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COIN HANDLING APPARATUS.

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Description

This invention relates to coin handling apparatus and particularly but not exclusively to such apparatus which is adapted to examine coins for acceptability.

Such apparatus is well known, in which there is a passageway in which coins to be examined travel, and one or more sensors arranged so that a travelling coin will pass them, the sensors being part of a coin examination means for determining the acceptability or otherwise of the coin. Various types of sensors are known, and the most commonly used are inductive coils having cores, though optical sensors may also be used to sense certain coin characteristics and the use of capacitative sensors has also been proposed. Reference may be made, for example, to GB -B- 2093620 for further information on how coin sensors may be operated to respond to various different coin characteristics and how their output signals may be utilised in coin examination means for determining the acceptability or otherwise of the tested coins.

In most, if not all, such coin examining apparatus it is important for the coin to travel smoothly along a predetermined or predictable path past the sensors, with the least possible bouncing or rattling, in order for the sensor outputs to reliably give meaningful information for the purpose of accepting or rejecting the coin. If this is not achieved, an unacceptably large number of coins which should not be accepted may be accepted, and an unacceptably large number of coins which should be accepted will be rejected.

Various approaches have been adopted for the purpose of minimising unpredictable movements of the coin after it has entered the apparatus. Some have involved the provision of swinging elements which lie in the path of the entering coin and which are moved when the coin strikes them so that kinetic energy is transferred from the coin to the element thus reducing the kinetic energy of the coin. Another approach which has been widely used is to provide an impact element which is secured to a part of the apparatus in a position where it will be struck by a coin which has entered through the entry, the impact element extending generally transversely relative to the direction in which the coin approaches it. GB 1468162 discloses such an impact element incorporating a relatively soft material and GB 1482417 discloses such an impact element which is made of a hard material, namely sintered aluminium oxide.

The latter has in practice been preferred, and the hardness of the material of the impact element has been an important factor in maximising the reduction of the kinetic energy of the coin upon impact and hence improving the reliability of operation of the apparatus and also enabling the first sensor to be located nearer the point of coin impact, since the less the coin bounces initially, the sooner will the residual bouncing disappear so as to enable reliable testing of the coin.

The preference for the impact element to be of particularly hard material has led to widespread use of sintered aluminium oxide for the purpose. Mild steel or hardened steel have also been employed but are not as good.

The impact element has usually been either simply screwed to a plastics part of the apparatus, or has been screwed to it with glue intervening between the impact element and the part of the apparatus. In other cases, it has been chosen to allow the impact element a limited amount of free movement, for example by putting screws through it into a part of the apparatus through holes which allow clearance and not fully tightening the screws, so that the impact element can rattle or vibrate relative to the screws when struck by a coin.

Using these prior techniques, despite taking care in the selection of the material for the impact element, and care in securing it, it has been very difficult in mass-production conditions to avoid undesirable variations in performance between one apparatus and another, the variations sometimes being beyond tolerable limits so that a particular completed apparatus may need to be wholly or partially scrapped. Although it may be ascertained that poor performance is due to inadequate operation of the impact element, it is often not possible to determine why that is so.

An object of the invention is to improve the reliability of operation of such impact elements.

The invention provides a coin handling apparatus having a passageway in which coins travel, and an impact element secured to a part of the apparatus in a position where it will be struck by a travelling coin so as to reduce the kinetic energy of the coin, characterised in that the impact element has a securing portion around which plastics material, of which said part is made, has been moulded to secure the impact element.

It is convenient at this point to explain that the invention in its broadest aspect includes coin handling apparatus which does not necessarily examine coins for acceptability. Although the problems in the prior art have been explained above in relation to such examining apparatus, related problems also occur in other contexts. For example, window sorters are used for classifying coins (which have already been found acceptable) according to their diameters. Each coin rolls on a track past two or more (usually) windows of progressively increasing heights and the coin falls through the first window whose height is greater than the coin diameter. In this way, accepted coins
are mechanically tested for diameter, and coins of different diameters are separated from each other. However, such sorters will only operate reliably if the coins roll past the windows without significant bouncing and therefore if the coin has fallen onto the track ahead of the windows it is again desirable to minimise the kinetic energy of the coin as quickly as possible after it hits the coin track so that it will roll smoothly past the windows. Generally, in any coin handling apparatus, whether or not it includes facilities for determining the acceptability of coins or for testing coins for other purposes, there may be a requirement to minimise unpredictable and uncontrolled movement of a coin as it passes through the apparatus and hence various types of coin handling apparatus fall within the scope of the invention when provided with a moulded-in impact element as above defined.

It has been found that when the impact element has a securing portion which is moulded into the plastics material of part of the apparatus, the achievement of an acceptable degree of kinetic energy absorption becomes less dependent upon the exact material from which the impact element is made. For example, mild steel impact elements secured in accordance with the invention will reliably give performance as good as that of a very good example of a sintered aluminium oxide impact element secured using the previous techniques.

The impact element may be obtained more cheaply, either because the actual cost of production of the element in a material such as mild steel is lower than the cost of production in a ceramic material such as sintered aluminium oxide, or because there are more competing sources capable of supplying impact elements made from steel.

Virtually any metal may in principle be used for the impact element, such as brass or an aluminium alloy, though of course metals prone to rapid wear through the impact of coins should in practice be avoided.

It is not believed practical to utilise the invention with the presently preferred aluminium oxide impact elements in mass production conditions, because owing to the way in which they are made the resulting element is too variable in shape and size to be secured during the course of the plastics moulding process employed to simultaneously form the part of the apparatus to which it is fixed. However, if numerous ceramic impact elements of highly consistent dimensions were selected from a large number of original specimens, then it would be possible in principle to use them in normal production machinery in assembling coin testing apparatus in accordance with the invention having enhanced performance due to the additional hardness of the impact element material.

It is anticipated the coin testing apparatus in accordance with the invention can be mass-produced with less wastage of complete apparatus or substantial parts of complete apparatus, caused by variation of coin bounce outside acceptable limits.

In order that the invention may be more clearly understood, an embodiment thereof will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which:

Figure 1 shows a perspective view of an apparatus in accordance with the invention, for examining coins for acceptability, with its lid open;

Figure 2 is a cross-section taken on the line A-A in Figure 1;

Figure 3 is a perspective view of the impact element from the apparatus in Figure 1;

Figure 4 is an elevation of the impact element in Figure 3 taken in the direction of arrow B; and

Figure 5 is a cross-section through the impact element taken on line C-C in Figure 4.

The coin testing apparatus shown in Figure 1 is in most respects the same as models sold by Mars Electronics International of Eskdale Road, Winnersh Triangle, Wokingham, Berkshire, RG11 5AQ which are well known to those skilled in the art. It will therefore be described only briefly.

The apparatus has a main body 2, to which a lid 4 is secured by means of a hinge arrangement 6, these components being injection moulded from plastics material such as glass-filled NORYL (T.M.) with a 20% glass content. Integral with the lid 4 is a part 8 of a coin track, of which another part is formed by the impact element 10. In the normal operating condition of the apparatus, the lid 4 is closed onto the body 2, and the coin track 8, 10 lies adjacent to the rearwardly inclined inner wall 12 of the body 2 in the position indicated by broken line D-D.

A coin to be tested is introduced into the coin entry 14 and falls approximately vertically until it strikes the impact element 10. Element 10 is transverse to the path of the arriving coin (for example between 10° and 40° to the horizontal, preferably between 10° and 15°, the coin falling approximately vertically) and upon impact the kinetic energy of the coin is reduced so that the coin bounces relatively little before starting to roll or occasionally slide along the coin track towards the right as shown in Figure 1.

As the coin travels along the coin track, it will be leaning into substantially flat contact with the inclined wall 12 and will pass the sensors of the apparatus, which are responsive to various characteristics of the coin. For the sake of illustration only, three sensors are illustrated in broken lines which consist of double-sided coils 16, 16'; 18, 18'; and 20, 20', one coil of each pair lying behind the
wall 12 and the other coil of each pair lying within the lid 4.

The output signals of the sensors are passed to examination circuitry indicated schematically at 22 within the body 2 which in known manner determines from them whether the coin is acceptable. If it is, the examination circuitry activates an accept/reject gate 24 to withdraw it into the body so that the coin, dropping from the end of the coin track portion 8 can fall on the accept path indicated by arrow 26. If the coin is not found acceptable, the gate 24 remains in the illustrated position and the coin is diverted onto a reject path indicated by arrow 28.

The impact element 10 shown in detail in Figures 3 to 5 consists of a block formed from sintered steel and having an upper impact surface 30 which is struck by the coin and which is at an angle of approximately 15° to its major faces 32 and 34. The block has an enlarged upper portion 36 below which is a narrower securing portion 38, through which are three circular apertures 40 arranged in a row.

Being of metal, the impact element 10 is readily manufactured to sufficiently close tolerances to enable it to be a close fit in part of the cavity of an injection moulding machine of any suitable type, these being well known and readily available commercially, which is employed to injection mould the lid 4 from the plastics material. The mould cavity is designed so that in the moulding operation the plastics material for forming the lid 4 becomes moulded all around the securing portion 38, through the apertures 40, and into intimate contact with the surfaces 32 and 34 at both ends of those apertures, as can most clearly be seen in Figure 2. The material also extends right to the top of surface 34 and slightly around the edge onto the margin of the impact surface 30.

The side face of the enlarged portion 36 is left clear of plastics material as are the two lower corners 42 of the securing portion 38 as can be seen in Figure 1. The impact element rests by that surface and those two corners on internal surfaces of the mould cavity when the injection moulding process is taking place.

It will be appreciated that because of the circular apertures 40 (though other shaped apertures or different mechanical formations could be used to achieve the same purpose) the impact element is physically interlocked with the surrounding plastics material such that, even if there were a complete absence of bonding between the plastics material and the metal of the impact element it would be completely firmly and immovably held in position. In fact, such bonding does occur and the overall result is a particularly strong and secure mounting of the impact element in the plastics material which, as can be seen in Figures 1 and 2, forms a protrusion from, and integral with, the inner wall of the lid 4, into which the impact element 10 is set.

When the lid 4 is closed, its inner wall is parallel with wall 12 of the body 2 and the upper surfaces of the coin track portion 8 and the impact element 10 lie in the same plane as each other and at an approximately 15° inclination to those two walls. This ensures that as soon as a coin starts travelling down the coin track its lower edge moves towards wall 12 so that the face of the coin will slide along that wall in relatively uniform contact therewith as is required for the application of certain tests to the coin by the sensors.

It can be seen from Figure 1 that one pair of coils 20, 20' are at a relatively high level such that they can respond to the position, relative to the coin track, of the upper edge of the coin when it is centred between those coils. The coin will then, depending upon its diameter, occlude the coils from their lower limits up to the top edge of the coin so that the proportion of the coils occluded will depend upon the diameter of the coin. It is particularly in conjunction with sensors of this type, which respond to the position relative to the coin track of a part of the coin, that the described manner of securing the impact element has its maximum benefit since it is sensors which operate in that manner whose outputs are most affected by any bouncing of the coin as it passes them.

Claims

1. A coin handling apparatus having a passage-way in which coins travel, and an impact element (10) secured to a part (4) of the apparatus in a position where it will be struck by a travelling coin so as to reduce the kinetic energy of the coin, characterised in that the impact element (10) has a securing portion (38) around which plastics material, of which said part is made, has been moulded to secure the impact element (10).

2. Apparatus as claimed in claim 1 characterised in that the impact element (10) is of metal.

3. Apparatus as claimed in claim 2 characterised in that the impact element (10) is of sintered metal.

4. Apparatus as claimed in claim 2 or claim 3 characterised in that the metal is steel.

5. Apparatus as claimed in any preceding claim characterised in that the securing portion (38) of the impact element (10) is shaped to interlock with the surrounding plastics material.
6. Apparat as claimed in claim 5 characterised in that the securing portion (38) has at least one aperture (40) therein and the plastics material extends through the aperture and intimately contacts the surfaces of the securing portion (38) around both ends of said aperture.

7. Apparat as claimed in claim 6 wherein there are several said apertures (40).

8. Apparat as claimed in claim 7 wherein the apertures (40) are arranged in a row.

9. Apparat as claimed in any one of the preceding claims characterised in that the impact element (10) has an upper surface (30) which is struck by the coin and which protrudes step-like from a wall of said part.

10. Apparat as claimed in claim 9 characterised in that the securing portion (38) lies below said upper surface (30) and the plastics material moulded around the securing portion forms a protrusion from, and integral with, said wall.

11. Apparat as claimed in any one of the preceding claims, characterised by means for testing one or more characteristics of the coin, the testing means being located downstream from the impact element (10).

12. Apparat as claimed in claim 11, characterised in that the testing means comprises one or more sensors (16, 16', 18, 18', 20, 20') arranged so that the coin will pass them after striking the impact element, the sensors being part of a coin examination means for determining the acceptability or otherwise of the coin.

13. Apparat as claimed in claim 12 characterised in that the impact element forms part of a coin track (8) on which the coin travels edgewise and said one or more sensors are located adjacent to the path of the coin along the coin track.

14. A coin testing apparatus as claimed in claim 13 wherein at least one of the sensors is adapted to respond to the position, relative to the coin track, of at least a part of a coin travelling along the track.

**Patentansprüche**

1. Münzen-Handhabungsvorrichtung mit einem Kanal, in welchem Münzen laufen, und einem Prallelement (10), das an einem Teil (4) der Vorrichtung in einer Lage befestigt ist, wo es von einer laufenden Münze angeschlagen wird, um die kinetische Energie der Münze zu verrin- 5 gernd, dadurch gekennzeichnet, daß das Prallelement (10) einen Befestigungsabschnitt (38) aufweist, rund um welchen ein Kunststoff, aus dem das genannte Teil hergestellt ist, ge- formt wurde, um das Prallelement (10) zu befe- stigen.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das Prallelement (10) aus Metall besteht.

3. Vorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß das Prallelement (10) aus gesintertem Metall besteht.

4. Vorrichtung nach Anspruch 2 oder Anspruch 3, dadurch gekennzeichnet, daß das Metall Stahl ist.

5. Vorrichtung nach irgendeinem der vorangehen- 15 den Ansprüche, dadurch gekennzeichnet, daß der Befestigungsabschnitt (38) des Pralle- elements (10) so geformt ist, daß er in sperren- den Eingriff mit dem umgebenden Kunststoff tritt.

6. Vorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß im Befestigungsabschnitt (38) mindestens eine Öffnung (40) vorliegt, und daß sich der Kunststoff durch die Öffnung hin- durch erstreckt und in enge Berührung mit den Oberflächen des Befestigungsabschnitts (38) rund um beide Enden der genannten Öffnung tritt.

7. Vorrichtung nach Anspruch 6, worin mehrere der genannten Öffnungen (40) vorliegen.

8. Vorrichtung nach Anspruch 7, worin die Öff- nungen (40) in einer Reihe angeordnet sind.


11. Vorrichtung nach irgendeinem der vorangehenden Ansprüche, gekennzeichnet durch eine Einrichtung zum Prüfen einer oder mehrerer Merkmale der Münze, wobei die Prüfeinrichtung nach dem Prallelement (10) angeordnet ist.

12. Vorrichtung nach Anspruch 11, dadurch gekennzeichnet, daß die Prüfeinrichtung einen oder mehrere Meßfühlner (16, 16', 18, 18', 20, 20') aufweist, die so angeordnet sind, daß die Münze sie nach dem Anschlagen gegen das Prallelement passiert, wobei die Meßfühlner ein Teil einer Münzen-Untersuchungseinrichtung sind, um die Annehmbarkeit der Münzen oder diese sonstwie zu bestimmen.

13. Vorrichtung nach Anspruch 12, dadurch gekennzeichnet, daß das Prallelement einen Teil einer Münzenbahn (8) bildet, auf welcher die Münze hochkant läuft, und daß der genannte eine oder die mehreren Meßfühlner nahe dem Weg der Münze längs der Münzenbahn angeordnet ist bzw. sind.

14. Münzenprüfvorrichtung nach Anspruch 13, worin mindestens einer der Meßfühlner dazu eingerichtet ist, auf die Lage relativ zur Münzenbahn mindestens eines Teiles einer Münze anzusprechen, die längs der Bahn läuft.

Revendications

1. Appareil de manipulation de pièces de monnaie comportant un passage dans lequel des pièces de monnaie se déplacent et un élément d’impact (10) fixé à une partie (4) de l’appareil, dans une position dans laquelle il sera frappé par une pièce de monnaie qui se déplace de manière à réduire l’énergie cinétique de la pièce de monnaie, caractérisé en ce que l’élément d’impact (10) comporte une section de fixation (38) autour de laquelle une matière plastique dont ladite partie est faite a été moulee pour fixer l’élément d’impact (10).

2. Appareil selon la revendication 1, caractérisé en ce que l’élément d’impact (10) est en métal.

3. Appareil selon la revendication 2, caractérisé en ce que l’élément d’impact (10) est en métal fritté.

4. Appareil selon la revendication 2 ou 3, caractérisé en ce que le métal est de l’acier.

5. Appareil selon l’une quelconque des revendications précédentes, caractérisé en ce que la section de fixation (38) de l’élément d’impact (10) est formée de manière à s’interrelever avec la matière plastique qui l’entoure.

6. Appareil selon la revendication 5, caractérisé en ce que la section de fixation (38) comporte au moins une ouverture (40) ménagée en son sein et la matière plastique s’étend au travers de l’ouverture et entre en contact intime avec les surfaces de la section de fixation (38) autour des deux extrémités de ladite ouverture.

7. Appareil selon la revendication 6, dans lequel il y a plusieurs dites ouvertures (40).

8. Appareil selon la revendication 7, dans lequel les ouvertures (40) sont agencées selon une rangée.

9. Appareil selon l’une quelconque des revendications précédentes, caractérisé en ce que l’élément d’impact (10) comporte une surface supérieure (30) qui est frappée par la pièce de monnaie et qui fait saillie selon une forme de marche depuis une paroi de ladite partie.

10. Appareil selon la revendication 9, caractérisé en ce que la section de fixation (38) s’étend au-dessous de ladite surface supérieure (30) et la matière plastique moulée autour de la section de fixation forme une protubérance par rapport à ladite paroi et est d’un seul tenant avec celle-ci.

11. Appareil selon l’une quelconque des revendications précédentes, caractérisé par un moyen permettant de tester une ou plusieurs caractéristiques de la pièce de monnaie, le moyen de test étant positionné à l’aval de l’élément d’impact (10).

12. Appareil selon la revendication 11, caractérisé en ce que le moyen de test comprend un ou plusieurs détecteurs (16, 16', 18, 18', 20, 20') agencés de telle sorte que la pièce de monnaie passe devant eux après avoir frappé l’élément d’impact, les détecteurs faisant partie d’un moyen d’examen de pièce de monnaie permettant de déterminer l’acceptabilité ou autre de la pièce de monnaie.

13. Appareil selon la revendication 12, caractérisé en ce que l’élément d’impact forme une partie d’une piste de pièce de monnaie (8) sur laquelle la pièce se déplace sur la tranche et lesdits au moins un ou plusieurs détecteurs
sont positionnés de manière à être adjacents au chemin de déplacement de la pièce de monnaie le long de la piste de la pièce de monnaie.

14. Appareil de test de pièce de monnaie selon la revendication 13, dans lequel au moins l'un des détecteurs est conçu pour être sensible à la position, par rapport à la piste de pièce de monnaie, d'au moins une partie d'une pièce de monnaie qui se déplace le long de la piste.