

COIN DISPENSING MACHINE

This invention generally relates to a coin
5 dispensing machine, and more particularly to a coin
dispensing machine comprising a hopper and a main body
disposed under the hopper, which is used to handle and
dispense coins or token coins, for example, for a money
exchanger, a changemaker, an automatic transactor, a
10 vending machine, a game machine, or the like.

A game machine, for example, which uses a coin or a
15 token coin as a playing medium is provided with a coin
dispensing machine which sequentially deals out coins or
token coins as playing medium, arranging them in order,
to count the number of the coins put into the machine or
to dispense a given number of token coins to a player.

20 Heretofore, various kinds of coin dispensing
machines are proposed. In this connection, it is to be
noted that the word "coin" used here means not only a
hard money, coin, but an equivalent or the like including
a token coin having a configuration similar to the coin.
25 The most popular coin dispenser is such that coins put in
a hopper are received on a rotating horizontal disc
provided under the hopper, the coins on the disc being
regulated by a surrounding wall around the disc to be
discharged one by one through a discharge opening formed
30 in the surrounding wall. The so discharged coins are
taken out through a coin conveying means which
distributes the coins to the outside.

In the coin dispensing machine, a plurality of

selector plates are provided to eliminate possible stacking of the coins. A coin which lays on another coin is removed and returned onto the disc by the selector plates. Thus, the coins are sequentially fed one by one.

5 However, it is still possible that the stacked coins are pushed under the selector plates or that coins form bridging, depending upon some conditions of the edges of the coins or the postures of the coins entering the selector plates. In these cases, the coins in trouble
10 obstruct the way of other coins and stop the operation of the machine.

When such troubles occur, it is general in the conventional coin dispensing machine, to eliminate the disorder and put the machine in order again, to stop a
15 drive motor upon detection of increase in load of the motor to check the trouble. Thereafter, if necessary, the rotating disc is driven in a reverse direction until the trouble such as stacking or bridging is dissolved.

In the conventional machine, the reverse rotation or
20 increment is effected for a predetermined time set by a timer.

However, the conventional machine has such a disadvantage that the coin dispensation is suspended and the operation of the machine is not halted when a trouble
25 dissolving operation is being carried out. Thus, not only the operation efficiency of the machine is lowered, but a user of the machine, for example, a player of a game machine, if the coin dispensing machine is used for the game machine, feels irritation and dissatisfaction
30 when they are waiting for the coins not delivered.

The present invention has been made to overcome the

problems involved in the conventional coin dispensing machine and it is an object of the present invention to provide a coin dispensing machine which is capable of rapidly and automatically dissolve a bridging phenomenon etc when it occurs, minimizing the suspension time, allowing the coin dispensation to continue without substantial suspension.

The present invention features a coin dispensing machine having a hopper section for storing coins therein, a main body section which includes a rotatable disc situated under the hopper section substantially in a horizontal plane and a peripheral wall surrounding said disc for preventing coins deposited thereon from the hopper section from being scattered, and a guide section which receives coins deposited on the disc to guide the coins to an outlet which machine comprises a drive source connected to said rotatable disc for continuously rotating said disc in a forward or backward direction; means for switching the driving direction of the drive source to change the direction of the rotation of the disc; said outlet having two input passages defined relative to the peripheral wall so that one receives coins when the disc rotates in the forward direction and the other receives coins when the disc rotates in the backward direction, respectively, and said guide section has two guide mechanisms associated with the respective passages for guiding coins thereto in association with the rotation of the disc in the forward direction and the rotation of the disc in the backward direction, respectively.

The coin dispensing machine preferably comprises means for detecting a change in load of the drive source and means responsive to the detecting means to switch the

driving direction of the drive source.

In a preferred mode of the present invention, a coin dispensing machine further comprises a drive belt fitted around the rotatable disc to drive the same, a
5 follower roller situated at merged downstream ends of the two guide mechanisms, said drive belt being extended to pass around the follower roller, a plurality of guide rollers provided in each of the guide mechanisms to support a portion of the drive belt extending between the
10 rotatable disc and the follower roller, a top surface of said portion of the drive belt being supported in a plane containing a top surface of the rotatable disc, and a pressing member provided in each of the guide mechanism so as to be spaced by a distance corresponding to a
15 thickness of the coin from said top surface of the drive belt.

In another preferred mode of the invention, the guide section has a mechanism arranged in a V-shape which opens towards the outlet of the peripheral wall, two
20 rollers, a drive roller and a free roller, provided adjacent to the discharge spouts, respectively, upper and lower intermediate rollers rotatably supported around a vertical shaft situated at a merging point of the V-shaped mechanism, a flat guide belt extended in V-
25 shapes, passing the drive roller, the upper intermediate roller, the free roller and the lower intermediate roller, tension rollers provided to support lower portions of the guide belt, guide members formed in a channel shape opening at the top and provided for the
30 respective lower portions of the guide belt, said lower portions of the guide belt being spaced by a distance corresponding to the thickness of the coin from upper surfaces of the respective guide members, and the rotatable disc is fitted with a drive belt which is

further extended to pass around a roller connected to a shaft of said drive roller of the guide section.

In a further mode of the present invention, a coin dispensing machine further comprises a flat belt having 5 projections at intervals slightly larger than a diameter of the coin, said rotatable disc having recesses complementary with said projections to receive the belt fitted therearound, said belt being further extended to pass around guide rollers situated adjacent the discharge 10 passages and additional guide rollers located outside and disposed about said peripheral wall, said guide section including a guide member opened in association with the discharge passages of the peripheral wall for receiving coins through the passages and extending 15 to a downstream passage.

In a still further mode of the present invention, a coin dispensing machine further comprises a drive belt fitted around the rotatable disc whose rotational direction may be switched, upper and lower follower rollers drivable 20 by said drive belt situated at an intermediate position between the forward guide mechanism and the backward guide mechanism so that they can rotate in a plane vertical to the rotatable disc, a drive roller provided in the guide mechanism for the forward rotation which is 25 connected to the upper follower roller, another roller provided in the guide mechanism for the backward rotation which is connected to the lower follower roller, driven rollers provided in association with the drive rollers in the forward and the backward rotation, respectively, 30 guide belts provided between the drive rollers and the corresponding drivable rollers, respectively, a guide rail for the forward rotation which is provided with a space corresponding to a thickness of the coin from a lower surface of the corresponding guiding belt, and a

guide rail for the backward rotation which is provided with a space corresponding to a thickness of the coin from an upper surface of the corresponding guide belt.

In a still further mode of the present invention, a coin dispensing machine further comprises a guide member having a common outlet for both the discharge passages and extends to a downstream passage, rotatable rollers covered with a frictional material and provided in the discharge passages, respectively, to sweep the coins conveyed on the rotatable disc out of the corresponding passage, belt rollers connected to shafts of said rotatable rollers, respectively, and a resilient belt fitted around the rotatable disc and extended to pass around the belt rollers of the rotatable rollers through idle rollers disposed adjacent to the guide member.

In a still further mode of the present invention, a coin dispensing machine further comprises a swingable member rotatably supported by a shaft which extends horizontally in the radial direction of the rotatable disc and having two side members hanging from a top of said swingable member which face the coins in the forward and the backward rotational directions of the disc, respectively, pawls provided on the respective side members which are directed outwardly at an angle with the respective side members for allowing the coins to enter the swingable member, said swingable member being tilted when a coin passes through one of the side members to lower the other side member to stop the coin from passing the same, upper and lower follower rollers for a drive belt fitted around the rotatable disc which are disposed vertically so that they may rotate in a plane vertical with the rotatable disc, upper and lower drive rollers for coin guide belts in the respective guide mechanisms which are connected to said upper and lower follower rollers, respectively, upper and lower

driven rollers disposed in a coin feeding direction in association with the upper and lower drive rollers, respectively, said coin guiding belts being provided between the upper and lower drive rollers and the
5 corresponding upper and lower driven rollers, respectively, a coin slide member disposed between the upper and the lower coin guide belts, said coin slide member being so connected to the swingable member that it may be placed in an upper position and a lower position
10 for guiding the coins in association with the lower coin guide belt and the upper coin guide belt, respectively.

In a still further mode of the present invention, a coin dispensing machine further comprises a drive belt
15 fitted around the rotatable disc to drive the same, follower rollers situated at downstream ends of the two guide mechanisms, said drive belt being extended to pass around the follower roller, a plurality of rollers of a smaller diameter provided in each of the guide mechanisms
20 to contact a portion of the drive belt extending between the rotatable disc and the follower roller, a pinch roller provided for closely pressing the drive belt against the rollers of a smaller diameter, rollers of a large diameter which are coaxially fixed to the respective
25 follower rollers, said rollers of a larger diameter having a tangential line which is in a plane containing an upper surface of the rotating disc, and a pressing member provided in each of the guide mechanisms so as to be spaced by a distance corresponding to a thickness of
30 the coin from said tangential line.

In a still further mode of the present invention, a coin dispensing machine further comprises a drive belt fitted around the rotatable disc to drive the same, follower rollers situated at downstream ends of the two

guide mechanisms at a position lower than the rotating disc, said drive belt being extended to pass around the follower roller, driven rollers of a smaller diameter provided in each of the guide mechanisms to support a
5 portion of the drive belt extending between the rotatable disc and the follower roller horizontally, guiding rollers of a larger diameter which contact a horizontal plane containing the rotatable disc which are fixed coaxially with said driven rollers, idle rollers provided
10 upstream of said rollers of a larger diameter, in the guide mechanisms, respectively, whose peripheries contact said horizontal plane, intermediate rollers provided for the respective guide mechanisms which respectively contact closely both the rollers of a larger diameter and
15 idle rollers, and a pressing member provided above the roller of a larger diameter and the idle roller in each of the guide mechanism so as to be spaced by a distance corresponding to a thickness of the coin from said top surface of the drive belt.

20 According to the present invention, when a bridging phenomenon occurs at one of the discharge passages which is dispensing the coins therethrough, the rotation of the rotatable disc is reversed and the rotation in the reversed direction is continued. As a result of this,
25 coins can be continuously dispensed as if no trouble such as bridging occurs.

At this time, coins forming the bridge are removed from the discharge passage around which the bridge is formed, as the disc is being rotated. Thus, said
30 discharge spout is maintained empty until another bridging is caused at another discharge passage and the disc rotation is reversed, when the former discharge passage is ready to start discharge of coins immediately.

Therefore, even if a trouble such as bridging

occurs, coin supply is continued without substantial suspension, giving no irritating feeling to an operator of the machine. In addition, this effect can be obtained with a simple construction, without

5 substantially increasing the manufacturing cost of the machine.

Embodiments of the present invention will now be described by way of example with reference to the accompanying drawings, in which:

10 Figs.1 to 3 illustrate a first embodiment of the present invention: Fig.1 is a perspective view of a machine main body section of the embodiment, Fig.2 is a front view of the same and Fig.3 is a vertical cross sectional view of the entire configuration of the first
15 embodiment;

Figs.4 and 5 illustrate a second embodiment of the present invention: Fig.4 is a perspective view of a machine main body section of the embodiment and Fig.5 is a plan view of the same;

20 Fig.6 is a plan view of the machine main body section of the embodiment;

Figs.7 to 10 illustrate a fourth embodiment of the present invention: Fig.7 is a plan view of a machine main body section of the embodiment, Fig.8 is a front view of
25 a guide section of the embodiment and Figs.9 and 10 are explanatory views showing the operation of the embodiment;

Fig.11 is an explanatory view of a machine main body section of a fifth embodiment of the present invention;

30 Figs.12 to 16 illustrate a sixth embodiment of the present invention: Fig.12 is a plan view of a machine main body section of the embodiment, Fig.13 is a front view of a swingable member and Figs.14 to 16 are explanatory views showing the operation of the

embodiment;

Fig 17 is an explanatory view of a guide section of a seventh embodiment of the present invention; and

Fig 18 is an explanatory view of a guide section of an eighth embodiment of the present invention.

Referring more specifically to the drawings, Figs 1 to 3 illustrate a first embodiment of a coin dispensing machine in accordance with the present invention.

The coin dispensing machine (hereinafter referred to as a machine) 1 comprises a hopper section H which acts as a reservoir for coins A therein and a main body section D which is disposed under the hopper section H to dispense coins A therefrom, while putting the coins A in order. The machine main body section D comprises a disc section P provided with a horizontal rotating disc which is adapted to receive the coins A thereon and rotated substantially in a horizontal plane by a drive motor M for providing a centrifugal force to the coins A thereon and a guide section G for guiding the coins A to the outside.

A hopper 10 in the hopper section H has a funnel shape which opens at a top 11 thereof, defining an inlet for receiving the coins A and a reservoir space for the coins A therein.

The hopper 10 has, on a bottom thereof, a guide surface 13 which diverts the passage of the coins A towards a side wall 12. A passage cover 13a is provided at a bottom portion of the hopper 10 so as to be raised therefrom. A first passage 14 of the coins A is formed

by the guide surface 13 and the passage cover 13a. The side wall 12 has an inclined extension and a second passage is formed by the side wall 12 and the inclined extension thereof. An exit is formed at a lower end of the second passage 15. The so bendedly formed first and second passages 14 and 15 regulate the flow of the coins A.

In the disc section P, the drive motor M is held on a bottom 20 of a cylindrical peripheral wall 21 and a rotating disc 23 is fixed to a drive shaft 22 of the drive motor M.

The rotating disc 23 has an outer diameter slightly smaller than an inner diameter of the peripheral wall 21. A friction disc 24 is attached to a central portion of the top surface of the disc 23. A hub 25 is formed on a bottom surface of the disc 23 and the hub 25 is fixed to the drive shaft 22 of the drive motor M.

The exit 16 of the hopper 10 opens towards the top surface of the disc 23 at its one-sided position. A flat spring 16a is disposed in the exit 16 to regulate the flow of the coins A. A baffle plate 17 is provided under the guide surface 13 of the hopper 10, facing the exit 16 to block the flow of the coins.

The rotating disc 23 has an engaging projection 28 at a central portion thereof. A stirrer rod member 18, which is resiliently deformable, is fixed, at a base thereof, to the engaging projection 28, extends through the first passage 14 in the hopper 10 and fitted, at a tip end thereof, to an engaging bracket 19 fixed to the hopper 10. The passage cover 13a has an opening through which the stirrer rod member 18 extends.

The stirrer rod member 18 is preferably a compression spring having such a resiliency that it can not only rotate around its central axis, but it can wag

in a pile of coins A. The stirrer rod member 18 is bent, at an intermediate portion thereof, to form a stirring portion. The stirrer rod member 18 is not limited to a compression spring, but it may be in any other form so long as it has a proper resiliency as specified above and has a rod-like shape.

The peripheral wall 21 has two discharge spouts or passages 30 for discharging the coins A therethrough. Selector plates 31 for selecting the coins A are provided downstream of the discharge spouts 30, respectively, to stand in coins' way, leaving a space corresponding to a thickness of the coins A above a plane corresponding to the top surface 23 of the rotating disc 23.

For convenience, an operation and parts associated with counterclockwise rotation of the rotating disc 23 is hereinafter referred to as "forward side" or "forward direction" and operation and parts associated with clockwise rotation of the disc 23 is hereinafter referred to as "backward side" or "backward direction".

The wordings "forward side" and "backward side" have no difference in functions therebetween and they are used only for convenience of explanation.

Configuration of the guide section G following the discharge spout 30 is illustrated in Figs.1 and 2.

As illustrated in Fig.1, a flexible drive belt 41 having an O-form in section is fitted around a belt groove 27 formed on a periphery of the rotating disc 23. The drive belt 41 extends further to pass around a follower roller 44. The follower roller 44 is supported by a horizontal shaft 43 held horizontally by a stepped portion 42 formed on a base plate 20 of the machine main body D as illustrated in Fig.3.

The follower roller 44 is situated at a position lower than the top surface of the rotating disc 23. The

drive belt 41 at a position intermediate between the rotating disc 23 and the follower roller 44 is supported by a plurality of guide rollers 45 both on the forward and backward sides.

5 The guide rollers 45 of each of the forward and backward sides are encased in a coin guiding casing 46. The coin guiding casing 46 has a coin pressing plate 46a which is spaced by a distance corresponding to the thickness of the coin A from the drive belt 41 supported
10 by the guide rollers 45.

The coin guiding casing 46 further has coin guiding side walls 46b for preventing the coins A from dropping.

A portion of the coin guiding casing 46 near the disc section P is configured to conform to the discharge
15 spout of the disc section P and the coin pressing plate 46a is curved upward so that it can receive the coin A easily.

A sensor (not shown) for detecting a coin A is provided on the outer coin guiding side wall 46b of each
20 of the coin guiding casing 46.

The operation of the first embodiment of the present invention will now be described.

When the drive motor M is actuated, the rotating disc 23 is driven to rotate and the drive belt 41 over
25 the guide rollers 45 is also driven. When the rotating disc 23 is driven forwardly, the belt in a guide mechanism G-1 of the forward side is driven in a direction for dispensing coins.

When coins A are fed into the hopper 10 through the
30 opening 11, the coins A are once held in the reservoir space, then move towards the side wall 12 through the first passage 14 on the guide surface 13, turn into the second passage 15 and are discharged onto the top surface of the rotating disc 23 through the exit 16, while

slowing down its flowing speed.

In the hopper 10, the stirrer rod 18 rotates, while wagging, conjointly with the rotating disc 23. This will prevent the coins from forming bridges. Thus, the coins
5 are continuously fed to the exit 16 without breathing or pausing. At the exit 16, the flat spring 16a regulates the flow of the coins as can be seen from Fig.3.

The coins A are driven out on the top surface of the rotating disc 23 by a centrifugal force and forced to
10 move about the rotating disc 23. Some of the coins A which reaches the selector plate 31 passes under a selecting edge 31a of the selector plate 31 to be arranged into a line towards the discharge spout 30.

The coin A which leaves the discharge spout 30 is
15 conveyed by the drive belt in the guide mechanism G-1 of the forward side and fed into a single downstream passage (not shown) into which two passages for the coins of the forward and backward sides are merged.

If a bridge phenomenon occurs at an entrance to the
20 selector plate 31 of the discharge spout 30 on the forward side, the rotating disc 23 is halted and then rotated reversely.

The bridge phenomenon may be detected by various known means. For example, a drastic increase in a load
25 current for the drive motor may be used for detection of the phenomenon.

The coins A on the rotating disc 23 which is now rotated reversely are fed into a guide mechanism G-2 of the backward side and conveyed into the single downstream
30 passage.

As can be seen from Fig.1, the drive belt 41 in the guide mechanism G-2 of the backward side is driven to convey the coins A in the dispensing direction.

In the course of this reverse rotation of the disc

23, the coins A which have formed the bridge at the entrance to the selector plate 31 dissolve the bridging phenomenon and are sequentially brought to the selector plate 31 on the backward side.

5 The bridging phenomenon and the resulting inability of discharge of the coins A on the forward (or backward) side are not noticed by an operator of the machine at all. Thus, the coins A can be received by the operator continuously without becoming aware of the trouble. The
10 troubles caused by the bridging phenomenon, thus, may be dissolved automatically before he knows.

A second embodiment will now be described, referring to Figs.4 and 5.

The configuration and operation of the hopper
15 section H and the disc section P are similar to those of the first embodiment and they will not be repeated here and only the guide section G will be described.

As illustrated, the drive belt 41 comprising an O-ring fitted around the rotating disc 23 is further
20 extended to pass around a follower roller 61 and a tension roller 62.

The follower roller 61 is connected through a transmission shaft 63 to a drive roller 64 of the guide section G.

25 A flat guiding belt 70 is used to pass around the drive roller 64 both for transmission of drive force and transportation and guide of the coins A. The belt may alternatively be a round belt.

The guiding belt 70 is fitted around a first
30 intermediate roller 65 rotatably supported by a shaft which stands vertically at a downstream end of the guide section G, passing a start roller provided at a start end of the guiding mechanism G-1 of the forward side and a second intermediate roller 66 supported by the vertical

shaft 71, and extends to the drive roller.

Tension rollers 68 and 69 are provided to support the lower surface of the guiding belt 70 horizontally.

In the embodiment as illustrated, the guiding belt 5 70 is comprised of a timing belt and the rollers including the drive roller 64 are comprised of timing rollers with teeth to prevent possible slip.

A guiding member 72 is provided under the guiding belt 70, leaving a space corresponding to a thickness of 10 the coin A between the lower surface of the guiding belt 70 and the upper edge of the guiding member 72.

The operation of the second embodiment will now be described.

When the rotating disc 23 is rotated forwardly 15 (counterclockwise), the follower roller 61 and the drive roller 64 rotate counterclockwise, and the first intermediate roller 65 rotate clockwise. The start roller 67 and the second intermediate roller 66 rotate clockwise. Thus, the lower surface of the guiding belt 20 70 in the guiding mechanism G-1 of the forward side is driven in the coin dispensing direction.

If a bridging phenomenon occurs and the rotating disc 23 is reversed, the rotation directions of the respective rollers are also reversed. Thus, the lower surface of 25 the guiding belt 70 in the guide mechanism G-2 of the backward side is driven in the coin dispensing direction.

Now, a third embodiment will be described, while referring to Fig.6.

30 In the present embodiment, the configurations of the hopper section H and the disc section P are similar to those of Figs.1 and 2. This embodiment is different in that a rotating disc 80 is used instead of the rotating disc 23 and a drive belt 81 is used instead of the drive

belt 41. The drive belt 81 has specific small projections 81a and the disc 80 has recesses 80a on the outer periphery of the disc 80. The recesses 80a are formed so as to correspond to the small projections 81a.

The pitch of the small projections 81a provided on the drive belt 81 is a bit larger than the diameter of the coin A.

The drive belt 81 is fitted around the rotating disc 80 and extends to pass around guide rollers 82a, 82b which are each pivotally supported by a vertical shaft and situated at opposite positions of discharge spouts 30a, 30b of the disc section P and further pass around guide rollers 82c, 82d provided outside the disc 23 at positions remote from the discharge spouts.

The operation of the third embodiment will be described.

The coin A is driven by the small projection 81a of the drive belt 81 to be guided towards the discharge spout 30a (30b) by the central V-shaped guide and the drive belt 81 in the region of rollers 82a and 82b, and then guided by a guiding member 83 towards a simple outlet passage 83a.

If a bridge phenomenon occurs at one of the discharge spouts (30a), the rotating disc 80 is reversed immediately and the coins A are discharged through another discharge spout 30b.

It is apparent from Fig 6 that continuous discharge of the coins A is assured at a downstream passage 83a of the guiding member 83, which discharge spout 30a or 30b is in operation.

A fourth embodiment of the present invention will now be described referring to Figs 7 to 10.

In the present invention, the drive belt 41 fitted around the rotating disc 23 extends to pass around two follower rollers 93 and 95 fixed to shafts 91 and 94, respectively, which extend horizontally in different planes and supported rotatably at positions intermediate

between the discharge spouts 30a, 30b and the guide mechanisms G-1, G-2 (Fig.9).

Guide rollers 106, 107 are provided to pass the drive belt 41, which is fitted around the rotating disc 23 and extending in a horizontal plane, around the follower rollers 93, 95 to extend in a vertical plane.

A first drive roller of the guide section G is fixed to the shaft 91 and a second drive roller 98 is fixed to the shaft 94.

A guiding belt 100 of the forward side is stretched between the first drive roller 96 and a first driven roller 97 and a guiding belt 101 of the backward side is stretched between the second drive roller 98 and a second driven roller 99.

Extensions of the ends of the peripheral wall 21 which faces the discharge spouts 30a, 30b, respectively, form a guiding base member 105. The guiding base member 105 has two passages at portions adjacent to the discharge spouts 30a, 30b. The two passages merge into a single downstream passage 105.

A guide rail 102 is provided adjacent to the discharge spout 30a and extend under the guiding belt 100 of the forward side along the length of the guiding belt 100. The guiding belt 100 is so situated that the lower surface of the belt is spaced by a distance corresponding to the thickness of the coin A from the upper edge 102a of the guide rail 102.

On the other hand, in the guide mechanism G-2 of the backward side, a slide rail 103 is fixed to a bracket 104 which is in turn fixed to a side wall of the guiding base member 105. In this arrangement, the guiding belt 101 is so situated that the upper surface of the guiding belt 101 is spaced from the lower edge 103a of the slide rail 103 by a distance corresponding to the thickness of the

coin A.

The operation of the fourth embodiment will now be described.

During the forward rotation of the rotating disc 23, the drive belt 41 is driven in a direction from the lower follower roller 95 to the upper follower roller 93. As a result of this, the lower surface of the guiding belt 100 operates to drive the coins A in a dispensing direction. Thus, the coins A is discharged to a dispensing spout (Figs.9 and 10).

If the rotation disc 23 is reversed by a bridging phenomenon, the drive belt 41 is driven in a direction from the upper to the lower as viewed in Figs.8 and 9. Thus, the upper side of the guiding belt moves in the dispensing direction and the coins A are discharged along the lower edge 103a of the slide rail 103.

A fifth embodiment of the present invention will now be described, while referring to Fig.11.

In the present embodiment, the guide section G is provided before the discharge spout 30 as different from the foregoing embodiments. The coins A are forced to be discharged or swept out by rotation of rollers.

More particularly, as illustrated in Fig.11, rotating rollers 111a, 111b are provided at positions intermediate between the selector plates 31 and the discharge spouts 30, respectively. Each of the rollers 111a and 111b is situated to contact, at its lower end, the coin to drive the same to the discharge spout 30. Drive rollers 112a, 112b are connected to shafts of the rotating rollers 111a, 111b, respectively. The driving belt 41 is extended around the drive rollers 112a, 112b through idle rollers 113a, 113b, respectively, as illustrated in Fig.11.

The drive belt 41 leaving the rotating disc 23

passes the idle roller 113a of the forward side, passes the drive roller 112a of the forward side downwardly, passes lower idle rollers 113a', 113b', then goes upwardly through the drive rollers 112b of the backward side and the idle roller 113b of the backward side to reach the rotating disc 23.

In the present embodiment, the drive belt 41 is preferably a resilient one such as an O-ring as used in the foregoing embodiment or even more resilient one is preferably used to be fitted more tightly.

A guiding plate 114 adjacent to the discharge spouts 30 is inclined towards the dispensing spout.

The surfaces of the rollers 111a, 111b are coated with a resilient material such as rubber.

15 The operation of the fifth embodiment will now be described.

With the arrangement, when the rotating disc 23 is rotated forwardly, the rotating roller 111a is driven in a direction to force the coins A towards the discharge spout 30. When the disc 23 is reversed by occurrence of a bridging phenomenon, the rotating roller 111b forces the coins A to the discharge spout.

A sixth embodiment will be described, referring to Figs.12 to 16.

25 This embodiment includes a swingable member 120 which swings upon entrance of the coin A according to the forward or backward rotation of the rotating disc 23 as illustrated in Fig.13. By this swingable member 120, the coin dispensing positions in the guide section G are 30 switched as can be seen from Figs.15 and 16.

More specifically, the swingable member 120 is pivotally supported by a shaft 125 which is supported in a horizontal plane, at an intermediate position of the discharge spout dividing a forward side and a backward

side. The swingable member 12 comprises a forward side wall 122a and a backward side wall 122b and a top member 121 which form a channel shape. The side walls 122a and 122b have lower ends which extend outwardly to form pawls 5 123a and 123b, respectively.

The pawls 123a and 123b are directed, at the respective tip ends, slightly upward so that the lower surfaces of the respective pawls may lightly touch the surface of the rotating disc 23 when the swingable member 10 120 is tilted to the forward side or to the backward side.

An arm member 124 is provided at a side portion of the top plate 121 of the swingable member 120. A connecting rod 126, which is pivotally supported at the 15 outside, is connected to the arm member 124. The connecting rod 126 is further connected to a coin slide member 127.

The drive belt 41 which is fitted around the rotating disc 23 is extended to pass around follower 20 rollers 131 and 132 which are arranged vertically. Intermediate between the disc and the follower rollers, the drive belt 41 is supported by rollers including an idle roller 130.

The follower rollers 131 and 132 are connected to an 25 upper drive roller 135 and a lower drive roller 137 of the guide section G through an upper transmission shaft 133 and a lower transmission shaft 134, respectively. The upper and lower transmission shafts 133 and 134 are disposed horizontally.

30 As can be seen, for example, in Fig.15, a guiding belt 139 is provided between the upper drive roller 135 and a roller 136 disposed oppositely to constitute a guide mechanism G-1 of the forward side.

Similarly a guiding belt 140 is provided between the

lower drive roller 137 and a roller 138 disposed oppositely to constitute a guiding mechanism G-2 of the backward side.

In operation, the positional relationship between the coin slide member 127 provided between the guide mechanisms G-1 and G-2 and the guiding belts 139 and 140 is as follows:

When the coin slide member 127 is located in a lower position, the upper surface of the member 127 is in the same plane as the top surface of the disc 23 is. At this time, there is a space corresponding to the thickness of the coin A between the lower surface of the lower portion of the guiding belt 139 and the upper surface of the coin slide member 127.

When the coin slide member 127 is located in an upper position, the lower surface of the member 127 is in the same plane as the top surface of the disc 23. There is a space corresponding to the thickness of the coin A between the upper surface of the guiding belt 140 and the lower surface of the coin slide member 127.

The operation of the sixth embodiment will now be described.

When the disc 23 is rotated forwardly, the coin A coming from the left in Fig.13 enters the swingable member 120 passing through the pawl 123a. The coin A, however, is blocked by the side wall 122b and does not advance on the disc any more. Thus, the coin is forced to the discharge spout 30, while being guided by the side wall 122b.

At this time, the coin slide member 127 connected to the connecting rod 126 is in the lower position, with the swingable member 120 inclined to the right. Therefore, the coin A from the discharge spout 30 is received as shown in Fig.15.

More specifically, the drive belt 41 fitted around the rotating disc 23 is extended to pass around the idle roller 130, passing around the follower rollers 132 and 131, again merge to return to the disc as illustrated in 5 Fig.14. In the forward rotation of the disc 23, the drive belt 41 drives in the order as mentioned above, so that the upper drive roller 135 connected to the follower roller 131 is rotated in a direction of arrow X-1 in Fig.15. As a result of this, the coin A in contact with 10 the lower portion of the guiding belt 139 is guided in the dispensing direction.

When the disc 23 is reversed, the driving direction is also reversed and the lower drive roller 137 of the backward side is rotated in a direction of arrow Y-1. As 15 a result of this, the coin A is conveyed on the upper portion of the guiding belt 41. At this time, the swingable member 120 is raised by the coin A as different from the position shown in Fig.13 and the coin slide member 127 is switched to the upper position.

20 A seventh embodiment will be described referring to Fig.17.

The present embodiment is substantially the same as that of the first embodiment except for a guiding roller in the guide section G.

25 In Fig.1, the guiding rollers 45 for guiding the drive belt 41 is adapted to directly contact the coins to convey the same. However, the present embodiment includes drive rollers 151a, 151b which contact the drive belt 41 to transmit the driving force and guiding rollers 30 150, 150b which receive the driving force from the drive rollers 151a, 151b, respectively, and adapted to contact the coin A. A pinch roller 152 is provided between the drive rollers 151a and 151b.

The operation of the seventh embodiment is similar

to that of the first embodiment. However, the present embodiment is capable of solving some difficulty involved in the first embodiment. In the first embodiment, since the guiding rollers 45 function as drive rollers, too, it is required to align the upper surface of the drive belt 41 with the top surface of the rotating disc 23. For this reason, it is necessary to change the level of the drive belt 41 a bit higher at the guide section G.

However, it is difficult to interpose tension means such as pinch rollers to give tension to the drive belt 41.

Referring now to Fig.18, there is illustrated an eighth embodiment of the present invention.

The present embodiment is a modification of the seventh embodiment and basically similar to the first embodiment.

In the present embodiment, the drive belt 41 is wound around a drive roller 162. A first guiding roller 161 which rotates conjointly with the drive roller 162 transmits its driving force to an intermediate roller 160. The intermediate roller 160 is in contact with a second guiding roller 163. The intermediate roller 160 is rotatably pressed against the guiding rollers 161 and 163 like a pinch roller.

The operation of the present embodiment is similar to those of the first and seventh embodiments.

The present embodiment differs from the seventh embodiment in that the pinch roller 152 is provided between the drive rollers 151a and 151b to assure the rotation of the guiding rollers 150a and 150b for preventing possible slip of the drive belt 41 in the seventh embodiment, whereas the intermediate roller 160 is provided, while positively contacting the first and second guiding rollers 161 and 163.

According to the present invention, even if a

bridging phenomenon occurs, coins can be dispensed continuously. More particularly, when the coins conveyed by the rotating disc are not discharged from one spout due to the bridging phenomenon, the disc is reversed immediately to dissolve the bridging phenomenon and the coins are supplied continuously through another spout. Thus, the operator of the machine receive the coins before he know any trouble in the machine and without substantial interruption. Thus, the suspension time of the coin dispensing is minimized and the operation efficiency is improved very much. This advantage can be obtained basically by providing another set of some existing parts without employing expensive mechanism.

CLAIMS:

(1) A coin dispensing machine having a hopper section for storing coins therein, a main body section which includes a rotatable disc situated under the hopper section substantially in a horizontal plane and a peripheral wall surrounding said disc for preventing coins deposited thereon from the hopper section from being scattered, and a guide section which receives coins deposited on the disc to guide the coins to an outlet which machine comprises a drive source connected to said rotatable disc for continuously rotating said disc in a forward or backward direction; means for switching the driving direction of the drive source to change the direction of the rotation of the disc; said outlet having two input passages defined relative to the peripheral wall so that one receives coins when the disc rotates in the forward direction and the other receives coins when the disc rotates in the backward direction, respectively, and said guide section has two guide mechanisms associated with the respective passages for guiding coins thereto in association with the rotation of the disc in the forward direction and the rotation of the disc in the backward direction, respectively.

(2) A coin dispensing machine as claimed in claim 1, which further comprises means for detecting a change in load of the drive source and means responsive to the detecting means to switch the driving direction of the drive source.

(3) A coin dispensing machine as claimed in claim 1,



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which further comprises a drive belt fitted around the rotatable disc to drive the same, a follower roller situated at merged downstream ends of the two guide mechanisms, said drive belt being extended to pass around
5 the follower roller, a plurality of guide rollers provided in each of the guide mechanisms to support a portion of the drive belt extending between the rotatable disc and the follower roller, a top surface of said portion of the drive belt being supported in a plane
10 containing a top surface of the rotatable disc, and a pressing member provided in each guide mechanism so as to be spaced by a distance corresponding to a thickness of the coin from said top surface of the drive belt.

15 (4) A coin dispensing machine as claimed in claim 1, in which said guide section has a mechanism arranged in a V-shape which opens towards the outlet of the peripheral wall, two rollers, a drive roller and a free roller,
20 provided adjacent to the discharge spouts, respectively, upper and lower intermediate rollers rotatably supported around a vertical shaft situated at a merging point of the V-shaped mechanism, a flat guide belt extended in V-shapes, passing the drive roller, the upper
25 intermediate roller, the free roller and the lower intermediate roller, tension rollers provided to support lower portions of the guide belt, guide members formed in a channel shape opening at the top and provided for the respective lower portions of the guide belt,
30 said lower portions of the guide belt being spaced by a distance corresponding to the thickness of the coin from upper surfaces of the respective guide members, and in which said rotatable disc is fitted with a drive belt which is further extended to pass around a roller



connected to a shaft of said drive roller of the guide section.

(5) A coin dispensing machine as claimed in claim 1,
5 which further comprises a flat belt having projections at intervals slightly larger than a diameter of the coin, said rotatable disc having recesses complementary with said projections to receive the belt fitted therearound, said belt being further extended to pass around guide
10 rollers situated adjacent the discharge passages and additional guide rollers located outside and disposed about said peripheral wall, said guide section including a guide member opened in association with the discharge passages the peripheral wall for
15 receiving coins through the passages, extending to a downstream passage.

(6) A coin dispensing machine as claimed in claim 1, which further comprises a drive belt fitted around the
20 rotatable disc whose rotational direction may be switched, upper and lower follower rollers drivable by said drive belt situated at an intermediate position between the forward guide mechanism and the backward guide mechanism so that they can rotate in a plane vertical to the
25 rotatable disc, a drive roller provided in the guide mechanism for the forward rotation which is connected to the upper follower roller, another roller provided in the guide mechanism for the backward rotation which is connected to the lower follower roller, driven rollers
30 provided in association with the drive rollers in the forward and the backward rotation, respectively, guide belts provided between the drive rollers and the corresponding drivable rollers, respectively, a guide rail for the forward rotation which is provided with a



space corresponding to a thickness of the coin from a lower surface of the corresponding guide belt, and a guide rail for the backward rotation which is provided with a space corresponding to a thickness of the coin
5 from an upper surface of the corresponding guide belt.

(7) A coin dispensing machine as claimed in claim 1, which further comprises a guide member having a common outlet for both the discharge passages and extends to a
10 downstream passage, rotatable rollers covered with a frictional material provided in the discharge passages, respectively, to sweep the coins conveyed on the rotatable disc out of the corresponding passage, belt rollers connected to shafts of said rotatable rollers,
15 respectively, and a resilient belt fitted around the rotatable disc and extended to pass around the belt rollers of the rotatable rollers through idle rollers disposed adjacent to the guide member.

(8) A coin dispensing machine as claimed in claim 1, which further comprises a swingable member rotatably supported by a shaft which extends horizontally in the radial direction of the rotatable disc and having two side members hanging from a top of said swingable member which
25 face the coins in the forward and the backward rotational directions of the disc respectively, pawls provided on the respective side members which are directed outwardly at an angle with the respective side members for allowing the coins to enter the swingable member, said swingable member being tilted when
30 a coin passes through one of the side members to lower the other side member to stop the coin from passing the same, upper and lower follower rollers for a drive belt fitted around the rotatable disc which are disposed vertically so that they can rotate in a plane vertical



with the rotatable disc, upper and lower drive rollers for coin guide belts in the respective guide mechanisms which are connected to said upper and lower follower rollers, respectively, upper and lower drivable rollers
5 disposed in a coin feeding direction in association with the upper and lower drive rollers, respectively, said coin guide belts being provided between the upper and lower drive rollers and the corresponding upper and lower driven rollers, respectively, a coin slide member
10 disposed between the upper and the lower coin guide belts, said coin slide member being so connected to the swingable member that it can be placed in an upper position or a lower position for guiding the coins in association with the lower coin guide belt and the
15 upper coin guide belt, respectively.

(9) A coin dispensing machine as claimed in claim 1, which further comprises a drive belt fitted around the rotatable disc to drive the same, follower rollers
20 situated at downstream ends of the two guide mechanisms, said drive belt being extended to pass around the follower roller, a plurality of rollers of a smaller diameter provided in each of the guide mechanisms to contact a portion of the drive belt extending between
25 the rotatable disc and the follower roller, a pinch roller provided for closely pressing the drive belt against the rollers of a smaller diameter, rollers of a large diameter which are coaxially fixed to the respective follower rollers, said rollers of a larger diameter
30 having a tangential line which is in a plane containing an upper surface of the rotatable disc, and a pressing member provided in each of the guide mechanisms so as to be spaced by a distance corresponding to a thickness of the coin from said tangential line.



(10) A coin dispensing machine as claimed in claim 1, which further comprises a drive belt fitted around the rotatable disc to drive the same, follower rollers situated at downstream ends of the two guide mechanisms at a position lower than the rotatable disc, said drive belt being extended to pass around the follower roller, drivable rollers of a smaller diameter provided in each of the guide mechanisms to support a portion of the drive belt extending between the rotatable disc and the follower roller horizontally, guide rollers of a larger diameter which contact a horizontal plane containing the rotatable disc which are fixed coaxially with said driven rollers, idle rollers provided upstream of said rollers of a larger diameter, in the guide mechanisms, respectively, whose peripheries contact said horizontal plane, intermediate rollers provided for the respective guide mechanisms which respectively contact closely both the rollers of a larger diameter and idle rollers, and a pressing member provided above the roller of a larger diameter and the idle roller in each of the guide mechanism so as to be spaced by a distance corresponding to a thickness of the coin from said top surface of the drive belt.

(11) A coin dispensing machine substantially as hereinbefore described with reference to, and as illustrated in, Figs. 1 to 3; or Figs. 4,5 and 6; or Figs. 7 to 10; or Fig. 11; or Figs. 12 to 16; or Fig. 17; or Fig. 18 of the accompanying drawings.



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