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(71) Applicant: **Esselte Meto International GmbH**
64646 Heppenheim (DE)

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(72) Inventor: **Andrews, George F.**
Highlands, N.C. 28741 (US)

(54) Deactivatable resonant tag and method of making the same

(57) A deactivatable resonant tag which includes a supplemental conductive medium disposed on a conductor, the supplemental conductive medium preferably being different from the conductive material of the conductor proper, as well as a medium via which material from the supplemental conductive medium can migrate from

the turn of the conductor on which the supplemental conductive medium is disposed to an adjacent, parallel turn of the conductor. Also contemplated is a method of making such a deactivatable tag.

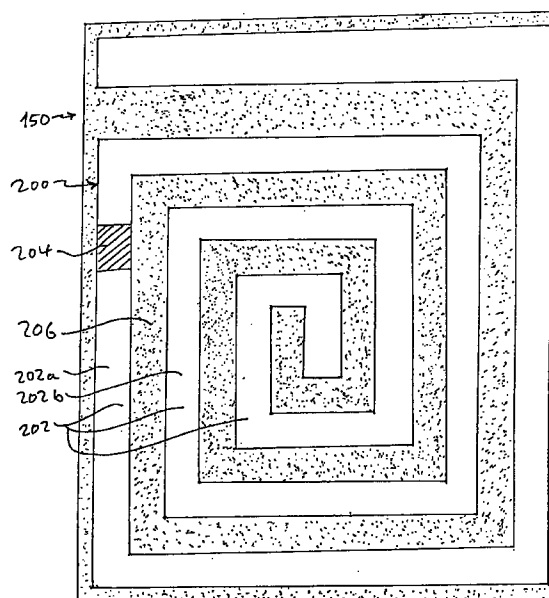


FIGURE 2

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention generally relates to deactivatable tags that can be used with electronic article surveillance systems, as well as methods for making such tags.

2. Background Information:

Several U.S. Patents disclose conventional deactivatable tags and conventional methods of making the same. Among these are: U.S. Patent No. 5,367,290 to Kind et al.; No. 5,341,125 to Plonsky et al.; No. 5,184,111 to Pichl; No. 5,172,461 to Pichl; No. 5,006,856 to Bengé et al.; No. 4,910,499 to Bengé et al.; No. 4,876,555 to Jorgensen; No. 4,835,524 to Lamond et al.; No. 4,818,312 to Bengé; No. 4,567,473 to Lichtblau; No. 4,498,076 to Lichtblau; No. 4,778,542 to Bengé et al.; No. 4,717,438 to Bengé et al.; and 4,694,283 to Reeb.

U.S. Patent Nos. 4,778,552 and 5,006,856 to Bengé et al. appear to disclose deactivatable tags in which deactivation may take place between parallel and adjacent turns of one of the conductors.

It has been found, generally, that the tags disclosed in the U.S. patents listed above, as well as other known tags, do not often present deactivation results that are consistently and reliably satisfactory, and are not often manufactured at reasonable cost.

OBJECT OF THE INVENTION

It is an object of the present invention to provide a deactivatable tag, and a method of making the same, that avoids disadvantages associated with known tags and methods, produces consistent and satisfactory results, and reduces the expenditures of time, energy, materials and cost often associated with known deactivatable tags and methods.

SUMMARY OF THE INVENTION

In accordance with at least one preferred embodiment of the present invention, there is provided a deactivatable tag which essentially includes a supplemental conductive medium disposed on a conductor, the supplemental conductive medium preferably being different from the conductive material of the conductor proper, as well as a medium via which material from the supplemental conductive medium can migrate from the turn of the conductor on which the supplemental conductive medium is disposed to an adjacent, parallel turn of the conductor.

The present invention also contemplates, in accordance with at least one preferred embodiment, a method

of making a deactivatable tag such as that described immediately above.

The instant specification provides specific examples of the materials and methods alluded to immediately above, and it is to be understood that the present invention is not to be limited to these specific examples.

The above discussed embodiments of the present invention will be described further hereinbelow with reference to the accompanying figures. When the word "invention" is used in this specification, the word "invention" includes "inventions", that is, the plural of "invention". By stating "invention", the Applicant does not in any way admit that the present application does not include more than one patentably and non-obviously distinct invention, and maintains that this application may include more than one patentably and non-obviously distinct invention. The Applicant hereby asserts that the disclosure of this application may include more than one invention, and, in the event that there is more than one invention, that these inventions may be patentable and non-obvious one with respect to the other.

In summary, one aspect of the invention resides broadly in a method of making a deactivatable tag for use in an electronic article surveillance system, the tag comprising: a resonant circuit responsive to receipt of a deactivation signal; the resonant circuit including a spiral conductor, the spiral conductor having at least two turns, the at least two turns being spaced apart from one another, each of the at least two turns comprising a conductive medium; an additional conductive medium being disposed on a first of the at least two turns; and means for promoting, in response to a deactivation signal, migration of at least a portion of the additional conductive medium from the first of the at least two turns to a second, adjacent one of the at least two turns, to conductively connect the first and second turns and deactivate the tag; the method comprising the steps of:

providing a resonant circuit, and configuring the resonant circuit to be responsive to receipt of a deactivation signal;

the step of providing a resonant circuit comprising the step of providing a spiral conductor, the spiral conductor having at least two turns, the at least two turns being spaced apart from one another, each of the at least two turns comprising a conductive medium; disposing an additional conductive medium on a first of the at least two turns; and providing means for promoting, in response to a deactivation signal, migration of at least a portion of the additional conductive medium from the first of the at least two turns to a second, adjacent one of the at least two turns, to conductively connect the first and second turns and deactivate the tag.

Another aspect of the invention resides broadly in a deactivatable tag for use in an electronic article surveillance system, the tag comprising: a resonant circuit responsive to receipt of a deactivation signal; the reso-

nant circuit including a spiral conductor, the spiral conductor having at least two turns, the at least two turns being spaced apart from one another, each of the at least two turns comprising a conductive medium; an additional conductive medium being disposed on a first of the at least two turns; and means for promoting, in response to a deactivation signal, migration of at least a portion of the additional conductive medium from the first of the at least two turns to a second, adjacent one of the at least two turns, to conductively connect the first and second turns and deactivate the tag.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be discussed with relation to the accompanying figures wherein:

Figures 1a-1h illustrate a conventional deactivatable resonant tag, as well as conventional arrangements for manufacturing the same, as well as various stages in a conventional process for manufacturing the same;

Figure 2 is a schematic elevational view of a deactivatable resonant tag in accordance with a preferred embodiment of the present invention;

Figure 3 is essentially the same view as Figure 2, but schematically illustrating an intermediate stage of deactivation;

Figure 4 is essentially the same view as Figures 2 and 3, but schematically illustrating a more advanced stage of deactivation;

Figure 5 schematically illustrates an arrangement for preparing a substrate;

Figure 6 schematically illustrates an arrangement for applying a supplemental conductive medium to a resonant tag; and

Figures 7-9 are actual illustrations of a resonant tag, according to the present invention, in various stages of deactivation.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Prior to discussing the preferred embodiments of the present invention, the disclosure will address some examples of conventional components relating to conventional deactivatable resonant tags, as well as conventional methods for making deactivatable tags, that may be utilized in accordance with the embodiments of the present invention.

Figure 1 is an exploded perspective view of a conventional tag 19. The tag 19 is shown to include a sheet 20T having pressure sensitive adhesive 21 and 22.

A conductor, indicated generally at 25, includes a spiral conductor 26 having several turns. The conductor 26 can be of essentially the same width throughout its length except for a connector bar 27 at the outer end portion of the conductor spiral 26.

Typically, there can be a sheet of dielectric 28T

over, and adhered to, the conductor spiral 25 and the underlying sheet 20T by means of adhesive 29.

A conductor, generally indicated at 30, includes a spiral conductor 31 having several turns. This conductor spiral 31 may, in several aspects, be configured similarly to conductor spiral 25.

Typically, the conductor spirals 25 and 30 can be aligned in face-to-face relationship, save for portions 33 which are not face-to-face with the conductor 26 and portions 35 which are not face-to-face with the conductor 31.

Typically, connector bars 27 and 32 can be electrically connected, such as by a staking 90 (see Figure 1b).

Figure 1b generally illustrates a conventional method for making the tag 19 shown in Figure 1a. A further description of this conventional method may be found in U.S. Patent Nos. 4,778,552 and 5,006,856 to Benge et al., particularly with reference to Figure 3 in both patents.

Figures 1c-1h variously illustrate successive stages in the formation of a sheet of resonant tag conductors. Similarly to Figure 1b, further details regarding the tag sheets illustrates in Figures 1c-1h may be found in U.S. Patent Nos. 4,778,552 and 5,006,856 to Benge et al., particularly with reference to Figures 4-9 in both patents.

The disclosure now turns to a discussion of deactivatable resonant tags formed in accordance with at least one preferred embodiment of the present invention, as illustrated in Figures 2-9. It should be understood that components discussed herebelow with reference to Figures 2-9 may, if appropriate, be considered to be interchangeable with similar components discussed and/or illustrated herein.

Figure 2 may be considered to be a schematic elevational view of a resonant tag 150 according to a preferred embodiment of the present invention. Accordingly, only one side of the tag 150 is actually shown.

As shown in Figure 2, a given conductor 200 will preferably include a plurality of turns 202, with each of these turns 202, for example, essentially being disposed parallel with respect to one another and spaced apart from one another. Other configurations of a conductor known to those of ordinary skill in the art could also likely be used in alternative embodiments of the present invention.

A selected one of the turns 202a may preferably have disposed thereupon a supplemental conductive medium 204. This supplemental conductive medium 204 will preferably be of a different composition than the conductive medium of the corresponding turn 202a.

Preferably, this supplemental conductive medium 204 will be used in the deactivation of the tag. Particularly, the supplemental conductive medium 204 will preferably be configured such that, upon the tag generally reaching a predetermined or given voltage, such as a voltage threshold, a quantity of material from the sup-

plemental conductive medium 204 will be urged to migrate, within a given period of time, towards an adjacent turn 202b of conductor 200.

In order to permit such migration, there will preferably be disposed, preferably at least between the turns in question 202a and 202b (or portions thereof), a medium 206 sufficient for promoting the migration of material from supplemental conductive medium 204 from the initial turn 202a to neighboring turn 202b. In accordance with at least one preferred embodiment of the present invention, this medium 206 could preferably include a composition containing tin ions. If, for example, the supplemental conductive medium 204 includes or consists of copper, it is believed that tin ions would be particularly suitable for promoting the migration of material from the supplemental conductive medium away from the initial turn 202a. Further, it is believed that the tin ions would facilitate considerably the continued migration of such material from initial turn 202a to neighboring turn 202b, in order to establish a conductive "bridge" between initial turn 202a and neighboring turn 202b. Upon completion of a conductive "bridge", it will be apparent that deactivation of the tag can take place, by virtue of a lower resistance between the turns 202a and 202b than what would likely be an originally higher resistance therebetween. Such a lower resistance could be considered to be a short circuit, this in turn being created via a conductive "bridge" between initial turn 202a and neighboring turn 202b. This advanced stage of deactivation is illustrated more particularly in Figure 4, showing such a "bridge" 204b having been created.

Figure 3 illustrates what may be considered or believed to be an intermediate stage of migration of material from supplemental conductive medium 204, between turns 202a and 202b. Particularly, Figure 3 illustrates what is believed to be the formation of a partial "bridge" 204a. At this stage, some migration of material from supplemental conductive medium 204, from turn 202a, has begun, but has not yet reached neighboring turn 202b, in order to establish a complete "bridge" sufficient for creating a short circuit between turns 202a and 202b, result in deactivation of the tag 150. It should be pointed out that the exact mechanism of migration may not be fully understood at the present time, so that the mechanism illustrated in Figure 3 is, in many respects, a theory to assist in the explanation of the phenomenon taking place.

In contrast, Figure 4 shows a more advanced stage of the aforementioned migration of material from supplemental conductive medium 204, in the creation of a complete "bridge" 204b between turns 202a and 202b. Since material from the supplemental conductive medium 204 now extends from turn 202a to turn 202b in the form of a complete "bridge" 204b, a short circuit will be created between turns 202a and 202b, and the tag will be deactivated.

It will be understood that, in accordance with at least one preferred embodiment of the present invention, the supplemental metallic material 204 will prefera-

bly have properties that will allow the same to break down at a lower voltage than would the constituent material of the turns 202a,b proper. Thus, in a preferred embodiment of the present invention, the supplemental metallic material 204 can include a copper-based material, with the turns 202a,b being made of aluminum.

Preferably, the substrate 206 will simultaneously serve as the dielectric between the two conductors of the tag.

The disclosure now turns to some specific examples of materials that may be utilized in accordance with the embodiments of the present invention.

The conventional deactivatable resonant tags produced by All-Tag Security AG of CH-6343, Rotkreuz/Zug, Switzerland, and commercially available substantially world-wide, have been used, making use both of the aluminum conductors present in such tags and the dielectric material provided therewith. Thus, the supplemental conductive medium discussed herein can be added to either or both of the conductors found in an All-Tag tag, and the dielectric found in an All-Tag tag can be prepared in the manner described herein, with respect to providing the same with a capability to promote the migration of conductive material thereacross.

It is desirable to use a polyethylene material for the substrate 206.

It has been found that a particularly effective material for use as the supplemental conductive medium 204 is a "599-Y1002 copper-conductive coating" manufactured by the Spraylat Corporation, 716 S. Columbus Ave., Mt. Vernon, NY 10550. Preferably, such a copper-based coating will be applied to the turn 202a with an appropriate binder or solvent.

Although satisfactory results can be achieved if the copper-based material is applied manually, it is conceivable to utilize any of a number of appropriate methods for applying the copper-based material to the turn 202a automatically, in a mass-production setting, as shown in U.S. Patent Nos. 4,778,552 and 5,006,856 to Bengel et al. Such methods could include, for example, feeding a sheet of conductors 200, themselves having been deposited on substrate 206 or even a temporary carrier by essentially any suitable well-known technique, to a further device (which may still be part of the same assembly line), that is capable of automatically depositing on each conductor, or on selective ones of the conductors, a quantity of the supplemental conductive medium 204. Such methods are described in more detail herebelow with reference to Figure 6.

In preparing the substrate, it is desirable to apply, to a polyethylene base, a low-viscosity fluid including stannous chloride and hydrochloric acid, essentially by wetting the polyethylene base.

In accordance with at least one preferred embodiment of the present invention, the aforementioned low-viscosity fluid, which may be termed a "sensitization mixture", may be composed of or made from the following: 480 ml deionized water; 2 ml hydrochloric acid; 1.25 grams stannous chloride; and 3 grams of tin filings.

Preferably, the sensitization process, whether done manually in a laboratory or automatically in a mass-production arrangement, can include wetting the substrate with a mixture such as that described, and with a dwell time of preferably about 2 minutes. This may then be followed by a deionized water rinse and subsequent drying. This will also be discussed in more detail herebelow, with reference to Figure 5.

Preferably, after drying of the substrate 206, the supplemental conductive medium 204 may be applied, dried and sealed. Preferably, any suitable sealant may be utilized for the purpose of sealing. Among the sealants that may be utilized, and that have been used in making a tag according to the present invention are, for example, Norland Optical Adhesive #60 and Norland Optical Adhesive #81, both available from Norland Products Inc., New Brunswick, NJ 08902. Surprisingly, satisfactory results have also been achieved, in a laboratory setting, with clear nail polish as a sealant, applied manually. Essentially any commercially available, conventional clear nail polish is suitable for this purpose; for example, it is possible to use the well-known clear nail polishes manufactured by Revlon, Maybelline and L'Oreal.

Figure 5 illustrates, in schematic form, an arrangement that may be utilized to form a finished substrate 206 in accordance with at least one preferred embodiment of the present invention. As discussed above, substrate 206 can preferably serve as the dielectric between two opposing conductors of a completed tag 150. Accordingly, a non-conductive sheet of material 300 may preferably be fed into a coating unit 302, in which unit the sheet 300 may be coated with a "sensitization mixture" similar to that discussed above. Preferably, the sheet 300 may remain in the coating unit for a given dwell time, such as about 2 minutes; however, longer or shorter dwell times may be feasible. Subsequently, the now-coated sheet 300 may be fed into a rinsing unit 304, to be rinsed with an appropriate rinsing agent, such as deionized water. After rinsing, the sheet 300 may then preferably be fed into a suitable drying unit 306, such as a warm-air drying unit, for drying.

It will generally be understood, then, that, subsequent to the steps of application, rinsing and drying, in units 302, 304 and 306 respectively, sheet 300 will essentially have been transformed into a substrate base material 300a, having the properties alluded to heretofore with regard to a capability for promoting migration of conductive material thereacross.

Turning now to Figure 6, a carrying medium 400, which may possibly, but not necessarily, correspond to the substrate base material 300a described heretofore with respect to Figure 5, and having already imprinted thereupon an array of conductors 200 (not shown), may preferably be fed to an application unit 402. In the application unit, the aforementioned supplemental conductive medium 204 may be applied to one of the turns of a selected plurality of individual conductor coils (see Figure 2). If it is to be assumed that the supplemental con-

ductive medium being applied is a metallic medium, such as copper or a copper-based composition, it is conceivable to apply the same as an ink to one of the coil turns.

Subsequent to application of the supplemental conductive medium onto the coils carried by carrier 400, the carrier 400 may then preferably be fed into a suitable drying unit 404, such as a warm-air drying unit.

Finally, after drying, the carrier 400, with the array of conductive coils disposed thereupon and the supplemental conductive medium having been applied and dried thereupon, may preferably be fed to a sealing unit 406. Preferably, the sealing unit 406 may be configured as to apply a lacquer-type solution to the now-applied and dried supplemental conductive medium on each conductor 200 (not shown) to which the supplemental conductive medium has been applied.

The carrier 400 may then preferably exit the sealing unit, possibly for further drying, or at least for further processing in order to form a complete deactivatable resonant tag.

Inasmuch as Figures 5 and 6 illustrate arrangements, and methods associated therewith, that are encompassed in at least one preferred embodiment of the present invention, it should be understood that any other steps in the formation of a deactivatable resonant tag that involve well-known manipulations, can be assumed to be chronologically placed in an appropriate manner, before or after the steps performed via the arrangements shown in Figures 5 and 6.

Figure 7 shows what may be considered to be a "microscopic" or up-close view of a section of a tag according to the present invention, before being deactivated.

Figure 8 shows what may be considered to be a "microscopic" or up-close view of a section of a tag according to the present invention that has been deactivated. The actual deactivation path can be considered to have taken place in the area marked with a circle. Further, the supplemental conductive medium can be considered to have been applied generally to the area marked with a rectangle.

Figure 9 illustrates a somewhat more remote view of the deactivated tag illustrated in Figure 8. Within the rectangle shown in Figure 9, it is still possible to see the conductive path which has been formed between two coil turns.

It will be understood that, in accordance with at least one preferred embodiment of the present invention, the supplemental conductive coating 204 described heretofore may be applied to as great an area of a given turn of a conductor coil as is deemed appropriate, as well as to any of the turns, as deemed appropriate. Thus, the areas of coverage of the supplemental conductive medium illustrated or alluded to in Figures 2-9 as well as the exact coil turn on which it is positioned, is not to be limited by the examples set forth heretofore.

It will also be understood that, in accordance with at least one preferred embodiment of the present inven-

tion, materials other than copper or copper-based materials may be used as the supplemental conductive medium 204, which would adhere to at least a portion of a conductor turn. Also, it is conceivable to treat a substrate 206 in a manner different than any manner described herein; for example, different types of ions other than tin may be utilized, and the ions may be disposed on the substrate 206 in patterns or manners different from any described herein.

In general, although the materials and methods described hereinabove are provided as desirable examples in accordance with at least one preferred embodiment of the present invention, they are not meant to be limiting, and may be interchanged, if appropriate, with other suitable materials and methods, without departing from the spirit and scope of the present invention.

Examples of conventional deactivatable resonant tags, as well as conventional methods for forming the same, having components and/or steps that may be utilized in accordance with the embodiments of the present invention, may be found among the U.S. patents listed at the beginning of the instant specification.

The components disclosed in the various publications, disclosed or incorporated by reference herein, may be used in the embodiments of the present invention, as well as, equivalents thereof.

All, or substantially all, of the components and methods of the various embodiments may be used with at least one embodiment or all of the embodiments, if any, described herein.

All of the patents, patent applications and publications recited herein, and in the Declaration attached hereto, are hereby incorporated by reference as if set forth in their entirety herein.

The details in the patents, patent applications and publications may be considered to be incorporable, at applicant's option, into the claims during prosecution as further limitations in the claims to patentably distinguish any amended claims from any applied prior art.

The appended drawings in their entirety, including all dimensions, proportions and/or shapes in at least one embodiment of the invention, are accurate and to scale and are hereby included by reference into this specification.

The invention as described hereinabove in the context of the preferred embodiments is not to be taken as limited to all of the provided details thereof, since modifications and variations thereof may be made without departing from the spirit and scope of the invention.

Claims

1. A method of making a deactivatable tag for use in an electronic article surveillance system, the tag comprising: a resonant circuit responsive to receipt of a deactivation signal; the resonant circuit including a spiral conductor, the spiral conductor having at least two turns, the at least two turns being spaced apart from one another, each of the at least

two turns comprising a conductive medium; an additional conductive medium being disposed on a first of the at least two turns; means for promoting, in response to a deactivation signal, migration of at least a portion of the additional conductive medium from the first of the at least two turns to a second, adjacent one of the at least two turns, to conductively connect the first and second turns and deactivate the tag; said method comprising the steps of:

providing a resonant circuit, and configuring the resonant circuit to be responsive to receipt of a deactivation signal;

said step of providing a resonant circuit comprising the step of providing a spiral conductor, the spiral conductor having at least two turns, the at least two turns being spaced apart from one another, each of the at least two turns comprising a conductive medium;

disposing an additional conductive medium on a first of the at least two turns; and

providing means for promoting, in response to a deactivation signal, migration of at least a portion of the additional conductive medium from the first of the at least two turns to a second, adjacent one of the at least two turns, to conductively connect the first and second turns and deactivate the tag.

2. The method according to Claim 1, further comprising the steps of:

providing a generally non-conductive substrate and disposing the spiral conductor on the generally non-conductive substrate; and

said step of providing the generally non-conductive substrate comprising said step of providing means for promoting migration of at least a portion of the additional conductive medium.

3. The method according to Claim 2, wherein the additional conductive medium is materially different from the conductive medium of the first turn.

4. The method according to Claim 3, wherein the means for promoting migration of at least a portion of the additional conductive medium comprises means for promoting migration of the at least a portion of the additional conductive medium substantially along the substrate, in a direction generally parallel to the substrate, between the first and second turns.

5. The method according to Claim 4, wherein: the additional conductive medium comprises a metallic material;

the promoting means comprises a medium, substantially integral with the substrate, configured for promoting migration of the metallic material of

the additional conductive medium between the first and second turns.

6. The method according to Claim 5, wherein the additional conductive medium is disposed on the first turn by:

directly applying the additional conductive medium to the first turn in liquid form;
thereafter drying the additional conductive medium having been applied to the first turn in liquid form; and
thereafter sealing the additional conductive medium on the first turn with a sealant.

7. The method according to Claim 6, wherein the substrate is provided with the medium configured for promoting migration of the metallic material of the additional conductive medium by:

coating the substrate with the a starting solution of the medium, the starting solution being in liquid form;
thereafter rinsing the substrate; and
thereafter drying the substrate, with the medium disposed thereupon, and integrating the medium with the substrate.

8. The method according to Claim 7, wherein the medium being substantially integral with the substrate comprises metallic ions configured for promoting migration of the metallic material of the additional conductive medium between the first and second turns.

9. The method according to Claim 8, wherein the substrate is rinsed with deionized water during said rinsing step.

10. The method according to Claim 9, wherein:
the metallic ions comprise tin ions; and
the metallic material of the additional conductive medium comprises a copper-based conductive material.

11. The method according to Claim 10, wherein the copper-based conductive material, when applied to the first turn in the form of a liquid, is applied in the form of an ink.

12. The method according to Claim 11, wherein:
the first turn of the spiral conductor is formed from aluminum;
the spiral conductor is a first spiral conductor;
the resonant tag includes a second spiral conductor disposed on the substrate opposite from the first spiral conductor; and
the substrate is configured to act as a dielec-

tric between the first spiral conductor and the second spiral conductor.

13. A deactivatable tag for use in an electronic article surveillance system, said tag comprising:

a resonant circuit responsive to receipt of a deactivation signal;
said resonant circuit including a spiral conductor, said spiral conductor having at least two turns, said at least two turns being spaced apart from one another, each of said at least two turns comprising a conductive medium;
an additional conductive medium being disposed on a first of said at least two turns; and
means for promoting, in response to a deactivation signal, migration of at least a portion of said additional conductive medium from said first of said at least two turns to a second, adjacent one of said at least two turns, to conductively connect said first and second turns and deactivate said tag.

14. The deactivatable tag according to Claim 13, further comprising:

a generally non-conductive substrate, said spiral conductor being disposed on said generally non-conductive substrate; and
said generally non-conductive substrate comprising said means for promoting migration of at least a portion of said additional conductive medium.

15. The deactivatable tag according to Claim 14, wherein said additional conductive medium is disposed on said first turn and is materially different from the conductive medium of said first turn.

16. The deactivatable tag according to Claim 15, wherein said means for promoting migration of at least a portion of said additional conductive medium comprises means for promoting migration of said at least a portion of said additional conductive medium substantially along said substrate, in a direction generally parallel to said substrate, between said first and second turns.

17. The deactivatable tag according to Claim 16, wherein:

said additional conductive medium comprises a metallic material;
said promoting means comprises a medium, substantially integral with said substrate, configured for promoting migration of said metallic material of said additional conductive medium between said first and second turns.

18. The deactivatable tag according to Claim 17,

wherein said medium being substantially integral with said substrate comprises metallic ions configured for promoting migration of said metallic material of said additional conductive medium between said first and second turns.

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19. The deactivatable tag according to Claim 18, wherein:

said metallic ions comprise tin ions; and

said metallic material of said additional conductive medium comprises copper.

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20. The deactivatable tag according to Claim 19, wherein:

said first turn of said spiral conductor is formed from aluminum;

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said spiral conductor is a first spiral conductor;

said resonant tag includes a second spiral conductor disposed on said substrate opposite from said first spiral conductor; and

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said substrate is configured to act as a dielectric between said first spiral conductor and said second spiral conductor.

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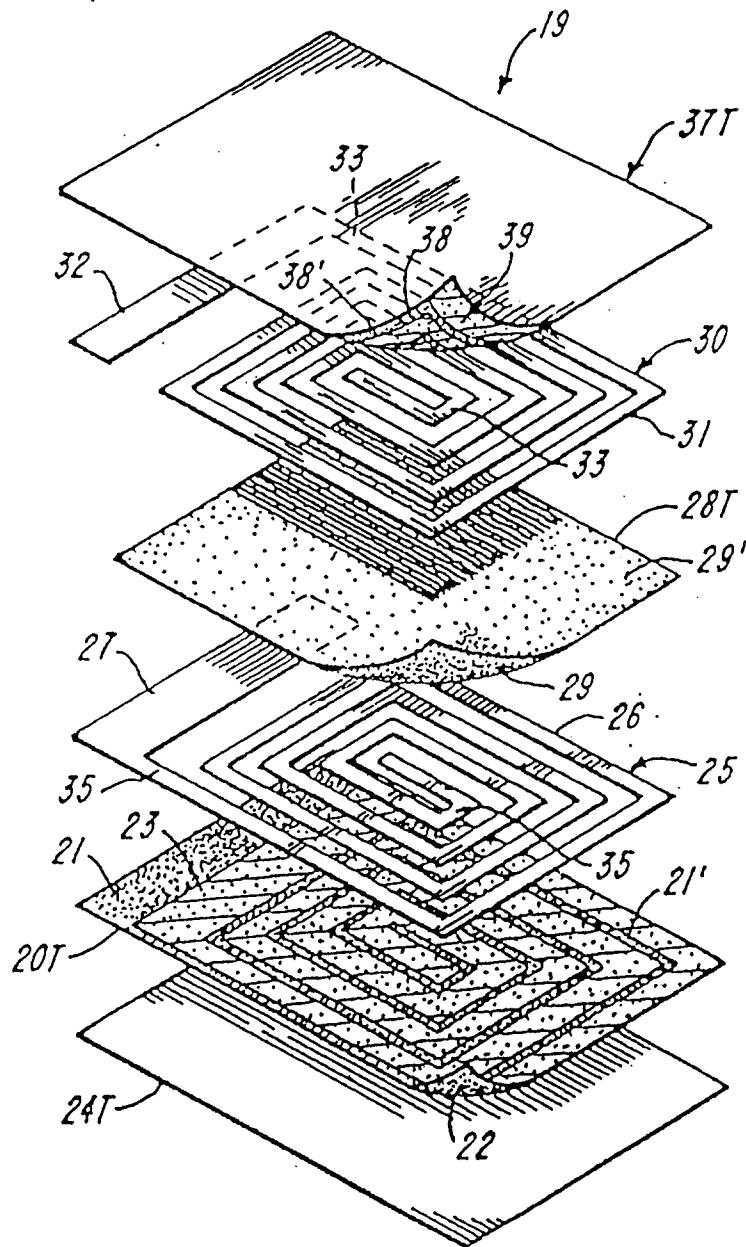
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FIG-1a



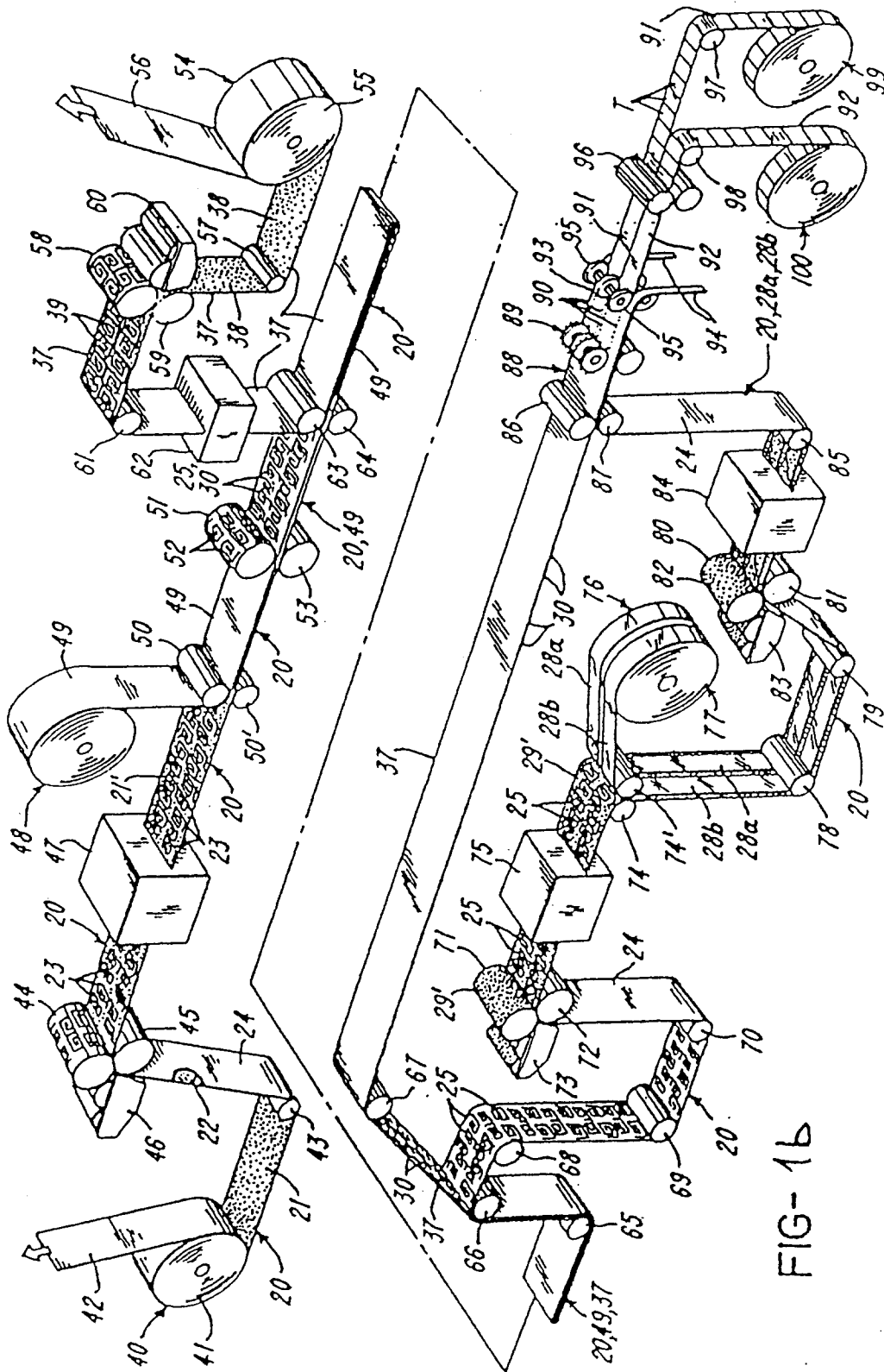


FIG-1c

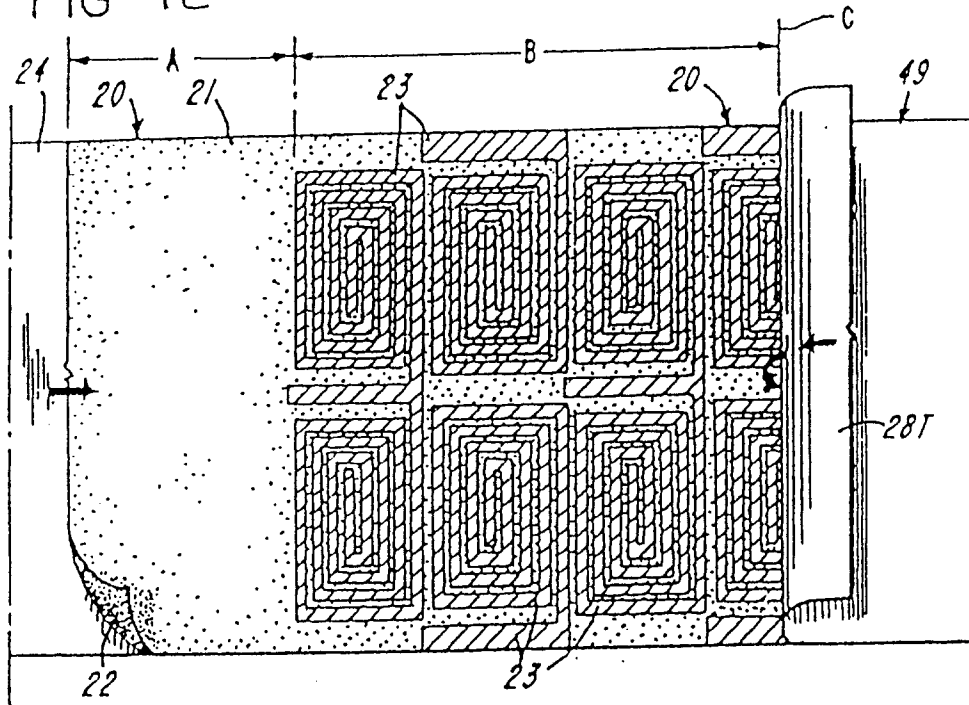
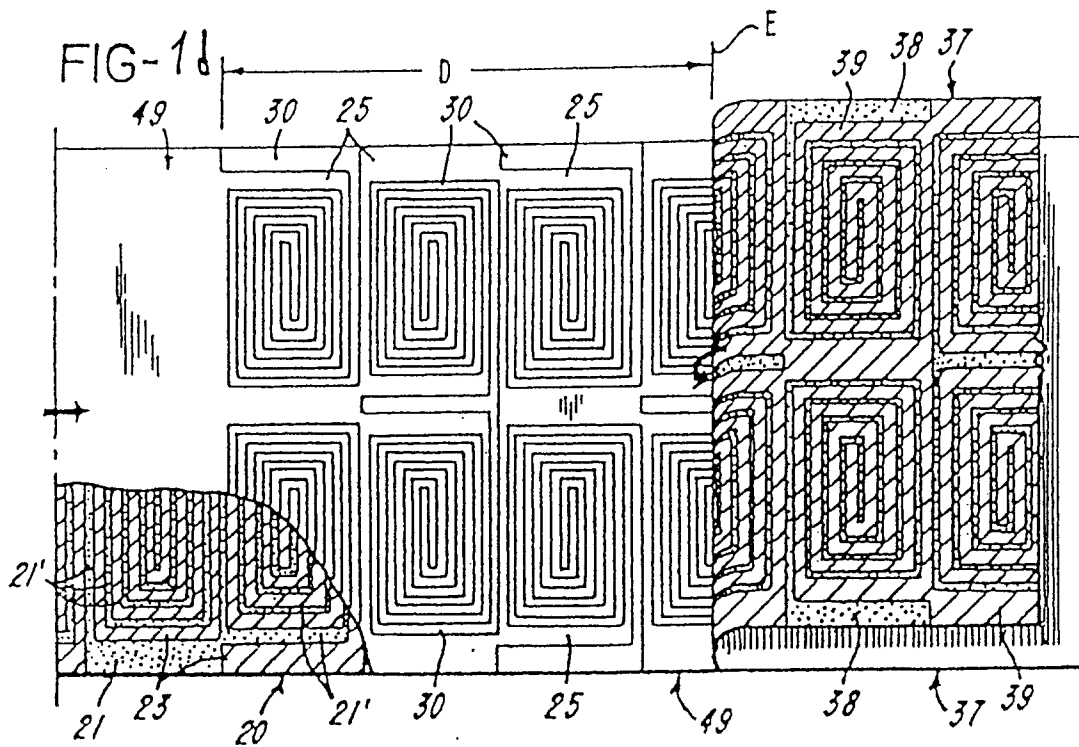
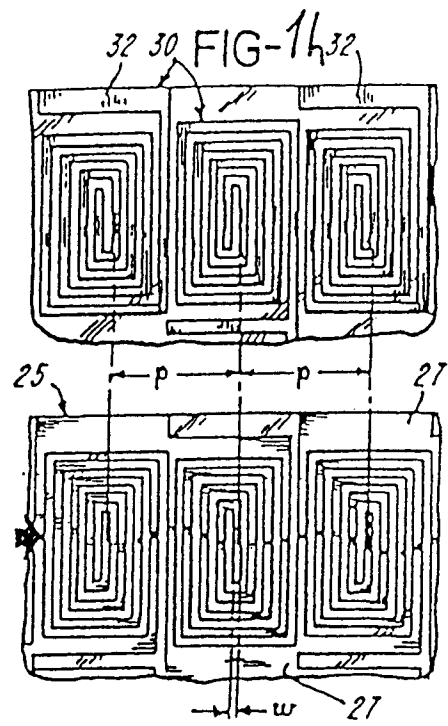
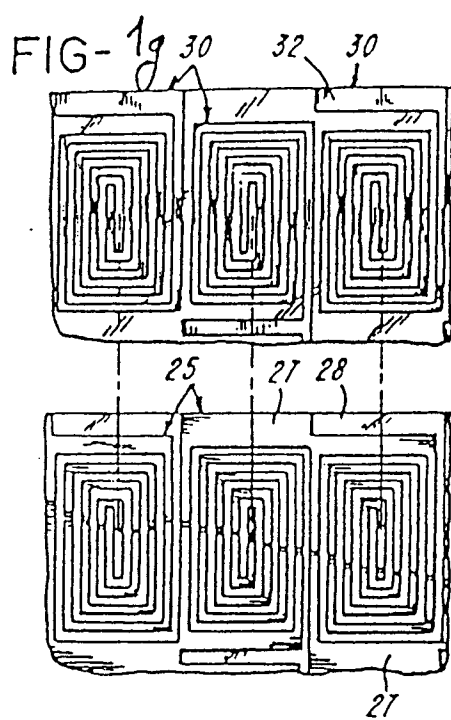
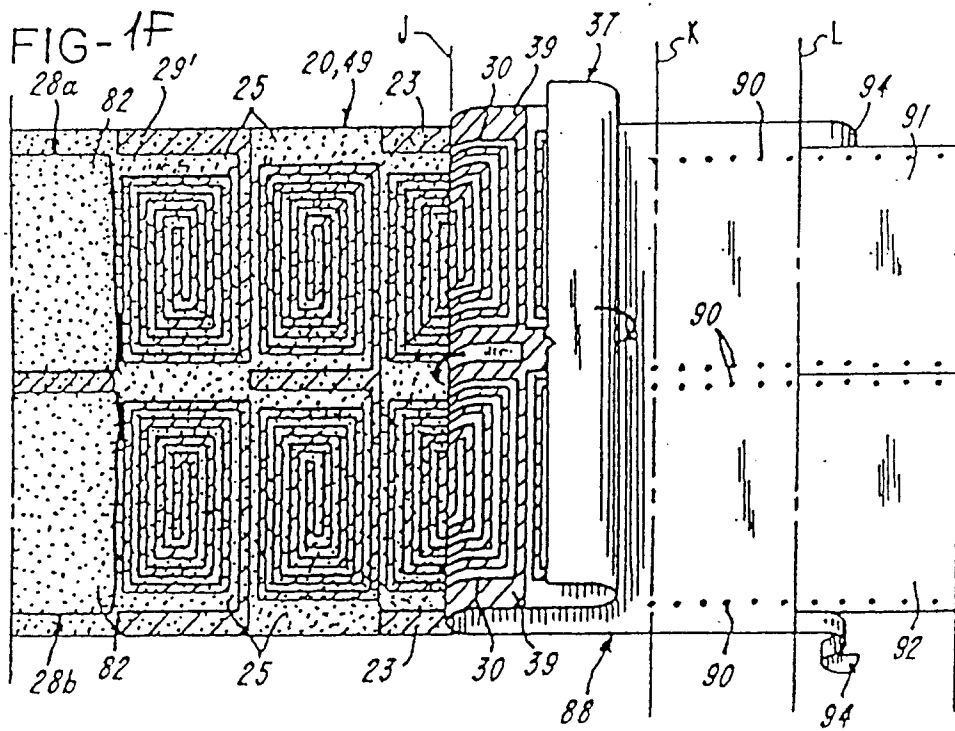
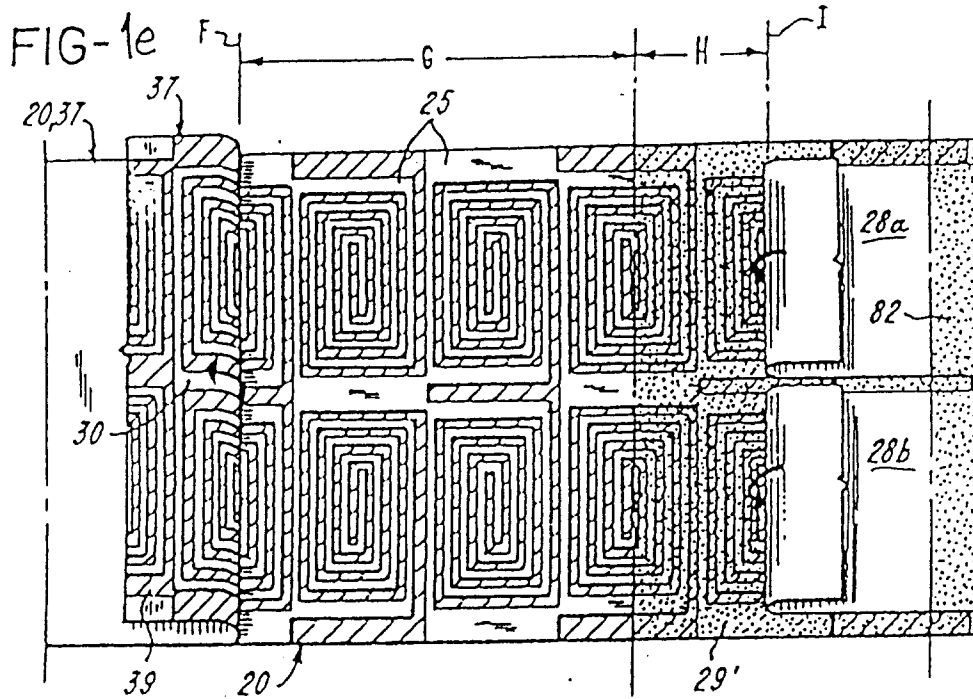


FIG-1d







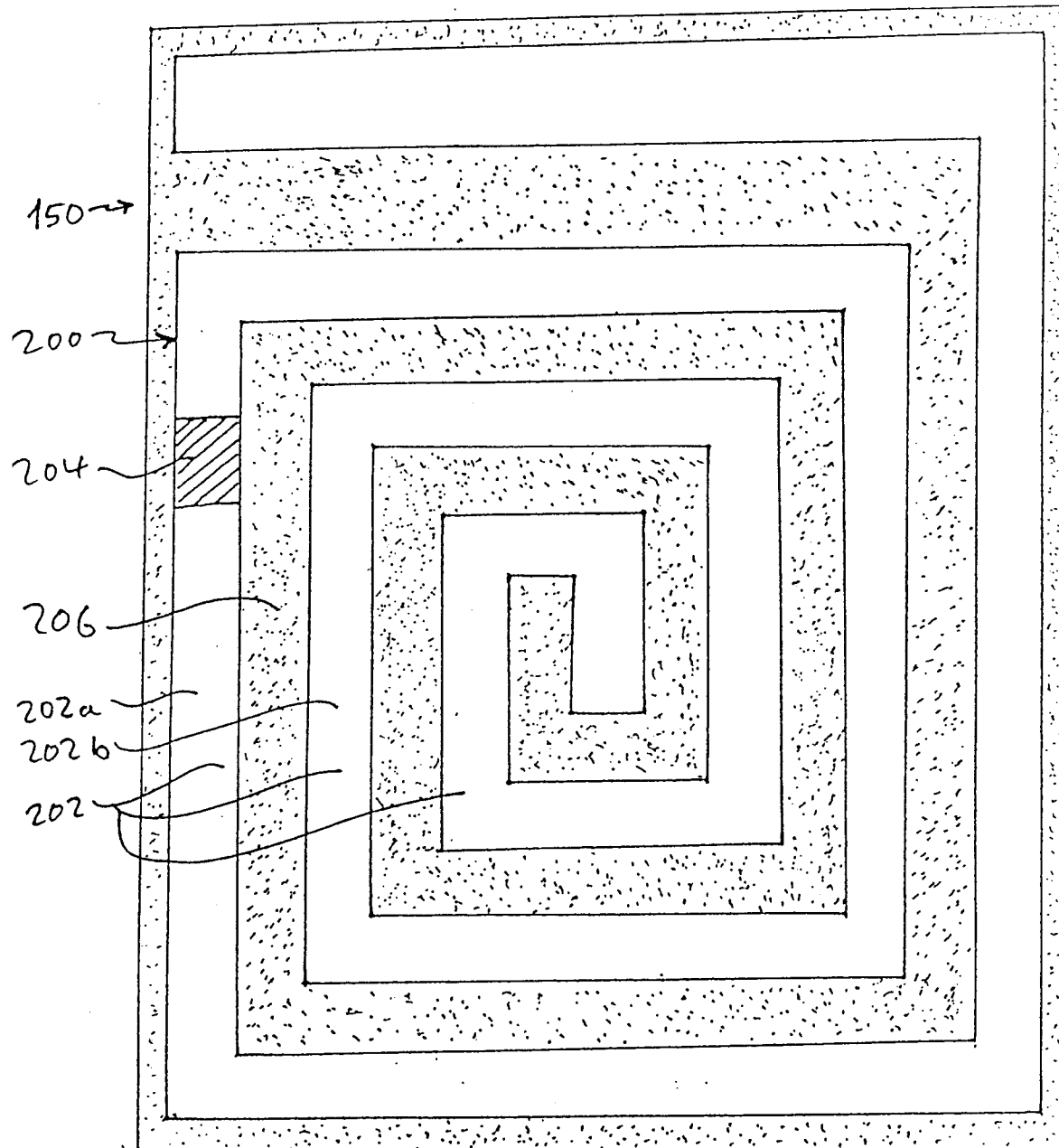


FIGURE 2

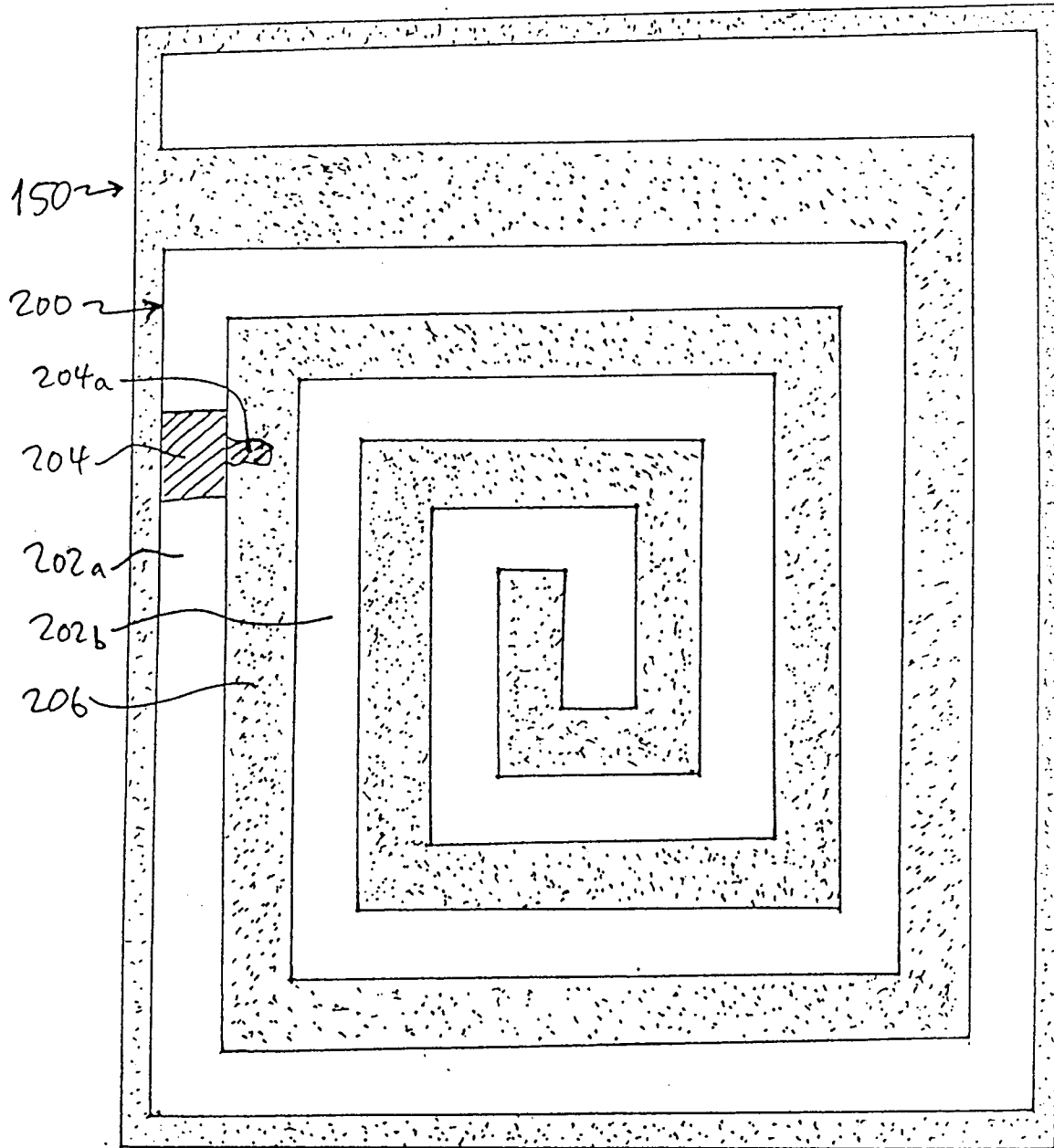


FIGURE 3

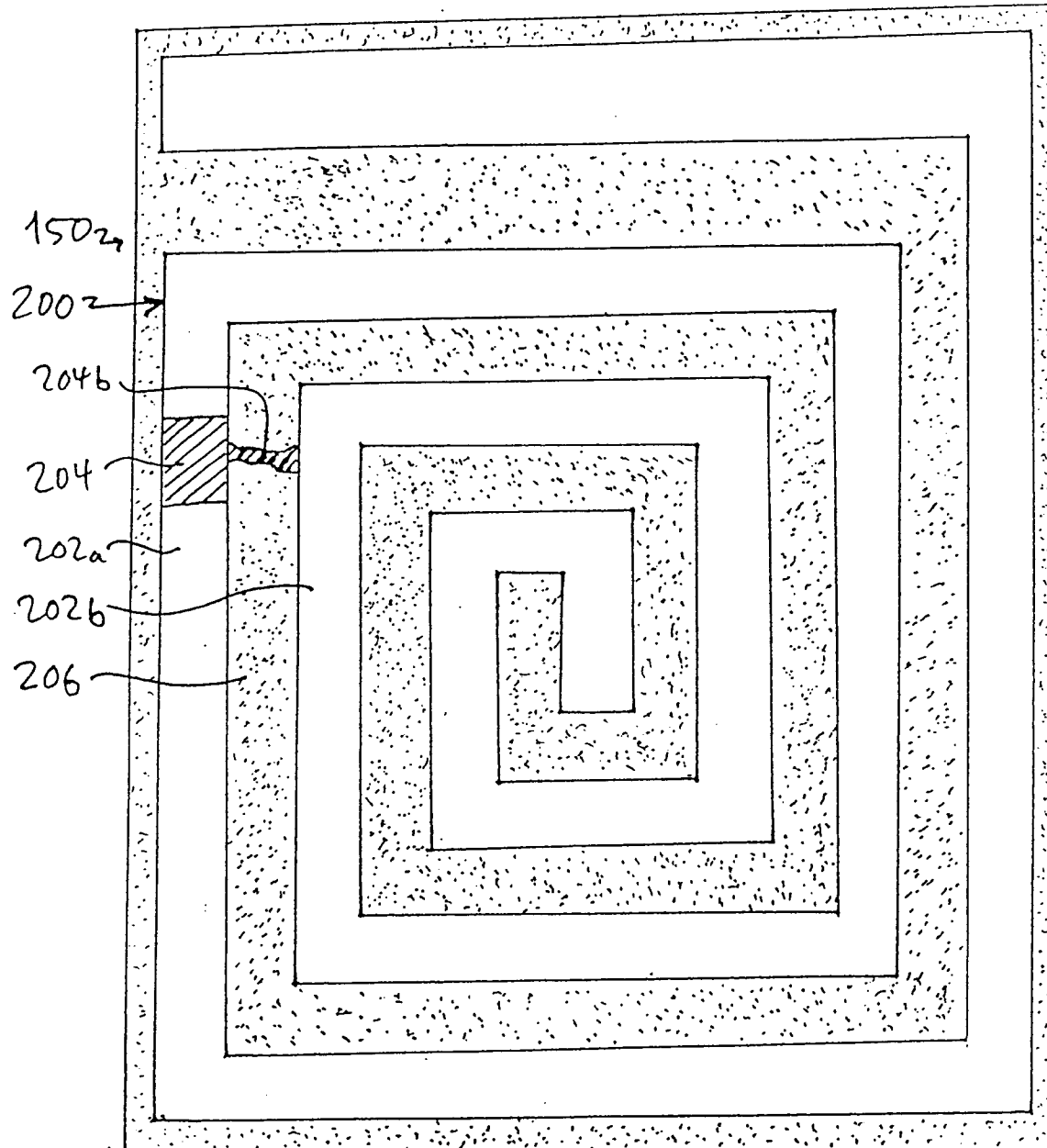


FIGURE 4

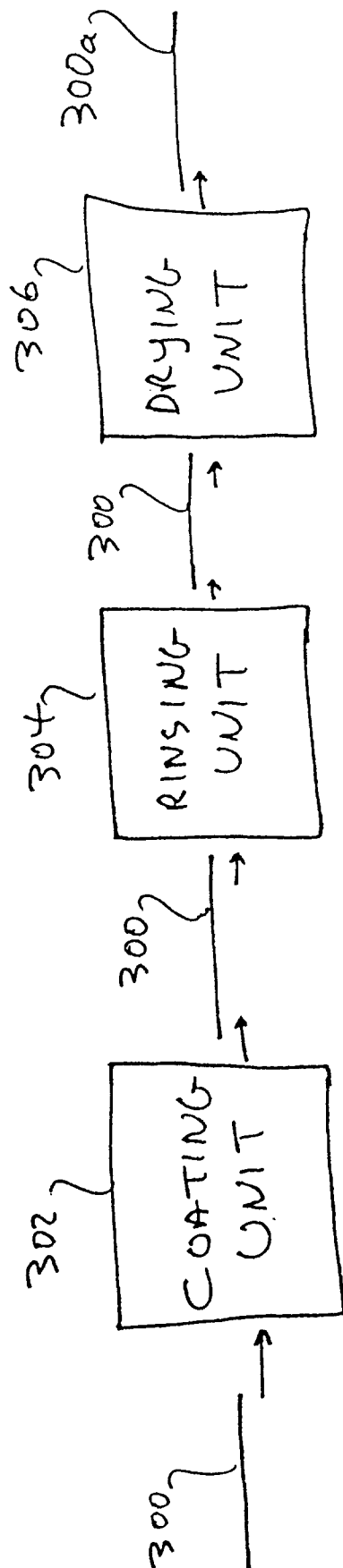


FIGURE 5

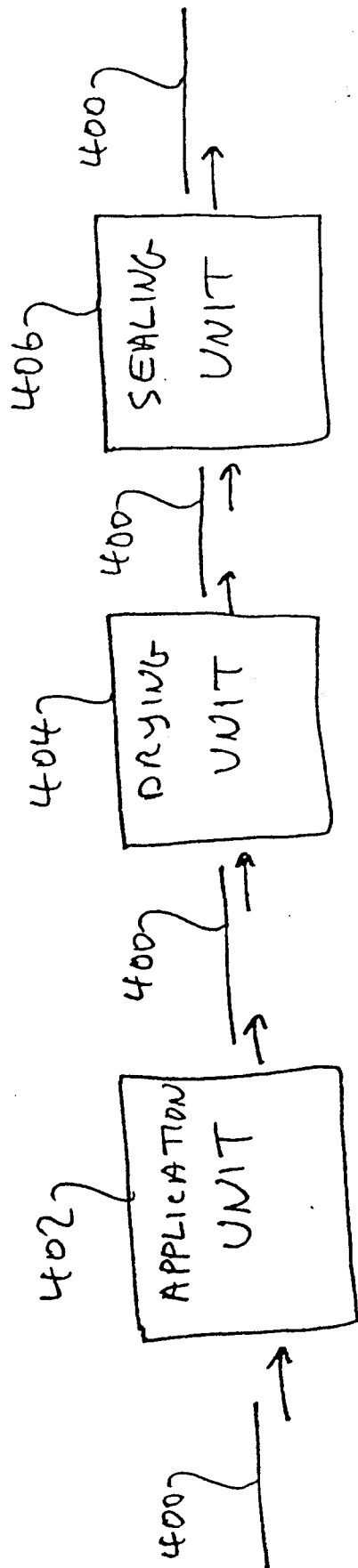


FIGURE 6

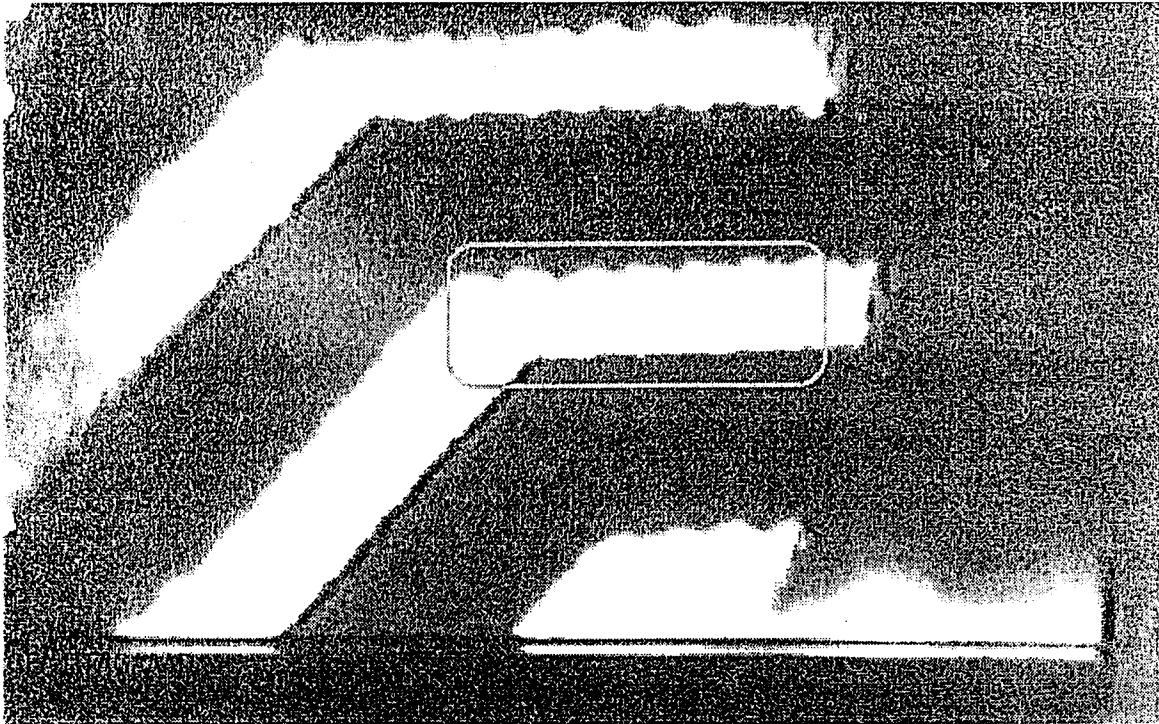


FIGURE 7

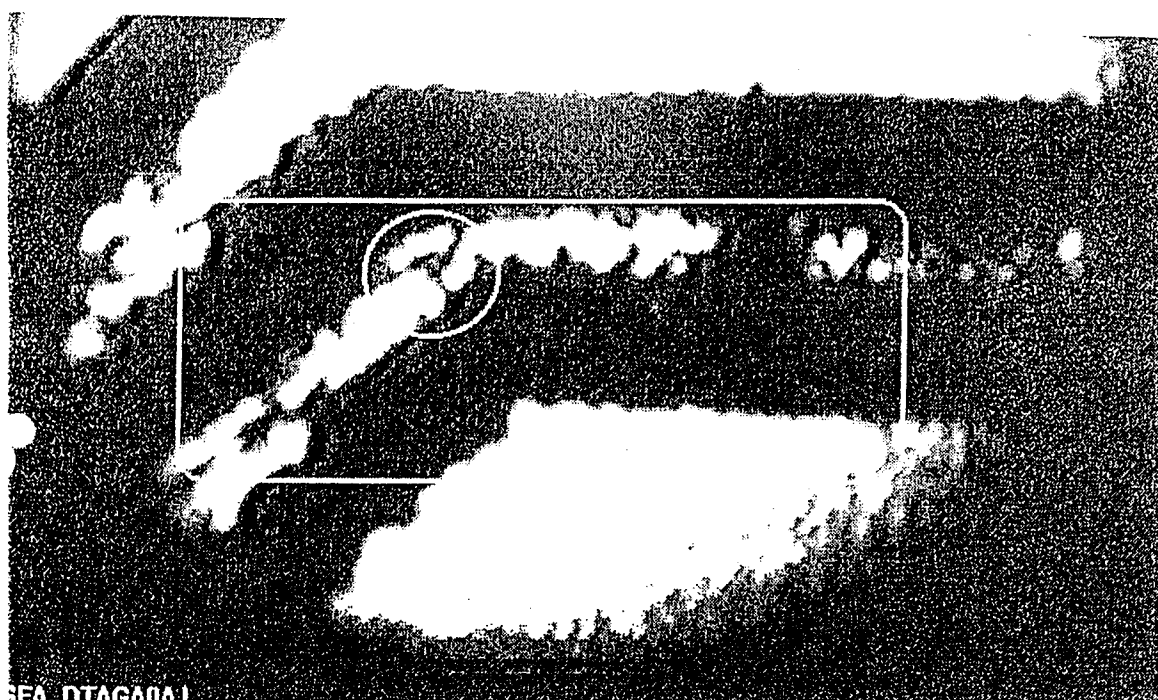


FIGURE 8



FIGURE 9



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 11 1423

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	EP-A-0 472 073 (KOBE PROPERTIES) * column 3, line 19 - column 4, line 14; claims 1,4; figure 1 *	1,13	G08B13/24
Y	WO-A-94 12957 (DUTCH A&A TRADING B. V.) * page 7, line 7 - line 36; figure 4 *	1,13	
A	* page 4, line 35 *	12,20	
Y	WO-A-91 09387 (ACTRON ENTWICKLUNGS AG) * page 7, line 4 - line 33; figure 1 *	1,13	
D	* page 9, line 24 - line 36; figure 4 * & US-A-5 367 290		
A,P	US-A-5 510 770 (K. G. RHOADS) * column 7, line 1 - column 10, line 29; figures 6-8 *		
A	US-A-3 386 007 (M. W. HUTCHINSON) * column 1, line 34 - line 42; figures 1,6 * column 3, line 34 - line 56 *		
A	US-A-3 836 883 (TATSUNORI TAKAYASU ET AL) * column 4, line 42 - line 61; figure 5 *		
A	GB-A-2 247 594 (MONARCH MARKING SYSTEMS) * page 13, line 6 - page 14, line 12; figures 19-21 *		
D	& US-A-4 818 312		
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 23 October 1996	Examiner Breusing, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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