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S. KLACKOWSKI ET AL

3,295,651

MONETARY TOKENS

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FIG. 1.

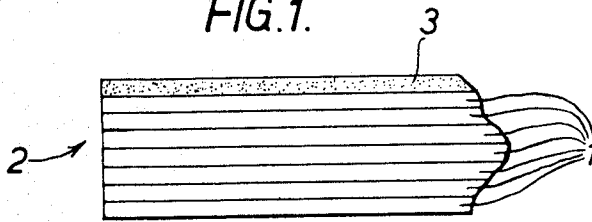


FIG. 2.

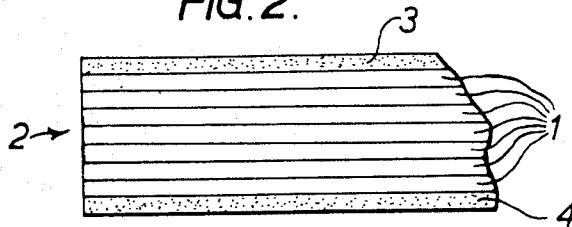
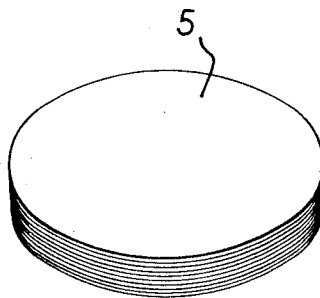


FIG. 3.



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MONETARY TOKENS

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8 Claims. (Cl. 194-4)

This invention relates to monetary tokens which can readily be distinguished from counterfeits, and to the production of such items.

Vending machines are commonly operated by the insertion therein of coins, the weight, shape and size of which are adapted, in any given instance, to cause the delivery mechanism to operate in accordance therewith. With the development and increasing acceptance of vending machines, there is a need for tokens or other mechanism-actuating devices which represent greater monetary values than those of the largest value coins now in use. Unmodified blanks of suitable weight, shape and size would not be suitable for this purpose because they could be virtually valueless per se and could easily be produced and used fraudulently to cause machines to operate. Suitable tokens or other devices would necessarily have to include and to operate the delivery mechanism partly at least in accordance with a constant characteristic thereof, other than weight, shape or size, which has been specially imparted thereto and which cannot readily be created or reproduced by unauthorised persons.

It is an object of the present invention to provide such tokens.

According to the invention there is provided monetary tokens which comprise a radioactive isotope or element emitting a radiation of a predetermined penetration or energy level whereby the tokens can readily be tested for authenticity.

A token according to the invention may comprise a radioactive material which emits a radiation of a predetermined penetration range and intensity range. Such a token may be used to actuate the delivery mechanism of an automatic vending machine by the radiation emitted by the token, the mechanism being actuated only by radiation of a given penetration range and intensity range.

Any convenient substance may be used as the base material for the token or other object, but preferably it includes one or more synthetic resins in moulded, reinforced or laminated form. A preferred method of adding the radioactivity is by using a radioactivity labelled compound which reacts with the resin during the production of the token.

The radioactive isotope or element may be present in, on or beneath one or both faces of the token, and may be mixed with the synthetic resin, contained in a reinforcing or carrier material for the resin, or present in the form of ink or other marking or colouring ingredient applied externally or internally to the token. Additionally, the characteristics of the tokens may be modified by including in the tokens a barrier material resistant to radiation and so capable of reducing the energy of the radiation actually emitted on either or both sides.

A suitable delivery mechanism actuable by the tokens of the present invention is actuated by an electric circuit which includes an electronic component adapted to be influenced by a mechanism, for example one or more Geiger-counter type devices, capable of being activated by the radiation emitted by the token.

Sensing mechanism systems involving differential activation of a pair of suitably interconnected Geiger-Muller

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tubes are particularly advantageous. For example, when isotopes having low penetration energy of radiation are used, one Geiger-Muller tube may be adapted to be activated by radiation of low penetration energy and the other only by radiation of high penetration energy; the sensitivity of the latter tube may conveniently be restricted by providing its window with a shield, e.g. of thin aluminium. In such an instance the electric circuit controlling the delivery mechanism is preferably arranged in such a way that delivery occurs only when the Geiger-Muller tube accepting low penetration energy radiation is activated, but the Geiger-Muller tube accepting only high penetration energy radiation is receiving only the degree of activity normally associated with a background radiation from cosmic and other extraneous sources. A token containing an isotope or element which emits particles with a high penetration energy would cause both Geiger-Muller tubes to be activated and delivery would not be effected.

In a two Geiger-Muller tube system the tubes may be placed to observe a single active face or, alternatively, they may be placed one on each side of the token. If the token has radioactive material on both surfaces a shield must be used to restrict the sensitivity of one of the Geiger-Muller tubes so that it will receive only high penetration energy radiation, but if a token having radioactive isotope on one side only is used the token itself can be used as a shield; the token can then be observed by two identical tubes, one on either side, since by correct choice of the materials used for the token it can be arranged that the tube remote from the radioactive side of the token is activated only if the isotope is of high penetration energy.

Alternatively, the electric circuit may be so arranged that the delivery mechanism is activated by tokens containing isotopes of only high penetration energy. In any arrangement it is preferable that the electric circuits in the vending machine are so arranged that the delivery mechanism is activated only when the energy or number of particles emitted by the radioactive isotopes lies between defined limits.

The following methods for producing tokens according to this invention are given by way of example only, do not limit the scope of the invention, and will be described with reference to the accompanying drawings in which FIGURES 1 and 2 show broken away elevational views of two different constructions of sheet material and FIGURE 3 shows a perspective view of a circular token.

Example 1

Referring to FIGURE 1, there are shown seven sheets 1 of 10 mil kraft paper impregnated with 35-45% by weight of phenol-formaldehyde resin, cured to approximately the B stage, and assembled in a stack 2, and on one face of the stack 2 there is placed a 3 mil sheet 3 of alpha-cellulose paper impregnated throughout with 60-65% by weight of a melamine-formaldehyde resin to which had been added a radioactive isotope or element (carbon¹⁴ or uranium) in the form of a soluble compound. The carbon¹⁴ was added in the form of urea which can react with melamine-formaldehyde resin.

The entire assembly was pressed between flat metal plates at 1500 p.s.i. and a temperature of 150° C. to cure the resin and to consolidate the sheets into a unitary structure. The laminated product was then removed from the press and blanks 5 shown in FIGURE 3 having the diameter of a penny (about 1.25 inches) were cut from it.

Five tokens 5 were constructed as described, with differing amounts of carbon¹⁴ or uranium, as shown in the table, incorporated in the resin of the surface sheets on one side only.

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The activity of these tokens measured on a conventional thin window Geiger-counter having an effective aperture of 0.9 inch diameter, was as follows:

Token	Isotope	Activity Active Side (Particles/Minute)	Activity Reverse Side (Particles/Minute)
1-----	C ¹⁴	3,509	26
2-----	C ¹⁴	4,018	19
3-----	C ¹⁴	4,663	19
4-----	C ¹⁴	5,807	21
5-----	U	4,193	1,553

The tokens were inserted in a vending machine whose sensing mechanism comprised an electric circuit including on one side of the token sensing position a Geiger-Muller tube adapted to influence the circuit positively when it received a number of emitted particles per minute within a predetermined range, and on the other side of Geiger-Muller tube adapted, in conjunction with the first tube, to influence the circuit positively only when it received less than 30 emitted particles per minute. Only Token 2 operated the delivery mechanism; Tokens 1, 3 and 4 were unacceptable because their levels of activity were above or below the setting for the first tube and Token 5 was unacceptable for although the first tube received a number of particles within the predetermined range and was thus activated, the second tube received more than 30 emitted particles per minute because of the high penetration energy of the isotope used, and so cancelled the positive action of the first.

Of course, the token must be inserted in the prescribed way, so that the melamine-formaldehyde resin layer faces the first tube, since otherwise it will not operate the mechanism at all.

Example II

Referring to FIGURE 2, there are shown seven sheets 1 of kraft paper in a manner similar to those of Example I, with the exception that a three mil sheet 3 and 4 of alpha-cellulose paper impregnated with 60-65% by weight of a melamine-formaldehyde resin to which had been added a radioactive isotope or element (carbon¹⁴ or uranium) in the form of a soluble compound was provided on both sides of the stack 2. From this laminated assembly there were produced five further tokens similar to that shown at 5 in FIGURE 3.

These tokens were inserted in a vending machine having the sensing mechanism described in Example I, with the exception that the second Geiger-Muller tube adapted in conjunction with the first tube to influence the circuit positively only when it receives less than 30 emitted particles per minute or equivalent energy was screened by aluminium foil .003 inch thick. The tokens operated the vending mechanism in a manner identical to that described in Example I but it was not necessary to insert the tokens any particular way round because the radioactive isotope was present on both faces and the aluminium foil reproduced the screening effect of the thickness of the single-sided tokens in Example I.

From the above examples it is clear that the vending machine was able to distinguish both the energy and activity of the isotope or element used. The use of C¹⁴ is particularly advantageous since this isotope can only be obtained from a government controlled source and is only available to registered users. The distinguishing of

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tokens made from this material from those made using the comparatively readily obtainable salts of uranium is thus of particular importance in ensuring that these tokens cannot easily be imitated.

The tokens according to this invention may, if desired, be provided with a removable protective covering or supplied in a protective container to eliminate any possible objections to their use on the grounds of health hazard.

We claim:

1. A monetary token made from a material which includes radioactive urea containing carbon¹⁴, and having a first surface having a substantially uniform distribution of carbon¹⁴ thereon, the emission of radioactivity from said surface being within predetermined ranges of penetration and intensity.

2. A monetary token as claimed in claim 1 having the radioactive material present in only one face of the token.

3. A monetary token as claimed in claim 1 having a second surface from which there is no measurable emission of radioactivity.

4. A monetary token as claimed in claim 1 having a second surface on the opposite side from which there is an emission of radioactivity having a uniform distribution over the whole of the surface, the radioactivity emitted from the second surface being within predetermined ranges of penetration and intensity different from ranges of radioactivity emitted from said first surface.

5. A monetary token as claimed in claim having a second surface on the opposite side from which there is an emission of radioactivity having a uniform distribution over the whole surface, and the radioactivity emitted from the second surface being within predetermined ranges of penetration and intensity substantially the same as that emitted from said first surface.

6. A monetary token comprising a disc of polymerised synthetic resin having a first surface containing a substantially uniform distribution of carbon¹⁴ entirely over said surface thereon to produce a uniform distribution of emission of radioactivity within predetermined ranges of intensity and penetration.

7. A monetary token comprising a disc of polymerised synthetic resin having a first surface containing a substantially uniform distribution of carbon¹⁴ thereon to produce a uniform distribution of emission of radioactivity within predetermined ranges of intensity and penetration, said radioactive carbon¹⁴ being chemically combined in said polymerised synthetic resin, said resin comprising a radioactive urea compound and a melamine-aldehyde condensation product.

8. A monetary token according to claim 7 wherein the melamine-aldehyde condensation product is a melamine-formaldehyde resin.

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