

RADIOELECTRIC TRANSPONDER EQUIPPED WITH AN ANTENNA AND A FREQUENCY DETUNING CIRCUIT

The invention presented here involves the field of the detection and/or interrogation of radioelectric transponders using a detection system and/or the field of tuned radioelectric sensing. These transponders function in particular to detect or to identify the mobile objects on which the transponders are positioned.

These systems can, in particular, be used for the recognition of individual badge carriers, vehicles carrying badges for tolls on a roadway or even goods stored or put up for sale in stores.

A transponder is an emitter-receiver (transmitter-responder) responding automatically to the outside signal from an emitter of the detection system.

Radioelectric transponders, called badges for some applications, or labels, also have the role of transmitting information remotely in response to signals of an emitter of an interrogation system.

In the rest of the description, the term radioelectric will be abbreviated under its common form "radio".

The detection and/or interrogation systems of known radio transponders include an emitter/receiver E and the transponders T1, T2 as shown in Figure 1.

The emitter/receiver E generates a radio field B (or electromagnetic field). While a transponder T1 is located inside the field limits B, the transponder picks up the field and signals its presence to the emitter/receiver E.

Currently, transponders are used which are called "active", and which thus re-emit a radio signal called a response signal directed to the emitter/receiver E. The response signal can consist of information which makes it possible to identify the transponder and/or the object on which it is placed.

In order to re-emit a radio signal, the active transponders can include an autonomous power source. But preferably, the transponder recovers the power of the radio field B in order to supply its electronic circuit. In order to fully pick up the field or the radio signal, the transponder has a radio antenna. The antenna consists, for example, of a metal winding of the imprinted circuit, which has the advantage of reducing the transponder dimensions.

Some transponders called "passive" simply have a short-circuited metal loop. The presence of such a transponder in the field of an emitter E, made as shown in Figure 1, from a loop to which a current is applied, changes the mutual induction of the loop of the emitter E and of the loop of the transponder T1.

This system of emitter and passive transponder is thus similar to the primary and secondary circuit of an electric transformer. The emitter/receiver E can thus detect the presence of a transponder T1 in its field by detecting a modification of its induction current.

In addition, there are systems for transmitting to the transponder, in which a radio emitter sends the information which can be registered on an electronic chip contained in the transponder.

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In a general manner, the application presented here is intended for any detection and/or interrogation system for transponders, where the transponders can be detected or at least interrogated, or even registered, by the emitter/receiver. The term emitter/receiver generally designates any device which allows for the emitting of a radio field and detecting or interrogating the transponders present in the field, the device being preferably fitted to receive a radio signal in response coming from one of the transponders.

These difficulties appear when many transponders are present at the same time in the radio field B. The transponders thus respond to the excitation of the field B all at the same time, or they do not give a response.

In order to avoid this confusion, it has been proposed to stall the responses of the transponders, each transponder responding to the excitation of an initialization signal of the emitter, after a random time.

However, in numerous cases, there are still transponders which do not respond to the excitation of the radio field B or of the radio signal, the transponders appearing to be inhibited.

The problem, which is not resolved, is mentioned in particular in the document FR-A-2 717 593. The fact is noted that "two adjacent labels can be located in the field of the same reader, which runs the risk of causing their automatic mutual inhibition."

A purpose of the invention is to optimize the detection and/or interrogation of multiple transponders present in the field of the detector and/or readers E.

Another purpose is to avoid the perturbations of the functioning of the transponder caused by the proximity of the other transponders.

An explanation of the mutual inhibition of the transponders is that one transponder induces a radio shadow effect as seen in Figure 1, so that another transponder located in the shadow no longer receives enough of the field or the power in order to function properly.

According to the invention, these purposes are achieved by providing that the antenna of one transponder can be detuned in frequency or mismatched in impedance in a manner such that the transponder and its electronic circuit absorb less of the radio field and of the power.

Thus, another transponder located nearby the mismatched or detuned transponder will be able to sufficiently receive the radio field and the power in order to function properly.

The transmission system can thus detect or consult this other transponder as if it is found alone in the field B of the emitter.

Preferably, according to the invention, a transponder is provided which is ready to be introduced into a radioelectric field of a set frequency, the transponder having an antenna capable of receiving the radioelectric field of a set frequency and an electronic circuit connected to the antenna, the circuit absorbing and reconstructing the power supplied by the field received by the antenna, characterized in that the transponder consists of mechanisms for detuning to reception of a radioelectric field of a set frequency and mechanisms for tuning to the reception of the radioelectric field of the set frequency, the mechanisms for tuning being implemented while the transponder is in a selected state, the mechanisms for detuning being implemented when the transponder is

in a non-selected state in order to limit the absorption of power and/or the field by the transponder in the non-selected state.

Preferably, the invention is made by providing that the mechanisms for tuning allow for tuning the antenna according to the set radioelectric frequency, and in that the mechanisms for detuning allow for detuning the antenna relative to the set radioelectric frequency.

A first embodiment mode provides that the mechanisms for detuning and/or tuning are made to change a capacitance value, the antenna having an inductance value, in a manner such that the tuning frequency of the antenna is changed relative to the set frequency of the radioelectric signals.

A second embodiment mode provides that the mechanisms for tuning and/or detuning make it possible to change the tuning of the frequency between the antenna and the electronic circuit.

In a second embodiment mode example, the mechanisms for tuning and/or detuning are made to change a value of the load and/or resistance in order to change the impedance value of the antenna and/or the impedance value of the electronic circuit.

Thus, according to one characteristic, when two transponders are introduced into a radioelectric field, each of the transponders receives the radioelectric field and/or the set frequency signals regardless of the position of a transponder relative to the other transponder; each transponder consisting of the mechanisms for tuning and detuning in order to avoid the radioelectric perturbations provoked by the nearness of the other transponder.

According to another characteristic, the transponders pass into a selected state in turns, only one transponder or a low number of transponders being in a selected state at any one instant in time.

According to another characteristic, a transponder passes into a non-selected state during a period of time corresponding to a temporary inhibition of the transponder.

This is also planned for the transmission systems fitted to the transponders according to the invention.

The invention will be better understood in reading the description and the drawings which will follow, given as non-restrictive examples. For the attached drawings:

- Figure 1 shows a diagram of the principle of the system of transmission to a transponder according to the state of the art;
- Figure 2 shows a diagram of the principle of the system of transmission to a transponder according to the invention;
- Figure 3 shows a circuit diagram of a transponder according to a first embodiment mode of the invention;
- Figure 4 shows a circuit diagram of a transponder according to a second embodiment mode of the invention.

Figure 1 shows two conventional transponders T1 and T2 introduced into the field B of an emitter/receiver E. The transponder T1, in direct view of the emitter E, correctly receives the field B. The radio field supplies it with the power for it to function properly and to signal its presence to the emitter/receiver E and if necessary, to transmit the radio signals in response. In the layout of Figure 1, the transponder T1 intervenes between the

emitter E and the transponder T2 which then receives the radio field B' with difficulty.

The radio field B and its power are in effect absorbed by the transponder T1 which forms in some manner, a radio screen. This radio shadow effect often prevents a good detection of the transponder T2; this transponder does not receive enough of the radio field and power to function properly.

You can see in a general manner the effect of the attenuation or mutual inhibition when the conventional transponders are adjacent, so that the transponders are not detected properly or can not communicate a response to the emitter/receiver.

The conventional transponders preferably have reduced dimensions, the specialist develops the antennas particularly tuned to the frequency of the radio field that the antenna must receive and perfectly tuned in impedance to the electronic circuits served by the antenna.

In a surprising manner, the invention plans the mechanisms for detuning of the antenna of a transponder in order to limit the absorption of the radio field by the transponder when it is not selected. An adjacent transponder can thus properly receive the radio field and be detected or communicate with the emitter/receiver.

On the other hand, the mechanisms for tuning the antenna of this adjacent transponder are planned such that it fully receives the radio field.

In Figure 2, similar to Figure 1, you can see two transponders P1 and P2 arranged in the radio field B emitted by the emitter/receiver E.

You will notice in the example of Figure 2 that the antenna of the transponder P1 is de-tuned, i.e. that the antenna absorbs little, or none, of the radio field B. At the level of the second transponder P2, the radio field B' will thus have a normal power as if the transponder P1 were not there. The transponder P2 will thus sufficiently receive power in order to function and be detected or respond to the emitter/receiver E.

The radio shadow effect or the radio screen caused by the transponders of the state of the art is thus removed or attenuated (see Figure 1).

A first embodiment mode of the mechanisms for detuning the antenna of a transponder consist in detuning the antenna relative to the frequency of the radio field of the emitter, this set frequency being denoted f_e .

The antenna of a transponder is generally made up of a resonant circuit consisting of an inductance and a capacitance as shown in Figure 3. The inductance L can thus be made in the form of a coil of helicoid windings. The capacitance C can be made up of a single capacitor. It is preferably made of an assembly of capacitors C1, C2 connected in parallel in a manner such that the capacitance of each of the capacitors C1, C2 of the assembly is added together.

The resonance frequency well known for a circuit of this type is determined by the product of values of inductance L and capacitance C.

A mechanism for detuning the antenna consists in tuning the antenna to a resonance frequency f_d different from the frequency f_e of the radio field or of the radio signals transmitted to the transponder. In this way, the antenna of the transponder is detuned with respect to the transmitted frequency f_e . The transponder and its antenna thus absorb the field or the radio signal of the emitter very weakly.

Inversely, the invention provides the mechanisms for tuning the antenna of a transponder. These tuning mechanisms make it possible for the transponder to fully

receive the field or the radio signal when it needs to do so, particularly when the transponder is selected. The first embodiment mode provides the tuning of the antenna in accord with the resonance frequency of the antenna on the frequency f_e of the field of the transmitted signals.

As shown in Figure 3, the tuning mechanisms for the resonance frequency of the antenna consist advantageously of a changeable capacitance. The changeable capacitance is obtained according to the example of Figure 3 using the capacitor V1 connected by the action of a commutator I1 in parallel with the capacitors C1 and C2. When the commutator I1 is closed, the capacitance C of the resonance circuit is thus:

$$C = C1 + C2 + V1$$

where C1, C2, V1 are the capacitance values of the capacitors C1, C2, and V1 respectively.

The resonance frequency f_a of the tuned antenna is thus determined by the following product:

$$L \bullet C = L \bullet (C1 + C2 + V1)$$

The frequency f_a of the tuned antenna will thus be different from the frequency f_d of the detuned antenna, determined by the following product:

$$L \bullet C = L \bullet (C1 + C2)$$

The frequency f_d will be correctly shifted relative to the frequency f_a by the proper selection of the capacitance values C1, C2, and V1.

For example, if the frequency f_e of the field or of the radio signal transmitted is 130 kHz, the antenna will be tuned to the frequency f_a of 130 kHz by choosing the following values of these components:

- an inductance L of 1 μ H
- identical capacitors C1, C2, V1 of 0.5 μ F. The product of the inductance values and the capacitance will thus amount to:

$$L \bullet (C1 + C2 + V1) = 1.5 \bullet 10^{-6} \text{ s}^2$$

This product corresponds to a resonance frequency of 130 kHz.

The mechanisms for detuning the antenna can consist, simply, in disconnecting the capacitor V1 by opening the interrupter I1. The product of the inductance values and the capacitor of the detuned antenna will thus amount to:

$$L \bullet (C1 + C2) = 1 \bullet 10^{-6} \text{ s}^2.$$

This product corresponds to a resonance frequency f_d for the detuned antenna of approximately 160 kHz. The antenna, being tuned to the frequency f_d shifted from the frequency f_a of the field or the signals transmitted by the emitter, receives this transmission very faintly and does not disturb the reception of the field or the signals by

an adjacent transponder.

Figure 2 shows this situation in which two transponders T1, T2 are located in the radio field of the emitter E. In considering that the transponder P1 is in a detuned state, you see that the field B is correctly transmitted to the transponder P2, although the transponder P1 is intervening.

In an equivalent manner, the tuning of the antenna can be obtained when the commutator I1 is open, the values of the inductance L and the capacitors C1 and C2 corresponding thus to the frequency f_e of the emitter. The antenna is detuned by closing the commutator I1, i.e. in connecting the capacitor V1 or even in connecting many capacitors V1, V2 using many interrupters I1, I2.

It is preferable that the resonance frequency f_d of the detuned antenna be near to the frequency of the emitter f_e and thus the resonance frequency f_a of the tuned antenna. In effect, the detuned antenna will then receive the field or the radio signal weakly. Thus, the transponder uses a low but sufficient power to activate the tuning mechanisms, such as interrupter I1, and then goes into a tuned state. This effect can be advantageously used in order to activate the transponders in turn as is seen in the following.

A second embodiment mode of the detuning mechanisms of the antenna of a transponder consists in performing a mismatching of the impedance between the antenna and the electronic circuits D of the transponder.

The antenna of a transponder has in effect a specific impedance at the frequency f_e of the field or the transmitted signals.

So that the electronic circuit D served by the antenna receives the signal and the power sufficiently, conventionally a matching of the impedance was carried out, i.e. the electronic circuit calculated and adjusted in order to present an input impedance roughly identical to the impedance of the output of the antenna, for the electronic signals having the set frequency f_e .

Figure 4 makes it possible to better understand the second embodiment mode. It shows a transponder similar to that of Figure 3 in which a resistance R can be connected in the circuit of the antenna in order to perform a detuning of the impedance. The antenna always consists of an inductance L and the capacitors C1, C2, the capacitance of the capacitors being fixed in this example of the second embodiment mode. The resonance frequency of the antenna determined by the product of the values of the inductance and capacitance ($L \cdot C$) is thus fixed and corresponds to the frequency f_e of the field and of the transmitted signals. In this second embodiment mode, there is thus no detuning of the frequency. A commutator I makes it possible to connect the resistor R in parallel with the components L, C1, C2 of the antenna and to the electronic circuit D.

The value of the resistor R is selected in order to change the value of the impedance of the antenna or the value of the impedance of the electronic circuit D, the value of resistance R being preferably low. The value of resistance R can be, at the extreme, zero, the mechanism for detuning thus returning to short-circuit the antenna, the transponder thus absorbing neither power nor field.

Functionally, the antenna receives the field or the signals of the frequency f_e normally.

When the interrupter I is closed, the resistor R changes the impedance of the antenna L, C1, C2 and the antenna is mismatched in impedance relative to the electronic

circuit.

In this detuned state, the electronic signals and the power received by the antenna are weakly transmitted to the electronic circuit. The antenna of the transponder thus absorbs little to none of the field or transmitted signals.

In the tuned state according to the second embodiment mode, the commutator I is open and the resistor R is disconnected from the circuit. The antenna L, C1, C2 thus has an impedance matched to the impedance of the electronic circuit D served by the antenna. The antenna thus transmits fully the signal and the power that it receives to the electronic circuit D. The transponder thus absorbs the field B and the power. It can thus be correctly detected by the emitter/receiver E, this emitter/receiver detecting the absorption of the field. According to a variation, the transponder uses the power absorbed in order to re-emit a strong response signal to the emitter/receiver E.

Other embodiments of the tuning/detuning of the commanded impedance can be imagined without leaving the frame of the invention. The use of a quarter-wave line, an impedance transformer ... are, for example, two of the many mechanisms for tuning and/or mismatching the impedance which are available to the specialist.

More generally, other mechanisms for detuning and tuning for transmission of the field or the signal which are well known by the specialists can be imagined in a similar manner.

In the following description, you generally use the expression "tuned transponder" to designate a transponder which has an antenna in a tuned state, one of the previous mechanisms for tuning to transmission of the field or of the radio signals being implemented.

In the opposite case, reference is made to the detuned transponder.

The function of the group of transponders as well as the transmission protocols of a system of transponders, according to the invention, will now be described, which illustrates the other advantages of the invention.

The transponders which are not working, i.e. outside the radio field B, are preferably in a detuned state.

Thus when several transponders simultaneously enter into the field B, each transponder can go into an tuned state and be detected or interrogated by the emitter/receiver without perturbation by the other transponders, which are all detuned.

In the detuned state, it is planned that a transponder receives a little of the field and thus of the power. The transponder will thus have available to it the minimum power necessary to go from the detuned state into the tuned state by activating, for example, the commutator I, I1, I2.

This condition is easily carried out because an antenna tuned to a frequency which is slightly shifted from the frequency of the transmitted field always receives weakly the radio field and its power. In the same manner, a mismatching of the impedance between the antenna and the electronic circuit always allows a low transmission of the radio signal and thus of the power.

A first protocol of detection/interrogation provides that a transponder goes into a tuned state in a random manner. If the interval of time during which the transponder stays in the tuned state is reduced, the probability that the two transponders will be tuned at the same time is low. One thus obtains in an advantageous manner, a good detection or

good response to the transponders.

The phases of the protocol of the reading are thus the following:

- the transponders are initially detuned.
- among the transponders existing in the field, which are receiving a little of the power, a transponder goes into the tuned state in a random manner.
- the radio signals are exchanged between this tuned transponder and the emitter/receiver E.
- this transponder becomes detuned again.

A second protocol consists in providing that one transponder goes into the tuned state after an appropriate command signal of the emitter E.

The transponders can thus be activated in turns, a single transponder being tuned at a given instant.

One can also provide that the transponders are all in a tuned state when they are not working. In this third protocol, the emitter can then send a command ordering a transponder to go into a detuned state. The emitter can thus detune all of the transponders located in the field except for one. The transmission phase of signals between the transmitter and the selected transponder can thus take place.

After this exchange the emitter activates another transponder.

And then in succession up until the emitter has interrogated each transponder located in its field.

This command by the emitter is preferably combined with a known identification code protocol of a transponder bit by bit.

You can again use a protocol for detecting/interrogating in which the protocol begins from an initialization signal of the emitter/receiver, each transponder re-emitting a recognition signal after a period of time corresponding to a component of its identification code.

These protocols and the systems of detection/interrogation are described, for example, in the patent EP-B-0 495 708, in the name of the applicant, the description of which is incorporated here.

The invention again provides a detection and/or interrogation system of transponders consisting of a radioelectric emitter/receiver and several transponders such as those described above, ready to be brought into its field.

Figure 2 shows an example of such a detection system. You can thus see a group of three transponders P0, P1, P2, and an emitter/receiver E which makes it possible to detect them and/or to interrogate them.

The two transponders P1 and P2 are found in the limits, shown in dotted lines, of the radio field B emitted by the emitter E.

Each transponder consists of an antenna, shown for example in Figure 2 under the form of the circuit resonant by the inductance, capacitance, load and electronic circuit.

Preferably this antenna functions to receive the radio field B and its power as well as the radio signals transmitted in modulating the field B. In this case, the field and the signals have the same frequency, called the set frequency f_e .

One can also make it so that the field and the signals have separate frequencies, the antenna of the transponder receiving the signals of the frequency determined from the emitter E and the electronic circuit of the transponder receiving, on the other hand, a field

B of the ordinary frequency and its power.

One can, in addition, make it so that the antenna of the transponder emits the set frequency signals intended for the receiver E, an electronic circuit of the transponder receiving separately the field B of the ordinary frequency.

Each transponder thus consists of an antenna capable of transmitting radio frequency signals set between the emitter/receiver E and the transponder.

When the transponders P1, P2 according to the invention are in the field B, the transponder P1 can be detuned or mismatched. Thus, one avoids any perturbation of a transmission between the emitter/receiver E and the transponder P2 by the other transponder P1 present in the radio field B.

At the same time, at another phase of the transmission protocol, the transponder P2 can be mismatched or detuned in order to avoid any perturbation of a transmission between the emitter/receiver E and the transponder P1.

In order to go to this other phase, it is preferable to provide that the emitter/receiver sends a command to one transponder of the group of the transponders present. This command signal can be, for example, the identification code of a transponder. The transponder involved thus goes, preferably, into a selected state after this command comes from the emitter/receiver radio.

Finally, the invention provides that the system of detection/interrogation consists of an emitter with frequency scanning on a reduced range.

This arrangement is advantageous when one uses the transponders which have the antenna detuned in frequency. Thus, a transponder which would not be detected or read during the interrogation phase can be detected during this frequency scanning phase.

According to the previous example, if the set frequency f_e , roughly equal to the frequency f_a to which the antenna of the fitted transponder is tuned, is 130 kHz, the emitter/receiver can consist of a frequency scanning on the range 130 kHz - 160 kHz. The range of frequency thus contains the frequency f_a of the resonance of the tuned antennas and the frequency f_d of resonance for the detuned antennas.

This functioning mode of the transponders described above provides that the emitter generates a unique radio field which has the set frequency, this field transmitting if necessary, information to a transponder, such as an interrogation or initialization signal in the form of the radio signal. This radio signal is preferably a simple modulation of the radio field.

In a general manner, the invention can be implemented with a transponder having a device for receiving the power separate from the system for receiving the radio signals.

Moreover, in the preceding applications imagined, only the fact has been mentioned that the antenna of the transponders was detuned in order to prevent the absorption of the field or the radio signal of the emitter.

But in a more general manner, the response signals sent by one of the transponders towards the emitter/receiver can also be absorbed by the adjacent transponders. This effect is all the more restrictive since the transponder generally has a power available to it which is very low for such a re-emission.

It is thus advantageous to provide that the other transponders be detuned in order to prevent the absorption of the response signal re-emitted by a transponder.

Thus, in a general manner, the invention provides a transponder ready to be

introduced in a radioelectric field, the transponder consisting of an electronic circuit which is able to absorb and to reconstruct the power supplied by such a field, and an antenna capable of transmitting the radioelectric signals of the set frequency, principally characterized in that the antenna consists of the mechanisms for detuning to the transmission of signals of the set frequency and mechanisms for tuning to the transmission of signals of the set frequency, the mechanisms for tuning the antenna being implemented when the transponder is in a selected state, the mechanisms for detuning the antenna being implemented when the transponder is in a non-selected state such that the non-selected transponder has a limited absorption of radioelectric signals of the set frequency.

The invention can be advantageously implemented in a transmission system consisting of a sensor or detector designed to read the information on the labels or to detect objects consisting of these labels. This system applies particularly to commercial applications, for example, for a tracing of products or monitoring of stock, the labels having price information, identification information, or the number of corresponding products.

Other applications and variations of the embodiment modes explained are known to the professional without leaving the frame of the invention presented here.



CLAIMS

1. Transponder (P1) ready to be introduced into a radioelectric field (B), the transponder (P1) made up of an electronic circuit (D) which is able to absorb and to reconstruct the power supplied by such a field, and an antenna (L, C1, C2) capable of transmitting radioelectric signals of a set frequency, characterized in that the antenna consists of the mechanisms for detuning to a transmission of signals of a set frequency and mechanisms for tuning to the transmission of signals of the set frequency, the mechanisms for tuning the antenna being implemented when the transponder is in a selected state, the mechanisms for detuning the antenna being implemented when the transponder is in a non-selected state such that the non-selected transponder (P1) has a limited absorption of radioelectric signals of the set frequency.

2. Transponder according to claim 1, ready to be introduced into a radioelectric field of a set frequency, the transponder (P1) consisting of an antenna (L, C1, C2) capable of receiving the radioelectric field (B) of the set frequency and an electronic circuit (D) connected to the antenna (L, C1, C2), the circuit absorbing and restoring the power supplied by the field received by the antenna, characterized in that the transponder consists of mechanisms for detuning (V1, R) to a reception of a radioelectric field of the set frequency and of mechanisms for tuning (V1, I1, R, I) to the reception of the radioelectric field of the set frequency, the mechanisms for tuning being implemented when the transponder is in a selected state, the mechanisms for detuning being implemented when the transponder is in a non-selected state in order to limit the absorption of power and/or of the field (B) by the transponder (P1) in the non-selected state.

3. Transponder according to one of the preceding claims, characterized in that the mechanisms for tuning (V1) allow for tuning the antenna according to the set radioelectric frequency, and in that the mechanisms for detuning (V1, I1) allow for detuning the antenna relative to the set radioelectric frequency.

4. Transponder according to one of the preceding claims, characterized in that the mechanisms for tuning (V1) and/or the mechanisms for detuning (V1, I1) are made to change a capacitance value (C1+C2+V1), the antenna having an inductance value (L), in a manner such that the tuning frequency of the antenna is changed relative to the set frequency of the radioelectric signals.

5. Transponder according to one of the preceding claims, characterized in that the mechanisms for tuning (R) and/or the mechanisms for detuning (R, I) make it possible to change the matching of the impedance between the antenna and the electronic circuit.

6. Transponder according to one of the preceding claims, characterized in that the mechanisms for tuning and/or the mechanisms for detuning are made to change a value of the load and/or resistance (R) in order to change the impedance value of the antenna (L, C1, C2) and/or the impedance value of the electronic circuit (D).

7. Group of transponders according to one of the preceding claims, characterized in that when two transponders (P1, P2) are introduced into a radioelectric field, each (P2) of the transponders receives the radioelectric field and/or the set frequency signals regardless of the position of a transponder (P2) relative to the other transponder (P1).



each transponder consisting of the mechanisms for tuning and detuning in order to avoid the radioelectric perturbations caused by the nearness of the other transponder.

8. Group of transponders according to one of the preceding claims, characterized in that the transponders pass into a selected state in turns, only one transponder or a low number of transponders being in a selected state at any one instant in time.

9. Group of transponders according to one of the preceding claims, characterized in that a transponder goes into a non-selected state during a period of time corresponding to a temporary inhibition of the transponder.

10. Detection and/or interrogation system of transponders, consisting of a radioelectric emitter/receiver (E) and several transponders (P1, P2) ready to be brought into a radioelectric field (B) emitted by the emitter/receiver (E), each transponder consisting of an antenna (L, C) capable of transmitting radio frequency signals set between the emitter/receiver (E) and the transponder, the system being characterized in that it consists of transponders according to one of the previous claims in order to avoid the perturbation of a transmission between the emitter/receiver and a transponder by the other transponders present in the radio field.

11. System according to claim 10, characterized in that the radioelectric emitter/receiver has frequency scanning in a range around the set frequency so that a transponder located in a non-selected state absorbs the power supplied by the field emitted by the emitter/receiver and goes into a selected state so that the transponder is detected and/or interrogated.

12. System according to claim 10 or claim 11, characterized in that a transponder goes into a selected state after a command coming from the radioelectric emitter/receiver.