ABSTRACT: A coin tester has an oscillator with a self-induction coil surrounding a coin duct, the oscillator temporarily varying the oscillation thereof in response to the effect on the field of the coil of an object passing through the coin duct, and means responsive to the variation for indicating whether the object is an acceptable coin. The wall of the duct in the vicinity of the coil may be made of insulating material or metal formed with a slot with insulating material in the slot.
The invention relates to a coin tester, in particular for vending machines and coin-operated telephones in which a coin duct extends through the field of at least one self-induction coil of an oscillator circuit whose oscillations are temporarily variable due to the action on the coil field of an object dropping through the coin duct, the acceptance of the object as an acceptable coin or its nonacceptance depending on the variation of the oscillator oscillation.

The variation of the oscillator oscillation which decides acceptance or nonacceptance of the object may for example be a change of frequency or of amplitude; in the last mentioned case for example a temporary cessation of the oscillation. A demodulator, comprising a discriminator or rectifier, may supply a pulse for said oscillations if a metal object which passes through the coin duct temporarily effects a specific change of the oscillations.

According to a proposal not disclosed in the prior art, the coil of a coin tester of the kind heretofore mentioned was so disposed on an inclined part of the coin duct that the objects passed through the coin duct in parallel to the endface of the coil and through the field thereof. Reproducible results were obtained with the aforementioned coin tester only if the objects, in particular the acceptable coins, passed by the coil while being in a specific position relative to these conditions. These conditions could be ensured only for a single coin diameter and a single coin thickness by adaptation of the coin duct to the aforementioned diameter and thickness. Bent coins could lead to defects by jamming in the coin duct or, by virtue of their curvature, by not producing the desired change of oscillations of the oscillator.

The object of the invention is to construct the coin tester so that the result of the coin-testing operation is independent of the position in which the object drops through the coin duct.

According to the invention this is achieved by the self-induction coil surrounding the coin duct.

Since the field strength of the coil field is identical at all positions of the space surrounded by said coil, the change of oscillator oscillations within the range of practically feasible positions of an object passing through the coin duct of the aforementioned coin tester is independent of the position of the said object. Accordingly, the cross section of the coin duct can be adapted to the largest diameter and the greatest thickness of different acceptable coins without rendering the test result uncertain in the case of the smaller coins.

An exemplified embodiment of the coin tester according to the invention will now be described by reference to the accompanying drawing. A single illustration shows in diagrammatic form a coin tester for two coin denominations, the electrical part of said coin tester being so constructed that the acceptance of a metal object as an acceptable coin or the nonacceptance thereof depends on whether the oscillations of an oscillator temporarily cease.

The illustrated coin tester is provided with a coin duct 1 shown partially, the clear cross section thereof being adapted to the largest dimensions of the two coin denominations including some slack. A coin with the larger dimensions is designated with the numeral 2. Each of two self-induction coils 3 and 4 surrounds the coin duct 1, said coils being disposed at a distance from each other, said distance being sufficiently large to prevent any coupling of the two coils from interfering with the method of operation described hereinbelow. To this end it is possible for the distance to correspond to at least the dimension of one diagonal of the rectangular coils.

The walls of the coin duct may be constructed of insulating material or of metal. In the last mentioned case the coin duct walls have to be provided with a longitudinal slit 20, extending between the two coils and on both sides thereof to a distance which is sufficiently long to prevent the occurrence of interfering eddy current losses in the walls of the coin duct. The longitudinal slit may be filled with insulating material 21. If the walls of the coin duct are constructed of metal a metal object dropping therethrough cannot act capacitatively on to the coils. A capacitive effect of the present system would also depend on the position in which the object drops through the coin duct.

Each of the two coils is the oscillator coil of an oscillator circuit 5 and 6 respectively, incorporating an oscillator and a rectifier which functions as a demodulator to supply a pulse to a conductor 7 or 8, respectively, if the oscillator oscillations temporarily cease.

The amount of feedback of the oscillators of both circuits 5 and 6 is adjusted that a coin of the first acceptable denomination causes the temporary cessation of only the oscillations of the oscillator of circuit 5 while a coin of the other denomination causes the temporary cessation of only the oscillations of the oscillator of circuit 6, while an object, which is not acceptable as a coin, either causes the oscillations of both oscillators to cease temporarily and successively or allows them to remain unaffected.

Each of the conductors 7 and 8 extends to the input of a monostable multivibrator 9 or 10 respectively. The time constant of the monostable multivibrator 9 is longer than the time during which an object dropping through the coin duct 1 successively passes through both coils 3 and 4 and the time constant of the monostable multivibrator 10 is longer by at least this period of time than the time constant of the monostable multivibrator 9. The time constant of each of the monostable multivibrators 9 and 10 is smaller than the time spacing of objects which are inserted successively. The output of the monostable multivibrator 9 is connected to the blocking input 11 of an AND gate 12. The other input 13 of the AND gate 12 is connected to the output of the circuit 6. The output of the monostable multivibrator 9 has connected to it a differential circuit 14, followed by an inverter 15 whose output is connected to one input 16 of an AND gate 17. The outer input 18 of the aforementioned AND gate 17 is a blocking input fed by the monostable multivibrator 10.

An acceptable coin of the first denomination causes temporary cessation of the oscillator of circuit 5 and thus supplies a pulse to the conductor 7 but no pulse to the conductor 8. The monostable multivibrator 9 then supplies an extended pulse at the beginning and end of which the differential circuit 14 produces one short-period pulse each of opposite polarity. By virtue of its polarity and after inversion in the inverter 15 the first of the aforementioned short-period pulses will be ineffective at the input 16 of the gate 17, the second pulse of opposite polarity will however be effective. A coin acceptance not for the first coin denomination will occur at the output of the gate 17 because the monostable multivibrator 10 was not operated and the blocking input 18 of the gate 17 therefore not rendered operative.

An acceptable coin of the second denomination causes temporary cessation of the oscillator of circuit 6 and therefore provides a pulse to the conductor 8 but no pulse to the conductor 7. The pulse on the conductor 8 operates the monostable multivibrator 10 so that a voltage occurs at the blocking input 18 of the gate 17 said voltage having no further effect since in the absence of a pulse on the conductor 7 no pulse can occur at the other input 16 of the AND gate 17. The pulse on the conductor 8 is also applied to the input 13 of the AND gate 12 and since its other input 11, which is a blocking input, is not rendered operative in the absence of a pulse on conductor 7, a coin-acceptance pulse will be produced for the second coin denomination at the output of the gate 12.

If a nonacceptable metal object produces a pulse on the conductor 7 and thereafter a pulse on the conductor 8, both monostable multivibrators 9 and 10 will be operated successively. Operation of the monostable multivibrator 9 produces the blocking input of the gate 12 operative and since the time constant of the aforementioned monostable multivibrator 9 is longer than the time spacing of the pulses on conductors 7 and 8 the gate will remain blocked even if the pulse of line 8 occurs at the input 13 of the aforementioned gate. Accordingly, the gate 12 will not supply a coin-acceptance pulse. In view of
the time constant of the monostable multivibrators 9 and 10 the blocking input 18 of the gate 17 will already have been made operative if the pulse formed by differentiation and inversion at the end of the output pulse of the monostable multivibrator 9 occurs at the input 16 of the gate 17. Accordingly, the aforementioned gate 17 will also not supply any coin-acceptance pulse.

If a nonacceptable object does not cause any of the oscillators to cease operation, a pulse will be produced neither on the conductor 7 nor on the conductor 8 so that neither the gate 12 nor the gate 17 will deliver a coin-acceptance pulse.

Because of the dimensioning described hereinabove of the two monostable multivibrators 9 and 10, said multivibrators return into their quiescent state after each operation before the next object drops through the coin duct.

I claim:

1. A coin tester, comprising a coin duct adapted for guiding coins therethrough, said coin duct having connected wall portions constructed of electrically conductive material and having a slot extending longitudinally of said duct in one of said wall portions, an induction coil surrounding said coin duct, an oscillator circuit including said induction coil operative in response to the effect on the field of said induction coil of an object passing through said coin duct to temporarily vary the oscillation thereof, and means responsive to said temporary variation from said oscillator circuit for indicating whether said object is an acceptable coin.

2. A coin tester as set forth in claim 1, including insulating material connected in said longitudinal slot.