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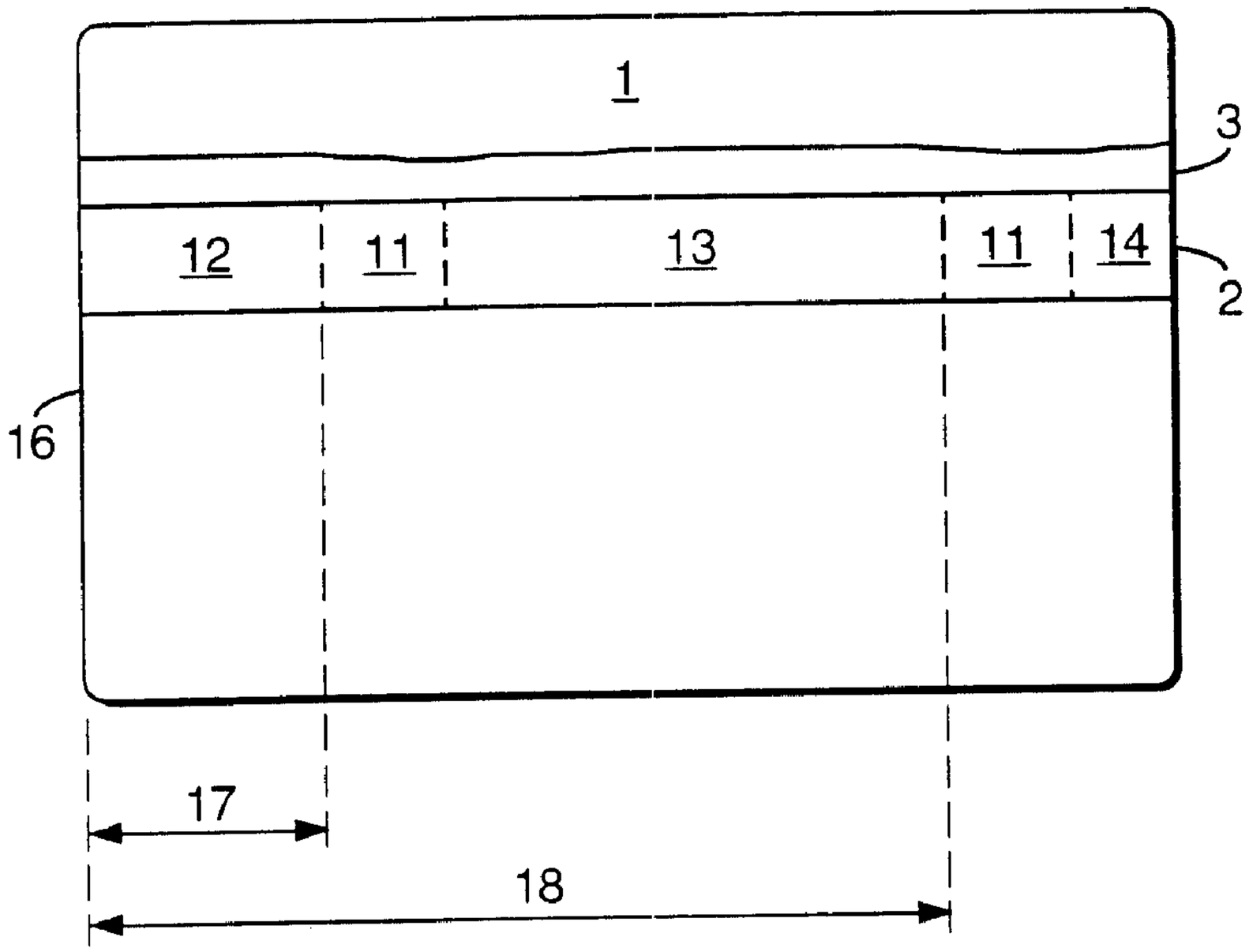
(72) Inventeur/Inventor:
GREEN, IAN MACDONALD, GB

(73) Propriétaire/Owner:
THORN SECURE SCIENCE LIMITED, GB

(74) Agent: RIDOUT & MAYBEE LLP

(54) Titre : SUPPORT D'ENREGISTREMENT ET PROCEDE D'ETIQUETAGE D'UN ARTICLE DE VALEUR
(54) Title: A RECORD CARRIER AND METHOD OF LABELLING AN ARTICLE OF VALUE



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A record carrier (1) has a secure first data storage means (2) storing a plurality of different identification numbers (12, 13, 14) in a sequence and a further data storage means (3) storing a further number. The identification numbers comprise successive integers, and the further number comprises the least significant digit of one of the said integers. The secure data storage means preferably comprises permanently structured magnetic tape. The further number is derivable in a predetermined way from only one of the identification numbers, thus identifying uniquely which one of the identification numbers is characteristic of the record carrier.

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(71) Applicant *(for all designated States except US)*: THORN SECURE SCIENCE LIMITED [GB/GB]; Rutland House, Hargreaves Road, Groundwell Industrial Estate, Swindon, Wiltshire SN2 5AZ (GB).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: GREEN, Ian, MacDonald [GB/GB]; 96 Goldsmith Avenue, London W3 6HW (GB).

(74) Agent: LEAMAN, Keith; QED Patents Limited, Dawley Road, Hayes, Middlesex UB3 1HH (GB).

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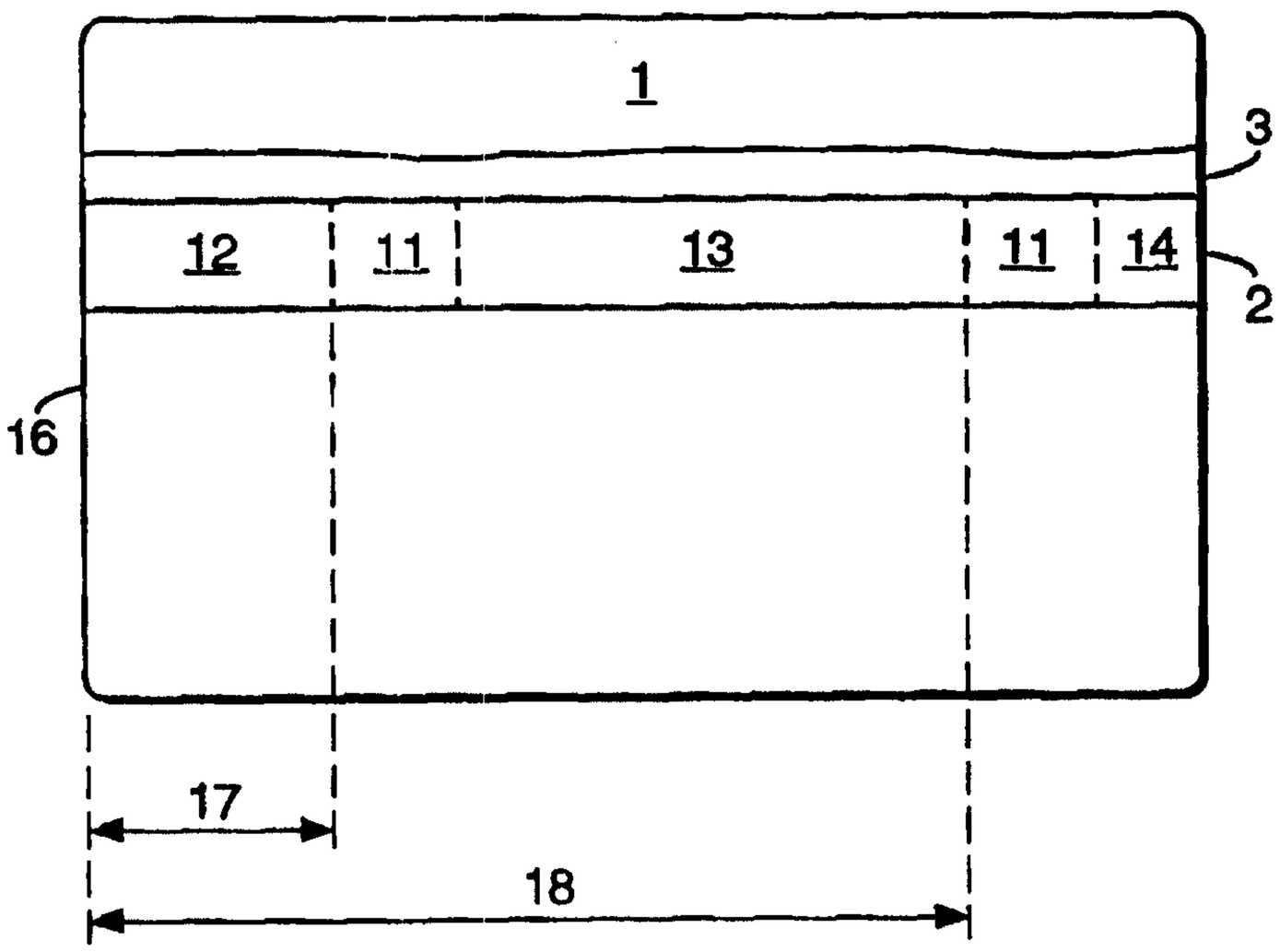
(57) Abstract

A record carrier (1) has a secure first data storage means (2) storing a plurality of different identification numbers (12, 13, 14) in a sequence and a further data storage means (3) storing a further number. The identification numbers comprise successive integers, and the further number comprises the least significant digit of one of the said integers. The secure data storage means preferably comprises permanently structured magnetic tape. The further number is derivable in a predetermined way from only one of the identification numbers, thus identifying uniquely which one of the identification numbers is characteristic of the record carrier.



A RECORD CARRIER AND METHOD OF LABELLING AN ARTICLE OF VALUE

This invention relates to a record carrier, and particularly, though not exclusively, to a credit card or the like having a secure data storage means. It also relates to a method of labelling an article of value.

A known data carrier is described in GB-A-1,331,604, in which a credit card is provided with a secure data storage means comprising a layer having spaced regions in which anisotropic magnetic particles are dispersed and fixedly aligned in a binder along a pre-set direction. In remaining regions of the layer the particles are not so aligned or are aligned along a substantially different pre-set direction. This arrangement is commonly described as a magnetic "watermark" or as forming a "permanent magnetic structure" since unlike conventional magnetic recordings the pattern of remanent magnetisation revealed by uniaxially magnetising or "developing" the document can be restored by re-magnetisation even after erasure (by, for example, the application of an a/c erase field). A magnetic "watermark" is particularly well suited to recording data in digital form since each alignment direction may be assigned a different significance i.e. a binary "ONE" or a binary "ZERO". Such a data storage means is fairly secure because the patterns comprising the data cannot be erased because the structure is permanently aligned in a given direction.

Due to the "built-in" nature of the recording, a data storage means may conveniently be prepared as a single "watermarked" tape comprising a sequence of binary coded numbers which provide a security feature when cut from the tape and applied to a support such as a document or card. Each of these identification numbers is different and is separated from the others by a marker or "sentinel" comprising a unique sequence of binary digits which itself never appears in the sequence. For this reason the "sentinel" can always be identified so that by reference to its position on the record carrier the digits chosen by the issuer of the record carrier as an identification number to be characteristic of the record carrier or to represent the security data (a particular set of characters appearing on the document, for example) can always be recovered.

However, due to tolerancing problems during manufacture of the tape and problems of registration between the tape and the support it is not possible without recourse to the use of expensive equipment, to ensure that a "sentinel" or "sentinels" always appear in the same position on the document.

In practice, when one "sentinel" appears at each end of the document the digits between the "sentinels" are chosen to represent the security data. It sometimes occurs, however, that only one "sentinel" appears on the document so that depending upon the

exact location an appropriate number of digits, selected from both sides of the "sentinel", are chosen to represent the security data identifying that document. Thus for each position of the first detected "sentinel" there is a different binary digit selection rule for choosing the bits constituting the security data. The sequence of bits representing the security data may then be used as verification information, or may be used to derive verification information, which for example, the user may have to supply before the card is validated. Such verification information is preferably unique and characteristic of the given record carrier.

This technique, however, has a weakness for the case when the first "sentinel" on the card is close to an edge. In such a case it is possible for the card reader to fail to detect the first "sentinel" and instead pick up the second "sentinel" on the card. Thus there is always the possibility of an ambiguity. For instance suppose that a card is made in a factory, and a piece of magnetic tape is attached to the card, the tape having the number 300 together with parts of the numbers 299 and 301. The card is read in the factory and the identification number 300 is obtained. Without knowing how the "sentinels" lie with respect to the edge of the card, it is possible for card readers in the field to recognise the identification number of the card as 299, 300 or 301. This is clearly undesirable for cards for use in financial transactions, as it might be possible to confuse two cards having adjoining lengths of "watermarked" tape attached to them. It is also undesirable for cards used for claiming benefit, or access control, or identification, or having a stored value such as prepaid fare cards..

In order to solve this problem, "WATERMARK" tape made by THORN Secure Science Limited, Swindon, England, is often applied to cards in a registered fashion such that the "sentinels" always occur at the same point on a card. Increased production costs are associated with such registered cards.

Another method of making security documents is disclosed in GB-A-2 021 835. In this method the position of the sentinel is erasably recorded on a different portion of the document, thus eliminating ambiguity.

According to a first aspect of the invention, there is provided a record carrier as claimed in claims 1 - 8. This can provide the advantage of identifying the record carrier uniquely without having to resort to expensive registration schemes to ensure that the markers are always at exactly the same position on the record carrier.

The invention is particularly advantageous for credit cards and the like provided with permanently structured magnetic ("watermark") tape, as it allows the tape to be placed freely on the carrier without the risk of introducing ambiguity.

According to a second aspect of the invention there is provided a method of labelling an article of value as claimed in claim 9.

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying diagrammatic drawings, in which:
Figure 1 shows a record carrier according to a first aspect of the invention, and
Figure 2 shows a flow diagram of a method according to a second aspect of the invention.

In Figure 1, a record carrier (1) is shown in the form of an article of value such as a credit card. The record carrier is provided with a tamper resistant first data storage means (2) which stores a plurality (12, 13, 14) of different identification numbers in a sequence, and a further data storage means (3) which stores a further number. The further number is derivable in a predetermined way from only one (13) of the said plurality. The further number thus identifies which one of the said plurality of possible identification numbers has been chosen to be characteristic of the record carrier (1). In the present example, the tamper resistant first data storage means (2) is constituted by a layer comprising a length of "WATERMARK" tape obtainable from Thorn Secure Science Limited, Swindon, England. This tape is described in greater detail in GB 1,331,604, and comprises spaced regions in which anisotropic magnetic particles (preferably acicular gamma iron III oxide particles) are dispersed and fixedly aligned in a binder along a pre-set direction. The data encoded thereon comprises markers known as start sentinels (11), having identification numbers (12, 13, 14) in the form of digits (for

example binary digits) therebetween. The identification numbers are in a sequence comprising the integers arranged in ascending magnitude.

The data on the record carrier can be read in at least two different ways. Firstly, using the conventional method, the identification numbers (which are stored in the watermark tape) are ready by a read head. The numbers are usually 12 digit numbers and are to be read securely. The reader then reads the number stored in the further storage means (3) which need not be read or stored securely. For example, the reader may read the numbers 999 000 123 455 and 999 000 123 456 securely. The number stored in further storage means 3 has to be uniquely derivable from only one of these numbers. One way of deriving such a unique number from successive integers is to discard all digits except the least significant digit. Therefore if the number 6 is read in storage means 3, the reader is programmed to disregard the number 999 000 123 455 and identify the number 999 000 123 456 as being the unique identification number which will be associated with the given card in the card issuer's database. For this method to work as described, the base of the number system in which the integer is expressed (e.g. 2 for binary or 10 for decimal) must be equal to or greater than the number of identification numbers in the plurality on a given record carrier which are readable.

A method of labelling an article of value according to the second aspect of the invention is shown in the flow diagram of Figure 2. In this Figure, the blocks have the following significance. Block 21 denotes the step of affixing a secure data storage means (2) carrying a plurality of different identification numbers or parts thereof to the article. Block 22 denotes the step of choosing one of the plurality of identification numbers (12, 13, 14) or parts thereof in accordance with a predetermined scheme. Block 23 denotes the step of deriving a further number characteristic of only the chosen one of said plurality. Block 24 denotes the step of storing the further number in a further data storage means (3) carried by the article. Finally, block 25 denotes the step of storing the corresponding chosen identification number in a data storage means separate from said article.

Although methods of using the record carrier are described above, there are other practical alternatives which fall within the scope of the present invention. For example, the concepts of rounding to 11 digits might be combined with a check on the fractional part of the identification number.

The invention is most relevant to on-line systems, where a central computer checks the validity of the identification number returned by the reader. However, it is also applicable to off-line systems where the identification number may be stored as part of a transaction certificate.

It will be appreciated that there is no advantage to be gained by fraudulently altering the separately stored digit. In the first method described above the result would be either to make the reader signal an error or to return an invalid identification number. In the second reading method, the same result holds but for different reasons. For cards having fractional numbers close to 0.4 or 0.5 it would be possible to change the stored bit from odd to even (or vice versa) without the reader detecting an error. The reader would then return the wrong identification number. However, the wrong identification number is never that of a valid card, since the adjacent issued card under these circumstances always has an ID which is spaced by 2 rather than 1.

The invention is expected to find application in systems using unregistered Watermark tape, where there is a desire to associate a unique integer identification number with each record carrier without special measures to position the tape on the substrate.

CLAIMS:

1. A record carrier having a secure data storage means storing a plurality of different identification numbers or parts thereof in a sequence, and a further data storage means storing a further number, the further number being derivable from the value of only one of the said plurality, the further number indicating which one of the said plurality is characteristic of the record carrier, characterised in that the plurality of different identification numbers comprise successive integers and the further number comprises the least significant digit of one of said integers.

2. A record carrier as claimed in claim 1 in which the secure data storage means comprises a layer of material having a permanent pattern of a detectable magnetic property.

3. A record carrier as claimed in claim 2 in which the layer of material comprises spaced regions including permanently aligned anisotropic magnetic particles.

4. A record carrier as claimed in any one of claims 1-3 in which the further data storage means comprises a layer of material storing data as a pattern of a detectable magnetic property.

5. A record carrier as claimed in any one of claims 1-4 in which the data in the further data storage means is not secure.

6. A credit or debit card constituting a record carrier as claimed in any one of claims 1-5.

7. A smart card constituting a record carrier as claimed in any one of claims 1-5.

8. A smart card as claimed in claim 7 in which the plurality of different identification numbers or parts thereof are stored in a secure memory location.

9. A method of labelling an article of value, including the steps of a) affixing a secure data storage means carrying a plurality of different identification numbers or parts thereof to the article, b) choosing one of the plurality of identification numbers or parts thereof, c) deriving a further number characteristic of only the chosen one of said plurality, d) storing the further number in a further data storage means earned by the article, e) storing the corresponding chosen identification number in a data storage means separate from said article, characterised in that the plurality of different identification numbers comprise successive integers and the further number comprises the least significant digit of one of said integers.

RIDOUT & MAYBEE LLP
Toronto, Canada
Patent Agents

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Fig.1.

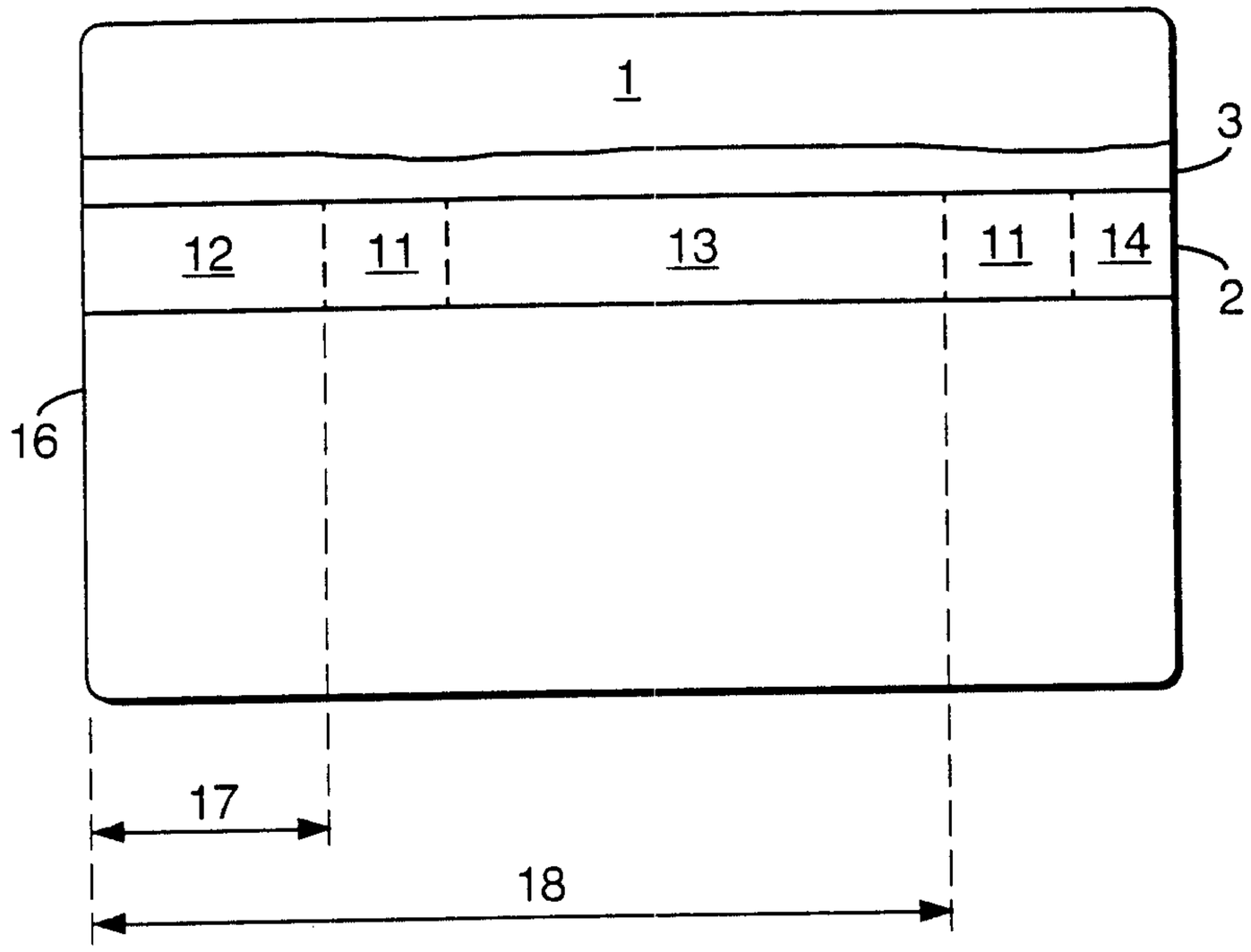
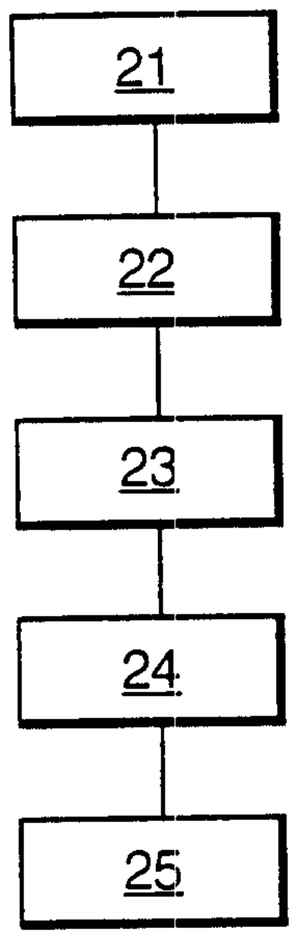
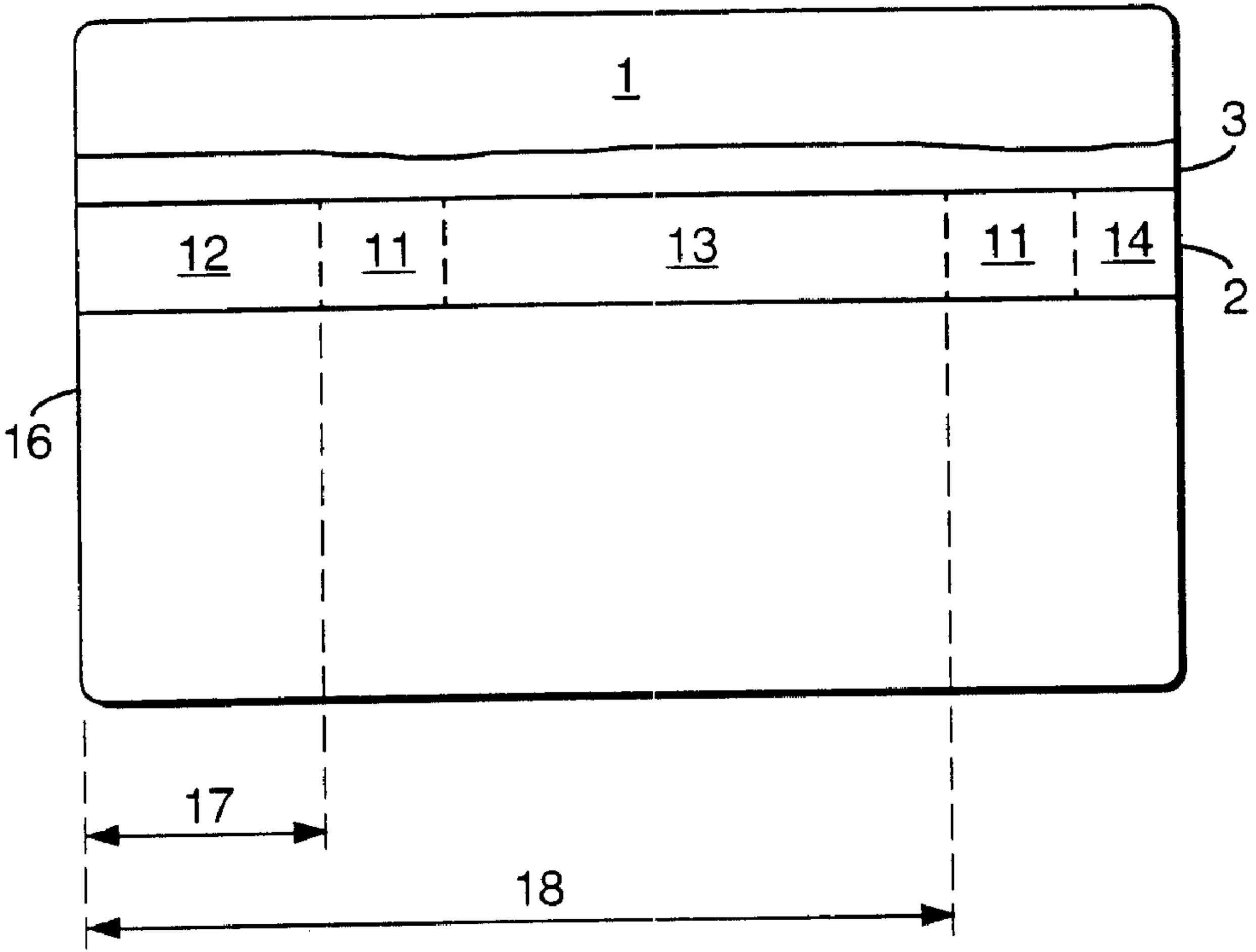


Fig.2.

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