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Specification

Title of the Invention

Coin Discrimination Apparatus

5 Background of the Invention

The present invention relates to a coin discrimination apparatus applied to a vending machine, a public telephone, or the like and, more particularly, to a discrimination apparatus for lightweight and magnetic
10 coins.

In a conventional structure, a lightweight coin discrimination unit and a magnetic coin discrimination unit are independently arranged. Figs. 5A and 5B show the schematic arrangement of a coin
15 discrimination apparatus of this type and a section along the line Vb - Vb, respectively. Reference numeral 40 denotes a substantially upright base plate; 41, a coin slot member attached to the upper end portion of the base plate 40; 42, a vertical path formed
20 immediately below the coin slot member 41; 43, a coin receiving portion arranged at the lower end of the vertical path 42 and attached to the base plate 40 such that the rolling surface thereof is inclined; 44, a magnet attached outside the upper portion of the
25 vertical path 42; and 45, an expansion path obtained by expanding the width of the vertical path 42 toward the magnet 44 side. The expansion path 45 is branched from



the vertical path 42 by the coin receiving portion 43 to communicate with a coin return path 53. Reference numeral 46 denotes a diameter discrimination window; and 47, a lightweight coin discrimination lever which is swingably supported by the rear surface side of the base plate 40 and to which swinging properties is imparted such that a bent portion 47a at the distal end extends through the diameter discrimination window 46 to the front surface of the base plate 40, i.e., to a coin path. Reference numeral 48 denotes a coin rail formed at the lower end of the diameter discrimination window 46 and having a rolling surface communicating with the coin receiving portion 43; 49, an extendible coin storage lever disposed between a coin accumulation path 51 and a coin storage path 52; and 50, an extendible coin return lever disposed between the coin accumulation path 51 and the coin return path 53.

In this arrangement, of coins C received from the coin slot member 41, a magnetic counterfeit coin C2 is attracted by the magnet 44 toward the expansion path 45 and guided to the coin return path 53. A non-magnetic coin which is not discriminated by the magnet 44 drops on the coin receiving portion 43 and rolls along the coin rail 48. At this time, a counterfeit coin C3 having a smaller diameter than that of a corresponding authentic coin drops from the coin rail 48 through the diameter discrimination window 46



and is guided to the coin return path 53. On the other hand, a lightweight counterfeit coin C1 drops from the coin rail 48 by the lightweight coin discrimination lever 47 and is guided to the coin return path 53. An authentic coin C5 having passed through the coin discrimination apparatus for performing magnetic coin discrimination, diameter discrimination, and lightweight coin discrimination is locked by the coin storage lever 49 and the coin return lever 50 and accumulated in the coin accumulation path 51. In this state, e.g., when the coin storage lever 49 is retracted upon reception of a storage signal in the public telephone, the authentic coin C5 is guided to the coin storage path 52. On the other hand, when the coin return lever 50 is retracted in response to the coin return operation, the accumulated authentic coin C5 is guided to the coin return path 53.

In the conventional coin discrimination apparatus described above, however, the magnetic coin discrimination magnet 44 and the lightweight coin discrimination lever 47 are spaced apart from each other, resulting in a disadvantage in downsizing the apparatus. In addition, since the magnet 44 is arranged outside the coin path in the radial direction, the expansion path 45 for removing the magnetic counterfeit coin C2 must be expanded from the vertical path 42 in the radial direction of a coin. The shape of the



apparatus is expanded in the radial direction of a coin,
and the apparatus undesirably becomes bulky.

Summary of the Invention

It is an object of the present invention to
5 provide a downsized coin discrimination apparatus.

In order to achieve the above object,
according to the present invention, there is provided a
coin discrimination apparatus for performing weight
discrimination and magnetic coin discrimination of a
10 coin rolling along a coin path constituted along a base
plate for supporting a head or tail of the coin,
comprising a window formed in the base plate in
correspondence with the coin path, a lightweight coin
discrimination lever, swingably supported by the base
15 plate, for removing a lightweight coin from the coin
path, the lightweight coin discrimination lever having
swinging properties such that a distal end enters in the
coin path through the window, and a magnetic coin
discrimination magnet, formed to oppose the lightweight
20 coin discrimination lever through the coin path, for
attracting and removing a magnetic coin from the coin
path.

Brief Description of the Drawings

Fig. 1 is a plan view showing a coin
25 discrimination apparatus according to an embodiment of
the present invention;



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Fig. 2 is a sectional view showing the coin discrimination apparatus in Fig. 1 along the line II - II;

Fig. 3 is a perspective view showing a lightweight coin discrimination unit in Fig. 1 when viewed from the back;

Fig. 4 is a perspective view showing the main part of the coin discrimination apparatus in Fig. 1 when viewed from the front; and

Fig. 5A is a plan view showing a conventional coin discrimination apparatus, and Fig. 5B is a sectional view along the line Vb - Vb in Fig. 5A.

Description of the Preferred Embodiment

An embodiment of the present invention will be described below with reference to the accompanying drawings. Fig. 1 shows a coin discrimination apparatus according to the present invention. Fig. 2 shows a section along the line II - II in Fig. 1. Fig. 3 shows a lightweight coin discrimination unit in Fig. 1 when viewed from the back side. Fig. 4 shows the coin discrimination apparatus in Fig. 1 when viewed from the front side. Referring to Fig. 1, a coin discrimination apparatus 1 comprises an almost flat rectangular synthetic resin base plate 2. The base plate 2 extends such that the rear surface thereof is slightly inclined. As shown in Figs. 2 and 3, a cover 3 like a shallow case is detachably attached to the base plate 2 to entirely



cover the front surface of the base plate 2. Reference numeral 5 denotes a coin slot member attached to one end of the upper end portion of the base plate 2 and having a slot gauge 6 (Fig. 2). Reference numeral 7 denotes a coin receiving portion arranged below the coin slot member 5 and attached to the base plate 2 such that the rolling surface thereof is inclined. A vertical path 8 is constituted between the coin receiving portion 7 and the coin slot member 5.

10 As shown in Fig. 2, a lightweight coin discrimination unit 10 for discriminating and removing a lightweight coin and a magnetic coin discrimination unit 17 for discriminating and removing a magnetic coin are arranged at symmetrical front and rear positions through
15 the vertical path 8. That is, the lightweight coin discrimination unit 10 consists of a synthetic resin. As shown in Fig. 3, the lightweight coin discrimination unit 10 is constituted by a pivot plate 11 formed integrally with a pair of arms 12, and a lightweight
20 coin discrimination lever 13 mounted on the pivot plate 11 by a screw 14 so as to suspend obliquely downward. Nibs 12a projects on the two outer surfaces of the distal ends of the arms 12. The pair of arms 12 are elastically deformed in a direction close to each other,
25 and the nibs 12a are fitted in the bearing holes of a pair of opposite bearing plates 15 extending from the base plate 2. With this operation, the lightweight coin



discrimination lever 13 is swingably supported about the nibs 12a. The screw 14 functions as a weight to impart swinging properties to the lightweight coin discrimination lever 13 such that a distal end 13a
5 extends in the vertical path 8 through a window 16 formed in the base plate 2. The lightweight coin discrimination lever 13 to which the swinging properties is imparted is brought in contact with a thin stopper formed at the upper half of the window 16. The
10 extension amount of the lightweight coin discrimination lever 13 in the vertical path 8 is regulated.

As shown in Fig. 4, the magnetic coin discrimination unit 17 comprises a semicylindrical synthetic resin bracket 18 formed integrally with a pair
15 of opposite arms 19. A columnar magnet 20 is fixed to the bracket 18 by a screw 21. As shown in Fig. 2, nibs 19a project from the opposite inner surfaces of the distal ends of the pair of arms 19. The pair of arms 19 are elastically deformed in opposite directions, and the
20 nibs 19a are fitted in recessed fitting portions in the two side surfaces of a mounting body 22 extending from the front surface of the cover 3. With this operation, the bracket 18 is swingably supported by the mounting body 22. In a normal state, swinging properties is
25 imparted to the bracket 18 by its own weight such that the magnet 20 is in contact with the surface of the cover 3.



The lightweight coin discrimination lever 13 constituting the lightweight coin discrimination unit 10 and the magnet 20 constituting the magnetic coin discrimination unit 17 are arranged to oppose each other through the vertical path 8 constituted by the cover 3 and the base plate 2. The cover 3 is curved outward at a position where the magnet 20 is arranged to expand the vertical path 8 in the direction of thickness of a coin. That is, the vertical path 8 is expanded downward from the arrangement position of the coin receiving portion 7 in the vertical path 8 toward the magnet 20 side so as to increase the width of the vertical path in the direction of thickness of a coin. This expanded portion constitutes a coin removal path 23.

In Fig. 1, reference numeral 24 denotes a coin discrimination portion formed at the downstream side of the rolling direction of the coin receiving portion 7. The coin discrimination portion 24 comprises a diameter discrimination window 25, formed in the base plate 2, for discriminating the diameter of a coin, and a discrimination rail 26 serving as a thickness gauge, attached to the base plate 2 in correspondence with the lower end of the diameter discrimination window, for discriminating the thickness of a coin. The discrimination rail 26 communicates with the rolling surface of the coin receiving portion 7. Reference numeral 27 denotes a flapper for covering the diameter



discrimination window 25 and the coin accumulation path
by a predetermined distance with the base plate 2. The
upper end portion of the flapper 27 is swingably
supported by the base plate 2, and the lower end portion
5 thereof has a coin drop window 28 in correspondence with
the diameter discrimination window 25 and the
discrimination rail 26. The coin drop window 28 is
openable with respect to the base plate 2. The flapper
27 is normally biased by a spring (not shown) in a
10 direction to close the coin drop window 28. In a closed
state, the flapper 27 drops a counterfeit coin
discriminated by the diameter discrimination window 25
and the discrimination rail 26 through the coin drop
window 28. In an open state, the flapper 27 drops and
15 returns an authentic coin accumulated in the coin
accumulation path upon releasing holding of the coin. A
coin support portion 29 is formed at the lower end of
the rear surface of the flapper 27 to communicate with
the discrimination rail 26. A spindle-like coin return
20 actuating portion 30 is formed at the distal end of an
arm extending upward from the upper end of the flapper
27.

Reference numeral 31 denotes an escape pin
extending through a hole formed in the base plate 2 so
25 as to be extendible from the rear surface side to the
front surface side of the base plate 2 upon actuation of
a rotary solenoid (not shown) arranged on the rear



surface of the base plate 2. Reference numeral 32 denotes a coin accumulation sensor 32 for detecting coin accumulation; and 33, a storage lever extending through a hole formed in the base plate 2 so as to be extendible from the rear surface to the front surface side of the base plate 2. The escape pin 31 and the storage lever 33 are interlocked with each other and alternately project in the coin accumulation path. Reference numeral 34 denotes a coin storage sensor for detecting storage of a coin; and 35, a branching plate for branching an authentic coin accumulated in the coin accumulation path into a coin storage path 37 and a coin return path 36.

A coin discrimination operation of the coin discrimination apparatus having such an arrangement will be described below. Of coins C to be received from the coin slot member 5, a counterfeit coin having larger diameter and thickness than those of a corresponding authentic coin cannot pass through the slot gauge 6 and is discriminated. Of all the coins having passed through the slot gauge 6, a lightweight counterfeit coin C1 is prevented from dropping on the coin receiving portion 7 by the lightweight coin discrimination lever 13 extending in the vertical path 8, and removed in the direction of thickness of coins, i.e., to the coin removal path 23 side. In this case, an authentic coin having a predetermined weight retracts the lightweight



coin discrimination lever 13 into the window 16 against the swinging properties, and drops on the coin receiving portion 7. On the other hand, since a magnetic coin C2 is attracted by the magnet 20 toward the cover 3, the
5 magnetic coin C2 does not drop on the coin receiving portion 7 and is removed to the coin removal path 23 side, like the lightweight counterfeit coin C1. The lightweight counterfeit coin C1 and the magnetic coin C2 are guided to the coin return path 36.

10 In this manner, the lightweight coin discrimination unit 10 having the lightweight coin discrimination lever 13 and the magnetic coin discrimination unit 17 having the magnet 20 are arranged at the plane symmetrical positions with respect to the
15 base plate 2. Therefore, the coin discrimination apparatus of the present invention can be downsized compared to the conventional apparatus in which these units are separately arranged in the coin rolling direction. In addition, since the two discrimination
20 units 10 and 17 set a direction to remove a counterfeit coin in the direction of thickness of the coin, this coin discrimination apparatus can be downsized compared to the conventional apparatus which increases in size in the radial direction of a coin. Further, since the two
25 discrimination units 10 and 17 remove counterfeit coins in the same direction, they can commonly use the coin removal path 23, thereby preventing an increase in size.



of the apparatus. Moreover, since the two discrimination units 10 and 17 are arranged with respect to the vertical path 8 immediately below the coin slot member 5, the discrimination path of the coin discrimination portion 24 arranged at the downstream side of the coin rolling direction need not be elongated, thereby further downsizing the apparatus.

The coins except for the counterfeit coin C1 and the magnetic coin C2 drop on the rolling surface of the coin receiving portion 7. The coins roll along the rolling surface and the discrimination rail 26 communicating with the rolling surface. On the discrimination rail 26, a counterfeit coin C3 having a smaller diameter than that of a corresponding authentic coin is discriminated by the coin discrimination window 25 and guided to the coin return path 36 through the coin drop window 28. A counterfeit coin C4 having a smaller thickness than that of a corresponding authentic coin is discriminated by the discrimination rail 26 and guided to the coin return path 36 through the coin drop window 28, like the counterfeit coin C3.

An authentic coin C5 having passed through the coin discrimination portion 24 is supported by the storage lever 33 and the coin support portion 29 of the flapper 27 and accumulated in the coin accumulation path. The accumulation sensor 32 detects whether at least one authentic coin C5 is accumulated in the coin



accumulation path. In storing this accumulated authentic coin C5, when, e.g., a storage signal is received in the public telephone, the storage lever 33 is retracted from the coin path, and at the same time the escape pin 31 enters into the coin path. Only the lowermost accumulated coin is guided to the coin storage path 37. The second and subsequent accumulated coins are prevented by the escape pin 31 from rolling along the coin accumulation path. When the storage sensor 34 confirms storage of the coin into the coin storage path 37, the storage lever 33 enters into the coin accumulation path, and at the same time the escape pin 31 is retracted from the coin accumulation path. The second and subsequent accumulated coins are supported by the storage lever 33 and the coin support portion 29. In this manner, the authentic coins C5 are stored one by one in accordance with the storage operation.

When the user performs a coin return operation at the end of operation of the equipment, the coin return actuating portion 30 of the flapper 27 is interlocked with the return operation and pressed against the base plate 2 side by an interlocking rod (not shown). The flapper 27 is pivoted about the upper end portion against the biasing force to separate the lower end of the flapper 27 from the base plate 2. The lower portion of the coin accumulation path is opened to guide the authentic coin C5 accumulated therein to the



coin return path 36, so that the authentic coin C5 is returned.

As has been described above, according to the present invention, since the lightweight coin discrimination lever and the magnet are arranged at the symmetrical positions through the base plate, the coin discrimination apparatus can be downsized compared to the conventional apparatus in which these units are separately arranged in the rolling direction. In addition, the lightweight coin discrimination lever and the magnet set a direction to remove a counterfeit coin in the direction of thickness of the coin, and they can use the common removal path. Therefore, this coin discrimination apparatus can be downsized compared to the conventional apparatus which increases in size in the radial direction of a coin.

According to the present invention, since the lightweight coin discrimination lever and the magnet are arranged immediately below the coin slot, the discrimination path of the coin discrimination portion need not be elongated, thereby downsizing the apparatus.





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CLAIMS

What is claimed is:

1. A coin discrimination apparatus for performing
2 weight discrimination and magnetic coin discrimination
3 of a coin rolling along a coin path constituted along a
4 base plate (2) for supporting a head or tail of the
5 coin, characterized by comprising:
6 a window (16) formed in said base plate in
7 correspondence with the coin path;
8 a lightweight coin discrimination lever (13),
9 swingably supported by said base plate, for removing a
10 lightweight coin from the coin path, said lightweight
11 coin discrimination lever having swinging properties
12 such that a distal end (13a) enters in the coin path
13 through said window; and
14 a magnetic coin discrimination magnet (20),
15 formed to oppose said lightweight coin discrimination
16 lever through the coin path, for attracting and removing
17 a magnetic coin from the coin path.
2. An apparatus according to claim 1, wherein
2 said lightweight coin discrimination lever and said
3 magnet are arranged with respect to a vertical path
4 immediately below a coin slot.
3. An apparatus according to claim 2, further
2 comprising: a coin receiving portion (7), formed on said
3 base plate in correspondence with a distal end of said

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4 lightweight coin discrimination lever entering in the
5 vertical path, for receiving an authentic coin dropping
6 from the coin slot to roll the authentic coin; and a
7 coin removal path (23), formed along said base plate so
8 as to be spaced apart from said base plate by a
9 thickness of said coin receiving portion, for guiding
10 the removed lightweight and magnetic coins.

4. An apparatus according to claim 3, further
2 comprising a cover (3) covering said base plate to
3 constitute the vertical path together with said base
4 plate, so that said lightweight coin discrimination
5 lever is formed on a surface of said base plate opposite
6 to the vertical path, and said magnet is formed on a
7 surface of said cover opposite to the vertical path.

5. An apparatus according to claim 4, wherein
2 said cover has an inclined step in correspondence with
3 said magnet so as to expand the vertical path in a
4 direction of thickness of a coin.

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