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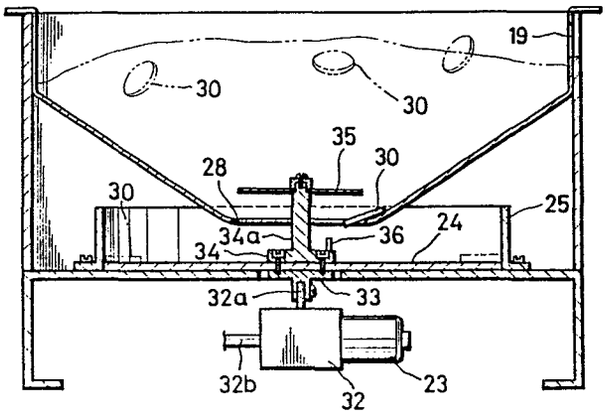
(54) Coin dispenser.

(57) A coin dispenser for discharging coins stored in a bucket in an automatic vending machine, a money exchanging machine, a coin-operated amusement machine such as a slot machine and the like, comprising a bucket (12) having an opening at its bottom, a coin discharging rotary disk (24) disposed horizontally below the bucket (12), a guide wall (25) having a coin exit slit (26) which surrounds the coin discharging rotary disk (24) and a control member (35) which is disposed inside the bucket and above the opening. The rotary disk (24), when rotating, causes coins supplied thereon to slide outwardly with centrifugal force and moves the coins along the guide wall (25) to the exit slit (26) for discharging the coins therethrough. The control member (35) prevents the rotary disk (24) from being directly subject to the whole weight of the coins stored in the bucket, allowing the rotary disk to rotate at a high speed, so as to discharge the coins at a high coin discharge rate.



EP 0 203 779 A2

COIN DISPENSER

The present invention relates to coin dispensers which are able to discharge coins at a high rate.

As is well known in the art, automatic vending machines, money exchanging machines, coin or token-operated amusement machines such as slot machines, etc. have a coin or token (hereinafter referred to as coins) dispenser therein which is adapted discharge coins into a pay-out outlet.

This coin dispenser usually includes a motor driven rotary disk placed at an angle of, for example, about 60 degrees relative to a horizontal plane in a bucket which stores therein a number of coins to be discharged. This rotary disk is provided, on its surface, with a circular row of projections arranged at regular intervals for releasably holding the coins between them. The rotary disk faces the bottom of the bucket at its lower position and a coin passage communicating with the coin discharge outlet at its upper position. When the rotary disk is rotated, a circular row of coins held between the projections are carried by the rotary disk upwardly and discharged one by one into the coin passage and then into the coin discharge outlet.

However, in the above-described coin dispenser, since the rotary disk is inclined, at its lower position the rotary disk is directly subject to the weight of the coins stored in the bucket. As a result, it is hard to rotate the rotary disk at a high speed in order to discharge coins at

a high rate. The coin discharge rate is, heretofore, up to four to five coins per second.

It is, therefore, the principal object of the present invention to provide a coin dispenser in which a coin discharging rotary disk can be rotated at a high speed so as to discharge coins at a high discharge rate.

According to the present invention there is provided

a coin dispenser comprising:

a bucket for storing a number of coins therein which has an opening at its bottom;

a rotary disk driven by a motor for placing thereon a part of said coins supplied from said bucket through said opening, said rotary disk being adapted to rotate in a substantially horizontal plane and causing said coins placed thereon to slide outwardly with centrifugal force:

control means disposed above said opening in said bucket for preventing said rotary disk from being directly subject to the weight of said coins remaining in said bucket; and

guide means having an exit slit for causing coins which slide outwardly on said rotary disk to move along the inner wall thereof to said exit slit as a result of the rotation of said rotary disk , thereby discharging said coins one by one through said exit slit.

According to a feature of the present invention, since the control means allows the coin discharge rotary disk to rotate a high speed, the coin discharging rotary disk can discharge coins at a high rate.

The invention will be further described by way of non-limitative example with reference to the accompanying drawings, in which:-

Figure 1 is a perspective view of the interior of a slot machine embodying the present invention;

Figure 2 is a perspective view showing more particularly an embodiment of the coin dispenser in accordance with the present invention;

Figure 3 is a cross sectional view of the coin dispenser of Figure 2;

Figure 4 is a plan view of the coin dispenser of Figure 2;

Figure 5 is a block diagram showing a control circuit applied to the coin dispenser of Figure 2;

Figure 6 is a perspective view similar to Figure 2, showing another embodiment of the coin dispenser;

Figure 7 is a cross sectional view of the coin dispenser of Figure 6; and

Figure 8 is a plan view of the coin dispenser of Figure 6.

Referring now to Fig. 1 showing a slot machine with its front door opened, in which the apparatus for discharging coins according to an embodiment of the present invention is incorporated, there is provided, in a housing 2 with a hinged door 1, a set of reel assemblies 3 well known per se each of which includes a rotatable reel having an annular row of various symbols arranged thereon at regular intervals. The front door 1, which is usually closed, is adapted to allow symbols on each reel to be observed through reel windows 4 provided therein.

A coin selector 6 is provided to receive coins inserted prior to the start of a game into a coin slot (not shown), through an exit 5 communicating with the coin slot and to then distinguish genuine coins from counterfeits therein. The coin selector 6 transfers the genuine coins into a main bucket 12 of a coin dispenser 10 through its outlet 7 and a chute 8 and the counterfeits to a coin receptacle 13 from a pay-out outlet through another outlet 9 and a chute 11.

As is well known, such a slot machine is played by inserting coins into the coin slot and pulling a start lever (not shown). When the player pulls the start lever, the reels start into rotation simultaneously. After each reel reaches a constant speed of rotation, each reel is controlled to stop on a random basis. When each reel is thus randomly stopped, the displayed symbols on each reel may be observed through the respective reel windows 4. At this time, a win decision is made based on the combinations of symbols stopping on the winning lines.

At a result of the win decision, if in fact there is a win, the coin dispenser 10 is actuated to pay out as many coins as correspond to that win, into the coin receptacle 13 form a pay-out outlet 15 formed in the chute 11, through a dispenser chute 14.

At the top of the housing 2, there is provided a cover 16 which is opened to allow access to a coin reservoir 17. Coins from coin reservoir 17 pass into the main bucket 12 of the coin dispenser 10 through a chute 18 and its outlet 19.

In one side wall of the main bucket 12, there is an outlet defined by an opening 20 through which coins can flow out when the bucket 12 is filled up by more coins than its capacity as a result of continuous insersions of coins for repeated games. Coins flowing out are collected in an auxiliary bucket 22.

As shown in Figs. 2 to 4, the coin dispenser 10 includes a motor driven rotary disk 24 rotatably mounted in a base plate 22 attached horizontally to the housing 2 of the slot machine. On the base plate 22, there is provided a substantialy cylindrical guide wall 25 in such a way as to surround the rotary disk 24. As is apparent from Fig. 4, the guide wall 25 has a part 25a which is depressed inwardly and is formed with an exit slit 26 at its bottom edge. This exit slit 26 is so formed as to allow a coin 30 placed horizontally to pass therethrough. It is permissible to provide a space having a distance less than half a diameter of the coin between the guide wall 25 and the periphery of the rotary disk 24.

Above the base plate 22, there is a funnel-shaped bucket 12 having an opening 28 at its bottom. Coins stored in the bucket 12 can fall down onto the rotary disk 24. As is seen in Fig. 3, the bucket 12 is formed with a collar at its bottom so as to render coins falling down as horizontal as possible. This collar serves to strive for a smooth flow of coins from the bucket 12 to the rotary disk 24.

The rotary disk 24 is fixedly held between an upper holding plate 34 having a pole 34a and a bottom holding plate 33 having a sleeve which is firmly connected to an output shaft 32a of a gear box 32. The gear box 32 can serves to transmit the rotation of a motor 23 to output shaft 32a, 32b. This holding arrangement makes it easy to assemble the rotary disk 24 and to keep the same in a fixed plane.

The shaft 34a, which extends inside the bucket 12 passing through the opening 28, is provided with a control disk 35 rotatably mounted at its top. This control disk 35 is free from the rotation of the rotary disk 24 which is rotated by the motor 23 through the gear box 32.

Adjacent to the exit slit 26 there is an elastic roller 38 made of, for example, rubber which is connected to the output shaft 32b of the gear box 32 through a belt 37 for rotation in order to discharge coins passing the exit slit 26 toward the chute 14. Although it is desirable to keep the elastic roller 38 apart from the surface of the rotary disk 24, the elastic roller 38 may be conntacted with the surface of the rotary disk 24 when the elastic roller 38 is rotated at a proper speed relative to that of the rotary disk 24 so as not to cause any interference with each other. If desirable, it is permissible

to place the elastic roller 38 outside of the periphery of the rotatry disk 24.

Between the elastic roller 38 and the chute 14 there is a coin sensing means which comprises a sensing pin 40 positioned in the path of coins discharged by the elastic roller 38. The sensing pin 40 is provided on an arm 43 which is forced by a spring 42 to turn in the unticlockwise direction. The coin 30a (in Fig. 4) discharged by the elastic roller 38 strikes the sensing pin 40, turning the arm 43 in the clockwise direction against the force of the spring 42, and then reaches the chute 14. The turn of the arm 43 is detected by a photosensor 45 when a coin strikes the sensing pin 40, thereby coins 30a discharged by the elastic roller 38 can be counted.

As is shown in Fig. 2, the sensing pin 40 at its bottom end is connected to an arm of a solenoid 47 which pulls the sensing pin 40 when energized and holds it so as to disable the arm 43 to turn.

The operation of the coin dispenser 10 will be explained hereunder in conjunction with a control circuit shown in Fig. 5.

As a result of the win decision made based on the combinations of symbols displayed in the windows 4, if in fact there is a win, a win judging circuit 50 provides a win signal which in turn actuates a relay driving circuit 51 to cause a power source switch S1 for supplying power to the motor 23 to turn ON, rendering the motor 23 to start into rotation in a normal direction. The motor 23 rotates both of the shafts 32a, 32b through the gear box 32 so as to rotate the rotary disk 24 and the elastic roller 38 in the counterclockwise direction. The rotation of the rotary disk 24 causes coins 30 supplied thereonto through the opening

28 of the bucket 12 to slide outwardly under the centrifugal force of the rotary disk 24. When the margin of the coin 30 contacts with the guid wall 25, then the coin 30 is moved along the inner surface of the guide wall 25.

The coin 30, when reaches the depressed part 25a of the guide wall 25, is discharged outside the guide walls 25 passing through the exit slot 26. At this time, the discharged coin 30 is forced by the rotating elastic roller 38 to fly out toward the chute 14 and then is paid out into the coin receptacle 13 passing through the chute 11 and the pay-out outlet 15. The exit slit 26 is so dimensioned as to allow coins to pass therethrough one by one.

In the course from the roller 38 to the chute 14, the discharged coin 30a (see Fig. 4) strikes the sensing pin 40 so as to turn the arm 43 in the clockwise direction against the spring 42. This turn of the arm 43 is detected by the photosensor 45. During the rotary disk 24 rotated, coins are discharged one by one in such a way as described above, and the arm 43 detects every discharge of a coin. Since the photosensor 45 is adapted to produce pulse signals one for every detection by the arm 43, the number of coins discharged into the coin receptacle 13 can be known by counting the pulse signals by a counter 52.

As shown in Fig. 5, a win judgment circuit 50 causes a circuit 53 to set therein the number of coins to be paid out correspond to the win. When the accumulated count in the counter 52 reaches the number set in the coin number setting circuit 53, a coincidence detecting circuit 54 produces a coincidence signal. For a predetermined interval of time from the production of the coincidence signal, a timer 55 holds its

output signal at a high level so as to keep a relay actuating circuit 56 activated, causing motor control switches S2 to contact with contacts a from contacts b, respectively. As a result, the motor 23 rotates in the reverse direction, momentarily, making the rotary disk 24 and the roller 38 rotate in the clockwise direction so as to stop the discharge of coins, quickly. Therefore, no excess coins are discharged from the coin dispenser 10.

On the other hand, the coincidence signal is also sent to a solenoid actuating circuit 57 so as to energize the solenoid 47, prohibitting the arm 43 from turning. As a result, coins, if they are discharged accidentally, strike the detecting pin 40 and rebounded therefrom, so that accidentally discharged coins are not paid out. It is noted in the event of using alternating-current motors as the motor 23, it is possible to stop the alternating-current motor quickly by supplying direct current thereto at the moment when the rotary disk 24 is to be stopped.

After the predetermined interval of time has elapsed, the timer 55 is operated to hold its output at a low level, allowing the relay actuating circuit 51 to turn OFF so as to turn a power supply switch S1 OFF. Simultaneously, the relay actuating circuit 56 turns OFF, allowing the switches S2 to return to their initial possition, namely in contact with contacts b, respectively. When the coin pay-out operation is completed, the counter 52 and the coin pay-out number setting circuit 53 are reset to their initial situations.

In the above-described coin dispenser 10, even if a large number of coins is stored in the bucket 12, it is possible to keep the coin discharge rate more than 15 to 16 coins per second.

The reason is that the control disk 35 rotatably mounted on the shaft 34a projecting from the rotary disk 24 can sustain a large force from a large number of coins in the bucket 12 and thereby prevent the rotary disk 24 from being subject to a heavy loading, and that the control disk 35, which is rotatable independently from the shaft 34a, can allow the rotary disk 24 to rotate without lowering its speed of rotation even the control disk 35 is buried in a large amount of coins.

Even if the bucket is filled to capacity with coins, coins advancing under the control disk 35 are not subject to large forces. Consequently, it is possible to stir the coins using a pin 36 projecting from the upper holding plate 34 so as to distribute the weight exerted onto the rotary disk 24. As a result of stirring the coins, coins are prevented from getting stuck between the control disk 35 and the bucket 12 around the opening 28. It is of cource permissible to provide two pins or more.

Figs. 6 to 8 show the coin dispenser according to another embodiment of the present invention which is similar to that of the above described embodiment except in the construction of the control disk.

In Figs. 6 to 8, there is provided in the bucket 12 a control disk assembly 55 fixedly mounted on bosses 12a by set screws. This control disk assembly 55 comprises a holding plate 56 fixed to the bucket 12 and a cone-shaped disk 57 fixedly mounted on the holding plate 56 by set screws. The control disk assembly 55 is provided in order not only to prevent the rotary disk 24 from being directly subject to heavy weight from coins but also to prevent coins from remaining on the assembly. Therefore, if

it is allowable that coins remain on the flat holding plate 36, the cone-shaped disk 57 can be omitted.

The invention has been described with particular reference to preferred illustrative embodiments thereof, but it will be understood that variations and modifications can be effected within the scope of the invention as defined in the appended claims.

C L A I M S

1. A coin dispenser comprising:

a bucket (12) for storing a number of coins therein which has an opening (28) at its bottom;

a rotary disk (24) driven by a motor (23) for placing thereon a part of said coins supplied from said bucket (12) through said opening, said rotary disk (23) being adapted to rotate in a substantially horizontal plane and causing said coins placed thereon to slide outwardly with centrifugal force:

control means (35/55) disposed above said opening in said bucket for preventing said rotary disk (24) from being directly subject to the weight of said coins remaining in said bucket; and

guide means (25) having an exit slit for causing coins which slide outwardly on said rotary disk (24) to move along the inner wall thereof to said exit slit (26) as a result of the rotation of said rotary disk (24), thereby discharging said coins one by one through said exit slit (26).

2. A coin dispenser as defined in claim 1, wherein said control means (24) is rotatably mounted on a shaft (34a) which is fixed to said rotary disk (24) and extends inside said bucket (12) passing through said opening (28).

3. A coin dispenser as defined in claim 2, further comprising a projection (36) on said rotary disk (24), said projection (36) being positioned below said opening (28).

4. A coin dispenser as defined in claim 2, wherein said control means is a circular disk (34) and said opening (28) is a circle having its inner diameter smaller than the diameter of said disk (34).

5. A coin dispense as defined in claim 2, wherein said rotary disk (24) is, in use, stopped by making said motor (23) ratate in the reverse direction, momentarily.

6. A coin dispenser as defined in any one of the preceding claims, wherein control means (35/55) is fixedly mounted in said bucket above said opening.

7. A coin dispenser as defined in claim 6, wherein said control means comprises a holding plate (56) fixedly mounted in said bucket and a disk inclined downwardly from its center, said disk being fixed to said holding plate.

8. A coin dispenser as defined in claim 6 or 7, further comprising a projection on said rotary disk (36), said projection (36) being positioned below said opening.

9. A coin dispenser as defined in claim 6, 7 or 8, wherein said control means has a circular shape having a diameter larger than the inner diameter of said opening.

10. A coin operated machine incorporating a coin dispenser according to any one of the preceding claims.

FIG. 1

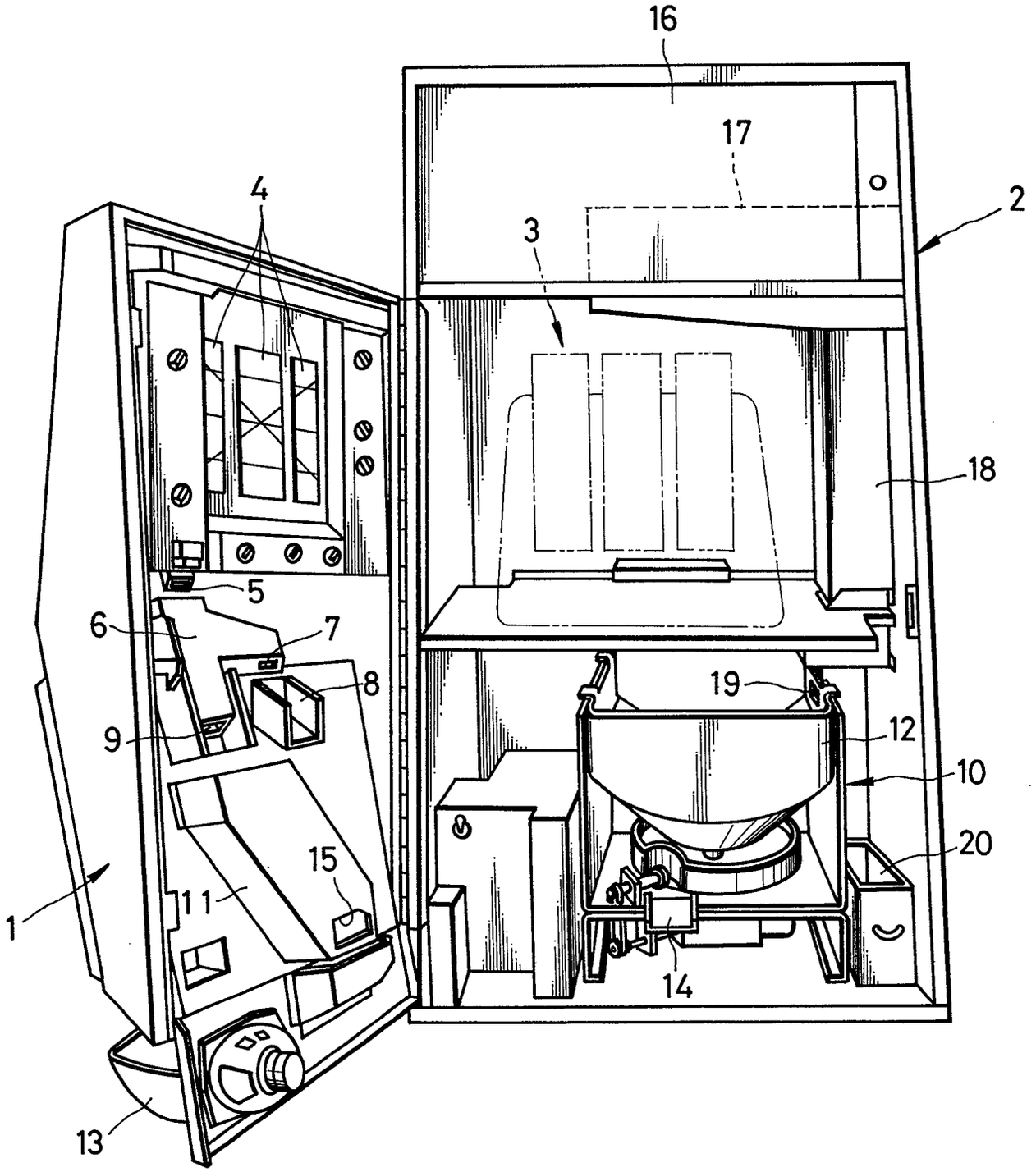
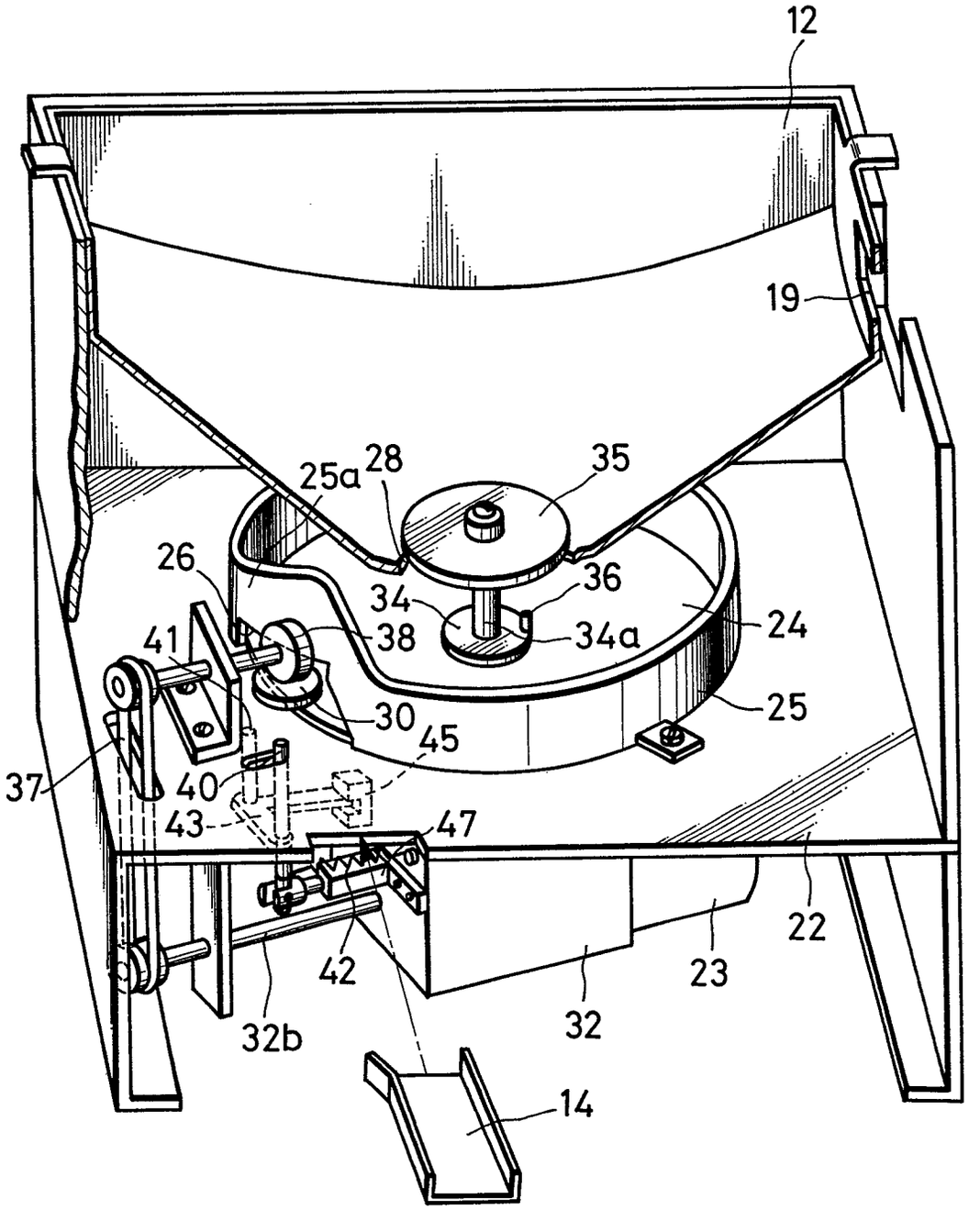


FIG. 2


12
19
25a
28
35
26
36
34
24
41
38
34a
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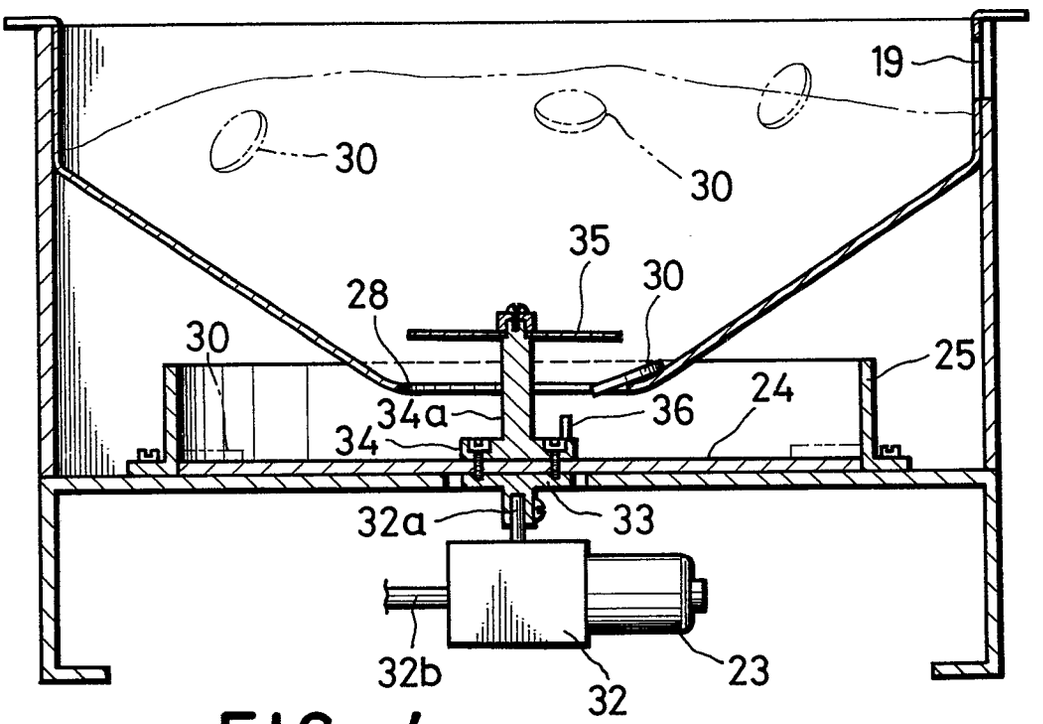
43
47
22
42
23
32
32b
14

FIG. 3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34a
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32a
33
32b
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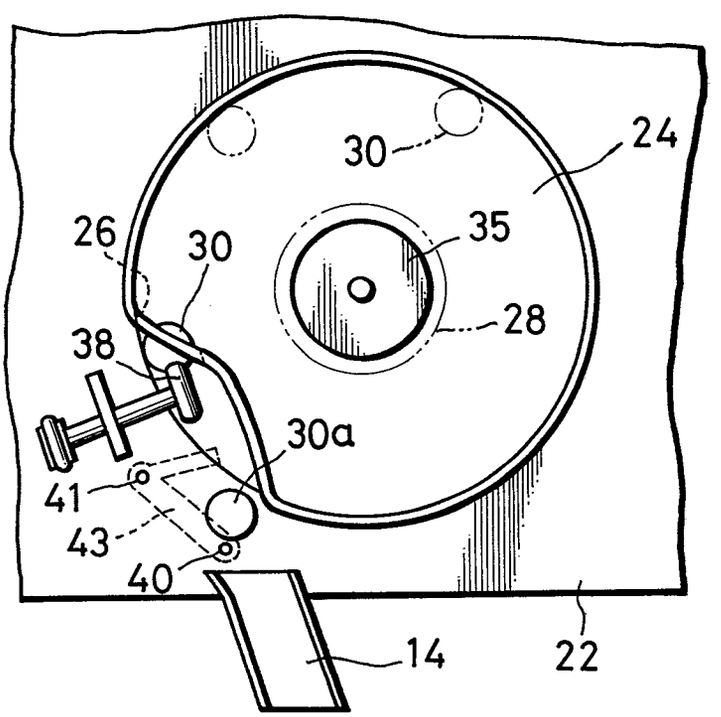
23

FIG. 4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24
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35
28
38
30a
41
43
40
14
22

FIG. 5

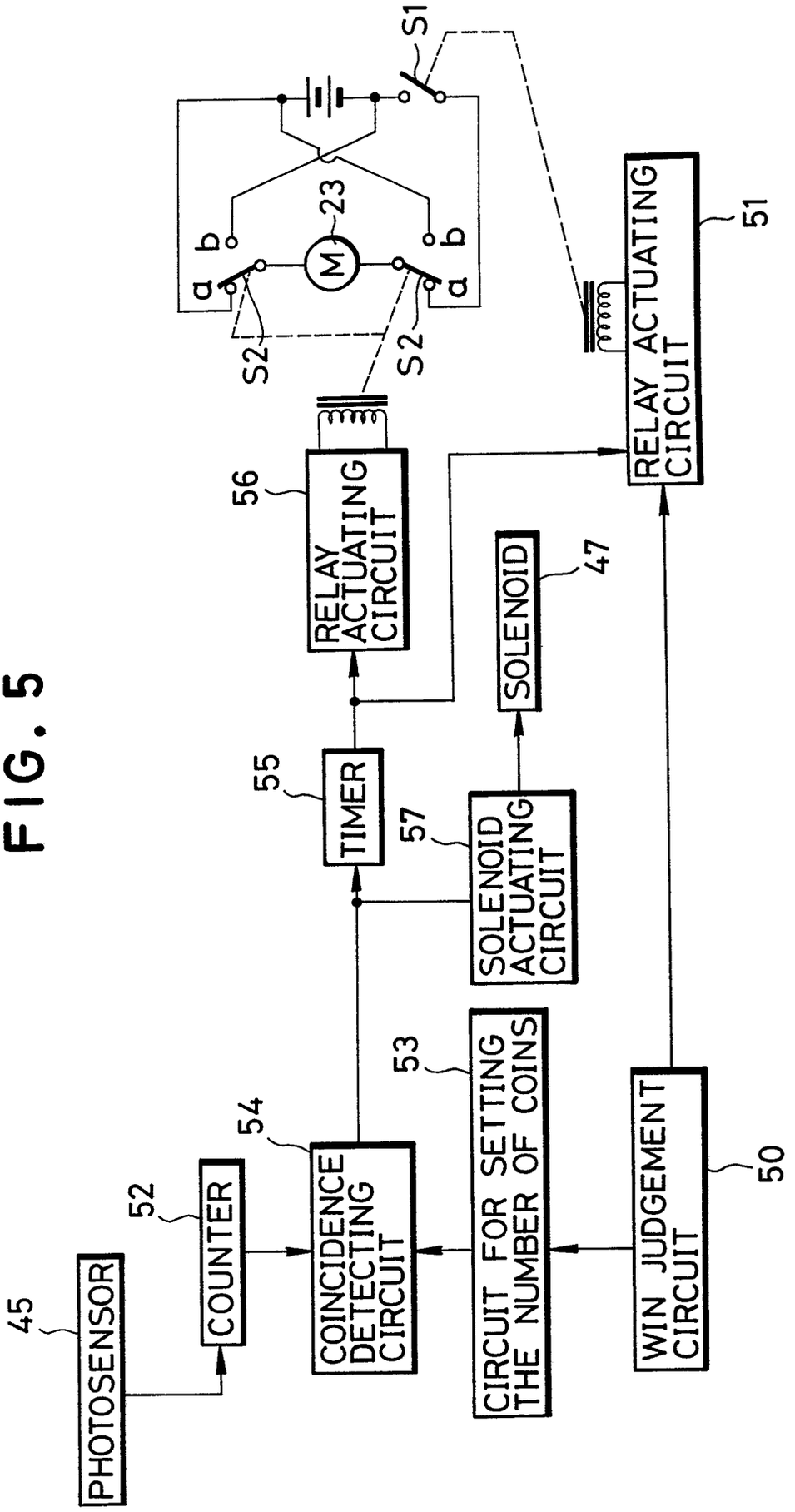
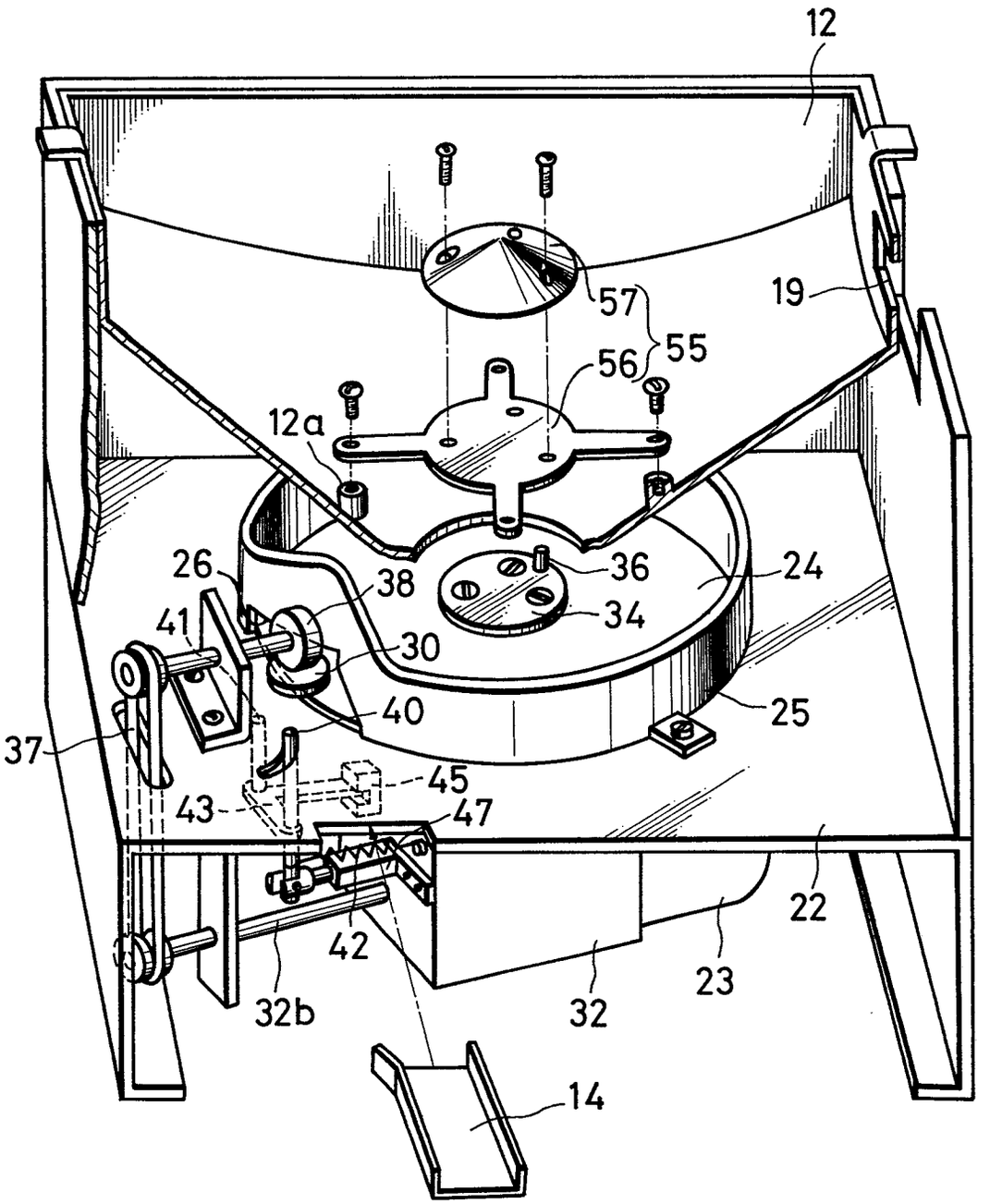

S1
23
M
a
b
S2
RELAY ACTUATING CIRCUIT
51
56
RELAY ACTUATING CIRCUIT
SOLENOID
47
55
TIMER
57
SOLENOID ACTUATING CIRCUIT
53
CIRCUIT FOR SETTING THE NUMBER OF COINS
54
COINCIDENCE DETECTING CIRCUIT
52
COUNTER
45
PHOTOSENSOR
WIN JUDGEMENT CIRCUIT
50

FIG. 6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12a
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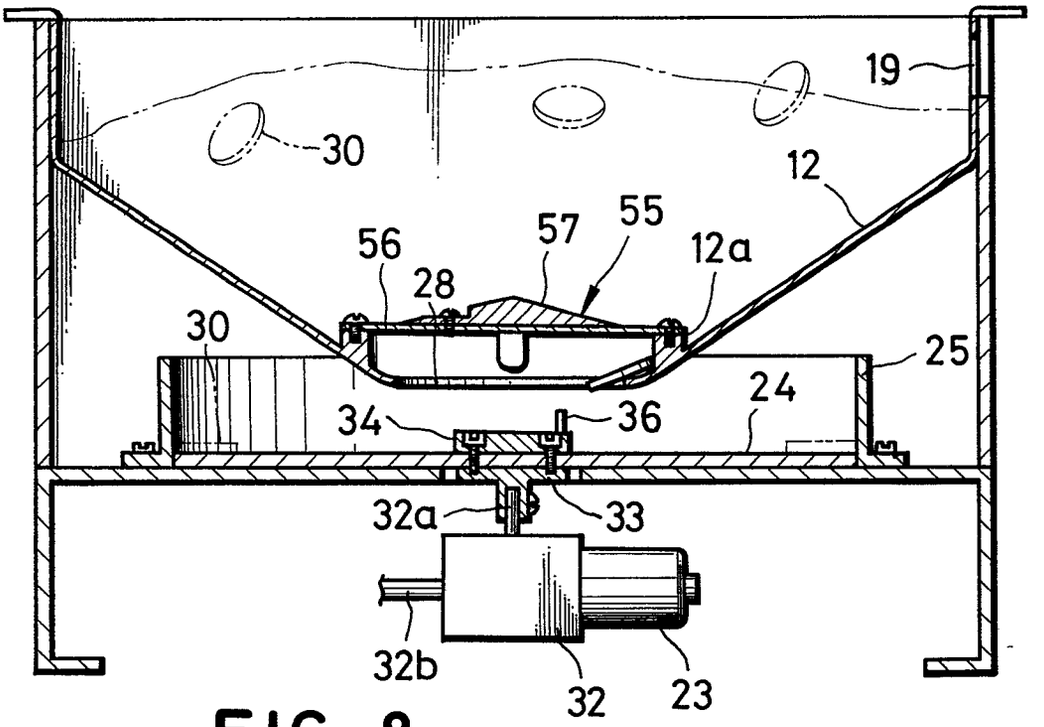
23
32b
32
14

FIG. 7


19
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12
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12a
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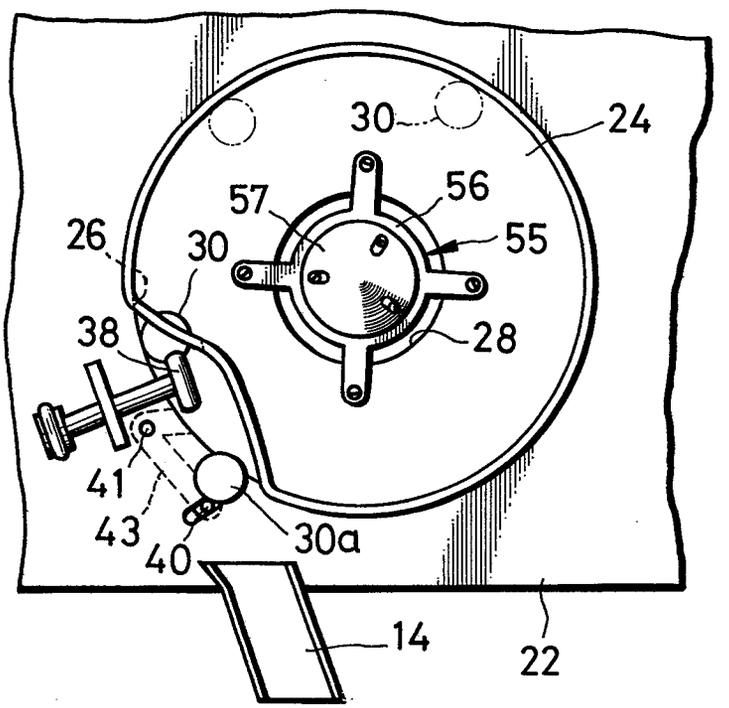
36
32a
33
32b
32
23

FIG. 8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