

Description**Chip module for an RFID system**

5 The invention relates to a chip module for an RFID system, in particular for an RFID label, a coupling label for use in an RFID label, an RFID inlay for an RFID label, and an RFID label produced using an RFID inlay (smart label).

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In the production of RFID labels, use is made in a known manner of chip modules having an RFID microchip and electrical connection contacts by means of which they are connected to the RFID antenna. WO 2005/076206
15 describes a continuous production method for RFID labels in which the chip modules are applied by their rear side remote from the connection contacts to adhesive film sections whose base area is in each case significantly larger than a base area of each chip
20 module. The electrical connection contacts of the chip modules are electrically contact-connected to the antenna connections, the adhesive film sections being connected to the antenna film sections in planar fashion in such a way that the chip modules are
25 positionally fixed relative to the antenna connections.

RFID labels are produced in a known manner in such a way that a so-called RFID inlay is arranged between the web-type covering material, which is provided with a
30 pressure-sensitive adhesive layer on the underside, and a likewise web-type carrier material that can be stripped from the pressure-sensitive adhesive layer. The RFID inlay contains an RFID chip that is fixed on a flat antenna and is galvanically connected thereto, the
35 RFID antenna being arranged on an antenna film.

It is known to fix the chip modules for processing in a series one behind another on strips and to supply them

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to the RFID antennas in this way during processing. Each microchip with its two connection contacts is then stripped from the strip and fixedly adhered on the RFID antenna in such a way that its connection contacts have
5 galvanic contact with the contacts of the RFID antenna.

This step necessitates positioning the chip modules very exactly on the RFID antenna in order that the galvanic contact is produced.

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Therefore, the invention is based on the object of providing a chip module which can be brought into contact with the RFID antenna in a simplified manner.

15 This object is achieved according to the invention by virtue of the fact that an RFID chip and a coupling antenna that is electrically, in particular galvanically, connected to the RFID chip are arranged on a web- or sheet-type carrier material, in particular
20 on a carrier film.

The coupling antenna makes it possible to produce an inductive connection to the RFID antennas. An inductive connection can be produced in a simplified manner
25 through corresponding configuration of the coupling antenna and the RFID antenna without both of them having to be positioned very exactly with respect to one another, particularly if the coupling region of the RFID antenna is wider than the coupling region of the
30 coupling antenna. The chip module can be adhesively bonded onto the corresponding location of the RFID antenna with a defined distance determined by the thickness of the carrier film and of the pressure-sensitive adhesive layer.

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A further advantage afforded is that the RFID chip can be arranged on the coupling antenna in a simplified

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manner without the need for complicated connection contacts for later connection to the RFID antenna.

5 The RFID antenna can advantageously be produced as a flat, for example etched or printed antenna from the customary antenna materials, and is advantageously arranged on a carrier film, in particular an adhesive material.

10 A so-called coupling label can advantageously be produced from the chip module according to the invention, said coupling label being used in the subsequent production of RFID systems, in particular RFID labels, tags or tickets. In the case of the
15 coupling label, the underside of the carrier film of a chip module has an adhesive layer covered by a strippable web- or sheet-type separating material.

In this case, the coupling labels can advantageously be
20 produced in strip form with a plurality of chip modules arranged at a distance one behind another. During the production of RFID systems, they are supplied in this way on strips into respective RFID antennas and either they are fixed in strip form on the antennas, which are
25 likewise arranged in strips, or they are separated from the strip and individually bonded adhesively onto an antenna.

If the coupling labels are used for producing RFID
30 labels, then preferably a so-called RFID inlay is firstly produced. The RFID inlay comprises a flat RFID antenna, which is preferably arranged on an antenna film and onto which a chip module according to the invention is adhesively bonded by its carrier film in a
35 manner positioned such that the coupling antenna and the RFID antenna are inductively coupled. Preferably, the antenna film has on its rear side a pressure-sensitive adhesive layer covered by a separating

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material. The RFID label is then produced in such a way that an RFID inlay according to the invention is arranged between a web- or sheet-type covering material, which is provided with a pressure-sensitive adhesive layer on the underside, and a web- or sheet-type separating material that can be stripped from the pressure-sensitive adhesive layer in order to uncover the latter for the adhesive bonding of the label. The covering material can be printed or configured graphically in some other way at its top side.

The chip module according to the invention can advantageously also be used in other RFID systems. Thus, the coupling label can be adhesively bonded onto an RFID antenna that has been applied, for example printed, onto the packaging means. The coupling antenna is then inductively coupled to the RFID antenna (6) of the packaging means (smart box).

The invention is explained in more detail below on the basis of an exemplary embodiment illustrated in simplified fashion.

Figure 1 shows an individual coupling label each having a chip module and their positioning on antennas for producing RFID inlays.

Figure 2 shows RFID inlays to which coupling labels in strip form are supplied.

Figure 3 shows a section through an RFID inlay.

Figure 1 illustrates two coupling labels 1 each containing a chip module 2 having an RFID chip 3. The RFID chip 3 is arranged on a coupling antenna 4 and is electrically, in particular galvanically, connected thereto. The coupling antenna 4 with the RFID chip 3 is arranged on a web- or sheet-type carrier material, in

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particular a carrier film 5. Preferably, the RFID chip 3, as illustrated in figures 1 to 3, is directly fixed on the coupling antenna 4 formed in planar fashion and is galvanically connected thereto. In order to produce
5 a self-adhesive coupling label, the underside of the carrier film 5 of a chip module 2 has an adhesive layer 9 covered by a strippable web- or sheet-type separating material 11. After the separating material 11 has been stripped off, the coupling label 1 can thus be
10 adhesively bonded onto an RFID antenna 6. In this case, the coupling antenna 4 adhesively bonded on maintains a precisely defined distance from the RFID antenna 6. The distance is chosen such that the coupling antenna 4 and the RFID antenna 6 are inductively coupled. It can be
15 set exactly by way of the thickness of the carrier film 5 and the adhesive layer 9 thereof. Preferably, each RFID antenna 6 is arranged on an antenna film 7. As illustrated in figures 1 and 2, a plurality of RFID antennas 6 are advantageously arranged at a distance
20 from one another on a strip-type antenna film 7 in order to produce RFID inlays which are connected to one another and which can be supplied for further processing in a simplified manner.

25 Preferably, the coupling region 6.1 of the RFID antenna 6 is wider than the coupling region 4.1 of the coupling antenna 4. This provides a certain leeway for positioning the coupling region 4.1 of the coupling antenna 4 on the coupling region 6.1 of the RFID
30 antenna 6. Leeway for the positioning of the coupling labels 1 on the antennas 6 is thus obtained in the production of the RFID inlays.

In the case of the procedure illustrated in figure 1,
35 the coupling labels 1 with the chip modules 2 are supplied individually in each case to the RFID antennas 6. After stripping off the respective separating film on the underside, the adhesive layer 9 of the carrier

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film 5 is uncovered, and a respective chip module 2 is adhesively bonded onto an RFID antenna 6.

It is likewise possible - as illustrated in figure 2 -
5 to arrange a series of chip modules 2 on a strip-type carrier film 8 at a distance from one another. In this case, the distance between the chip modules 2 corresponds to the distance between the RFID antennas 6 on the carrier film 7 thereof. After stripping off the
10 separating material from the underside, the adhesive layer is uncovered on the carrier film 8 and the chip modules 2, still situated on a common carrier film 8, are continuously bonded adhesively onto the antennas 6. The division into individual RFID inlays is
15 subsequently effected by means of transverse cuts between the individual antennas 6, only the antenna film 7 being severed in the case of the procedure according to figure 1. In the case of the procedure according to figure 2, the antenna film 7 and the
20 carrier film 8 are each severed jointly.

The RFID antenna 6 can likewise be an antenna which is applied, in particular printed, directly onto a packaging means, for example a folding box, and onto
25 which the coupling label 1 is adhesively bonded (smart box).

The construction of the RFID inlay according to the invention is illustrated in clarified fashion in figure
30 3: the RFID chip 3 is fixed directly on the coupling antenna 4. The coupling antenna 4 is situated on the top side of a carrier material 5 having an adhesive layer 9 on its underside. The carrier material 5 with the coupling antenna situated thereon and with the chip
35 3 is fixedly adhered on the RFID antenna 6 by means of the adhesive layer 9. Depending on the intended use, the RFID antenna 6 is an HF or UHF antenna. The RFID antenna 6 is fixed on the top side of the antenna film

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7, and the antenna film 7 has on its underside a pressure-sensitive adhesive layer 10 covered by a strippable separating material 11, for example a silicone carrier.

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In order to produce an RFID label, the RFID inlay illustrated in figure 3 is arranged between a web- or sheet-type covering material and a likewise web- or sheet-type carrier material. The covering material, which is usually printed on the top side, has on its underside a pressure-sensitive adhesive layer, onto which the carrier material is adhesively bonded in strippable fashion. In order to introduce the RFID inlay between the covering material and the carrier material of the label, the carrier material is lifted off and put down again after the RFID inlay has been fixedly adhered on the pressure-sensitive adhesive layer. The separating material 11 of the RFID inlay is removed beforehand, such that a continuous adhesive layer is present below the carrier material of the RFID label, which is composed of silicone paper, for example. The RFID label configured in this way can be adhesively bonded onto an item of merchandise or a packaging after the carrier material has been stripped off.

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PATENT CLAIMS

1. A chip module for an RFID system, in particular an RFID label, **characterized in that** an RFID chip (3) and a coupling antenna (4) that is electrically, in particular galvanically, connected to the RFID chip (3) are arranged on a web-type carrier material (5, 8) in particular a carrier film.
2. The chip module as claimed in claim 1, **characterized in that** the RFID chip (3) is fixed directly on the coupling antenna (4) formed in planar fashion.
3. A self-adhesive coupling label, in particular for use in an RFID label, **characterized in that** the underside of the carrier film (5, 8) of a chip module as claimed in claim 1 or 2 has an adhesive layer (9) covered by a strippable web- or sheet-type separating material.
4. An RFID inlay for an RFID label, **characterized in that** a chip module (2) as claimed in claim 1 or 2 is adhesively bonded by its carrier film (5, 8) onto a flat RFID antenna (6) in a manner positioned such that the coupling antenna (4) and the RFID antenna (6) are inductively coupled.
5. The RFID inlay as claimed in claim 4, **characterized in that** the flat RFID antenna (6) is arranged on an antenna film (7) having on its rear side a pressure-sensitive adhesive layer (10) covered by a separating material (11).
6. The RFID inlay as claimed in claim 4 or 5, **characterized in that** the coupling region (6.1) of the RFID antenna (6) is wider than the coupling region (4.1) of the coupling antenna (4).

7. An RFID label, **characterized in that** an RFID inlay
as claimed in any of claims 4 to 6 is arranged
between a web- or sheet-type covering material,
5 which is provided with a pressure-sensitive
adhesive layer on the underside, and a web- or
sheet-type carrier material that can be stripped
from the pressure-sensitive adhesive layer.
- 10 8. An RFID system, **characterized in that** a coupling
label (1) as claimed in claim 3 is adhesively
bonded onto the RFID antenna (6) of a packaging
means and its coupling antenna (4) is inductively
coupled to the RFID antenna (6) of the packaging
15 means.