

COIN SORTING DEVICE

5 This invention relates to a sorting device for coins,
or so called "tokens", for use in a game or other slot
machine.

For operating a conventional slot machine, use is
generally made of chrome-plated brass coins. In order to
discriminate special coins for a particular machine from
other coins by means of a sorting device the special coins
10 are made with a particular diameter and a particular
thickness different from those of other coins.

However, with an increased demand for a wide variety
of different special coins, it becomes difficult to meet
the demand simply by varying the dimensions of the coins.

15 In view of the above, many proposals have been made
for making a coin from various kinds of material. For
example, a coin made of synthetic resin is disclosed in
published Japanese Utility Model application No.
110977/1988 by Junichi Hamano. A coin made of a
20 combination of heterogeneous metallic plates in various
forms is disclosed in published patent applications Nos.
10632/1980, 27902/1987 by Haruo Mituwa, Tetsu Nariani et
al, and 60323/1989 by Nicora Ierpo.

25 However, the above-mentioned coins have less
durability than conventional homogeneous metal coins. In
addition, the above-mentioned coins cannot be sorted by an
inexpensive and reliable coin sorting device generally used
in a conventional slot machine. In this connection, it is
necessary to use a relatively expensive electronic sorting
30 device.

As prior art relevant to the present invention,
published Japanese patent application No. 29308/1988 by
Hiroshi Abe and published Japanese Utility Model No.
30143/1987 by Hiroshi Abe disclose means for sorting
35 nonmagnetic coins and ferromagnetic coins as genuine coins
or spurious coins.

It is therefore an object of the present invention to provide a coin sorting device which can discriminate genuine coins from spurious coins including nonmagnetic coins and ferromagnetic coins.

5 According to the invention, a coin sorting device for use in a slot machine has judging means for judging whether or not the coins have a degree of paramagnetism within certain limits, the judging means comprising an attracting member adjacent to a coin input path and capable of
10 attracting out of the path a non-acceptable coin with too high a degree of ferromagnetism whilst allowing passage of other coins; an inclined rail for receiving a coin from the input path whereby the coin rolls from an inlet end to an outlet end of the rail and picks up speed before flying off
15 the outlet end of the rail along a trajectory; and one or more deflecting members disposed adjacent to the rail for applying a magnetic field to the coin and deflecting the trajectory of the coin if it contains ferromagnetic material, the, or one of the, deflecting members comprising
20 a guide magnet which is disposed at the outlet end of the rail and has an arcuate surface to which an acceptable coin with a sufficiently high degree of ferromagnetism will be held by magnetic attraction so that the coin rolls around the arcuate surface before following a different trajectory
25 from that followed by an unacceptable coin with too low a degree of ferromagnetism.

By the term paramagnetic is meant having significant magnetic properties but less than those of a ferromagnetic material.

30 In the accompanying drawings:

Fig. 1 is a perspective view of a device according to an embodiment of this invention;

Fig. 2 is a schematic front view of the device;

Fig. 3 is a schematic side view of the device;

35 Fig. 4 is a schematic rear view of the device; and,

Fig. 5 is a schematic view illustrating the operation of the device.

A paramagnetic coin, for use as a token for a game machine, has particular paramagnetic properties by which it can be recognised as a genuine coin. The paramagnetic coin was as described and claimed in parent application No. 9206699.2, made from nonmagnetic material and ferromagnetic material by the following method.

Fine iron powder of 2 - 8, preferably 3.3-3.5, volume percent, Cu 65 volume percent, and the balance of Zn were used. The iron powder, as the ferromagnetic material, was mixed into a molten mass of brass, at a temperature in the range 900-1300°C, and comprising the Cu and Zn, as the nonmagnetic material. Alternatively the nonmagnetic material could include resin and/or ceramic material.

The mixture was electromagnetically agitated to disperse the fine iron powder uniformly in the brass melt. The reason why the content of the iron powder is given the upper limit of 8 volume percent is that a greater content cannot be uniformly mixed, tends to aggregate, and combines to form agglomerates. This results in intense local magnetization by a magnet to cause the effect similar to that of ferromagnetic material. In addition, the lower limit of 2 volume percent is chosen because the paramagnetic effect is effectively absent with a smaller value. The mixture was solidified into a moulded piece which was then rolled into a plate having a thickness of 2.1 mm. After the plate was coined by a press, nickel plating was carried out. Thus, paramagnetic coins having a diameter of 24.26 mm and a weight of 7 g were produced.

In the paramagnetic coin thus produced, the iron powder was uniformly dispersed and mixed in the brass. The coin exhibited paramagnetic properties such that it could not be attracted and deflected by a magnet providing a magnetic flux density of between 700 and 800 gauss but could be attracted and deflected by a magnet providing a magnetic flux density of between 4000 and 5000 gauss. Therefore, this paramagnetic coin is not significantly attracted by a ferromagnetic-material attracting magnet

providing a magnetic flux density between 700 and 800 gauss which can attract and capture a ferromagnetic coin such as

deflected as shown by an arrow B, and falls beyond a lug 23 to a genuine acceptance opening 20 disposed under the inclined rail 12, passing through the opening as shown by an arrow C.

5 When a nonmagnetic coin D, or a coin with too low a degree of ferromagnetism, of brass or nickel rolls down the inclined rail 12, the nonmagnetic coin D flies out along a parabolic trajectory E without influence or sufficient influence from the magnets 13 and 17. The nonmagnetic coin
10 D then collides with a buffering rivet 21 for impeding the movement of the coin D which then passes through a returning opening 22 as shown by an arrow F to be returned in a known manner.

15 The magnets may be permanent magnets or electromagnets, such as solenoids.

CLAIMS

1. A coin sorting device for use in a slot machine and having judging means for judging whether or not the coins have a degree of paramagnetism within certain limits, the
5 judging means comprising an attracting member adjacent to a coin input path and capable of attracting out of the path a non-acceptable coin with too high a degree of ferromagnetism whilst allowing passage of other coins; an inclined rail for receiving a coin from the input path
10 whereby the coin rolls from an inlet end to an outlet end of the rail and picks up speed before flying off the outlet end of the rail along a trajectory; and one or more deflecting members disposed adjacent to the rail for applying a magnetic field to the coin and deflecting the
15 trajectory of the coin if it contains ferromagnetic material, the, or one of the, deflecting members comprising a guide magnet which is disposed at the outlet end of the rail and has an arcuate surface to which an acceptable coin with a sufficiently high degree of ferromagnetism will be
20 held by magnetic attraction so that the coin rolls around the arcuate surface before following a different trajectory from that followed by an unacceptable coin with too low a degree of ferromagnetism.
- 25 2. A device as claimed in claim 1, wherein the attracting member comprises a first magnet.
3. A device as claimed in claim 2, where the flux density provided by the first magnet at the input path is between
30 700 and 800 gauss.
4. A device as claimed in any one of the preceding claims, wherein the, or one of the, deflecting members provides a speed reducing magnetic field for reducing the
35 rolling speed of the coin.



5. A device as claimed in any one of the preceding claims, wherein the guide magnet provides, in the path of a rolling coin, a flux density of between 4000 and 5000 gauss.

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6. A device as claimed in any one of the preceding claims, further comprising a sorting member disposed between the attracting member and the rail for sorting coins by particular dimensions and delivering acceptable

10 coins onto the inlet end of the rail.

7. A device as claimed in claim 6, wherein an acceptable coin has a particular diameter and a particular weight, the sorting member comprising a diameter/weight sorting cradle

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8. A coin sorting device, substantially as described with reference to the accompanying drawings.