic interrogation field is greater than the length of the circumference of each of the turns of

the antenna coil.

14. A detection system according to any one of claims 11-13, **characterized in that** the system is further provided with at least one capacity and/or at least one self-induction for fine tuning the antenna, which at least one capacity and/or at least one self-induction is connected with the connection cable and/or the transmitting and receiving device near an end of the connection cable that is connected with the transmitting and receiving device.

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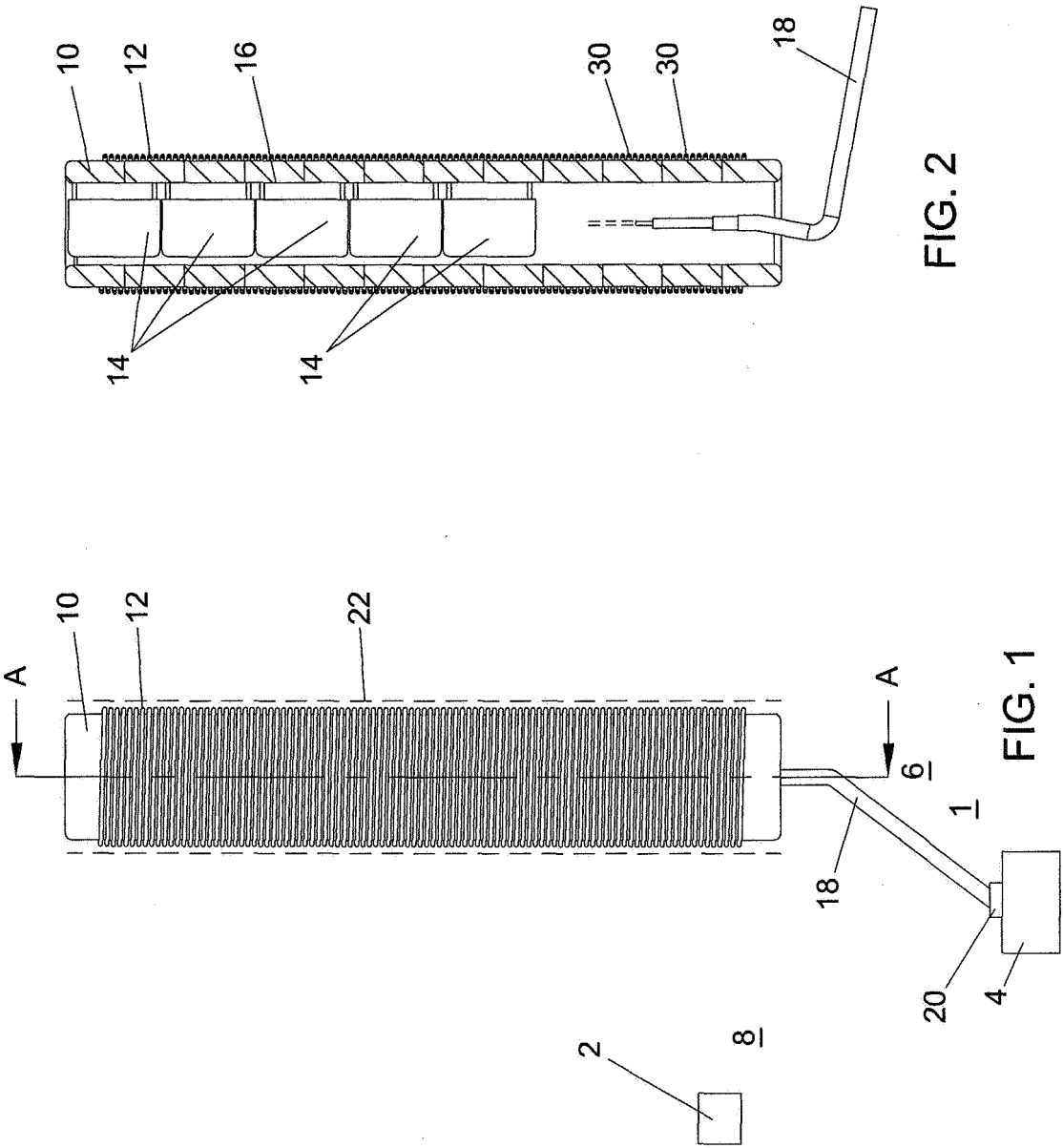
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EUROPEAN SEARCH REPORT

Application Number
EP 08 16 6210

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Place of search The Hague		Date of completion of the search 21 January 2009	Examiner Van Dooren, Gerry
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EPO FORM 1503 03.02 (P04C01)

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

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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