(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 080 858**
A2

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **82306256.7**

(51) Int. Cl.³: **G 07 D 9/06**

(22) Date of filing: **24.11.82**

(30) Priority: **26.11.81 JP 189965/81**
11.05.82 JP 79516/82
27.05.82 JP 90895/82
07.06.82 JP 98124/82
02.11.82 JP 192865/82

(43) Date of publication of application:
08.06.83 Bulletin 83/23

(84) Designated Contracting States:
CH DE FR GB IT LI SE

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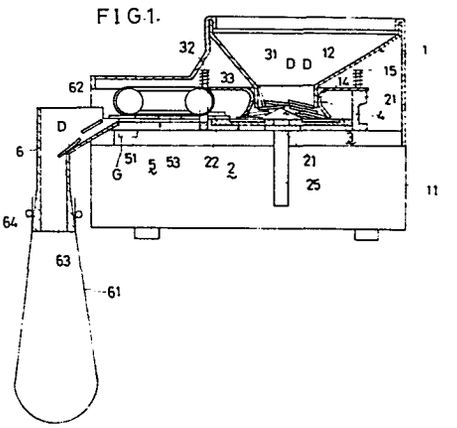
(54) **Coin feeder device for coin counter.**

(57) Coins to be counted are fed into a hopper (1) disposed above a rotary disk (2) which exerts a centrifugal force on coins fed thereto. A controller (3) provided between the hopper discharge opening and the rotary disk prevents coins being fed by centrifugal force toward the periphery of the disk one on top of another. A sorting ring (4) surrounds the peripheral part of the disk to prevent coins from falling off the edge of the disk. An arcuate section or small sorting ring (7) which forms a part of the sorting ring (4) defines a gap for passage of coins from the rotary disk to a sorter (5). The sorter (5) sorts coins to be counted from those not to be counted.

FIG.1.



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COIN FEEDER DEVICE FOR COIN COUNTER

The present invention relates to a coin feeder device for coin counter, more particularly, to a device for smoothly carrying out feeding of coins from the rotary disk designed to exert centrifugal force to the coin to the counter.

The conventional coin counter as shown in Fig. 18 comprises a rotary disk B for exerting a centrifugal force to the coins D,D' in a space formed by the sorting ring, a hopper A in a position deviated from the rotary axis B' of the rotary disk, a conveyor device C for feeding coin between the hopper A and the upper position of the rotary disk B, and further, with a cutout provided at a part of the sorting ring, a small sorting ring at the cutout portion to form a space for delivery of the coins to allow passage of a coin, and a sorting course E which is designed to permit to freely adjust the space broader or narrower continued to the space for delivery of coins.

Accordingly, the coins D,D' which have been fed onto the rotary disk by means of the conveyor device C from the hopper A are subjected to centrifugal force by the rotary disk B to collide against the inner circumferential surface of the sorting ring F and rotate with the rotary

disk B to be scattered, and led to the sorting course through the coin delivery space.

And, when the coins are allowed to run on the sorting course in one direction by means of the feed belt provided on the upper part at the central part of the sorting course E and the coins D' of the smaller diameter than the designed diameter to be counted are caused to drop through the gap in the sorting course, sorting out between the coins to be counted and the coins not to be counted is feasible.

However, if too large number of coins are fed onto the rotary disk at a time, a number of coins are accumulated at random on the rotary disk and are not ideally scattered, and sorting condition becomes extremely unfavorable, making it impossible to send out the coins smoothly to the sorting course through the delivery slit. Therefore, it is necessary to provide a coin detector to control driving of the conveyor device by means of the output signal of the coin detector. Even when the coin detector is provided, depending on the set amount of the coin to stop the conveyor device, there would be cases where the coins cannot be sufficiently sorted by spreading or the coins are spread in sparse state on a rotary disc, giving rise to lowering of coin feeding efficiency.

Further, some of the coins to be fed from the conveyor device and caused to drop assume upright condition at right angles to the rotary disc. Therefore, in order to let fall the upright coins, there are provided the projections of

a certain configuration on the inner lateral side of the separating ring which surrounds the rotary disk.

Accordingly, this will make the coin counter not only complicated as a whole but also large sized, especially make higher the position of the upper opening of the hopper at least by a weight of the conveying device, thus involving a defect of causing a difficulty to the work of charging the heavy bagged coins.

Another defect is that on each action of the conveyor device the coins drop on the metal rotary disk to produce fairly large noise by the impact between the metals.

According to the invention, there is provided a coin feeder device for coin counter, comprising a hopper into which the coins to be counted can be fed, a rotary disk which supports the coins to be

counted fed into the hopper and exerts centrifugal force to the coins to be counted, a control means provided between the lower end of the opening of said hopper and the rotary disk so as to control the number of the laid coins to be counted which slide toward the periphery of the rotary disk by rotation, a sorting ring surrounding the peripheral part of the rotary disk to prevent jumping out of the coins, a small sorting ring which constitutes a part of the sorting ring and forms a gap for coin path with the rotary disk, and a sorting means which is linked with the coin path gap and makes it possible to take out the coins to be counted and the coins not to be counted into the different positions by dropping the coins not to be counted.

Preferred and/or optional features of the invention are set forth in claims 2-27.

The invention will now be more particularly described, by way of example only, with reference

to the accompanying drawings, in which:

Figure 1 is a vertical sectional side view to show an embodiment of the coin feeder for coin counter, according to the invention,

Figure 2 is an enlarged vertical sectional side view of the essential part thereof,

Figure 3 is a cross section of the same,

Figure 4 is an enlarged vertical sectional view of the essential part showing by cutting out the other embodiment of the controller which is an essential part,

Figure 5 is a vertical sectional side view qhich shows other embodiment of the fitting structure of the hopper, controller, and sorting ring, which are the essential portions of the present invention,

Figure 6 is an enlarged vertical sectional view of the essential part of the same;

Figure 7 is a lateral cross-sectional view of the same,

Fig. 8 is a vertical sectional side view which shows other embodiment of the fitting structure of hopper, controller, and sorting ring in the present invention,

Fig. 9 is an enlarged vertical sectional view of the essential part of the same,

Fig. 10 is a vertical sectional side view of the same,

Fig. 11 is a cross-sectional view to show another embodiment,

Fig. 12 is a vertical sectional side view of the same,

Fig. 13 is a perspective plan view to show fitting structure of small sorting ring,

Fig. 14 is a front view of the same,

Fig. 15 is a cross-sectional view of Fig. 14 taken along the line XV-XV,

Fig. 16 is a front view to show other embodiment of the fitting structure of the small sorting ring,

Fig. 17 is a cross-sectional view taken along the line XVII - XXVII, and

Fig. 18 is a vertical sectional side view to show the conventional coin counter,

Referring to the drawing, the coin counter having the coin feeder of the present invention shown in Figures 1 to 3 comprises a hopper (1) for feeding the coins to be counted, a rotary disk (2) which exerts centrifugal force to the coins to be counted D,D' at the lower position of the hopper (1), a controller (3) which controls the number

of the counted and accumulated coins, a sorting ring (4) which surrounds the peripheral part of the rotary disk (2), a sorting course (5) which is led to the cutout (41) for engagement of the small sorting ring formed on the designed position of the sorting ring (4), and a guide metal (6) for guiding the counted and sorted coins and suspending the counted coin container bag (61).

The hopper (1) is shaped in downwardly tapered form by metal, synthetic resin, etc., and by being suspended integrally with the upper opened part of the coin counter casing (11) made of metal, synthetic resin, etc., being set at a fixed position so that the lower end opening 12 of circular section is positioned above the central part of the rotary disk (2). Further, by making the inner diameter of the lower end opening (12) of the hopper (1) more than about twofold the maximum diameter of the coins to be counted, occurrence of choking of coins is prevented before materialization.

The rotary disk (2) is provided on its upper surface of the central part with a conical projection (21), and a friction plate (22) made of rubber or urethane resin so as to surround the projection (21). The upper surface of the periphery of the rotary disk (2) is flush with the upper surface of the frictional plate (22).

The projection (21) is integrally provided with a columnar shaft (23) at the central part on the upper surface

of the conical member, and a columnar shaft (24) downwardly at the central part on its lower surface. The columnar shaft (24) thrusts through the rotary disk (2) and the rotary shaft (25) of the rotary disk (2) so as to make the projection (21) rotatable integrally with the rotary disk (2).

The controller (3) is constituted mainly by a circular cross-sectional tube (31) made of a metal or urethane resin. Its upper periphery is horizontally extended outward by projection. Thrusting through the outer peripheral portion, there is provided a guide rod (32) planted at the designed fixing position of the counter body to accommodate divided ring, etc. By loosely fitting the coil spring (33) onto the guide rod (32), the tube (31) is always pressed downward. By curving the lower periphery of the tube (31) outwardly, sliding of the coins to be counted is facilitated, and the lower periphery of the tube (31) is position-set so that it will be lower than the opening (12) of the hopper (1) and higher than the upper surface of the rotary disk (2), centering on the rotary shaft of the rotary disk together with the opening at the lower end of the hopper, so that, by the distance between the lower periphery of the tube (31) and the upper surface of the rotary disk (2), the number of laying of the coins to be counted is controlled. It is desirable for the opening at the lower end of the hopper, the controller, and the rotary disk to be aligned

at their centers on the same center line.

The sorting ring (4) is constituted by the tubular member of a designed height which surrounds the peripheral part of the rotary disk (2). With its designed position cut out, a cutout (41) for setting the small dividing ring is formed.

The sorting course (5) comprises a pair of guide plates (51)(51) placed in parallel to each other at a certain distance. The guide plates are provided at the top ends of their opposed inner lateral sides with grooves (52)(52) to support the peripheral part of the coin. Above the central part of the guide plates (51)(51), there is provided an endless belt (51) which causes to advance the coins while pressing them down toward the counted coin guide metal (6). Further, there is provided a spring (54) which applies force to one guide plate (51) in the direction to separate from the other guide plate (51). Also, there is provided a denomination cam (51') which sets the position of the guide plate (51) resisting the applied force of the spring (54). Accordingly, by operating the denomination cam (51'), the gap between the guide plates (51)(51) can be changed to sort out the coin of the desired denominations (large diameter and small diameter ones). At the terminal portion of the course there is provided a sensor G which generates pulse on passage of the coin so as to send a signal to the counter device. The counted coin guide metal

(6) comprises a tube which has at its upper periphery a feed inlet (62) which guides the coin which has passed the sorting course and a coin discharge port (63) at its lower periphery. It is formed in gradually expanded outer diameter toward the lower end. It is loosely fitted with a ring (64) so as not to allow pulling out downward, so that the outer circumferential surface of the tube and the ring (64) cooperate to hold by pressing narrow the mouth portion of the sorted and counted coin container bag (61).

The small sorting ring (7) to be inserted to set into the cutout (41) of the sorting ring (4) comprises, as shown in Fig. 13 and Fig. 15, by engaging with the guide tube (72) which is erected to fix to the designed fixing position of the coin counter body and which contains a coil spring (71), in a manner to be always forced upward. The small sorting ring (7) comprises a holding tube (74) of a large diameter to be engaged with the guide tube (72), an arc plate (75) positioned on the extension of the sorting ring (4), a flat plate (77) to form a gap (76) for passage of coin with the upper surface of the rotary disk (2) by being provided at the lower end of the arc plate (75), an eccentric pin (79) to hold the coin path gap (76) to a fixed amount by engaging with the fitting plate (78) provided at a designed position of the large diameter tube (74), and link rods (80), (81), (82), and (83) which work in linkage with the motion of the above denomination cam (51') to move

the eccentric pin (79) up and down to let the coin path gap (76) vary. The part 84) is an engaging member which is always forced upward by the coil spring (71) in the guide tube (72) and project up from the guide tube (72) to prevent slipping out. It is designed to force the small sorting ring (7) always upward in engagement with the cover plate (85) which covers the upper opening of the large diameter holding tube (74). Also, the fitting plate (78) is formed on its lower half part into downwardly tapered form to form a tapered surface (86). Also, continued to the upper periphery of the tapered surface (86) there is formed a square cutout recess (87). Further, between the designed position of the link rod (80) provided axially with an eccentric pin (79) and the designed fixing position of the coin counter body a spring (88) is stretched to give force to the link rod (80) so as to have the eccentric pin (79) set into the cutout recess (87). Further, the link rods (80), (81), (82), and (83) are forced respectively in one direction by being forced by the coil spring (71). They are mutually axially connected so as to permit the roll (89) axially provided at an end of the link rod (83) to be in pressure contact with the outer circumferential cam surface of the thickness adjusting cam (55) which coordinates with the denomination cam (51').

Accordingly, the denomination cam (51') and the thickness adjusting cam (55) may be operated in coordination

with the kind of the coin to be counted, and the motor (not shown) is energized to drive the rotary disk (2) for rotation and run the endless belt (53), under which condition a number of coins to be counted may be charged at a time into the hopper (1). Feeding of coins is conducted in a manner as described hereinafter.

The coins lying in the lowest position which are in contact with the rotary disk (2) at the lower end opening (12) is subjected to centrifugal force by the rotation of the rotary disk (2) and slid toward the sorting ring (4). At this time, as the coins slide outward through the gap between the rotary disk (2) and the controller (3), by setting the gap between the rotary disk (2) and the controller to a designed amount which is larger than the thickness of a piece of coin and smaller than the thickness corresponding to twice the thickness that of the thickness of the coin, the coin can be slid piece by piece. For example, when the coins in two layered state tend to slide outwardly, the controller (3) shifts upward, resisting the coil spring (33) to clamp the two coins up and down. Since the friction force between the lowermost coin and the friction plate (22) is the largest and the friction force between the coins is extremely small, the lowermost coins are subjected to a large centrifugal force, whereas the coins on the upper position are subjected to scarce centrifugal force. Eventually, only the coins on the lowermost position are slid toward the sorting ring (4). Also, when the coins have large

diameters and slide outwardly under the condition of being kept in inclined state by the projection (21), the controller (3) is shifted upward resisting the coil spring (33) to make it possible for the coins to move smoothly.

Since the coins which have slid to a position to come into contact with the sorting ring (4) rotate with the rotary disk (2) and fed one by one to the sorting course (5) through the coin path gap (76) formed by the small sorting ring (7), the coins of the largest diameter to be sorted are advanced by the endless belt (53), their passages are detected by the sensor G, dropped through the counted coin guide (6) into the counted coin container bag (61), and other coins of smaller diameter D' are dropped through the gap between the guide plates (51)(51) which constitutes the sorting course (5) and fed to other coin counter or recovered.

In the above case, when the amount of the coins which slide by centrifugal force from the hopper (1) toward the sorting ring (4) is larger than the amount of the coins to be fed to the sorting course (5), there will be the condition where more than two coins are accumulated at the peripheral part of the rotary disk (2). But, at the initial stage the coins slide under the unaccumulated condition, so that the coin sorting function is improved. Also, as it is possible by the projection (21) to support the coins at the position deviated from the center of the rotary disk (2), the coins can be slid securely toward the peripheral portion.

The present invention device can not only make the conveyor device for feeding the coins to be counted unnecessary and miniaturize the coin counter size but also facilitate the work of charging the heavy coins packed in bags by lowering the upper opening position of the hopper at least by the height of the conveyor device. Moreover, it can allow to produce noise only in the beginning of the charging of coins in the hopper and thus to suppress generation of noise. Further, even if the rotary disk does not exactly maintain horizontality, smooth supply of coin is assured.

Fig. 4 shows an embodiment of the above construction with modification of the construction of the controller (3), wherein the controller (3) is constituted by the tubular member molded by an elastic material such as urethane resin, and by fitting the tubular member into the hopper (1), the outer circumference of the lower end of the hopper (1) is covered with the upper half part of the tubular member.

The gap between the rotary disk (2) and the lower end periphery of the tubular member is set to an amount larger than the thickness of a piece of coin and smaller than the twofold thickness of the coin. Also, the elasticity held by the tube is so set as to permit the lowest positioned piece of coin to slide readily outwardly and to prevent exactly outward sliding of the coin accumulated on the upper surface of the coin on the lowest position.

Consequently, the coin on the lowest position which is subjected to centrifugal force by the rotary disk (2) is outwardly slid by causing elastic deformation or without causing deformation, and the rest of the coins are prevented from sliding, thus assuring exact sliding of the coins piece by piece outward and permitting sorting of the coins in the same manner as in the embodiment shown in Figs. 1 and 2.

Since the other portions of constitution are the same as those of the foregoing embodiment, detailed explanations are omitted.

In summary, in the case of the embodiment of Fig. 4, the guide rod (32) and the coil spring (33) may be omitted, so that the construction of the coin counter can be further simplified.

The coin counter as shown in Figs. 5 to 7 is a modification of the embodiment of Fig. 1 with respect to the construction of the tubular member (31) which constitutes the controller (3) and the fitting structure of the tubular member (31) and the sorting ring (4).

The controller 3 is constituted mainly by a tube (31) of urethane resin which has elasticity. Its configuration is downwardly expanding form. On the outer side wall at the top end there is formed an annular groove which accommodates to hold the support (35) which supports the ring (34), and at the periphery of the upper end opening there is formed in one-piece an upper outwardly extending elastic

annular hook (36) so that the elastic annular hook (36) can be brought into pressure contact with the lower outer circumference of the hopper (1) to prevent the coins from jumping out between the hopper (1) and the tubular member (31), so that, even when the hopper (1) is deformed under the weight of the charged coins and lowered, the hopper (1) and the tubular member (31) are exactly connected by its elasticity.

The gap between the lower end periphery of the controller (1) and the rotary disk (2) requires to be set to be larger than the thickness of the thickest coins to be counted. However, if the gap is too large, many pieces of coins are to be delivered under the accumulated state to give undesirable effect. Therefore, it is most desirable to set the gap to a degree of more than twofold the diameter of the coins having the largest diameter to be counted.

The support (35) is constituted by an annular member formed on its inner periphery to be engageable with the above annular groove. Its outer periphery is stepped down. On its lowest surface a ring (34) of urethane resin is set to support, and the lower end surface of the ring (34) is set to be on nearly the same level as the lower end face of the controller (3).

The member (37) is a fitting arm fixed at its one end to the designed position of the base on the outside of the

sorting ring. The lower end of the bolt (38) thrusted through the other end of the fitting arm (37) in a manner movable up and down is connected by screwing with the support (35) at its designed position, and further, it always exerts downward pressure to the support (35) and the controller (3) by loosely resiliently accommodating the coil spring (39) to the bolt (38) between the fitting arm (37) and the support (35).

The constitutions of sorting ring (4), small sorting ring (7), sorting course (5), and sorted and counted coin guide metal (6) are the same as those shown in the foregoing embodiment. Accordingly, the function of supply of coins to the sorting course (5) from the small sorting ring (7) by the rotation of the rotary disk is conducted in entirely the same action.

If, in its feeding action, the amount of the coins to slide from the controller (3) to the sorting ring (4) is larger than the amount of the coins to be fed to the sorting course (5), the amount of the coins laid on the rotary disk increases to a condition to be accumulated by more than two pieces. When the coins become accumulated in multiple, the coins on the upper position are to be laid between the controller (3) and the sorting ring (4). By these coins, the lower end portion of the controller (3) is pressed inward to narrow the gap between the rotary disk (2) and the controller (3), thereby providing a

possibility for the smooth sliding of the coins to be prevented.

However, in the present embodiment, the coins on the upper position are laid between the support (35) and the sorting ring (4) and they do not come into contact with the controller (3), so that there is no danger at all for the gap between the rotary disk (2) and the controller (3) to be narrowed, and the coin sorting efficiency can always be maintained on a high level. In this respect, this embodiment is superior to that shown in Figs. 1, 2, and 3.

Also, according to the present embodiment, by setting the denomination cam (51') and the thickness adjusting cam (55) to the size of the maximum diameter coin to be counted, the eccentric pin (79) is raised via the link rods (83), (82), (81) and (80), and the small sorting ring (7) is raised to the position at which the cutout recess (87) is engaged with the eccrntric pin (79), by which the coin path gap (76) can be set in tune with the thickness of the above maximum diameter coin.

In the coin counter, the portion where choking of coin is most liable to occur is experimentarily known to be the portion of the small sorting ring (7), and, when choking up of coin occurs, the small sorting ring (7) has to be removed to dissolve choking of coin. By swinging the link rod (80) against the spring (88) the engagement of the eccentric pin (79) with the cutout recess (87) is released, and the small

sorting ring (7) is forced to rise under the spring force of the coil spring (71). Thereafter, by drawing out the small sorting ring (7) as it is, the upper part of the gap for coin path can be opened free, by which choking of coins can be simply dissolved.

After dissolution of the choking of coin, the operation may be only to engage the large diameter holding tube (74) with the guide tube (72) and push down. By the step of the engagement of the tapered surface (86) of the fitting plate (78) with the eccentric pin (79), firstly the link rod (80) can be swung, and then, when the link rod (80) is returned to engage the eccentric pin (79) with the cutout recess (87), the small sorting ring (7) can be held in a manner to suppress slipping out.

The embodiment of the coin counter as shown in Figs. 8 to 10 is the one which has the most desirable construction. The difference of this embodiment from that shown in Figs. 5 to 7 is that this embodiment is provided with a control plate (101) and a supporting plate (102) in place of the above ring (34), support (35), and fitting arm (37).

The coin counter furnished with the coin feeder device of the present invention shown in Figs. 8 to 10 comprises a hopper (1) to feed the coins to be sorted, a rotary disk (2) which exerts a centrifugal force to the coins to be sorted D,D' under the hopper (1), a controller (3) to control the number of accumulated coins which slide toward the

peripheral part of the rotary disk (2), a sorting ring (4) which surrounds the peripheral part of the rotary disk (2), a sorting course (5) which is connected with the cutout (41) for accommodating the small sorting ring formed at the designed position of the sorting ring (4), and a counted and sorted coin guide metal (6) which hangs the counted coin container bag (61).

The hopper (1) is made of metal or synthetic resin and formed in downwardly tapered configur tion. The hopper (1) is so positioned that, by being suspended integrally with the upper opening of the coin counter casing (11) of metal or synthetic resin material, the lower end portion (12) thereof is positioned above the center of the rotary disk (2).

By designing the inner diameter of the opening (12) at the lower end of the hopper (1) to be larger than about twice that of the maximum diameter of the coins to be counted, occurrence of choking up of coins are prevented before materialization.

The rotary disk (2) has on the upper surface of its central part a conical projection (21). Surrounding the projection (21) there is provided a friction plate (22) of rubber or urethane resin. Further, the upper surface of the rotary disk (2) and the upper surface of the friction plate (22) are set to be in flush relation. The projection (21) is provided at the central part of the conical member vertically with a columnar shaft (23) in one piece, and at the central part of the lower surface with a columnar

shaft (24) downwardly. The columnar shaft (24) is thrusted through the rotary disk (2) and the rotary shaft (25) of the rotary disk (2), so that the projection (21) is rotatable in one-piece with the rotary disk (2).

The controller (3) is constituted mainly of the circular cross-sectional tube (31) of urethane resin or the like. Further, at the upper end periphery there is formed an elastic annular hook (36) which extends in upper outward direction in one-piece, so that the elastic annular hook (36) is made possible to be in pressure contact with the lower end outer circumferential surface of the hopper (1), thereby preventing the jumping out of the coin between the hopper (1) and the tubular member (31), and, even in case of the deformation of the hopper (1) under the load of the input coins and lowering of its position, the hopper (1) and the tubular member (31) are exactly connectable by their flexibility.

In the present embodiment, the gap between the lower end of the controller (3) and the rotary disk (2) requires to be so set as to become larger than the thickness of the thickest coins of those to be counted. However, as the control of the number of coins to be accumulated is to be made by the control plate (101) to be described later, the device of the present embodiment does not necessitate at all to set the gap to twice as large as the thickness of the thickest coin, different from the cases of the aforedescribed embodiments. Since the gap can be more than twofold the

thickness of the thickest coin, sliding of the coin can be more smoothly made. And, the inner diameter of the controller (3) is desirably more than about twice the diameter of the coins having the largest diameter.

The above controller (3) is immovably supported by engaging the inner circumferential periphery of the annular support (102) whose outer circumferential periphery is fixed at its designed positions to the designed positions of the base situated outside the sorting ring with the above annular groove (100).

The above control plate (101) is constituted by a plate of donut-like form covering the upper part of the rotary disk (2) between the lower end outer periphery of the controller (3) and the sorting ring (4). By bending the outer peripheral part, inner peripheral part, and central part upward, the bend strength in the direction of thickness is improved. The bolt (103) erected on the upwardly bent portion at the central area by screwing at its lower end is loosely inserted to move up and down into the designed position of the supporting plate (102). Further, between the supporting plate (102) and the control plate (101), the bolt (103) is loosely accommodated with a coil spring (104) of small spring force, by which the control plate (101) is at all times forced toward the rotary disk (2). The gap between the control plate (101) and the rotary disk (2) under the condition where the control plate (101) is in the most lowered position

is set to be slightly larger than the thickness of the thickest coin.

Screw connection of the lower end of the bolt (103) with the upwardly bent portion securely prevents the lower end periphery of the bolt (103) from projecting below the coin pressing surface (lowest surface) of the control plate (101).

The sorting ring (4) is constituted by a tubular member of a designed height which surrounds the periphery of the rotary disk (2), and has a cutout (41) for accommodating small sorting ring at a designed position.

The sorting course (5) comprises a pair of guide plates (51)(51). On the upper ends of the opposed inside surfaces there are provided the grooves (52)(52) for supporting the periphery of the coin. And, on the upper position of the guide plates (51)(51) there is provided an endless belt (53) which is designed to cause the coins advance toward the counted coin guide metal (6) while pressing them downward. Further, there is provided a spring (54) which exerts force in the direction to alienate one guide plate (51) from the other guide plate (51). A thickness adjusting cam (55) which sets the position of the guide plate (51) resisting the force of the spring (54) and the denomination cam (51') which coordinates with it are provided. Accordingly, by operating the thickness adjusting cam (55) and the denomination cam (51'), the gap between the guide

plates (51)(51) can be varied to select the coins of the desired denominations.

The sorted and counted coin guide metal (6) forms at its upper end an inlet (62) which leads the coins after passing the sorting course, and comprises a tubular member formed at its lower end with an outlet (63) for coins. It is formed in such configuration as to be gradually enlarged in its outer diameter nearly toward the lower end, and loosely accommodated with a ring (64) so that the mouth of the sorted coin container bag (61) is clamped by pressing with the outer circumferential surface of the tube and the ring (64) so as not to allow the container bag (61) to be pulled downward.

The small sorting ring (7) in this embodiment comprises, as shown in Fig. 16 and Fig. 17, the means to be engaged with the guide tube (72) which is erected to be fixed to the designed fixing position of the coin sorter body and which self-contains a coil spring (71) so as to be always forced upward. It is constituted by a large diameter holding tube (74) having a hole (73) for engagement with the guide tube (72), an arc plate (75) situated on the extension of the sorting ring (4), a flat plate (77) provided at the lower end periphery of the arc plate (75) to form a gap (76) for coin path with the upper surface of the rotary disk (2), an eccentric pin (79) which is designed to keep the gap (76) for coin path constant by being engaged with the fitting

plate (78) which is provided to be movable up and down at the designed position of the large diameter holding tube (74), and the link rods (80), (81), (82) and (83) which are operated in linkage with the operation of the denomination cam (55) to move the eccentric pin (79) up and down so as to vary the size of gap (76) for coin path.

Fig. 11 and Fig. 12 show an embodiment which is designed to make it possible to vary the lowest position of the central plate (101) shown in Figs. 8 to 10. The bolt (103) is upwardly extended. The cam (105) is loosely accommodated in the bolt (103) in a manner to prevent slipping out and to be freely rotatable between the supporting plate (102) and the head of the bolt (103). On the lower face of the cam (105) there are provided grooves (106)(106). On the upper surface of the supporting plate (102) there are placed the balls (107)(107) so as to permit only self rolling, and the lower surface of the cam (105) is received at all times by the balls (107)(107). At the upper end of the cam (105) an L-shaped metal (108) is fixed in one-piece, and the adjacent L-shaped metals are mutually connected by the link rod (109). This makes it possible for all cams (105) to rotate simultaneously. By allowing to couple the grooves (106)(106) of the lower surface of the cam (105) with the balls (107)(107), the control plate (101) is levelled down, and by allowing the bottom surface portions other than the groove to be supported by the upper surface of the balls

(107)(107), the control plate is levelled up.

The member (110) is a handle for operation which is fixed in one-piece with the cam (105). The member (111) is a spring for changing over the cam stretched between either of the L-shaped metal (108) and the designed position of the supporting plate (102).

Accordingly, in case of the sorting of the coins which have large diameter and thickness, the operating handle (110) is operated to rotate all the cams (105) simultaneously, and, of the lower surfaces of each cam, the bottom surface portions other than the groove may be allowed to be supported by the upper surfaces of the balls (107)(107) to cause the control plate (101) to go up. The thick coins to be counted are then accumulated not more than two pieces in the gap between the rotary disk (2) and the control plate (101), by which it becomes possible to feed the coins to be counted in the same manner as in the embodiments of Fig. 6 and Fig. 7.

In case of feeding the coins having small diameter and small thickness, the handle (110) for operation may be operated to rotate simultaneously all the cams (105) to engage the balls (107)(107) with the grooves (106)(106) out of the lower surfaces of cams (105), and the thin coins to be counted become accumulated in no more than two pieces in the gap between the rotary disk (2) and the control plate (101), thereby allowing to effect feeding

and sorting of coins in the same manner as in the embodiments of Fig. 6 and Fig. 7.

The member (84) is an engaging member which project above the guide tube (72) to prevent slipping, under exertion of the force at all times upward by means of the coil spring in the inside of the tube (72). The part (90) is a fine adjustment cam inserted in the upper half part of the large diameter tube (74) so as to be rotatably driven by means of the operating knob (91). The member (92) is a pin which is planted on the fitting plate (78), thrusting through the slit (93) on the side wall of the large diameter tube (74) to be engaged with the upper end cam surface (94) of the fine adjustment cam (90). The member (95) is a click stop ball which is forced by the spring (96) and designed to prevent accidental rotation of the operating knob. The distance for the fitting plate (78) to be movable up and down is set to he the same as or the larger than the distance for the pin (92) to be movable up and down by the rotation of the fine adjustment cam (90).

The lower half of the fitting plate (78) is formed into a downwardly tapered surface form (86), and, continued to the upper end periphery of the tapered surface (86) there is formed a square cutout recess (87) to accommodate the eccentric pin (79). Further, a spring (88) is stretched between the designed position of the link rod (80) axially provided with an eccentric pin (79) and the designed fixing

position of the coin counter body, and the link rod (80) is forced to set the eccentric pin (79) into the cutout recess (87).

The link rods (80), (81), (82), and (83) are respectively forced in one direction under the upward forcing of the link rod (80) by the coil spring (71), and are mutually axially connected to permit the roll (89) axially fitted to one end of the link rod (83) to be in pressure contact with the outer cam surfaces of the denomination cam (51') and the thickness adjusting cam (55). Accordingly, the denomination cam (51') and the thickness adjusting cam (55) are operated in accordance with the kind of the coin to be counted, the rotary disk (2) is driven by energizing the motor (not shown) in accordance with the procedures similar to those of the foregoing embodiments, the endless belt (53) is run, and under the operating condition many coins to be counted are charged into the hopper (1) to feed the coins to be counted.

The coins charged into the hopper (1) drop through the controller (3), and are received on the rotary disk. The coins on the lowest position in contact with the rotary disk (2) are subjected to centrifugal force by the rotation of the rotary disk (2), and slid toward the sorting ring (4).

At this time, the coins slide outward through the gap between the rotary disk (2) and the controller (3). Thus,

the coins can be slid under the condition placed in layers not more than the number of pieces to be laid determined by the gap between the rotary disk (2) and the controller (3) or under the condition not accumulated in layers at all.

The coins which have slid outward from the controller (3) are led to the position between the rotary disk (2) and the control plate (101). Accordingly, of the coins which have slid from the controller (3) under the condition of accumulation in plural pieces, only the coin on the lowest position is slid through the gap between the rotary disk (2) and the control plate (101) until it comes into contact with the sorting ring (4). The succeeding coin is slid until it comes into contact with the coin adjacent to the sorting ring (4). The above operations are repeated hereafter to align the coins in the gap between the rotary disk (2) and the control plate (101).

The foregoing explanations have been given on the actions of the case where the coins are aligned piece by piece in the gap between the rotary disk (2) and the control plate (101). However, since the coins inside the controller (3) are to slide outward continuously and each coin is subjected to relatively large centrifugal force in sliding, the succeeding coin is to be brought into strong collision with the preceding coin, and usually the succeeding coin is to hold up the preceding coin and advance under it. Moreover, since the spring force of the coil spring (104)

which forces the control plate (101) downward is made small, the succeeding coin holds up the preceding coin together with the control plate (101) to advance thereunder, and alignment is formed under the condition where more than two pieces of coin are laid in the gap between the rotary disk (2) and the control plate (101). In such a case, by means of the spring force of the compressed coil spring (104) the coins are to be pressed on the upper surface of the rotary disk (2) by the spring force of the compressed coil spring (104). However, since the spring force is small, there is no case for the continuation of rotation of the rotary disk (2) to be interrupted thereby. Further, it may be so designed that, when more than three pieces of coin are accumulated in layers, the intermediate coin is caused to slip out under the rotation of the rotary disk (2), so that the number of accumulation of the coin may be made not exceeding two pieces. Even when more than two pieces of coin are cumulatively laid between the rotary disk (2) and the control plate (101), the coins to be fed to the sorting course (5) are to become piece by piece. Therefore, there is no case of trouble in the coin feeding action to occur. In other words, in this embodiment, it is possible to dissolve any risk for a number of coins to be laid in layers in the gap between the rotary disk (2) and the control plate (101) and make the coins to be laid in layers not to exceed two pieces, so that the coin counting

performance and the coin sorting performance can be remarkably improved in comparison with the foregoing embodiments.

With regard to the relation between the diameter and the thickness of the coin, it is usual that when the larger the diameter is, the larger the thickness is. However, depending on country, there may exist a coin having a larger thickness even with a smaller diameter.

Accordingly, in such case as above, the operations of setting the denomination cam (51') and thickness adjusting cam (55) in coordination with the coin of the largest diameter, levelling up the eccentric pin (79) mediated by the link rods (83), (82), (81) and (80), levelling up the small sorting ring (7), and setting the coin path gap (76) to the size of the largest diameter coin are still unsatisfactory to lead all the coins to the sorting course (5).

However, this embodiment can cope with the case as above. By operating the operating knob (91) the fine adjustment cam (90) is rotated and the lower portion of the upper end cam surfaces (94) is engaged with the pin (92), upon which the fitting plate (78) is lowered, the small sorting ring (7) is raised, and the coin path gap (76) is widened, so that it becomes possible to send the coins of irregular sizes having small diameter and large thickness to the sorting course (5).

And, these coins, while rotating together with the

rotary disk (2), are fed piece by piece to the sorting course (5) through the coin path gap (76) formed by the small sorting ring (7), the coins of the largest diameter to be counted are advanced by the endless belt (53), dropped into the sorted coin container bag (61) through the sorted coin guide metal (6). Other coins of smaller diameters are let fall through the gap between the guide plates (51)(51) which constitute the sorting course (5) and fed into other coin sorter or collected.

CLAIMS:

1. A coin feeder device for coin counter, comprising a hopper into which the coins to be counted can be fed, a rotary disk which supports the coins to be counted fed into the hopper and exerts centrifugal force to the coins to be counted, a control means provided between the lower end of the opening of said hopper and the rotary disk so as to control the number of the laid coins to be counted which slide toward the periphery of the rotary disk by rotation, a sorting ring surrounding the peripheral part of the rotary disk to prevent jumping out of the coins, a small sorting ring which constitutes a part of the sorting ring and forms a gap for coin path with the rotary disk, and a sorting means which is linked with the coin path gap and makes it possible to take out the coins to be counted and the coins not to be counted into the different positions by dropping the coins not to be counted.

2. The coin feeder device for coin counter according to Claim 1, wherein there are provided the control means to control the number of laid coins on the upper position of the rotary disk and the hopper thereabove, each being provided on the same center line of the rotary shaft to be rotated by a motor.

3. The coin feeder device for coin counter according to Claim 1, wherein there are provided a central projection on the upper surface of the rotary plate and a friction plate on the outer periphery thereof.

4. The coin feeder device for coin counter according to Claim 1, wherein the means for controlling the number of laid coins is constituted by a tubular member of the larger diameter than the opening at the lower end of the hopper, said tubular member is caused to surround the external area of the opening at the lower end of the hopper, and said tubular member is supported to be movable up and down on the upper position of the rotary disk.

5. The coin feeder device for coin counter according to Claim 4, wherein the lower end periphery of said tubular member is curved outward.

6. The coin feeder device for coin counter according to Claim 1, wherein said tubular member is fixed to the outer circumferential surface of the lower end of the hopper.

7. The coin feeder device for coin counter according to Claim 6, wherein said tubular member is provided with elasticity at least at its lower end periphery.

8. The coin feeder device for coin counter according to Claim 1, wherein the means for controlling the number of laid coins is constituted by a tubular member, with the upper end opening of the tubular member being linked

with the lower end opening of the hopper, and the gradually expanding opening at the lower end of the tubular member positioned on the upper part of the central part of the rotary disk.

9. The coin feeder device for coin counter according to Claim 8, wherein said tubular member is provided with elasticity at least at its lower end periphery.

10. The coin feeder device for coin counter according to Claim 7 or Claim 9, wherein there is provided a large diameter holding tube which surrounds at least the outer circumference of the lower end portion of the tubular member.

11. The coin feeder device for coin counter according to Claim 10, wherein a ring is provided at the lower end periphery of said large diameter holding tubular member, and the gap between the ring and the rotary disk is set to be in the range of 1 to 2 fold of the thickness of the coin to be sorted.

12. The coin feeder device for coin counter according to Claim 8, wherein said tubular member is provided at its upper opening periphery with an elastic annular hook, and the tubular member and the hopper are connected with the elastic annular hook.

13. The coin feeder device for coin counter according to Claim 4 or Claim 6 or Claim 8, wherein the gap between the lower end periphery of the tubular member and the rotary disk is set to be in the range of about 1 to 2 fold of the thickness of the coin to be sorted.

14. The coin feeder device for coin counter according to Claim 1, wherein a spring to force the small sorting ring upward is provided, a pin for controlling the upward shifting of the small sorting ring in engagement with the small sorting ring is swingably provided to make it possible to set the height of the small sorting ring, a denomination cam which constitutes a means of sorting the coins to be counted and which is designed to adjust the gap of the gap-adjustable sorting course is provided, and a link rod which connects the pin with the denomination cam in a manner to permit adjustment of its up and down positions is provided.

15. The coin feeder device for coin counter according to Claim 14, wherein said small sorting ring is provided with a cam for adjusting the position of engagement with the pin up and down.

16. A coin feeder device for coin counter comprising a hopper into which the coins to be counted can be fed,

a rotary disk which supports the coins to be counted fed into the hopper and exerts centrifugal force to the coins to be counted, a control means to control the number of the laid coins which slide toward the periphery of the rotary disk, a sorting ring surrounding the peripheral part of the rotary disk to prevent jumping out of the coins, a sorting ring surrounding the peripheral part of the rotary disk to prevent jumping out of the coins, a control plate to control accumulation of the slid coins to be sorted on the upper position near the outer circumference of the rotary disk, a small sorting ring which constitutes a part of the sorting ring and forms a gap for coin path with the rotary disk, and a sorting means which is linked with the coin path gap and makes it possible to take out the coins to be counted and the coins not to be counted into the different positions by dropping the coins of smaller diameter.

17. The coinf feeder device for coin counter according to Claim 16, wherein said control plate for controlling the laid coins is forced downward above the rotary disk by means of a spring.

18. The coin feeder device for coin counter according to Claim 17, wherein the spring force of said spring is weakened, the control plate is rendered possible to be

raised by the accumulation of the coins which have slid under the centrifugal force, and the pressure of the rotary disk is made small.

19. The coin feeder device for coin counter according to Claim 17, wherein a cam for shifting said control plate upward against said spring force is rotatably provided.

20. The coin feeder device for coin counter according to Claim 16, wherein the inner periphery, outer periphery, and central part of the control plate are bent upward.

21. The coin feeder device for coin counter according to Claim 16, wherein a projection for sliding down the coins is provided on the upper surface at the central part of the rotary disk, and a friction plate is provided surrounding said projection.

22. The coin feeder device for coin counter according to Claim 16, wherein the control means is constituted by a tubular member, the upper end periphery of the tubular member is linked with the lower end opening of the hopper, and the large diameter opening at the lowef end of the tubular member is positioned above the central part of the rotary disk.

23. The coin feeder device for coin counter according

to Claim 22, wherein the tubular member is provided with elasticity at least at its lower end periphery.

24. The coin feeder device for coin counter according to Claim 22, wherein the tubular member is provided at its upper end opening periphery with an elastic annular hook, and the tubular member and the hopper are connected by said elastic annular hook.

25. The coin feeder device for coin counter according to Claim 22, wherein the gap between the lower end periphery of the tubular member and the rotary disk is more than the thickness of the coins to be sorted.

26. The coin feeder device for coin counter according to Claim 16, wherein a spring for forcing the small sorting ring upward is provided, a pin for controlling the upward shifting of the small sorting ring by engagement with the small sorting ring is swingably provided to make it possible to adjust the height position of the small sorting ring, a denomination cam which constitutes a means of sorting the coins to be counted and which is designed to adjust the gap of the gap-adjustable sorting course is provided, and a link rod which connects the pin with the denomination cam in a manner to permit adjustment of its up and down positions is provided.

27. The coin feeder device for coin counter according to Claim 26, wherein the small sorting ring is provided with a cam for adjusting the position of its engagement with the pin up and down.

FIG.3.

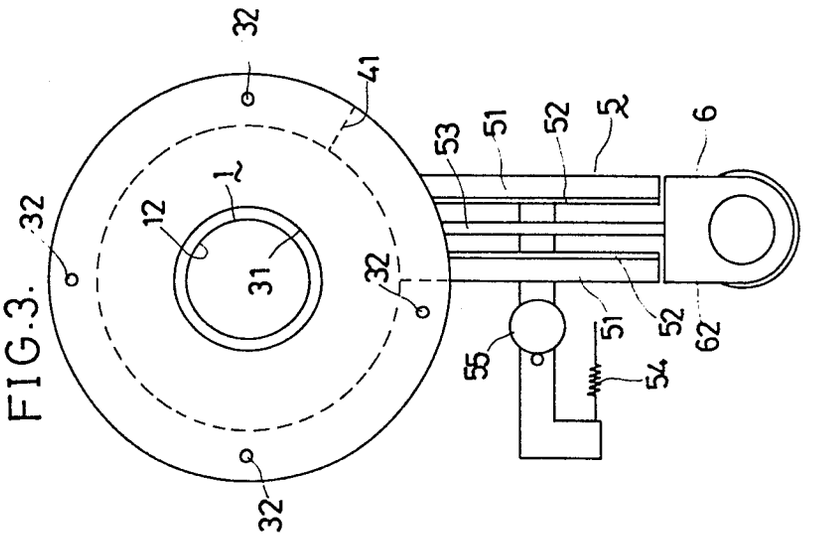

FIG.4.

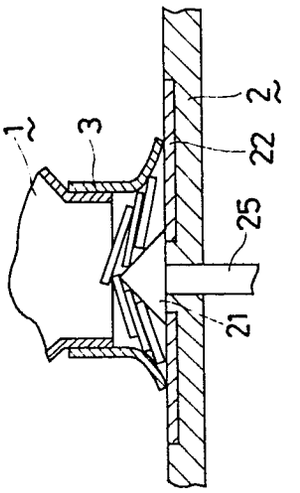

FIG.1.

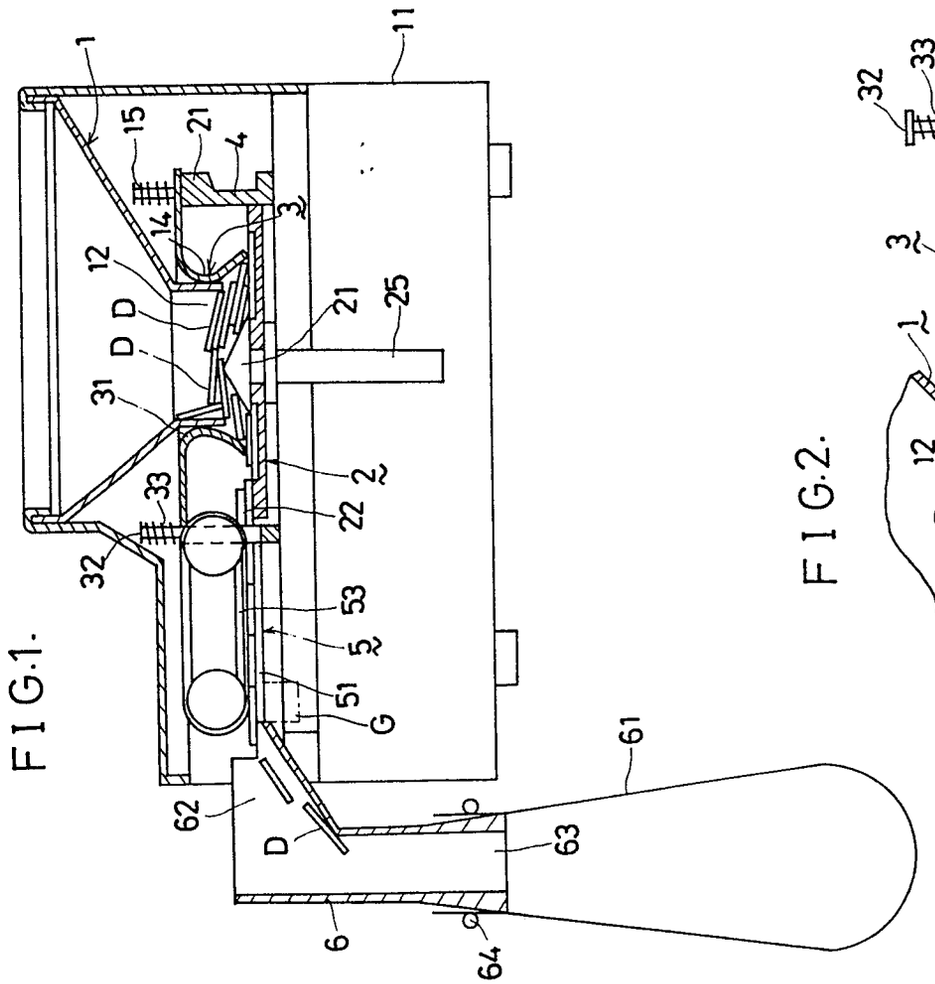

FIG.2.

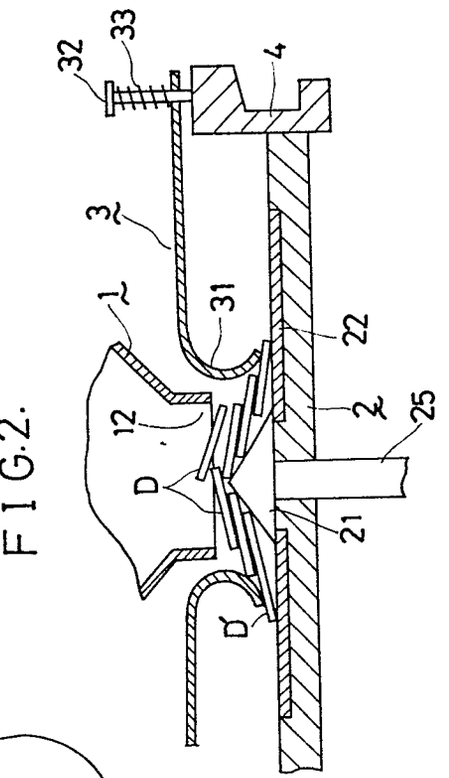

FIG.7.

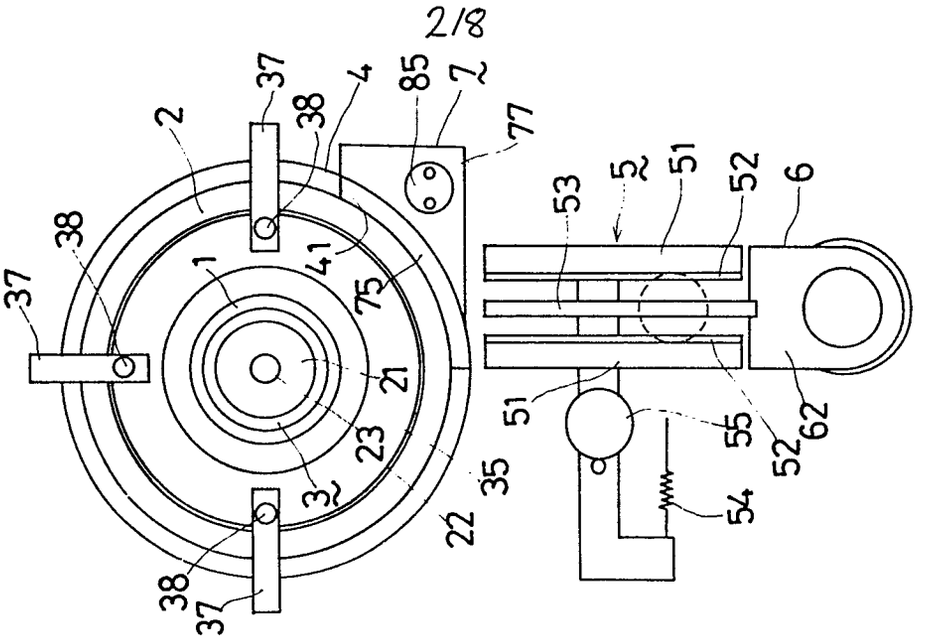
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FIG.5.

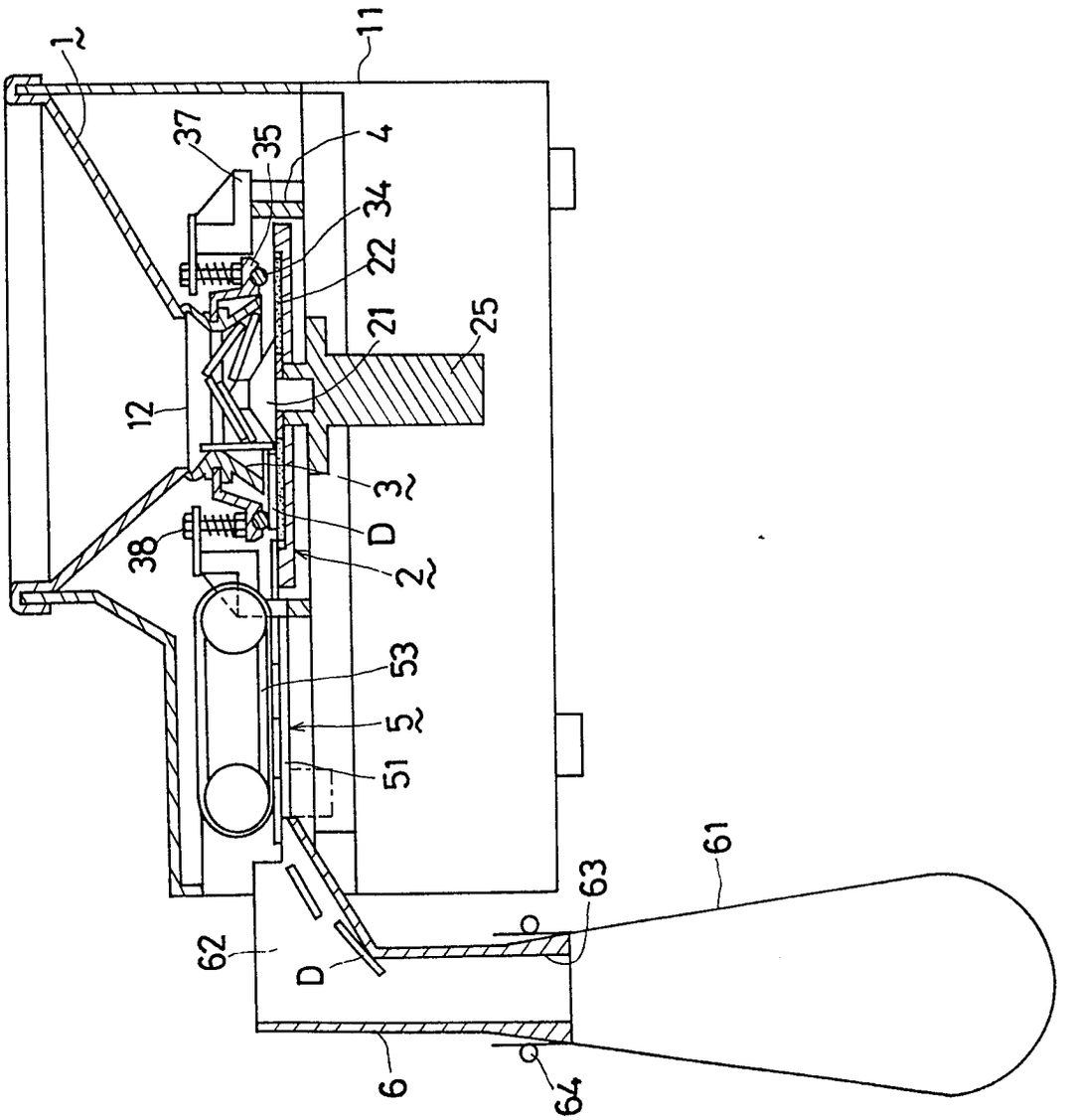
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FIG.6.

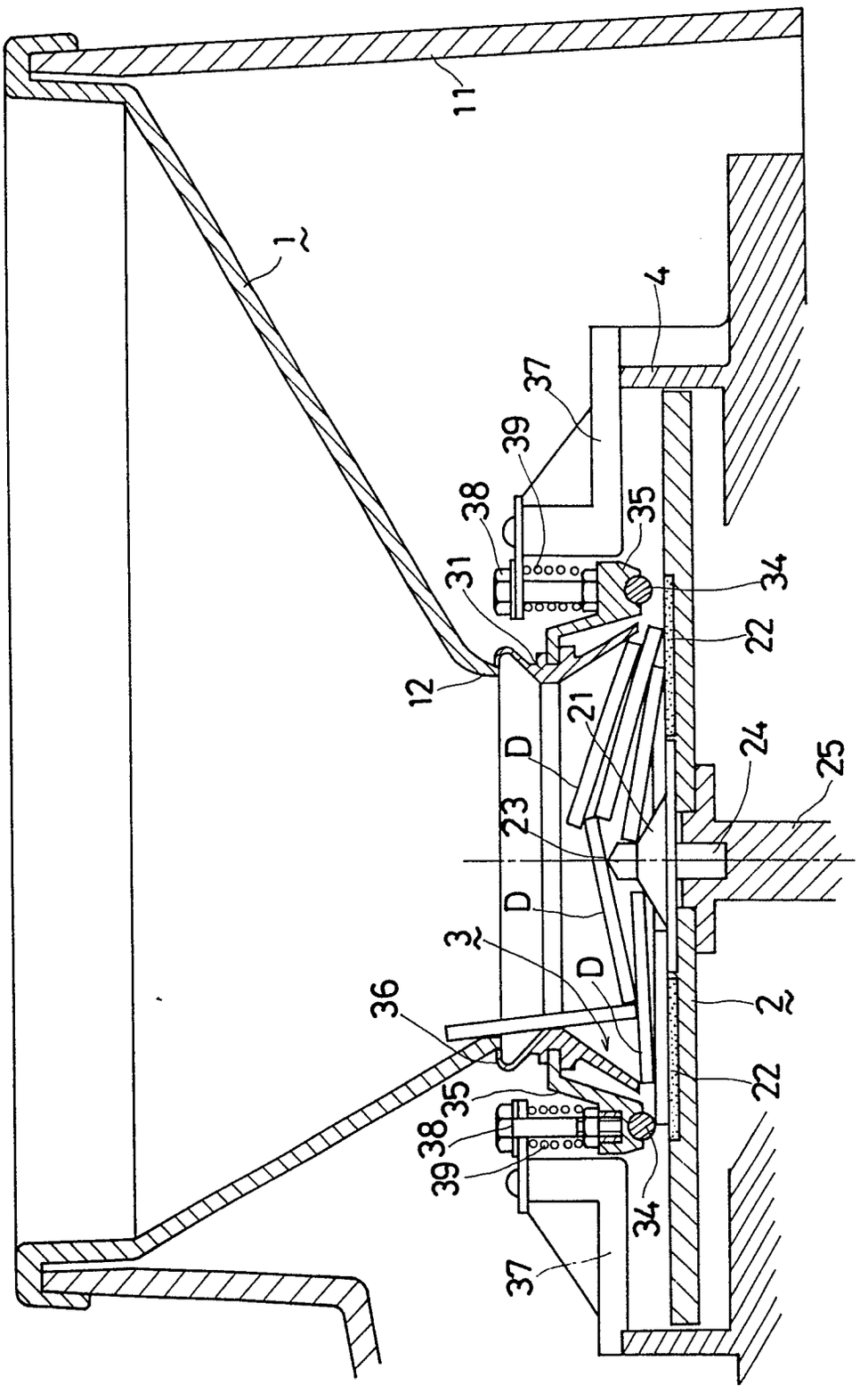

FIG.9.

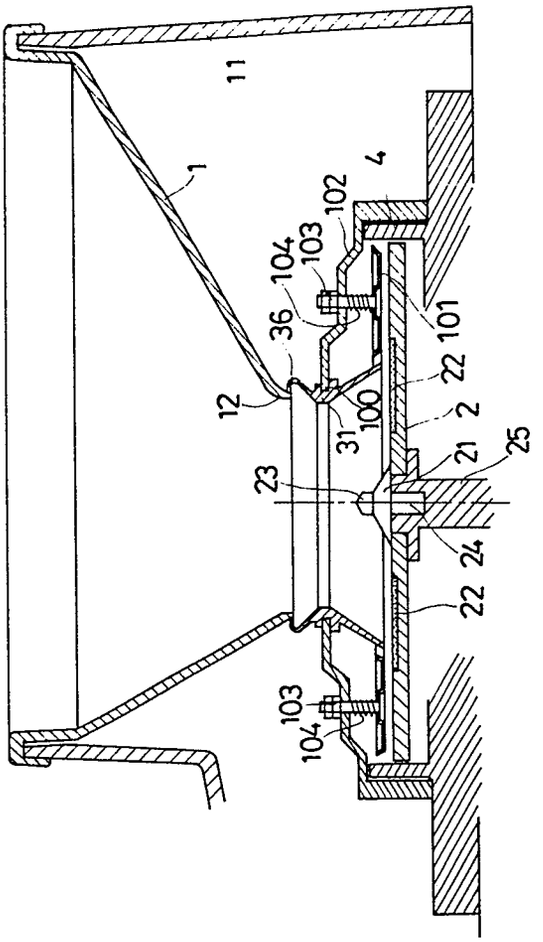
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FIG.8.

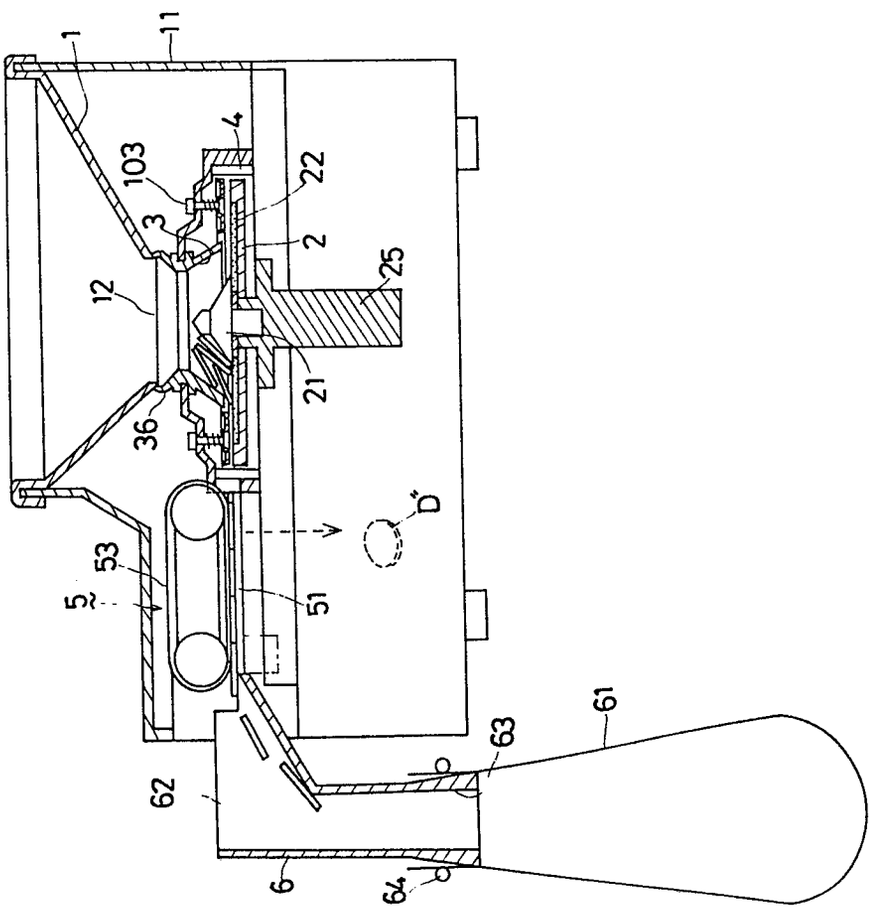
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FIG.11.

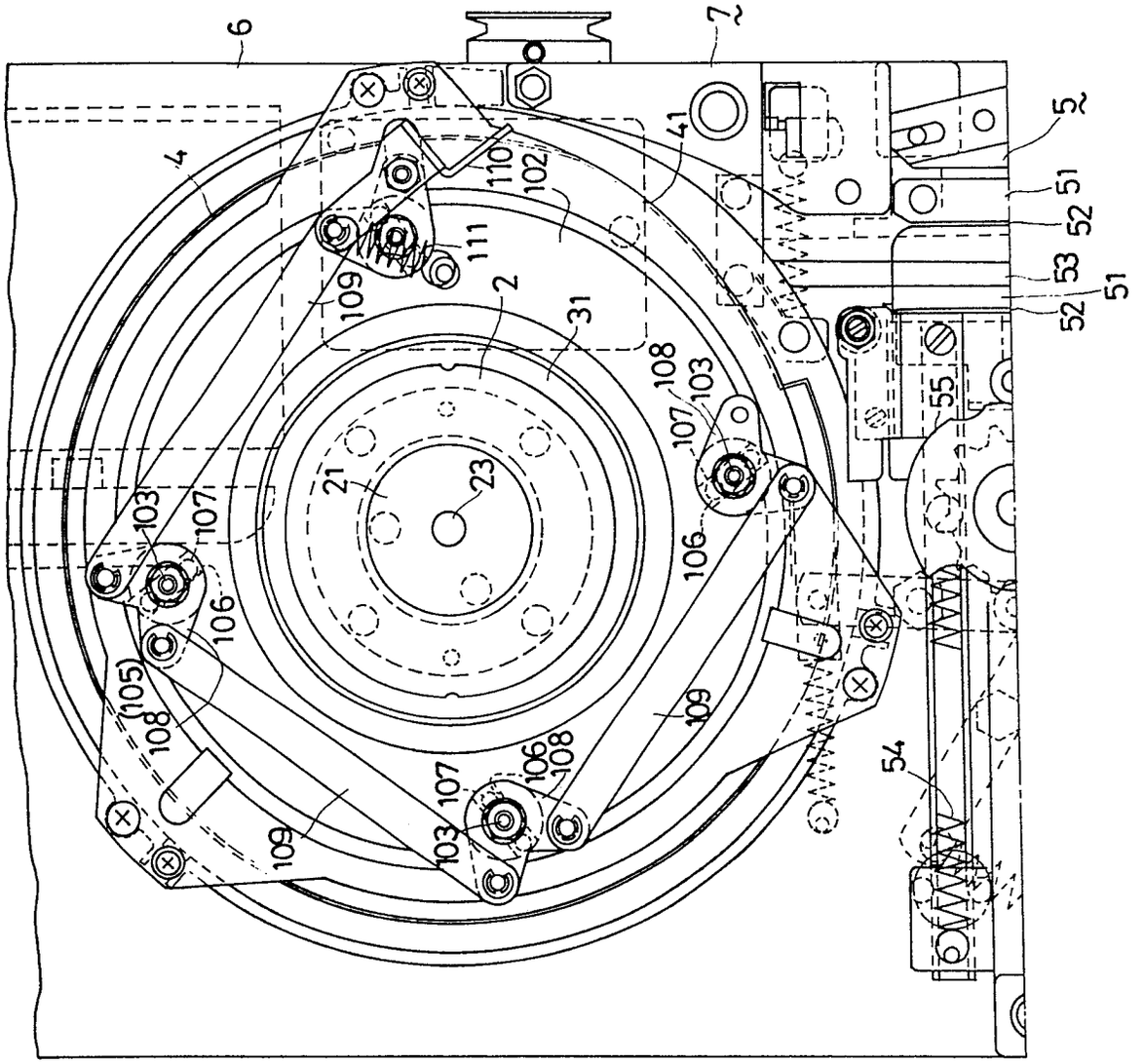
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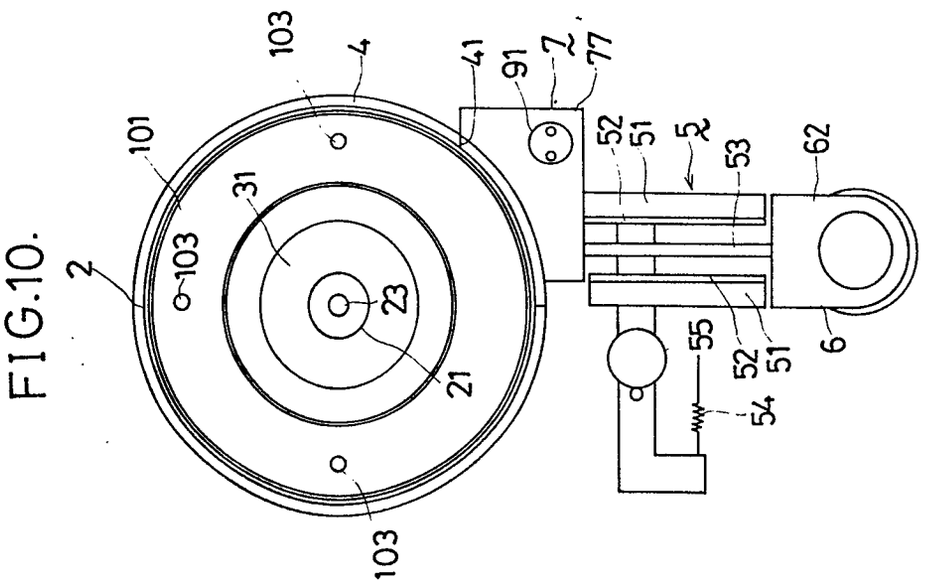
FIG.10.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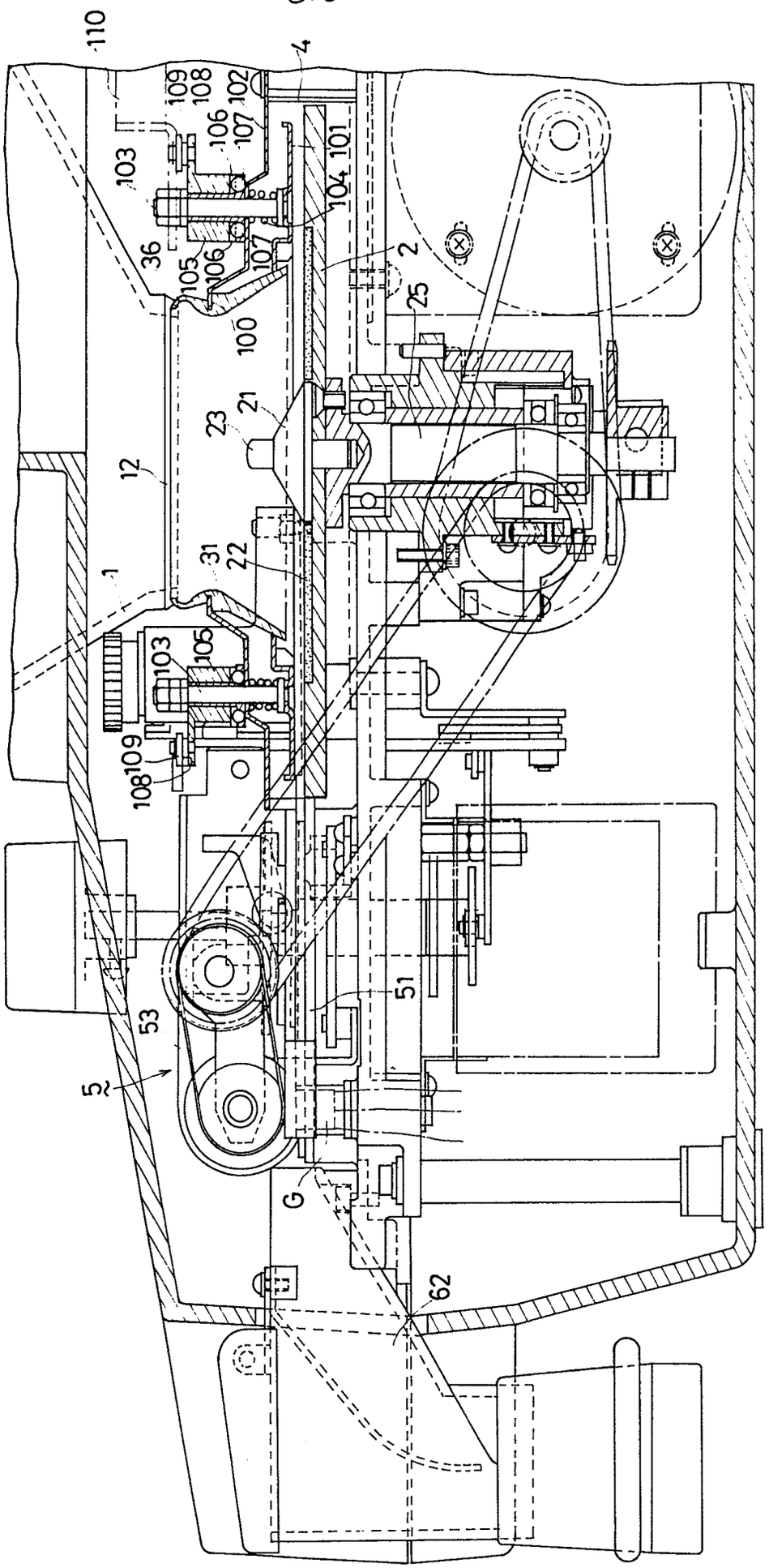
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FIG.12.

FIG.15.

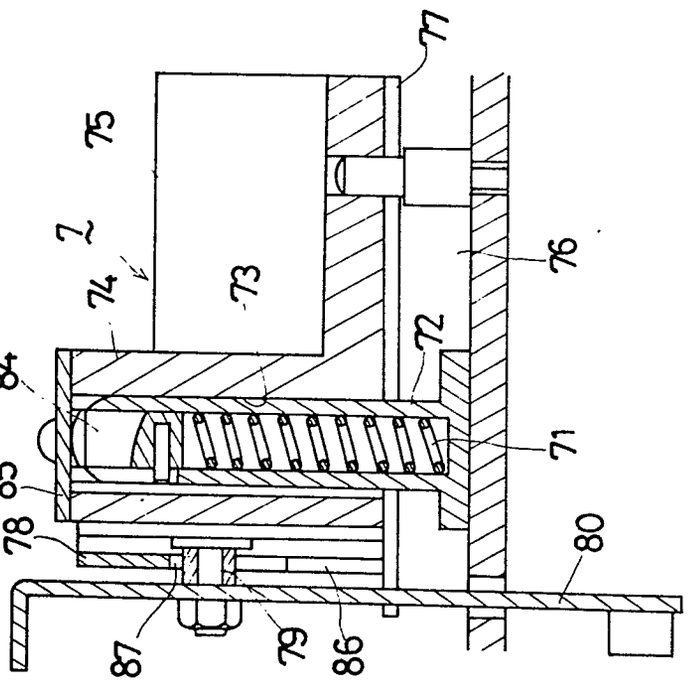

FIG.13.

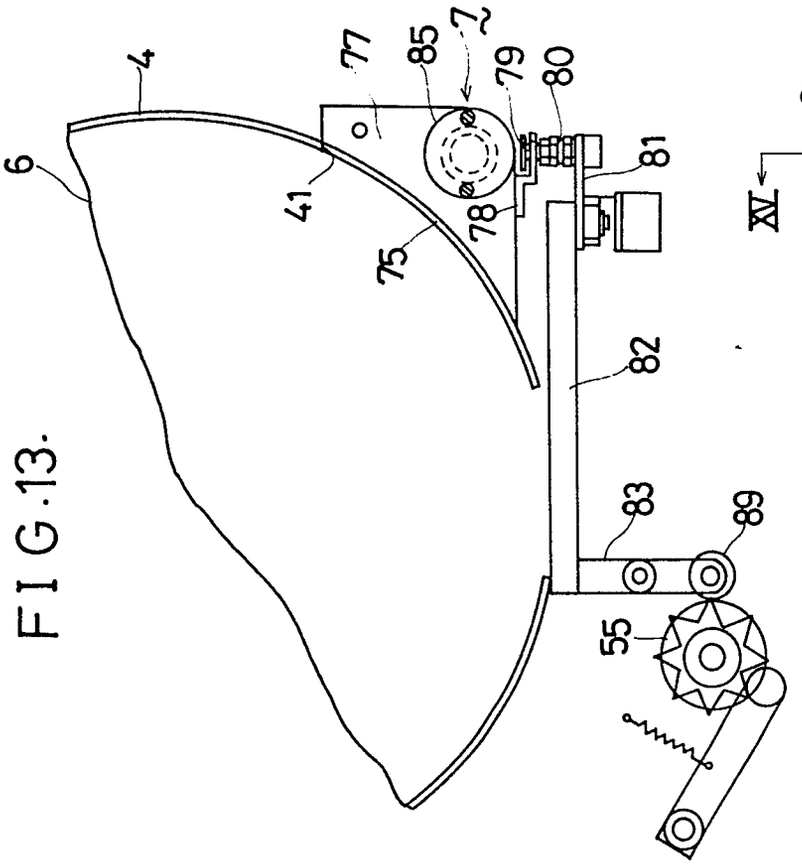

FIG.14.

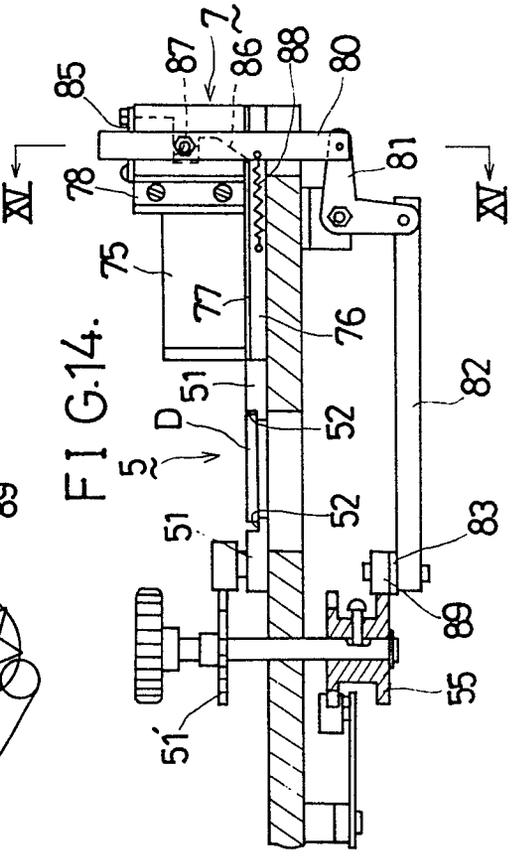

FIG.18.

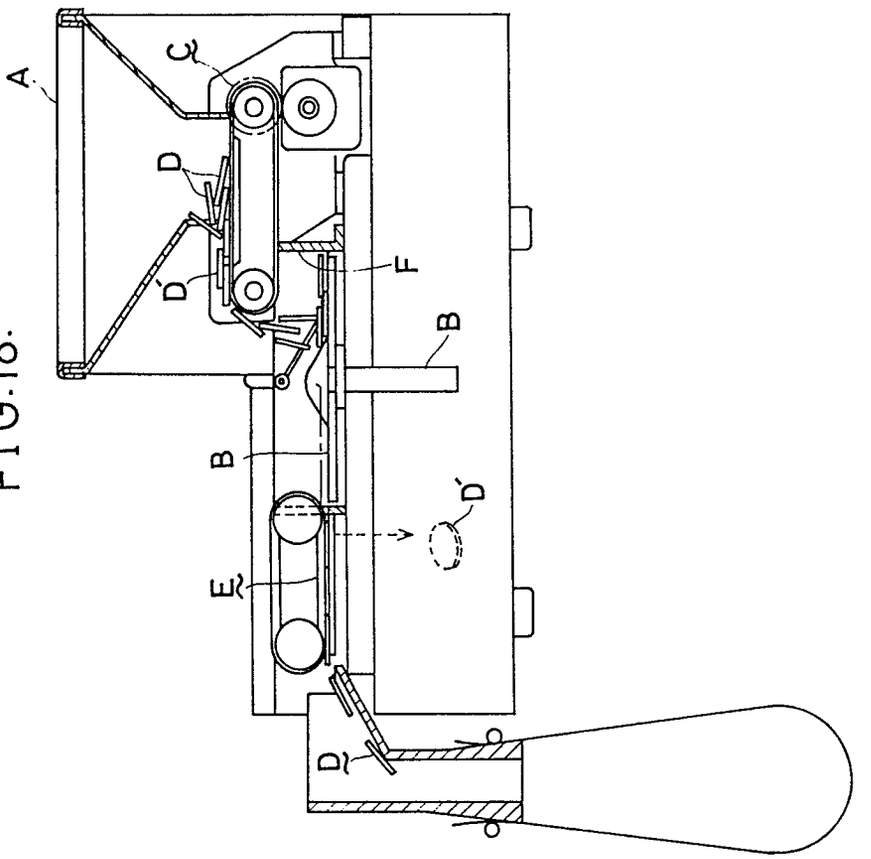

FIG.16.

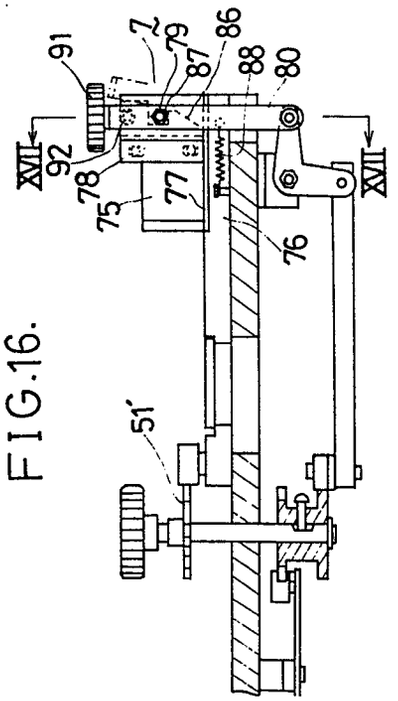

FIG.17.