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(54) Abstract Title
System for analysing reflected waves from an LC resonant tag

(57) A system for analysing waves reflected from an LC resonant tag 1 is applied to detecting whether a part or an exchanged expendable supply mounted on a machine is a genuine part, that is, a genuine spare or replaceable part, for example, a photocopier toner cartridge 32. In this example, a scanner 11 can be installed near a cartridge chamber of a copier 31 and the tag 1 is attached to a genuine toner cartridge 32 to indicate that it is a genuine part. When the genuine cartridge 32 is mounted on the copier 31, the scanner 11 analyses the waves reflected by the tag 1 to judge that it is a genuine part, whereby the copier 31 may enter a standby state and display a message such as "YOU CAN MAKE COPIES". When the scanner 11 judges that a non-genuine cartridge is mounted, copier operation may be inhibited and a message such as "PLEASE REPLACE THE TONER CARTRIDGE" may be displayed. The reflected wave scanner 11 operates by transmitting sweeping electromagnetic waves and comparing these with received waveforms to detect the presence and resonant frequency of a tag 1 in the transmission field. The LC resonant tag 1 is constituted by an electrically conducting spiral pattern on surfaces of a dielectric film (fig. 2) and the detection involves phase difference detection (fig. 6) and resonance sharpness detection (fig. 7). Genuine part detection may be applied to automobile spare parts and cash dispenser parts to improve security. Other applications include determining history of attachment of cash dispenser parts for security purposes, a recyclable part having one or more tags 1 which are altered when recycled to enable the scanner 11 to judge how many times the part has been recycled, a tagged toy enabling voice or image responses to tag detection and a tagged security key allowing access to a communication network, e.g. a PC.

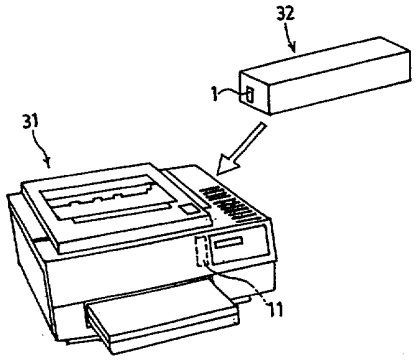

FIG 8

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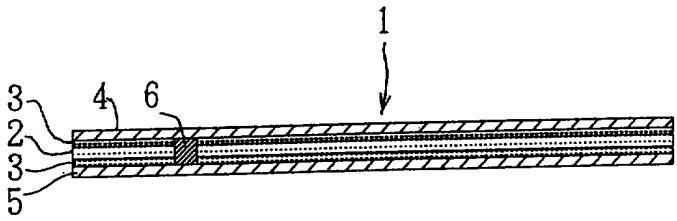

FIG 1

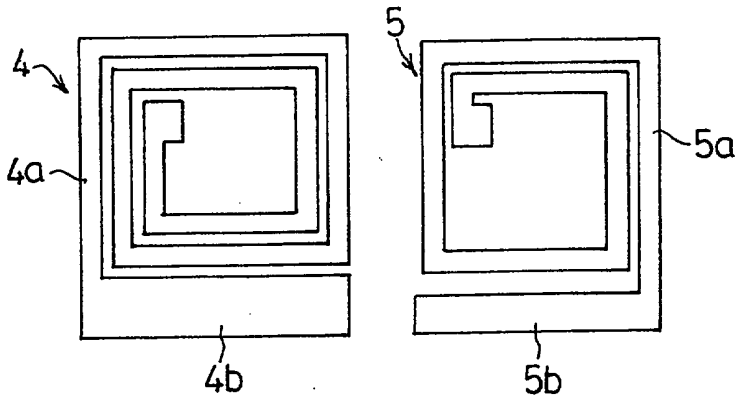

FIG 2a FIG 2b

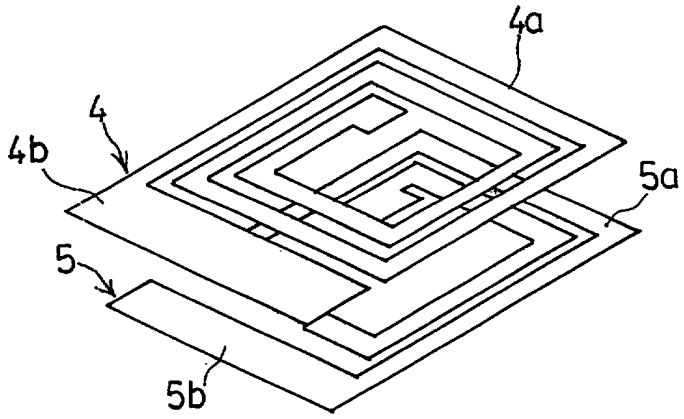

FIG 2c

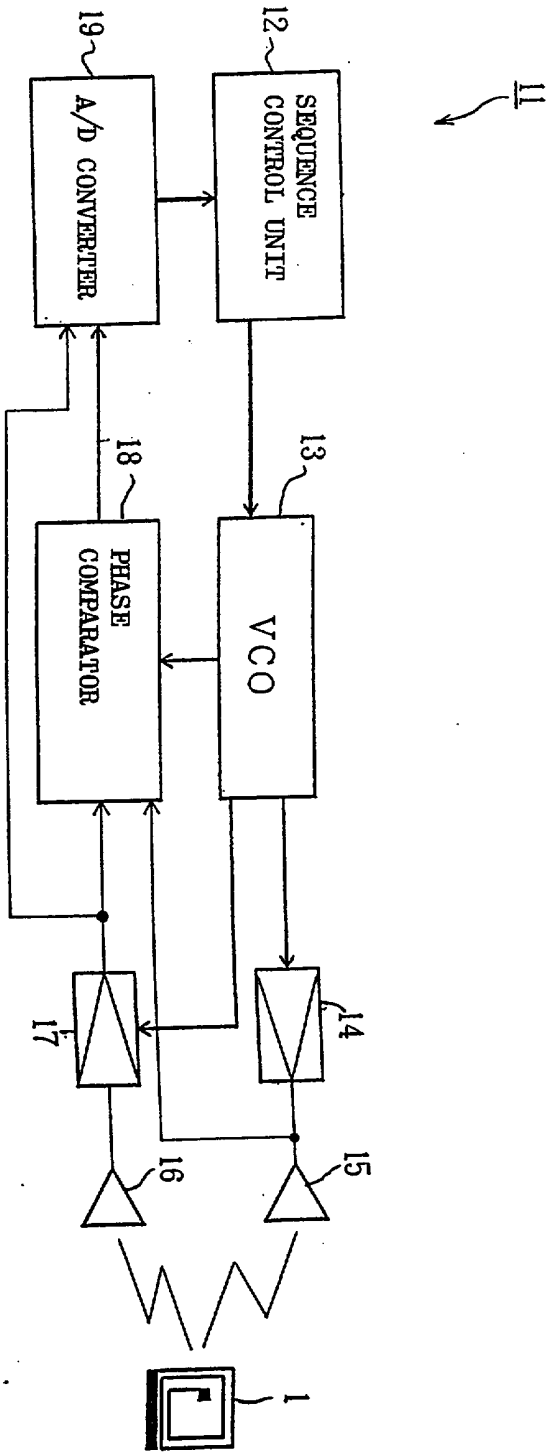
11
12
SEQUENCE CONTROL UNIT
19
A/D CONVERTER
13
VCO
18
PHASE COMPARATOR
14
17
15
16
1

FIG 3

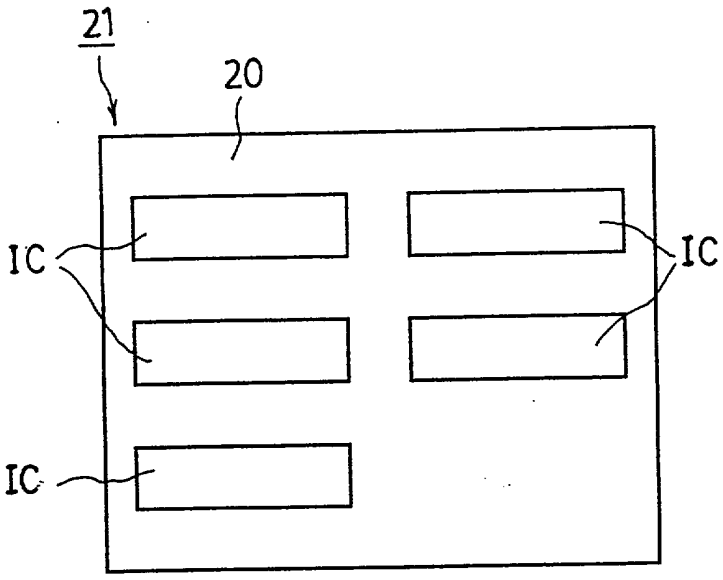

FIG 4a

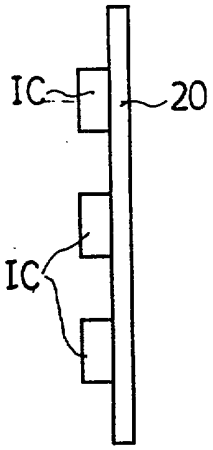

FIG 4b

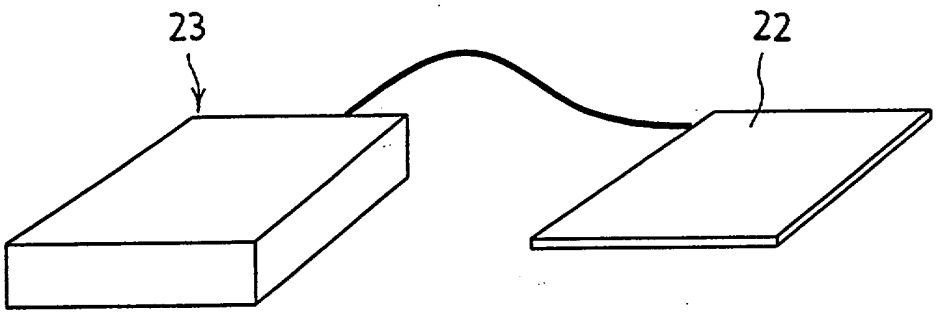

FIG 5

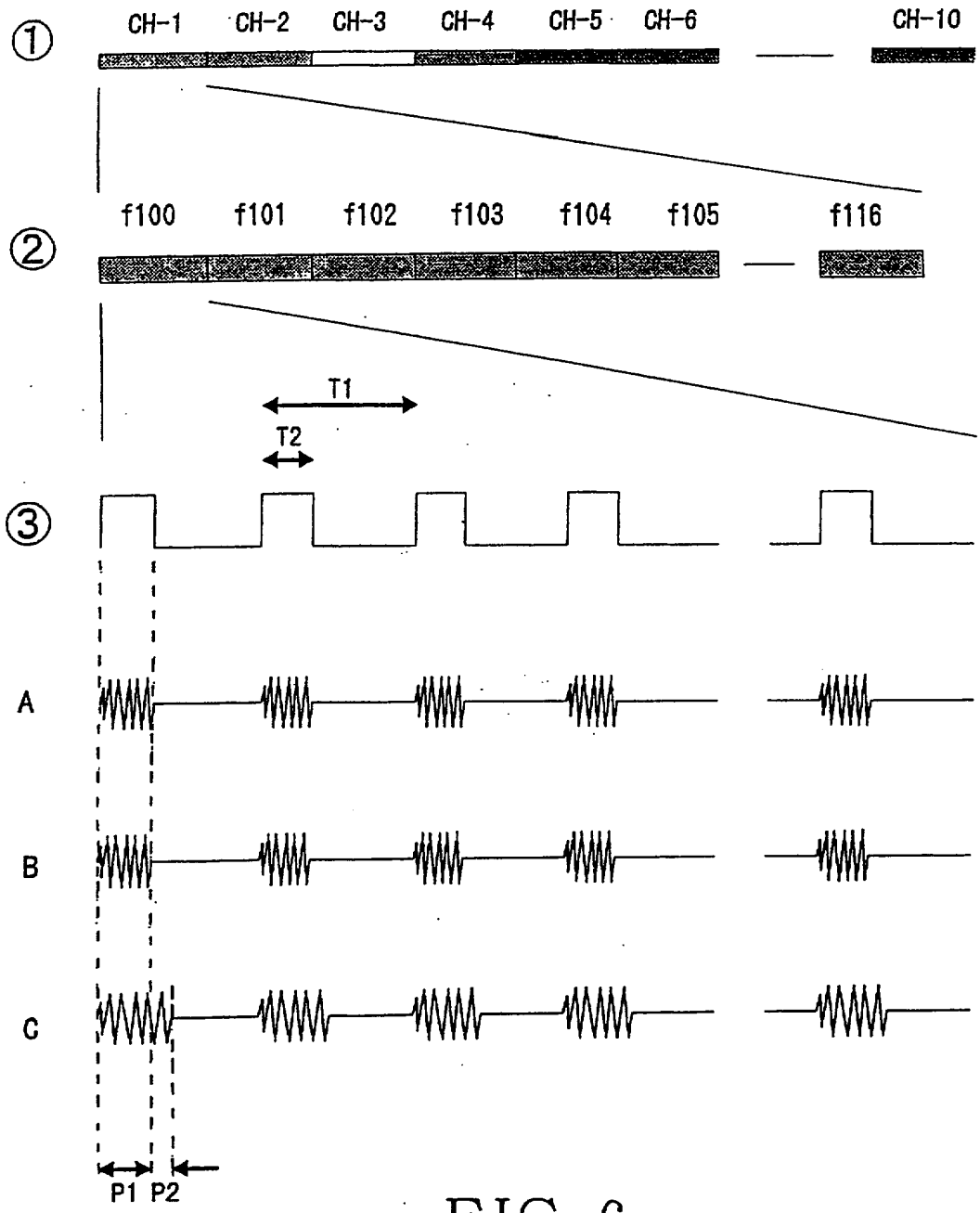
①
CH-1
CH-2
CH-3
CH-4
CH-5
CH-6
CH-10
②
f100
f101
f102
f103
f104
f105
f116
T1
T2
③
A
B
C
P1
P2

FIG 6

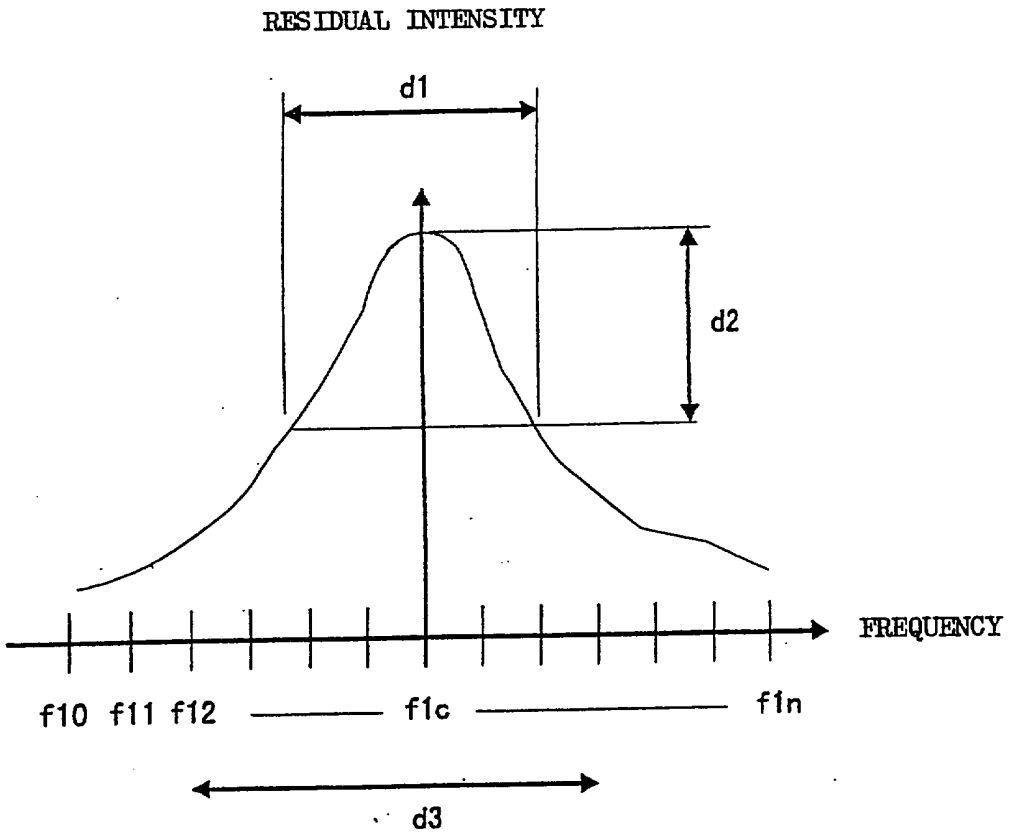

FIG 7

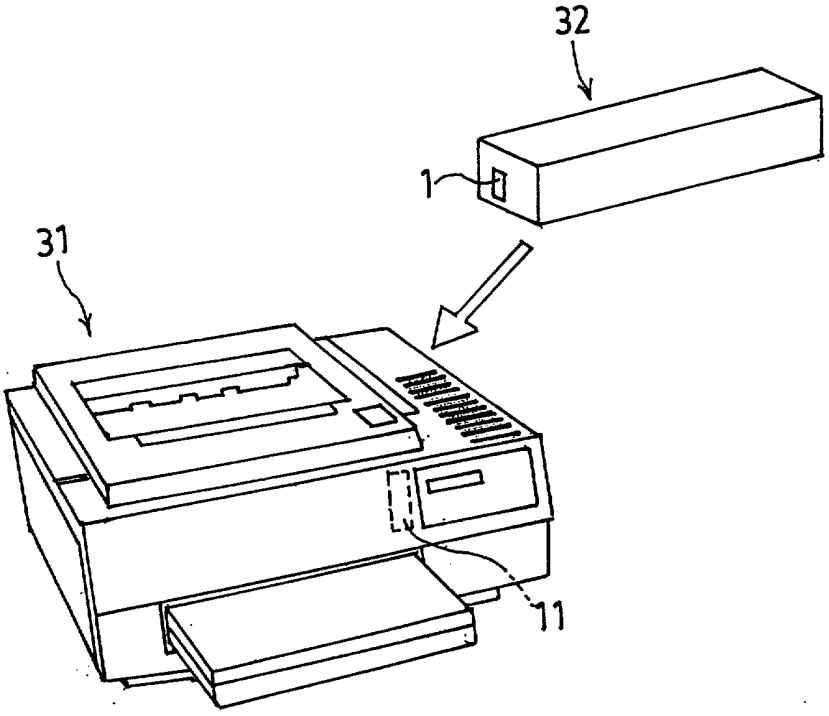

FIG 8

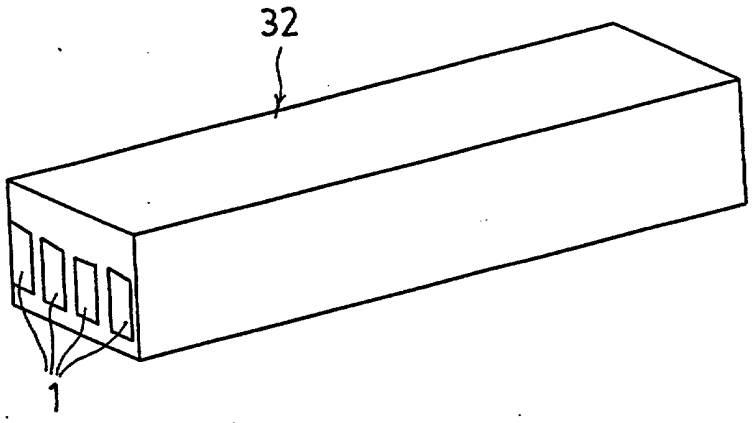

FIG 9

SYSTEM FOR ANALYZING REFLECTED WAVES AND REFLECTED WAVE SCANNER

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a system for analyzing reflected waves and, particularly, to a system for analyzing reflected waves for specifying the kind of an LC resonance tag by detecting the resonance frequency of the LC resonance tag and the frequency pattern of the reflected waves using a reflected wave scanner.

Description of the Prior Art

Third-party products and copied products are often used in addition to genuine expendable supplies and genuine parts in the fields of office machines and transportation equipment such as of automobiles. Non-genuine parts other than the genuine parts produced by the third parties who are obtaining license of production from the genuine parts manufacturer, in many cases, infringe the industrial property right. When use of the non-genuine parts causes troubles or malfunctions of the machine, a dispute often occurs between the manufacturer of the machine and the users concerning the repair and guarantee. In order to avoid trouble, therefore, the genuine parts manufacturer must grasp or manage the use of non-genuine parts.

In order to save resources, furthermore, it has been urged to recover and recycle machine parts and expendable supplies. For many products, however, limitation is imposed on the number of recycled times and the range for using them. Besides, means is required for easily judging and managing the number of recycled times and the kinds of the recycled parts in order to specify the disposal of parts and products and for automatic treatment.

Thus, there arises a technical assignment that must be solved for detecting whether the parts attached to the machine and the replaced expendable supplies are genuine parts, and for

reliably detecting the number of recycled times of the parts.

SUMMARY OF THE INVENTION

The object of this invention is to solve the above assignment.

The present invention was proposed in order to accomplish the above-mentioned object, and provides a system for analyzing reflected waves, comprising:

an LC resonance tag constituting an LC resonance circuit by forming an electrically conducting spiral pattern on one surface or on both surfaces of a dielectric film; and

a reflected wave scanner which transmits sweeping electromagnetic waves from a frequency sweeping transmitter, compares the waveforms received by a receiver with the transmitted waveforms, and detects the presence of the LC resonance tag in the transmission electric field and the resonance frequency of the LC resonance tag based upon the result of comparison; wherein

the reflected wave scanner is incorporated in a product that mounts a genuine part, a particular LC resonance tag is attached to the genuine part, and whether the part mounted on the product is genuine is judged based on the presence of reflected waves specific to the LC resonance tag.

The invention further provides a system for analyzing reflected waves, wherein:

a part being produced is provided with a piece of LC resonance tag, a plurality of pieces of LC resonance tags, or an LC resonance tag having a plurality of resonance frequencies;

an LC resonance tag is destroyed or the resonance frequency of the LC resonance tag having the plurality of resonance frequencies is changed when the product is recovered every time, and the product is shipped again; and

the number of pieces of the LC resonance tags is detected or the resonance frequency is detected by the reflection wave scanner at the time of recovery to judge the number of recycled times.

The invention further provides a system for analyzing

reflected waves, wherein the reflected wave scanner is incorporated in a response unit of a toy system which comprises a toy and the response unit, a particular LC resonance tag is attached to the toy, and the response unit executes the response such as offering voice data or image data that have been set in advance when the reflected wave scanner has detected the reflected waves specific to the LC resonance tag. The invention further provides a system for analyzing reflected waves, wherein the reflected wave scanner is provided in a household data equipment such as personal computer or the like, an LC resonance tag is attached as a security key to a medium such as IC card or magnetic card that is offered for making an access to a particular content on the communication network, and the household data equipment is permitted to make an access to a particular content on the communication network or to execute the downloading when the reflected wave scanner has detected the reflected waves specific to the LC resonance tag.

Further, the invention provides a reflected wave scanner in the system for analyzing reflected waves, wherein a module is constituted by mounting an IC constituting a reflected wave scanner circuit on a substrate, and provides a reflected wave scanner in the system for analyzing reflected waves, wherein a module is constituted as a unitary structure by mounting an IC constituting a reflected wave scanner circuit on a substrate on which an antenna pattern is formed.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view of an LC resonance tag;

Fig. 2 illustrates the LC resonance tag, wherein Fig. 2(a) is a plan view showing an electrically conducting pattern on the front surface, Fig. 2(b) is a plan view showing an electrically conducting pattern on the back surface, and Fig. 2(c) is a view illustrating a positional relationship between the electrically conducting patterns on the front and back surfaces;

Fig. 3 is a block diagram of a reflected wave scanner circuit;

Fig. 4 illustrates a reflected wave scanner IC module, wherein Fig. 4(a) is a plan view thereof, and Fig. 4(b) is a side view thereof;

Fig. 5 is a perspective view illustrating another embodiment of the reflected wave scanner IC module;

Fig. 6 is a timing chart illustrating the scanning operation of the reflected wave scanner;

Fig. 7 is a graph illustrating a waveform pattern drawn by sampling the echo waves of the LC resonance tag;

Fig. 8 is a perspective view of a copier; and

Fig. 9 is a perspective view of a toner cartridge mounting the LC resonance tag.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of the invention will now be described in detail. The system for analyzing reflected waves used in the invention is constituted by a reflected wave scanner and an LC resonance tag like a fee calculation device in a cafeteria or a fixed product-monitoring device proposed already by the present applicant.

Fig. 1 shows an LC resonance tag 1 having patterns formed on both surfaces, as an example of the LC resonance tag, which is in the form of a thin sheet formed by adhering metallic electric conductors 4 and 5 on both surfaces of a dielectric film 2 via an adhesive 3. In the LC resonance tag 1 having patterns formed on both surfaces as shown in Figs. 2(a), 2(b) and 2(c), the conductors 4 and 5 have capacitor patterns 4b and 5b of relatively large areas continuous to the outer ends of rectangular spiral coil patterns 4a and 5a. The inner peripheral ends of the coil patterns 4a ad 5a on the front and back surfaces are connected together by a conductor 6 shown in Fig. 1. An LC series resonance circuit is formed by an inductance due to the coil patterns 4a, 5a and by a capacitance due to the capacitor patterns 4b, 5b facing thereto via the dielectric film 2. The resonance frequency of the LC resonance tag 1 varies depending upon the numbers of turns of the coil patterns 4a, 5a and the areas of the capacitor patterns 4b, 5b,

and many kinds of LC resonance tags having different resonance frequencies are prepared and used in a range of a short wave band up to an ultrashort wave band.

The conductors 4 and 5 are formed by etching, by printing an electrically conducting paste or by the like means. As the dielectric film 2, there can be used PP (polypropylene), PET (polyethylene terephthalate) or PI (polyimide). As the adhesive 3, there can be preferably used a material having a dielectric constant nearly equal to that of the dielectric film 2.

Fig. 3 illustrates the constitution of circuit blocks of the reflected wave scanner 11, in which the output of a VCO 13 controlled by a sequence control unit 12 is amplified through a transmission amplifier 14, and is transmitted from a transmission antenna 15. Here, the frequency band that is used is from a short wave band through up to an ultrashort wave band, and the scanning of a preset frequency band is repeated at a regular scanning interval.

When the transmitted waves are reflected by an LC resonance tag 1 that resonances with a given frequency in the sweeping frequency band of the reflected wave scanner 11, then, the reflected waves fall on a reception antenna 16. The received waves are amplified through a reception amplifier 17 and are input to a phase comparator 18 together with the output of the transmission amplifier 14. The output of the phase comparator 18 is sampled by an A/D converter 19 in synchronism with the reference clocks. The received waveform data from which noise is removed and which are binary-coded, are written into a memory in the sequence control unit 12.

Sweeping frequency band data, scan interval data and waveform pattern-analyzing program are stored in the memory of the sequence control unit 12. The sequence control unit 12 has a comparing/analyzing function based on a pattern matching method that is widely used in a field of image processing, and collates the reference waveform pattern data with the received waveform pattern data. Further, a host computer is connected to the reflected wave scanner 11, so that the reference waveform

pattern data and display data can be newly written or rewritten into the memory of the sequence control unit 12 from the computer.

Based on the result of comparing and analyzing the reflected waves, the sequence control unit 12 sends analyzed data to equipment mounting the reflected wave scanner 11, e.g., to a control unit of a copier or the like, and the control unit of the copier or the like controls the display unit to display the result of analysis.

Referring to Fig. 4, the reflected wave scanner 11 is in the form of a hybrid IC module 21 fabricated by mounting a plurality of ICs constituting the above-mentioned circuit on a substrate 20 on which a transmission/reception antenna pattern (not shown) is formed, or is in the form of an IC module mounting a monolithic IC in which the above-mentioned circuits are formed integrally together, or as shown in Fig. 5, is in the form of an IC module to which a separate transmission/reception antenna 22 is connected, in order to decrease the size as small as possible and, hence, to reduce space when it is mounted on a business machine such as copier or the like or on an automobile or the like.

When the control unit of the copier or the automobile can be utilized as a main control unit of the reflected wave scanner 11, the reflection wave analyzing function and the memory function can be omitted from the sequence control unit, making it possible to further decrease the size.

Next, described blow is the operation of the system for analyzing the reflected waves. Here, the transmission frequency band of the reflected wave scanner is divided into ten channels, and ten kinds of LC resonance tags are used having resonance frequencies lying nearly at the centers of the bands of the channels.

The reflected wave scanner successively scans the frequency bands of from CH-1 (channel 1) through up to CH-10 (channel 10) shown in Fig. 6①. Each channel is constituted, as shown in Fig. 6②, by frequency bands of 17 steps (fn00 to fn16

(n = 1, 2, ---, 10)). The frequency is changed stepwise like 5.00 MHz, 5.01 MHz, 5.02 MHz, 5.03 MHz, --- by controlling the sequence control unit instead of analog sweeping in which the frequency continuously changes, in order to sweep each channel in 17 steps.

As shown in Fig. 6③, further, every frequency fn(i) of 17 steps is transmitted for a predetermined period of time T2 (several microseconds). In order to cope with noise, every frequency fn(i) is intermittently and repetitively transmitted a plurality of times maintaining a repeating timing T1 (several tens of microseconds) and, then, a frequency fn (i+1) of the next step is transmitted.

Fig. 6③ illustrates the timing of a transmission output gate, wherein A represents the waveform of electromagnetic waves transmitted from the transmission antenna, and B represents the waveform input to the reception antenna when the LC resonance tag does not exist in the sensitive region of the reception antenna.

On the other hand, when the LC resonance tag that resonates with the frequency of the transmitted electromagnetic waves exists in the sensitive region of the antenna, echo waves of the LC resonance tag are superposed on the electromagnetic waves directly arriving at the reception antenna from the transmission antenna thereby to form a waveform as represented by C.

In a section P1 (transmission time), in this case, the phase differs between B and C with respect to the transmission waveform denoted by A (A - B ≠ A - C). In C, further, echo waves delayed by the LC resonance tag are recognized in a section P2 that follows the section P1.

A pattern of resonance levels shown in Fig. 7 is obtained if the reception level of the delayed portion (P2) of the echo wave only at the same frequency transmitted a plural number of times maintaining a predetermined timing is accumulated and if the reception levels of echo waves at respective frequencies (fn0 to fn16) in each channel are

subjected to the A/D conversion and are sampled.

The reflected wave scanner repeats the transmission of the same frequency fn(i) to remove white noise and impulsive noise, and specifies the frequency channel of the LC resonance tag when a phase difference of C from B is recognized in the section P1 like in C, and when a resonance level pattern in the section P2 satisfies the sharpness of resonance based on d1 and d2 in Fig. 7 and satisfies a predetermined value in an error allowable range for the design frequency denoted by d3. Then, the reflected wave scaner sends the ID data of the LC resonance tag to the host computer.

In the case of a system in which the kinds of the LC resonance tags are limited to ten, and one kind of the LC resonance tag among the LC resonance tags of 10 channels is stuck to an object, the number of kinds that can be identified is ten. In the case of a system in which five kinds of the LC resonance tags among ten channels of the LC resonance tags are stuck in combination to the object, the number of kinds that can be identified is ${}_{10}C_5 = 252$ according to the formula of combination of permutations. When any six channels among 42 channels are combined, the number of kinds that can be identified is ${}_{42}C_6 = 5,245,786$. By increasing the transmission/reception channels and the frequency channels of the LC resonance tags as required, the number of kinds that can be identified can be increased nearly infinitely, making it possible to separately detect many kinds of parts.

Next, described below is a method of judging a genuine part using the above-mentioned system for analyzing reflected waves. In Fig. 8, reference numeral 31 denotes a copier and in which a toner cartridge 32 is incorporated. The reflected wave scanner 11 is installed near a cartridge chamber in the copier 31 and is connected to a control unit in the copier.

An LC tag 1 is attached to the toner cartridge 32 to indicate that it is a genuine part. The LC resonance tag 1 may be stuck on the outer surface of the toner cartridge 32 or on the inner surface thereof where it cannot be seen from the outside, or may be buried by insert-molding in the wall of the

plastic cartridge.

When the genuine toner cartridge 32 is loaded in the cartridge chamber in the copier 31, the reflected waves of the LC resonance tag 1 are analyzed by the reflected wave scanner 11 close to the toner cartridge 32, the control unit of the copier 31 displays a message such as "YOU CAN TAKE COPIES" on the display unit, and the copier 31 assumes the standby state.

On the other hand, when there is loaded a non-genuine toner cartridge without equipped with a predetermined LC resonance tag, the reflected wave scanner 11 cannot detect the reflected waves and judges it to be a non-genuine part. Accordingly, the control unit in the copier 31 displays a message such as "REPLACE THE TONER CARTRIDGE, PLEASE" on the display unit, and the copier 31 is placed in a state where it is inhibited from being driven.

It is thus allowed to prevent the use of exchangeable parts such as toner cartridge and drum cartridge other than the genuine parts in the copier, printer, facsimile and the like.

The above-mentioned method of judging genuine parts can be applied to extensive fields. For example, if exclusive LC resonance tags are attached to the genuine parts of household products and automobiles and the reflection wave scanners are installed near the places where the parts are incorporated, then, it is allowed to prevent the use of exchangeable parts other than genuine parts, offering an effective measure for safety.

Further, if exclusive LC resonance tags are attached to an ATM in a bank, to a data ROM in a cash dispenser, to a control program ROM and the like parts and if the reflected wave scanners are installed near the places where these parts are incorporated, then, the control unit in the ATM monitors the replacement of parts such as ROM and stores the history of attachment and detachment of parts in the memory, offering advantage for managing security.

Next, described below is the method of judging the number of recycled times by the system for analyzing reflected waves. For example, when the toner cartridge of the copier is

to be recycled four times, the simplest method is to attach four pieces of LC resonance tags 1 to the toner cartridge 32 as shown in Fig. 9. These plurality of LC resonance tags 1 may have different resonance frequencies or may have the same resonance frequency. This is because when a plurality of LC resonance tags are located near a reflection wave scanner, the received waveforms that are compounded together by the mutual interference of the LC resonance tags at different positions form a specific pattern irrespective of whether the resonance frequencies are the same or not. A reduction in the number of the LC resonance tags from this state causes a change in the pattern of the received waveforms. By storing the received waveform patterns of each of the pieces of LC resonance tags in the reflected wave scanner 11, therefore, it is allowed to detect the number of the LC resonance tags.

The manufacturer of the toner cartridge ships the unused toner cartridge 32 by attaching four pieces of LC resonance tags thereto, cuts or perforates a piece of LC resonance tag by using a cutter, a punch or a laser beam to destroy it every time when the toner cartridge 32 is recovered, and fills the toner cartridge with the toner through a predetermined recycling step to ship it again. Thus, the toner cartridge 32 which is used in the second time is shipped being provided with three pieces of LC resonance tags, and the toner cartridge 32 shipped in the fourth time is provided with one piece of LC resonance tag.

When the toner cartridge is used one to four times on the user's side, the reflected wave scanner 11 in the copier detects the resonance tags 1 to obtain data related to the genuine part and the data related to the number of recycled times.

The cartridge 32 recovered after it was used a specified number of four times, is provided with a piece of LC resonance tag 1. Therefore, the manufacturer learns based on the reflected wave scanner 11 that it has been used a specified number of times, and sends it to the treatment of disposal or to the step of recycling the plastic material. Like the above-

mentioned method of judging genuine parts, further, this method can be adapted to a wide range of applications not being limited to the fields of business machines such as copiers, various machines, electronic equipment and control equipment.

Further, a piece of LC resonance tag having a plurality of resonance frequencies may be attached to a part, and one among the plurality of resonance circuits may be destroyed by using a laser beam, a punch or a cutter every time when the part is recovered, to change the resonance frequency pattern of the LC resonance tag.

According to another embodiment, the reflected wave scanner 11 is incorporated in a response unit of a toy system equipped with, for example, a doll and the response unit. A particular resonance tag 1 is attached to the toy, and the display of voice data or image data or any other operation that has been set in advance in the response unit, is executed, making it possible to provide a toy system that performs a variety of novel behaviors.

In a household data equipment such as personal computer or the like, the reflected wave scanner is provided in the personal computer, an LC resonance tag is added to a medium such as IC card, magnetic card, bar-code card or numeric card for password that is attached for making access to a particular content on a communication network or for downloading the content, in order to emphasize the security of the medium itself or to use it as a key for the user only separately from the medium.

Further, if the personal computer is equipped with an LC resonance tag destruction means such as of a laser beam or a punch, or is equipped with means for changing the resonance frequency in addition to the reflected wave scanner, the LC resonance tag can be used as a temporary unsealing key for the download data on the network, offering advantage as a measure for securing the data.

The present invention is in no way limited to the above-mentioned embodiments only but can be modified in a variety of ways within the technical scope of the invention, and

it should be noted that the invention encompasses all of such modifications as a matter of course.

According to the present invention as described above, the LC resonance tag is attached to a part or an expandable supply, and the echo waves from the LC resonance tag are detected by the reflection wave scanner to judge whether it is a genuine part and to judge the number of the recycled times. the system for analyzing reflected waves is a non-contact type sensor system, and the LC resonance tag is not at all affected by external environment such as light, temperature, etc. Accordingly, a stable operation can be expected. Besides, it is very difficult to forge the LC resonance tag having quite the same electric properties as those of the genuine part, which is effective in excluding non-genuine parts and maintaining security for the data.

CLAIMS:

1. A system for analyzing reflected waves, comprising:

an LC resonance tag constituting an LC resonance circuit by forming an electrically conducting spiral pattern on one surface or on both surfaces of a dielectric film; and

a reflected wave scanner which transmits sweeping electromagnetic waves from a frequency sweeping transmitter, compares the waveforms received by a receiver with the transmitted waveforms, and detects the presence of the LC resonance tag in the transmission electric field and the resonance frequency of the LC resonance tag based upon the result of comparison; wherein

the reflected wave scanner is incorporated in a product that mounts a genuine part, a particular LC resonance tag is attached to the genuine part, and whether the part mounted on the product is genuine is judged based on the presence of reflected waves specific to the LC resonance tag.

2. A system for analyzing reflected waves, comprising:

an LC resonance tag constituting an LC resonance circuit by forming an electrically conducting spiral pattern on one surface or on both surfaces of a dielectric film; and

a reflected wave scanner which transmits sweeping electromagnetic waves from a frequency sweeping transmitter, compares the waveforms received by a receiver with the transmitted waveforms, and detects the presence of the LC resonance tag in the transmission electric field and the resonance frequency of the LC resonance tag based upon the result of comparison; wherein

a part being produced is provided with a piece of LC resonance tag, a plurality of pieces of LC resonance tags, or an LC resonance tag having a plurality of resonance frequencies;

an LC resonance tag is destroyed or the resonance frequency of the LC resonance tag having the plurality of resonance frequencies is changed when the product is recovered every time, and the product is shipped again; and

the number of pieces of the LC resonance tags is detected or the resonance frequency is detected by the reflection wave scanner at the time of recovery to judge the number of recycled times.

3. A system for analyzing reflected waves, comprising:

an LC resonance tag constituting an LC resonance circuit by forming an electrically conducting spiral pattern on one surface or on both surfaces of a dielectric film; and

a reflected wave scanner which transmits sweeping electromagnetic waves from a frequency sweeping transmitter, compares the waveforms received by a receiver with the transmitted waveforms, and detects the presence of the LC resonance tag in the transmission electric field and the resonance frequency of the LC resonance tag based upon the result of comparison; wherein

the reflected wave scanner is incorporated in a response unit of a toy system which comprises a toy and the response unit, a particular LC resonance tag is attached to the toy, and the response unit executes the response such as offering voice data or image data that have been set in advance when the reflected wave scanner has detected the reflected waves specific to the LC resonance tag.

4. A system for analyzing reflected waves, comprising:

an LC resonance tag constituting an LC resonance circuit by forming an electrically conducting spiral pattern on one surface or on both surfaces of a dielectric film; and

a reflected wave scanner which transmits sweeping electromagnetic waves from a frequency sweeping transmitter, compares the waveforms received by a receiver with the transmitted waveforms, and detects the presence of the LC resonance tag in the transmission electric field and the resonance frequency of the LC resonance tag based upon the result of comparison; wherein

the reflected wave scanner is provided in a household data equipment such as personal computer or the like, an LC

resonance tag is attached as a security key to a medium such as IC card or magnetic card that is offered for making an access to a particular content on the communication network, and the household data equipment is permitted to make an access to a particular content on the communication network or to execute the downloading when the reflected wave scanner has detected the reflected waves specific to the LC resonance tag.

5. A system for analysing reflected waves, comprising:

a first component and a second component which are put together for operation, the operation of the second component depending on a property of the first component,

an LC resonance tag mounted on the first component, the tag comprising an LC resonance circuit formed of an electrically conducting spiral pattern on one surface or on both surfaces of a dielectric film; and

a reflected wave scanner mounted on the second component, the scanner transmitting sweeping electromagnetic waves from a frequency sweeping transmitter of the scanner, comparing the wave forms received by a receiver of the scanner with the transmitted wave forms, and detecting the presence of the LC resonance tag in the transmission electric field and the resonance frequency of the LC resonance tag based upon the results of the comparison, wherein

the presence of waves specific to the LC resonance tag enables the property of the first component to be determined by the reflected wave scanner.

6. A reflected wave scanner constituted by mounting an IC constituting a reflected wave scanner circuit on a substrate.

7. A reflected wave scanner constituted as a unitary structure by mounting an IC constituting a reflected wave scanner circuit on a substrate on which an antenna pattern

is formed.

8. The system of any one of claims 1 to 5, wherein the reflected wave scanner is constituted as in claim 6 or claim 7.

9. A system for analysing reflected waves substantially as described with reference to any of the accompanying drawings.

10. A reflected wave scanner substantially as described with reference to any of the accompanying drawings.

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Claims searched: 1
Examiner: Anita Keogh
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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Other: Online: WPI, EPODOC, JAPIO, TXTE

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X, A, P	GB 2333933 A	(SENSOR TECHNOS) see whole document	X: 1 A: 2, 9
Y	GB 2246492 A	(CHIKARA) see whole document	1
A, P	WO 00/19278 A1	(OCE PRINTING SYSTEMS) see abstract	2
Y	US 5762377	(CHAMBERLAIN) see abstract, column 1 lines 16-53, column 2 lines 32-39, column 7 lines 41-63 and figure 8	1
A	US 5661470	(KARR) see abstract and column 2 lines 15-48	3
A	US 5339074	(SHINDLEY et al.) see abstract and column 1 lines 35-50 and column 3 lines 62-66	4, 5
Y	US 5294290	(REEB) see abstract, figure 1a and column 2 lines 1-12	1
Y, A	US 5132729	(MATSUSHITA et al.) see abstract, column 1 line 8 to column 2 line 29 and column 5 lines 9-43	Y: 1 A: 2, 5

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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Category	Identity of document and relevant passage	Relevant to claims
Y, A	WPI Abstract Accession no. 1998-342252 & JP 100129101 A (Omron) 19.05.98 (see abstract)	Y: 1 A: 5
Y, A	WPI Abstract Accession no. 1998-226191 & JP 100069139 A (Omron) 10.03.98 (see abstract)	Y: 1 A: 5

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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