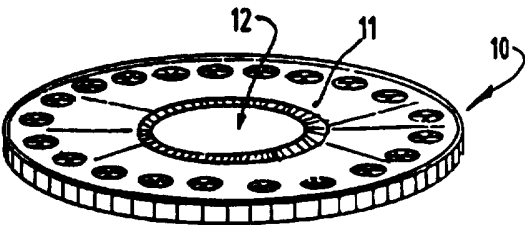


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(54) Title: COIN OR SIMILAR LEGAL TENDER WITH AN ELECTROMAGNETIC COMPONENT AND METHOD FOR MANUFACTURING SAME  (57) Abstract The present invention provides a coin or other similar legal tender obtained by a striking operation and comprising two components which are at least partially fixed to each other by means of the striking operation, wherein in at least one of the components is arranged at least one electromagnetic element which generates an electromagnetic signal in response to an external electrical, magnetic or electromagnetic field, and which is placed in this component such that it can withstand the striking operation.		

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COIN OR SIMILAR LEGAL TENDER WITH AN
ELECTROMAGNETIC COMPONENT AND METHOD
FOR MANUFACTURING SAME

5

Forgeries of banknotes and coins are being encountered on an increasingly larger scale. In many countries coins of increasingly higher nominal value are being brought into circulation, whereby counterfeiting of
5 coins by forgers also becomes worthwhile. Forged coins are mainly produced from cast metal with the aid of a mould made from a real coin obtained by a striking operation. In order to prevent this coins are now in circulation in some countries which are obtained from two
10 components of different metal, which components have a mutually differing colour. During the striking operation the mutual fixing of the two components, i.e. of an inner disc to an outer ring, is then ensured simultaneously with arranging of the embossing and the wear-resistant
15 edge.

Such two-colour coins can however also be forged by a casting process and subsequent colouring. A further problem is associated with coin-operated slot machines. These are usually based nowadays on the
20 principle that a coin inserted into a slot machine is identified on the basis of a magnetic field induced by the machine in the coin, which magnetic field depends on the composition or alloy of the metal coin. These magnetic properties of coins can likewise be copied
25 without the appearance of the coins having to show a high degree of similarity, whereby fraud with slot machines can take place comparatively easily.

The present invention provides a coin or similar legal tender obtained by a striking operation and
30 comprising two components which are at least partially fixed to each other by means of the striking operation,

wherein in at least one of the components is arranged at least one electromagnetic element which generates an electromagnetic signal in response to an external electrical, magnetic or electromagnetic field, and which
5 is placed in this component such that it can withstand, or is not affected by, the striking operation.

Such a coin can be applied for all relatively high nominal values, wherein the ECU (European Currency Unit), which is due to be introduced within the European
10 Union in a number of years and which will likewise be struck in greater nominal values, can also be seen as a non-limitative example. In order to have a sufficient supply of coins ready in time, an enormously large stock of coins must be minted in the coming years. It is of the
15 greatest importance that such coins are practically impossible to forge. It is expected that through the choice of suppliers for the electromagnetic elements and the control of distribution thereof, wherein the precise structure thereof is kept as secret as possible,
20 forgeries will become virtually impossible. Many advanced techniques will then in any case be necessary, whereby such forgeries will no longer be found lucrative.

Because in response to an electromagnetic inquiry field of the slot machine a high-frequency, for
25 instance radio frequency (RF), signal is generated by the coin, wherein the frequency depends for instance on the coin denomination, accurate detection of the coin in a slot machine can be carried out relatively easily while avoiding drastic changes in existing slot machines which
30 normally make use of a magnetic field.

This signal can be obtained by incorporating in the coin a resonance circuit with adjustable resonance frequency and searching for this resonance. The resonance circuit can consist of a very high frequency resonating
35 microstrip. In its simplest form this microstrip consists only of a metal strip having as important properties the small dimensions and the resistance to great forces such as occur during striking of coins. Another embodiment of

the resonance circuit consists of a parallel circuit of a coil and a capacitor. Yet another embodiment makes use of an electromagnetic element in the form of an integrated circuit (IC) which generates a coded signal, wherein
5 using this coding a distinction can be made between the different denominations as well as between for instance country of issue, currency and date of issue. The IC can also perform an authentication procedure to determine whether the coin is real.

10 This integrated circuit also contains the resonance circuit required for coupling to the electromagnetic field. The space available on the chip does not always permit use of a resonance circuit for coupling to the electromagnetic field. In these cases a
15 choice can be made for only a coil or only a capacitor providing the coupling to the electromagnetic field.

Since the electromagnetic carrier wave of the inquiry signal must remain as intact as possible in order to provide the electronic circuit with energy, the above
20 mentioned coding can be obtained by modulating the electromagnetic signal, wherein use can be made of phase modulation (PM), amplitude modulation (AM) or frequency modulation (FM).

The data signal can be supplied to the
25 modulator uncoded (NRZ) or coded in accordance with for instance the known codings, Manchester or Bi-Phase, wherein these are self-clocking.

The annular outer component of the coin is preferably formed from a metal since it is important for
30 particular types of slot machine that a coin can roll well, and the weight of the metal on the outer periphery thereof ensures this.

In addition, the present invention provides a method for striking a coin from two components.

35 Further advantages, features and details of the present invention will become apparent in the light of the following description of a preferred embodiment thereof with reference to the annexed drawings, in which:

fig. 1 shows a view in cross section of a method for striking a coin according to the present invention;

fig. 2 is a partly broken away side view of a coin struck in accordance with the method of fig. 1; and

fig. 3 shows a perspective view of the coin of fig. 2.

A preferred embodiment of a coin 10 (fig. 1, 2 and 3) according to the present invention comprises a ring 11, for instance of an alloy of nickel and iron or another alloy including for instance nickel (Ni), copper (Cu) and/or iron (Fe) in desired composition, and an inner disc 12 incorporating an electromagnetic element 13 containing, in a manner not shown, for instance a resonance circuit in an integrated circuit (IC), wherein the resonance circuit can be activated by an electromagnetic AC field to be applied externally of the coin, whereafter in response to that field for instance a radio frequency signal, which may or may not be modulated and coded, is generated in a slot machine for identification of the coin.

The electromagnetic element is preferably placed in a housing 14, for instance of relatively hard (synthetic) resin such as is known for housing integrated circuits in the electronics industry. The material of the disc 12 is formed by a cold deformable plastic which can withstand the striking operation for forming of a coin, wherein a force of for example 1,000,000 N is exerted between a lower die 20 and an upper die 21. When the upper die 21 and lower die 20 are moved toward each other as according to arrow A the plastic of the inner disc 12 is slightly compressed whereby it is clamped against the inner side of the outer ring 11. A little free space 15, which can optionally be filled with a relatively soft plastic, is preferably left between the housing 14 and the inner wall of disc 12, so that when disc 12 is compressed the housing 14 and the electromagnetic element 13 therein are not damaged.

It is also possible to provide the plastic disc 12 in advance with a depression during moulding of the electromagnetic element, wherein these plastic discs are fed in a fixed orientation to the minting press and
5 wherein these discs 12 have a dimension such that they are not deformed during the striking operation. The orientation of the depression in disc 12 can herein fit precisely with the orientation of the likeness or image struck into the coin.

10 In first tests for manufacturing a coin according to the present invention, use was made of a blank for a Dutch coin of a denomination of 5 guilders in which a hole was drilled. Into this hole was laid a close-fitting disc made of a plastic which in other
15 applications was known to be cold deformable by the forces occurring during the striking of coins. After the striking operation the plastic disc was found to be pressed fixedly into the aperture in the annular blank, while the relief of the coin was also applied by the die
20 in this cold deformable plastic.

In the further development of the present invention there will have to be research into which materials are most suitable for the inner disc respectively the outer ring. There will be further
25 research into which existing, or newly developed, electromagnetic component (resonance circuit plus IC) will be placed in the coin.

A particular embodiment of the electromagnetic component is one wherein in order to realize the coding
30 either the coil or the capacitor, or the LC circuit together with the necessary electronics is integrated onto one silicon chip so that no terminals or external connections are required on this chip.

The power supply for the required electronics
35 is obtained in all the above mentioned embodiments via L, C or resonance circuit from the electromagnetic AC field excited by the transmitter/receiver, wherein these elements are co-integrated into the integrated circuit.

The above preferred embodiments of the present invention must not therefore be deemed as limiting. The rights applied for are defined by the following claims, the scope of which also include the above stated further
5 developments.

CLAIMS

1. Coin or similar legal tender obtained by a striking operation and comprising at least two components which together form said coin after the striking operation, wherein in at least one of the components is
5 arranged at least one electromagnetic element which generates an electromagnetic signal in response to an external electrical, magnetic or electromagnetic field, and which is placed in this component such that it can withstand the striking operation or it is not adversely
10 affected by the striking operation.
2. Coin as claimed in claim 1, wherein the electromagnetic element comprises a resonance circuit.
3. Coin as claimed in claim 1 or 2, wherein the electromagnetic element comprises an integrated circuit.
- 15 4. Coin as claimed in claims 2 and 3, wherein the coil is integrated with the integrated electronic circuit on one electronic chip.
5. Coin as claimed in claims 2 and 3, wherein the capacitor is integrated with the integrated
20 electronic circuit on one electronic chip.
6. Coin as claimed in claims 2 and 3, wherein the resonance circuit is integrated with the integrated electronic circuit on one electronic chip.
7. Coin as claimed in one or more of the
25 foregoing claims, wherein a first component is annular.
8. Coin as claimed in claim 7, wherein the annular element is of metal.
9. Coin as claimed in one or more of the foregoing claims, wherein a second component is disc-
30 shaped.
10. Coin as claimed in claim 9, wherein the electromagnetic element is incorporated in the disc-shaped component which is of a material which is sufficiently permeable to the electromagnetic signal.

shaped component which is of a material which is sufficiently permeable to the electromagnetic signal.

11. Coin as claimed in claim 10, wherein the material of the second component is of cold deformable plastic such that it can withstand the striking operation.

12. Coin as claimed in claim 10, wherein the material of the second component has dimensions such that functionally it is not adversely affected by the striking operation.

13. Coin as claimed in one or more of the foregoing claims, wherein the electronic circuit integrated into the second component applies a modulation to the electromagnetic carrier wave of the inquiry signal.

14. Coin as claimed in claim 13, wherein the modulation is applied by phase modulation (PM).

15. Coin as claimed in claim 13, wherein the modulation is applied by amplitude modulation (AM).

16. Coin as claimed in claim 13, wherein the modulation is applied by frequency modulation (FM).

17. Coin as claimed in any of the claims 14, 15 or 16, wherein the logic level is assigned to the modulated signal by making use of an NRZ (Non Return to Zero) coding technique.

18. Coin as claimed in any of the claims 14, 15 or 16, wherein the logic level is assigned to the modulated signal by making use of a Manchester coding technique.

19. Coin as claimed in any of the claims 14, 15 or 16, wherein the logic level is assigned to the modulated signal by making use of a Bi-Phase coding technique.

20. Coin as claimed in claim 13, wherein the integrated circuit performs an authentication procedure.

21. Method for striking a coin or other similar legal tender, comprising the following steps of:

- placing in a holder an annular blank of metal;
- placing in the aperture of the annular blank, with or without fixed orientation, a disc-shaped central part of plastic in which is arranged an electromagnetic element; and
- performing a striking operation on the assembly of the annular blank and the central disc using one or more dies.

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FIG.3

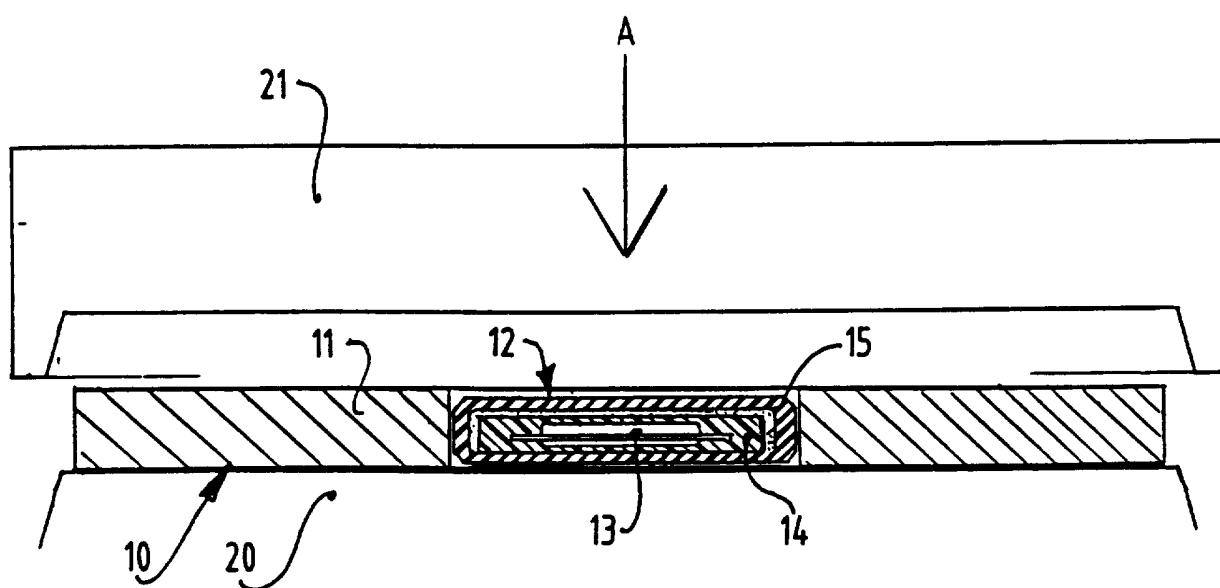
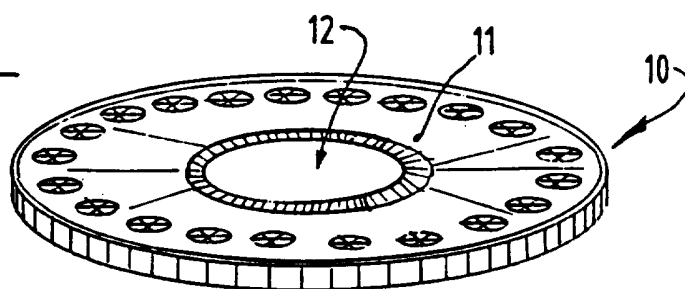


FIG.1

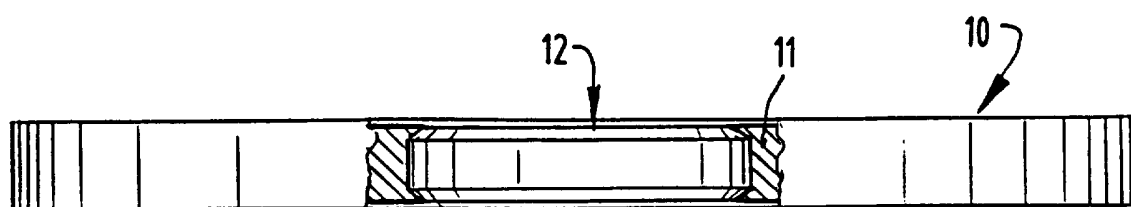


FIG.2