

Coin testing apparatus

The present invention relates to a coin-testing apparatus which performs a diameter-dependent test on coins to determine whether they are genuine coins of a particular denomination or denominations.

Of the testing devices that are used in coin-operated machines there are several different kinds in which the tests performed on the coins produce results which are dependent on the diameter of the coin under test. Apparatus is known in which the coin under test rolls on an inclined track along a passageway formed between two closely-spaced plates which are themselves inclined slightly to the vertical so that the coins bear against one wall of the passageway. For each denomination of coin which the apparatus is intended to accept there is an inductor located in the wall of the passageway against which the coins bear. The inductors are circular and correspond in diameter to the coins of their respective denominations. Each is positioned in the wall at such a height above the track that its axis is aligned with the top edge of coins of its respective denomination when they are on the track alongside the inductor. The inductors are connected in oscillating circuits which in the absence of a coin idles at a frequency of say 300 to 400 kHz. When a coin is present alongside one of the inductors the frequency of the oscillating circuit shifts to a value which is dependent on the coin's diameter. By comparing the maximum frequency shift with standard values for acceptable coins of the respective denomination, the coin can be identified as acceptable or unacceptable for that denomination. For more detail of a similar but not identical apparatus, reference may be made to U.S. Patent US—A—3,870,137.

The inductive testing apparatus of the kind described above is sensitive to fairly small deviations in diameter from the diameter of the acceptable coin. However, the sensitivity decreases the greater the deviation from the diameter of the acceptable coin so that it becomes difficult to distinguish between two coins of slightly different diameter if the two coins are substantially larger or substantially smaller in diameter than the acceptable coin. It is for this reason that in the apparatus described above a different inductor is used for each size of acceptable coin in order to provide a reliable test of high selectivity.

The manufacturer of coin testing mechanisms may have to supply machines which accept many different sets of coins to meet customers requirements throughout the world.

It is a disadvantage in these circumstances to have to match the sizes and positioning of the inductors to the sizes of the coins in each coin set.

U.S. Patent US—A—3,918,565 discloses

coin testing apparatus and in particular in Figure 7 shows a pair of coils 612 spaced above a coin track. However, the specification makes no express reference to the sensing of coin diameter.

U.S. Patent US—A—4,168,296 discloses an inductor arrangement (see Figures 8(a) to 10) in which coils on each side of a coin passageway are oblong and have the major axes of their oblong shapes transverse to the path of a coin along the passageway. The coils extend right across, and well beyond the lateral limits of, the passageway so that a coin of any particular diameter should have the same effect upon the coil field irrespective of the position of the coin in the transverse direction when it passes the coils, whereby the arrangement is said to be able to detect coin diameter irrespective of the orientation of the arrangement e.g. vertical as in Figure 9 or oblique as in Figure 10.

The object of the present invention is quite different, namely to achieve a high sensitivity to variations in coin diameter over a large range of diameters. In achieving this the present invention utilises an oblong inductor but in a way inconsistent with the teaching of the above U.S. patent, since the inductor has the lower edge of its coil spaced above a coin track (i.e. the coil does not and must not extend right across the coin passageway). By this characteristic, diameter sensing not only over a large diameter range, but also with high sensitivity throughout that range, can be achieved, and the need for several individual diameter sensing inductors matched to individual acceptable coin denominations is also avoided.

According to the present invention there is provided a coin testing apparatus comprising a coin passageway, a coin track along which coins pass on their edges and substantially in a predetermined plane through the coin passageway, and inductive coin examining means arranged to produce an oscillating magnetic field in the coin passageway and to respond, in a manner dependent on the diameter of the coin, to the interaction between a coin travelling in the passageway and the oscillating magnetic field, the coin examining means including an inductor, adjacent the coin passageway, connected in a coin acceptability testing circuit arranged to determine whether said diameter dependent interaction corresponds to the interaction for an acceptable coin of predetermined diameter, the coin track being arranged to guide all coins along a common path past the inductor, the inductor comprising a coil which is oblong, has the major axis of its oblong shape substantially parallel with said plane and transverse to the path of a coin along the track, is located alongside the passageway, and has the axis of its magnetic field directed through said plane, characterised in that the

inductor is arranged with the lower edge of its coil spaced above the coin track.

We have found that with such an arrangement the sensitivity to variations in diameter is both relatively high and relatively uniform over a large range of diameters.

By using an oblong inductor with a practical aspect ratio, the value of frequency shift, which with a circular inductor would be proportional to D^2 , where D is the coin diameter, approaches proportionality with D .

The inductor may comprise a coil in a ferrite pot core. The coil may be in the form of an oblong circle with straight portions parallel to the major axis and a semi-circular portion joining the straight portions at each end. It may be located in a similarly shaped groove in the pot core between a peripheral ferrite wall and a centre core, also of the same shape.

The inductor should desirably be mounted so that the smallest coin which the apparatus may be required to accept overlaps the lower end of the inductor centre pole when it is on the track adjacent the inductor and the largest coin which the apparatus may be required to accept does not extend above the inductor centre pole when it is on the track adjacent the inductor. In practice at present with the smallest coin being the 15 mm. diameter Dutch 10 cent coin and the largest being 33 mm. diameter Danish 5 Krone coin this means that in an apparatus which may be required to cater for these coins the bottom of the inductor should be less than 15 mm, and the top should be at least 33 mm. above the track. Using a ferrite pot core we have found that satisfactory results can be obtained with the peripheral wall at the bottom 4.6 mm. above the track and at the top 38.6 mm. above the track.

It will be evident that the angle which the major axis of the oblong inductor makes with the track can depart from the strictly perpendicular provided it remains generally transverse to the path of a coin along the track.

A further advantage of the oblong inductor is that it has a small dimension in the direction parallel to the track compared with a circular inductor which can distinguish up to the same size of coins. For example an inductor may be constructed in accordance with the present invention having a dimension perpendicular to the track of 34 mm. but a dimension parallel to the track of only 24 mm. A circular inductor which provides similar sensitivity at large diameter may be 33 mm. in diameter. This saving in space along the track can be important when designing a coin testing machine which performs other tests besides the one performed by the apparatus in accordance with the invention.

The inductive coin examining means can be an oscillator circuit which oscillates at a high frequency, say above 75 kHz, in order that the oscillating magnetic field penetrates only the surface of the coin under test. We have found

that a normal oscillating frequency of 600—700 kHz in the absence of a coin produces good results. The means for examining the interaction of the coin with the magnetic field may conveniently comprise means which examine the maximum frequency at which the circuit oscillates when a coin passes. The means determining whether the interaction corresponds to that for an acceptable coin might then comprise a comparator which compares a value representative of the maximum frequency or the maximum shift in frequency with a corresponding value for an acceptable coin.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings in which:—

Fig. 1 shows a diagrammatic front view of a coin-testing apparatus in accordance with the invention with a front wall removed;

Fig. 2 shows a diagrammatic vertical section on the line II—II of Fig. 1;

Fig. 3 shows a front view of the inductor of Figs. 1 and 2;

Fig. 4 shows a section of the inductor of Fig. 3 on the line IV—IV;

Fig. 5 shows a simplified logic diagram of the circuitry of the apparatus of Fig. 1; and

Fig. 6 is a graph showing the results of tests in which the frequency shift has been measured for different diameters of coin.

Referring to Figs. 1 and 2, a coin testing apparatus or coin selector 10 comprises a coin entry slot 11 through which coins may be inserted into the apparatus to fall onto an energy-dissipating device 12, which may be a block of sintered aluminium oxide as described in our United Kingdom Patent Specification No. 1482417 and which suppresses bouncing of the coin.

The energy-dissipating device forms the upstream end of an inclined coin supporting track 13 down which the coin moves on its edge under the influence of gravity.

The passageway through which the coin moves is defined by two closely-spaced plates 14 and 15. The parts of the plates which form the walls of the passageway along the track 13 are tilted at an angle of about 10° to the vertical so that coins moving down the track bear against the wall formed by the plate 14.

Adjacent the wall of the passageway against which the coins bear is an inductor 16 which forms part of a coin testing circuit. Below the downstream end of the track 13 is a coin acceptance gate 17. The gate 17 normally intercepts coins falling from the lower end of the track 13 and diverts them onto a reject coin track 18 whereby the coins are returned to the customer, but when a coin is found to be acceptable by the testing circuit the gate 17 is retracted into the wall of the passageway by means of a solenoid 19 so that the coin can fall past the gate 17 into a coin-acceptance passageway 20.

The inductor 16 is shown in greater detail in

Figs. 3 and 4. It comprises a coil 21 which is placed around the centre pole 23 of a ferrite pot core 24. The pot core 24 has a peripheral wall 25 which extends around the outside of the coil 21, the coil sitting in the channel formed between the wall 25 and the centre pole 23.

The coil 21 has the form of an oblong circle comprising two parallel straight sections 26 and two semicircular sections 27 joining the straight sections at opposite ends. The central pole 23 has a corresponding oblong form with rounded ends as does the peripheral wall. The overall dimension of the pot core along its major axis 28 is 34 mm., the dimension along its minor axis 29 is 24 mm. The centre pole measures 20 mm. by 10 mm.

The inductor is positioned behind the wall of the passageway with its major axis 28 perpendicular to the coin track 13. The height of the lower end of the ferrite core 24 above the track is 4.6 mm. In this position the top of a 15 mm. diameter coin (indicated at 31) will be just above the bottom end of the centre pole when it is on the track adjacent the inductor whereas a 33 mm. diameter coin (indicated by 32) will not extend above the top of the central pole. When the coin is adjacent the inductor they are separated only by the thickness of the wall which is 1.2 mm. of glass reinforced plastics.

Referring now to Fig. 5, the inductor 16 is connected in an oscillating circuit 40 which, in the absence of coins oscillates at a frequency of about 635 kHz. At this frequency the interaction between the coin and the magnetic field produced by the inductor is substantially independent of the thickness of the coin and depends principally on the diameter of the coin and to a lesser extent on its conductivity.

The output of the oscillator circuit 40 is fed to a circuit which measures the maximum shift in frequency from the normal idling frequency and determines whether this corresponds to certain bandwidths for acceptable coins.

The frequency of the oscillating circuit is measured using a counter 41. The oscillator circuit output is gated via an AND gate 42 into the counter 41 using a precise timing gate period of about 1 millisecond duration generated by a stable reference timing oscillator which is part of the time pulse generator 43.

A number corresponding to the idle frequency in the absence of the coin is stored in a register 44. This number is stored when a housekeeping circuit 45 produces signals either just after the power is first applied to the coin testing apparatus or when the testing apparatus has just rejected a coin. The reference value is fed into the register 44 from the counter 41 when the appropriate housekeeping pulse is received. By means of this periodic updating of the idle frequency reference value, small changes of idling frequency can be tolerated without affecting the overall performance of the apparatus.

The contents of the counter 41 and the

register 44 are periodically transmitted to an adder 46 by a multiplexer 47. The adder 46 determines the difference between the number in the counter 41 and the number in the register 44. At the end of each 1 millisecond examination period, the output of the adder 46 is compared with a number previously stored in a memory 48. The address of the number read from the memory to the comparator 50 is determined by an address counter 49. Whenever the number in the adder 46 exceeds the number in this memory location, the address counter is advanced by one count to the next address. The address in the counter 49 is then transmitted to the memory 48.

The numbers stored in the memory 48 are the numbers corresponding to the lower and upper frequency difference levels associated with each acceptable coin. Thus as the coin passages through the field of the inductor 16 the frequency of the oscillator will rise above the frequency produced in the absence of the coins, the frequency difference count from the adder 46 will rise through the levels set in the memory 48, and the address counter 49 will advance in count to an address corresponding to the frequency difference level next above the maximum frequency difference which is produced. If this address represents the upper level of a frequency difference band associated with a valid coin, then it means that the maximum frequency difference was within an acceptance band. If however this address corresponds to the lower level of an acceptance band it means that the coin caused the frequency difference to rise to a value outside a valid acceptance band and therefore should be rejected. Thus the number in the address counter is indicative of whether the test has identified the coin as acceptable and also the denomination of the coin.

In practice the testing apparatus may also perform other tests on the coin such as are described in our Patents GB-A-1397083 and GB-A-1452740. To provide sufficient space along the track for the testing apparatus, more than one inclined coin track may have to be used with a snubber at the top of each track and the acceptance gate below the lower end of the lowermost track. The results of the tests will be combined so that the coin is accepted only if the results of all tests indicate an acceptable coin of the same denomination.

It will be appreciated from the foregoing description that the testing apparatus can readily be adapted for different sets of coins. All that must be changed are the values stored in the memory representative of the upper and lower limits for the acceptance bands of the particular coins. If the memories are pre-programmed memories such as are described in our Patent GB-A-1527450, all that has to be done to change the coin set which the apparatus will accept is to replace the pre-programmed memory.

Fig. 6 shows a graph of experimental results obtained on a testing apparatus as described above indicating the frequency shift produced by different diameters of coin. As will be seen from the graph the apparatus produces a fairly uniform rate of change of frequency shift over a large range of coin diameters.

Claims

1. A coin testing apparatus comprising a coin passageway, a coin track (13) along which coins pass on their edges and substantially in a predetermined plane through the coin passageway, and inductive coin examining means arranged to produce an oscillating magnetic field in the coin passageway and to respond, in a manner dependent on the diameter of the coin, to the interaction between a coin travelling in the passageway and the oscillating magnetic field, the coin examining means including an inductor (16), adjacent the coin passageway, connected in a coin acceptability testing circuit arranged to determine whether said diameter dependent interaction corresponds to the interaction for an acceptable coin of predetermined diameter, the coin track being arranged to guide all coins along a common path past the inductor, the inductor comprising a coil (21) which is oblong, has the major axis (28) of its oblong shape substantially parallel with said plane and transverse to the path of a coin (31, 32) along the track, is located alongside the passageway, and has the axis of its magnetic field directed through said plane, characterised in that the inductor (16) is arranged with the lower edge of its coil (21) spaced above the coin track (13).

2. An apparatus according to claim 1, characterised in that the inductor comprises a coil (21) in a ferrite pot core (24).

3. An apparatus according to claim 1 or 2, characterised in that the coil is substantially oval with straight portions (26) parallel to its major axis and a semi-circular portion (27) joining the straight portions at each end.

4. An apparatus according to claim 3, characterised in that the coil is in a similarly shaped groove in a pot core (24) between a peripheral ferrite wall (25) and a centre pole (23), also of the same shape.

5. An apparatus according to claim 3 or 4, characterised in that the inductor is so arranged that the smallest coin which the coin testing apparatus is required to accept overlaps the lower end of the inductor centre pole when the coin is on the track adjacent the inductor and the largest coin which the apparatus is required to accept does not extend above the inductor centre pole when it is on the track adjacent the inductor.

6. An apparatus according to any of claims 1 to 5, characterised in that the inductor has a centre core the bottom of which is less than 15

mm. and the top of which is at least 33 mm. above the track.

7. An apparatus according to claim 4, characterised in that the peripheral wall at the bottom is 4.6 mm above the track and at the top is 38.6 mm above the track.

8. An apparatus according to any one of claims 1 to 7, wherein the coin acceptability testing circuit is an oscillator circuit, characterised in that the oscillator circuit (40, 16) is set to oscillate at a frequency above 75 kHz, in order that the oscillating magnetic field is concentrated mainly to the surface of the coin under test.

9. An apparatus according to claim 8, characterised in that the oscillator circuit has a normal oscillating frequency of 600—700 kHz in the absence of a coin.

10. An apparatus according to any of claims 1 to 9, wherein the coin acceptability testing circuit is an oscillator circuit, characterised in that the oscillator circuit (40, 16) comprises means (41, 44, 46, 47) for sensing the frequency, or frequency shift, of the oscillator when a coin passes.

11. An apparatus according to claim 10, characterised in that the coin acceptability testing circuit comprises a comparator (50) which compares a value representative of a maximum frequency, or the maximum shift frequency, with a maximum value for an acceptable coin.

12. An apparatus as claimed in claim 11, characterised in that the comparator compares said representative value with a plurality of maximum value bands for respective acceptable coins.

13. An apparatus as claimed in claim 11, characterised in that the comparator compares the instantaneous frequency, or frequency shift, of the oscillating circuit sequentially with a plurality of stored values which, in turn, define the lower and upper limits of maximum value bands for respective acceptable coins, and means (48, 49) is provided for recognising which of the stored values is the highest reached by the instantaneous frequency or frequency shift, this being indicative of whether or not the maximum lies within an acceptable coin band.

14. Apparatus as claimed in any preceding claim, characterised by an energy dissipating device (12), forming the upstream end of the coin track (13), for suppressing bouncing of coins to be tested dropped onto the energy dissipating device (12).

Revendications

1. Un appareil de contrôle de pièces de monnaie comprenant un passage de pièces de monnaie, une voie des pièces de monnaie (13), le long de laquelle les pièces de monnaie passent sur leur tranche et sensiblement dans un plan prédéterminé dans le passage de pièces

Fig. 6 shows a graph of experimental results obtained on a testing apparatus as described above indicating the frequency shift produced by different diameters of coin. As will be seen from the graph the apparatus produces a fairly uniform rate of change of frequency shift over a large range of coin diameters.

Claims

1. A coin testing apparatus comprising a coin passageway, a coin track (13) along which coins pass on their edges and substantially in a predetermined plane through the coin passageway, and inductive coin examining means arranged to produce an oscillating magnetic field in the coin passageway and to respond, in a manner dependent on the diameter of the coin, to the interaction between a coin travelling in the passageway and the oscillating magnetic field, the coin examining means including an inductor (16), adjacent the coin passageway, connected in a coin acceptability testing circuit arranged to determine whether said diameter dependent interaction corresponds to the interaction for an acceptable coin of predetermined diameter, the coin track being arranged to guide all coins along a common path past the inductor, the inductor comprising a coil (21) which is oblong, has the major axis (28) of its oblong shape substantially parallel with said plane and transverse to the path of a coin (31, 32) along the track, is located alongside the passageway, and has the axis of its magnetic field directed through said plane, characterised in that the inductor (16) is arranged with the lower edge of its coil (21) spaced above the coin track (13).

2. An apparatus according to claim 1, characterised in that the inductor comprises a coil (21) in a ferrite pot core (24).

3. An apparatus according to claim 1 or 2, characterised in that the coil is substantially oval with straight portions (26) parallel to its major axis and a semi-circular portion (27) joining the straight portions at each end.

4. An apparatus according to claim 3, characterised in that the coil is in a similarly shaped groove in a pot core (24) between a peripheral ferrite wall (25) and a centre pole (23), also of the same shape.

5. An apparatus according to claim 3 or 4, characterised in that the inductor is so arranged that the smallest coin which the coin testing apparatus is required to accept overlaps the lower end of the inductor centre pole when the coin is on the track adjacent the inductor and the largest coin which the apparatus is required to accept does not extend above the inductor centre pole when it is on the track adjacent the inductor.

6. An apparatus according to any of claims 1 to 5, characterised in that the inductor has a centre core the bottom of which is less than 15

mm, and the top of which is at least 33 mm, above the track.

7. An apparatus according to claim 4, characterised in that the peripheral wall at the bottom is 4.6 mm above the track and at the top is 38.6 mm above the track.

8. An apparatus according to any one of claims 1 to 7, wherein the coin acceptability testing circuit is an oscillator circuit, characterised in that the oscillator circuit (40, 16) is set to oscillate at a frequency above 75 kHz, in order that the oscillating magnetic field is concentrated mainly to the surface of the coin under test.

9. An apparatus according to claim 8, characterised in that the oscillator circuit has a normal oscillating frequency of 600—700 kHz in the absence of a coin.

10. An apparatus according to any of claims 1 to 9, wherein the coin acceptability testing circuit is an oscillator circuit, characterised in that the oscillator circuit (40, 16) comprises means (41, 44, 46, 47) for sensing the frequency, or frequency shift, of the oscillator when a coin passes.

11. An apparatus according to claim 10, characterised in that the coin acceptability testing circuit comprises a comparator (50) which compares a value representative of a maximum frequency, or the maximum shift frequency, with a maximum value for an acceptable coin.

12. An apparatus as claimed in claim 11, characterised in that the comparator compares said representative value with a plurality of maximum value bands for respective acceptable coins.

13. An apparatus as claimed in claim 11, characterised in that the comparator compares the instantaneous frequency, or frequency shift, of the oscillating circuit sequentially with a plurality of stored values which, in turn, define the lower and upper limits of maximum value bands for respective acceptable coins, and means (48, 49) is provided for recognising which of the stored values is the highest reached by the instantaneous frequency or frequency shift, this being indicative of whether or not the maximum lies within an acceptable coin band.

14. Apparatus as claimed in any preceding claim, characterised by an energy dissipating device (12), forming the upstream end of the coin track (13), for suppressing bouncing of coins to be tested dropped onto the energy dissipating device (12).

Revendications

1. Un appareil de contrôle de pièces de monnaie comprenant un passage de pièces de monnaie, une voie des pièces de monnaie (13), le long de laquelle les pièces de monnaie passent sur leur tranche et sensiblement dans un plan prédéterminé dans le passage de pièces



de monnaie, et des moyens inductifs d'examen des pièces de monnaie agencés pour produire un champ magnétique oscillant dans le passage des pièces de monnaie et pour répondre, d'une façon qui dépend du diamètre de la pièce de monnaie, à l'interaction entre une pièce de monnaie qui circule dans le passage et le champ magnétique oscillant, les moyens d'examen des pièces de monnaie comprenant un inducteur (16) adjacent au passage des pièces de monnaie, connecté dans un circuit de contrôle d'acceptabilité des pièces de monnaie agencé pour déterminer si ladite interaction fonction du diamètre correspond à l'interaction valable pour une pièce de monnaie acceptable d'un diamètre prédéterminé, la voie des pièces étant agencée pour guider toutes les pièces le long d'un trajet commun franchissant l'inducteur, l'inducteur comprenant une bobine (21) qui est oblongue, présente le grand axe (28) de sa forme oblongue, sensiblement parallèlement audit plan et transversalement à la trajectoire d'une pièce (31, 32) le long de la voie, est placée le long du passage et présente l'axe de son champ magnétique dirigé à travers le plan, caractérisé en ce que l'inducteur (16) est agencé de manière que le bord inférieur de sa bobine (21) soit placé à une certaine distance au-dessus de la voie des pièces de monnaie (13).

2. Un appareil selon la revendication 1, caractérisé en ce que l'inducteur comprend une bobine (21) contenue dans un noyau de ferrite (24) en forme de gobelet.

3. Un appareil selon la revendication 1 ou 2, caractérisé en ce que la bobine est sensiblement ovale, avec des parties rectilignes (26) parallèles à son grand axe et une partie semi-circulaire (27) qui relie les parties rectilignes à chaque extrémité.

4. Un appareil selon la revendication 3, caractérisé en ce que la bobine est placée dans une gorge de forme analogue ménagée dans un noyau (24) en forme de gobelet, entre une paroi périphérique (25) en ferrite et un pôle central (23), qui est également de même forme.

5. Un appareil selon la revendication 3 ou 4, caractérisé en ce que l'inducteur est agencé de manière que la plus petite pièce que l'appareil de contrôle des pièces de monnaie est appelé à accepter empiète sur l'extrémité inférieure du pôle central de l'inducteur lorsqu'elle se trouve sur la voie, et est adjacente à l'inducteur et que la plus grande pièce de monnaie que l'appareil est appelé à accepter ne s'étende pas au-dessus du pôle central de l'inducteur lorsqu'elle se trouve sur la voie et est adjacente à l'inducteur.

6. Un appareil selon l'une quelconque des revendications 1 à 5, caractérisé en ce que l'inducteur comprend un noyau central dont le bas est à moins de 15 mm et le haut à au moins 35 mm au-dessus de la voie.

7. Un appareil selon la revendication 4, caractérisé en ce que la paroi périphérique est, en bas, à 4,6 mm au-dessus de la voie et, en haut, à 38,6 mm au-dessus de la voie.

8. Un appareil selon l'une quelconque des revendications 1 à 7, caractérisé en ce que le circuit de contrôle de l'acceptabilité des pièces de monnaie est un circuit oscillateur, caractérisé en ce que le circuit oscillateur (40, 16) est réglé pour osciller à une fréquence supérieure à 75 kHz, afin que le champ magnétique oscillant soit concentré principalement sur la surface de la pièce de monnaie en cours de contrôle.

9. Un appareil selon la revendication 8, caractérisé en ce que le circuit oscillateur possède une fréquence d'oscillation normale de 600 à 700 kHz en l'absence d'une pièce de monnaie.

10. Un appareil selon l'une quelconque des revendications 1 à 9, dans lequel le circuit de contrôle de l'acceptabilité de la pièce de monnaie est un circuit oscillateur, caractérisé en ce que le circuit oscillateur (40, 16) comprend des moyens (41, 44, 46, 47) destinés à capter la fréquence, ou le décalage de fréquence, de l'oscillateur lorsqu'une pièce de monnaie passe.

11. Un appareil selon la revendication 10, caractérisé en ce que le circuit de contrôle de l'acceptabilité de la pièce de monnaie comprend un comparateur (50) qui compare une valeur représentative d'une fréquence maximum ou de la fréquence de décalage maximum, à une valeur maximum valable pour une pièce acceptable.

12. Un appareil selon la revendication 11, caractérisé en ce que le comparateur compare ladite valeur représentative à une pluralité de bandes de valeurs maxima valables pour les pièces de monnaie acceptables correspondantes.

13. Un appareil selon la revendication 11, caractérisé en ce que le comparateur compare successivement la fréquence instantanée, ou le décalage de fréquence instantané, du circuit oscillateur, avec une pluralité de valeurs mémorisées qui, à leur tour, définissent les limites inférieures et supérieures de bandes de valeurs maxima valables pour les pièces de monnaie acceptables correspondantes, et des moyens (48, 49) sont prévus pour reconnaître laquelle des valeurs mémorisées est la plus haute atteinte par la fréquence instantanée ou le décalage de fréquence instantané, ceci étant indicatif du fait que le maximum se trouve ou ne se trouve pas dans une bande de pièces de monnaie acceptables.

14. Un appareil comme revendiqué dans une revendication précédente quelconque, caractérisé par un dispositif dissipateur d'énergie (12) qui forme l'extrémité amont de la voie (13) des pièces de monnaie, pour supprimer le rebondissement des pièces de monnaie à contrôler qui tombent sur le dispositif dissipateur d'énergie (12).

Patentansprüche

1. Münzprüfvorrichtung mit einer Münzenlaufbahn, einer Münzenschiene (13), längs der



Münzen auf ihren Kanten und im wesentlichen in einer vorgegebenen Ebene die Münzenlaufbahn passieren, sowie einer induktiven Münzen-Untersuchungseinrichtung, die so angeordnet ist, daß sie in der Münzenlaufbahn ein oszillierendes Magnetfeld erzeugt und in einer vom Durchmesser der Münze abhängigen Weise auf die Wechselwirkung zwischen einer sich in der Laufbahn bewegendenden Münze und dem oszillierenden Magnetfeld anspricht, wobei die Münzen-Untersuchungseinrichtung einen nahe der Münzlaufbahn befindlichen Induktor (16) umfaßt, der mit einer Münzenannahme-Prüfschaltung verbunden ist zur Ermittlung, ob die durchmesserabhängige Wechselwirkung der Wechselwirkung für eine annehmbare Münze mit vorgegebenem Durchmesser entspricht, wobei die Münzenschiene so angeordnet ist, daß sie sämtliche Münzen längs einer gemeinsamen Bahn an dem Induktor vorbeiführt, und wobei der Induktor eine Spule (21) umfaßt, die länglich ist, wobei die Hauptachse (28) ihrer länglichen Form im wesentlichen parallel zu der besagten Ebene und quer zur Bahn einer Münze (31, 32) längs der Schiene verläuft, und die längs der Laufbahn angeordnet ist, und wobei die Achse ihres Magnetfeldes die besagte Ebene durchsetzt, dadurch gekennzeichnet, daß der Induktor (16) so angeordnet ist, daß die untere Kante seiner Spule (21) sich in Abstand über der Münzenschiene (13) befindet.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Spule in einer ähnlich (21) in eine Ferrit-Topfkern (24) aufweist.

3. Vorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Spule im wesentlichen oval ist, wobei gerade Teile (26) parallel zu ihrer Hauptachse verlaufen und ein halbkreisförmiger Teil (27) die geraden Teile an jedem Ende verbindet.

4. Vorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß die Spule in einer ähnlich geformten Nut in einem Topfkern (24) zwischen einer Ferrit-Umfangswand (25) und einem mittleren Pol (23) ebenfalls der gleichen Form angeordnet ist.

5. Vorrichtung nach Anspruch 3 oder 4, dadurch gekennzeichnet, daß der Induktor derart angeordnet ist, daß die kleinste Münze, die die Münzenprüfvorrichtung annehmen soll, das untere Ende des mittleren Pols des Induktors überlappt, wenn die Münze auf der Schiene dem Induktor benachbart ist, und daß die größte Münze, die die Vorrichtung annehmen soll, nicht über den mittleren Pol des Induktors hinausragt, wenn sie auf der Schiene dem Induktor benachbart ist.

6. Vorrichtung nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß der Induktor einen Mittelkern aufweist, dessen Unterseite weniger als 15 mm und dessen Oberseite

mindestens 33 mm oberhalb der Schiene liegen.

7. Vorrichtung nach Anspruch 4, dadurch gekennzeichnet, daß die Umfangswand an der Unterseite 4,6 mm über der Schiene und an der Oberseite 38,6 mm über der Schiene liegt.

8. Vorrichtung nach einem der Ansprüche 1 bis 7, wobei die Münzenannahme-Prüfschaltung eine Oszillatorschaltung ist, dadurch gekennzeichnet, daß die Oszillatorschaltung (40, 16) auf eine Oszillationsfrequenz über 75 kHz eingestellt ist, damit sich das oszillierende magnetische Feld hauptsächlich auf die Oberfläche der zu prüfenden Münze konzentriert.

9. Vorrichtung nach Anspruch 8, dadurch gekennzeichnet, daß die Oszillatorschaltung in Abwesenheit einer Münze eine normale Oszillationsfrequenz von 600 bis 700 kHz aufweist.

10. Vorrichtung nach einem der Ansprüche 1 bis 9, wobei die Münzenannahme-Prüfschaltung eine Oszillatorschaltung ist, dadurch gekennzeichnet, daß die Oszillatorschaltung (40, 16) eine Einrichtung (41, 44, 46, 47) zur Erfassung der Frequenz oder Frequenzverschiebung des Oszillators beim Passieren einer Münze aufweist.

11. Vorrichtung nach Anspruch 10, dadurch gekennzeichnet, daß die Münzenannahme-Prüfschaltung einen Komparator (50) aufweist, der einen für eine Höchstfrequenz oder die höchste Frequenzverschiebung repräsentativen Wert mit einem Maximalwert für eine annehmbare Münze vergleicht.

12. Vorrichtung nach Anspruch 11, dadurch gekennzeichnet, daß der Komparator den besagten repräsentativen Wert mit mehreren Maximalwert-Bereichen für jeweils annehmbare Münzen vergleicht.

13. Vorrichtung nach Anspruch 11, dadurch gekennzeichnet, daß der Komparator die momentane Frequenz oder Frequenzverschiebung der Oszillatorschaltung nacheinander mit mehreren gespeicherten Werten vergleicht, die ihrerseits die unteren und oberen Grenzen von Maximalwert-Bereichen für jeweils annehmbare Münzen definiert, und daß eine Einrichtung (48, 49) vorgesehen ist zur Erkennung, welcher der gespeicherten Werte der durch die momentane Frequenz oder Frequenzverschiebung erreichte höchste Wert ist, wobei dies anzeigt, ob das Maximum innerhalb eines Bereiches für eine annehmbare Münze liegt oder nicht.

14. Vorrichtung nach einem der vorhergehenden Ansprüche, gekennzeichnet durch eine das in Laufrichtung obere Ende der Münzenschiene (13) bildende energiezerstreuende Einrichtung (12) die ein Rückprallen der auf die energiezerstreuende Einrichtung (12) fallenden zu prüfenden Münzen unterdrückt.

