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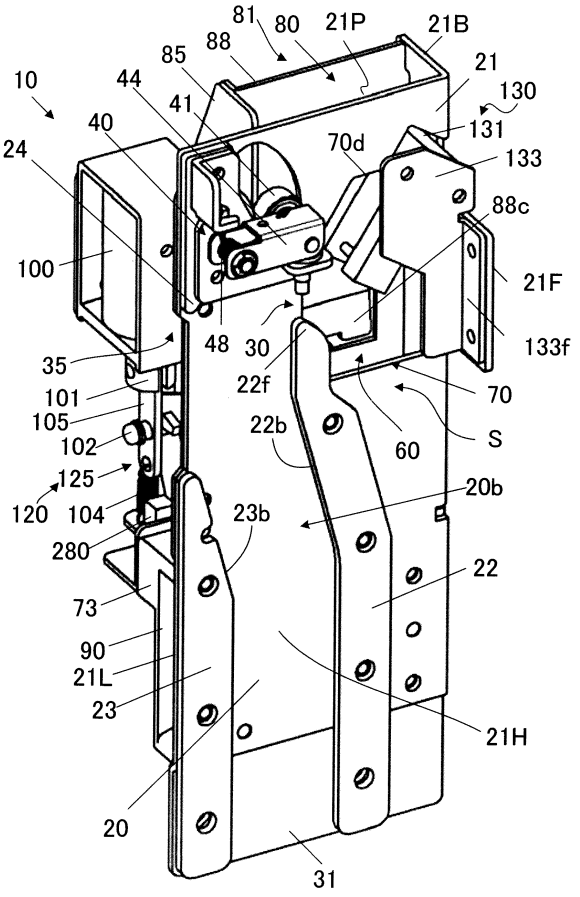
(54) **Disc guiding apparatus**

(57) A disc guiding apparatus comprises: a guide path (20) that guides disc d in its circumferential direction in line, a disc discharging means (40) that discharges disc d through an outlet (30) of the guide path (20), a discharge path (60) through which discharged disc d is guided, a sensing means (130) that senses disc discharged into the discharge path (60), a sorting path (80) through which disc d from the discharge path (60) is sorted and discharged, and a sorting means (120) of disc d provided in the sorting path (80).

Fig.3



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Description

[0001] The present invention relates to an improvement in a disc guiding apparatus that guides discs in line while circumferences thereof are in contact with each other, and selectively sorts discs to left and right of a guide path.

[0002] The term "disc" used herein implies coins which are currency, substitutive money such as medals for game machines and tokens, and the like.

[0003] As a conventional art, there is known an apparatus that comprises a guide path means that guides discs in line, an opening/closing means that pushes out disc disposed in an upper opening of the path means, a sorting path into which disc pushed out through the opening enters, a sorting means that sorts disc from the sorting path into either one of two paths, and a disc sensing means made up of a driven member disposed at the position where it comes into contact with a disc flipped into the sorting path through the opening and a sensor that senses the driven member. In this conventional apparatus, a disc is pushed up through the path means to reach the opening. This disc is shifted from the path means to the sorting path by being pushed by the opening/closing means at the opening. In this course, it is possible to sense discharge of disc by sensing the movement of the driven member because the driven member moves by being pushed by the disc. Then the disc is selectively sorted into right or left from the path means by the sorting means (see Japanese Unexamined Patent Publication No. 2005-74098 (Figs. 1 to 6, pp. 4 to 9).

[0004] In the above-described conventional art, a disc is pushed in the thickness direction of the disc, namely the face direction by the opening/closing means in an upper opening of the guide path, and moved from the guide path to the sorting path. When the disc is pushed up through the guide path, and then the entire disc comes into general coincidence with the opening, the disc is moved as described above. Then the sensor is actuated by the disc. The conventional art advantageously increases the allowable range of stopping position of disc. However, there is a fear that a disc is sensed by the sensor plural times due to bouncing as a result of vigorous collision and accompanying back action of the disc.

[0005] Therefore, the conventional apparatus of the type that a disc is sorted and discharged by being pushed out in the face direction of disc may lead to erroneous operation of the sensor as described above, and may raise the problem that discharge control of disc is not appropriately conducted.

[0006] The present invention was devised in consideration of the above points.

[0007] One aspect of the present invention is a disc guiding apparatus which comprises: a guide path that guides a disc in its circumferential direction in line, a disc discharging means that discharges a disc through an outlet of the guide path, a discharge path through which discharged disc drops under guidance, a sensing means that senses disc discharged into the discharge path, a sorting path through which a disc from the discharge path is sorted and discharged, and a sorting means of a disc provided in the sorting path. According to this aspect, a disc will be sorted at the end of discharge path when it is dumped into the discharge path from the guide path, and a disc may be sorted and discharged with such a simple path structure. Therefore, it is possible to provide a disc guiding apparatus with low costs. Since discharge of disc is sensed independently of operation of disc discharging means by the disc sensing means disposed in the discharge path, it becomes possible to sense a disc stably and accurately. Since a disc is bumped out such that it passes through the outlet of the guide path along the direction in which the disc is guided, operation of the discharging means will not be largely inhibited even if the disc bridges over the outlet to some extent. Therefore, a disc can be discharged independently of the position of the uppermost disc, and hence it is unnecessary to change the length of the guide path even when the size of disc is changed.

[0008] The present invention provides a disc guiding apparatus capable of accurately sensing a disc dispensed from a guide path and discharging the disc after smooth sorting. Also, it provides a disc guiding apparatus that achieves sorting with simple structure and mechanism by sorting a disc after discharging the disc in its circumferential direction, and enables the apparatus to be made compact.

[0009] Another aspect of the present invention is a disc guiding apparatus which comprises a base plate which serves as a passage plate, a guide path formed along the base plate, that guides a disc in line, a disc discharging means disposed at an outlet of the guide path and biased on the side of the guide path, a discharge pat formed next to the guide path so that it laterally guides a disc discharged from the guide path, a sorting path communicating with the discharge path, a sensing means that senses a disc passing through the discharge path, a first path and a second path situated below the sorting path, an introduction opening that introduces a disc to the sorting path from the discharge path, and a sorting means that causes the sorting path to communicate with either one of the first path and the second path by selective switching therebetween, wherein the guide path is bent to come nearer to either side with respect to the base plate near the outlet to shift the path, and space over the base plate created by this shift of the guide path is formed with a discharge path having a rectangular section that is arranged in parallel with the guide path, and the sorting path is formed in parallel with the discharge path.

[0010] According to this aspect, the path is shifted by bending the guide path near the outlet to cause the base plate to deflect to either end. The space created by the shift of path can be secured on the base plate in opposite side of the guide path. Therefore, by using this space, it is possible to form the discharge path serving as a relay

path relaying between the guide path and the point where the disc is discharged outside, in parallel with the sorting path into which a disc is discharged from the discharge path. Since the discharge path and the sorting path can be disposed within the width of the base plate, it is possible to provide an escalator having small entire width, and to realize compactification.

[0011] The discharge path may be provided with the disc sensing means, and the introduction opening is disposed downstream of the sensing means, while an introduction guide for guiding a disc into the introduction opening is further provided.

[0012] Since sensing of disc is conducted by the disc sensing device by sensing a discharged disc, it is unnecessary to adjust the length of the guide path even when disc size is changed. A disc enters the sorting path through the introduction opening by its own weight in the course of dropping, and opening/closing means for pushing out a disc as is conventionally provided to the opening is not provided on the lateral face of the path. Further, since there is no disc sensing means that strokes in the direction of thickness of the path, the apparatus can be made thin. Further, since there is an introduction guide that guides a disc into the induction opening in the discharge path, it is possible to naturally guide a disc into the sorting path from the guide path only with a simple means. Also smooth dispensing of disc is realized.

[0013] The guide path may be made up of a rectangular base plate, a support plate disposed opposite to the base plate, having generally the same shape with the base plate, and a pair of spacers disposed between the base plate and the support plate while keeping a clearance corresponding to passing width of the a disc therebetween, and the discharge path is defined between the base plate and the support plate, as a space having a rectangular section and running in parallel with the guide path, and in end parts of the pair of spacers facing to each other, oblique guides are provided for forming a deflection path deflected from a straight path of the guide path at a certain angle.

[0014] According to this aspect, by deflectively disposing a pair of spacers in which oblique guides facing each other are formed in their end parts between the base plate and the support plate having substantially the same form, it is possible to readily form a guide path which bends near the outlet and shifts to either end side of the base plate. As a result, it is possible to form a space adjacent to the guide path. Using this space, a spec having rectangular section is defined between the base plate and the support plate, which extends in parallel with the guide path. This space can be a discharge path. Since the guide path and the discharge path can be disposed in parallel with each other within plate width without using a large width of base plate, there arise advantages that the base plate as described above may be used, and the cost reduces.

[0015] Preferably, the introduction opening is provided by forming opening in the base plate constituting a part of the discharge path, and the introduction guide is provided by bending a part of the support plate obliquely downward toward the introduction opening. According to this aspect, as a means for guiding from the discharge path to the sorting path, only forming an introduction opening in the base plate suffices, so that it is unnecessary to provide a disc pushing means such as opening/closing means used conventionally. Therefore, the structure can be simplified. Similarly, the introduction guide may be readily and directly provided on the plate by bending process of a predetermined part of the support plate. Since the introduction guide is an oblique plate oriented obliquely downward toward the introduction opening, a disc is guided to the introduction opening and smoothly enters the sorting path during dropping through the support path. Although the introduction guide projects into the discharge path, it will not interfere with the travel of the disc because the lower end of the introduction opening is situated slightly higher at the most downstream position of the path.

[0016] In the following, a disc guiding apparatus embodying an example of the present invention will be explained based on the attached drawings, in which:-

Fig. 1 is an overall perspective view of a hopper to which a disc guiding apparatus of an example of the present invention is attached;
Fig. 2 is a perspective view of the disc guiding apparatus of Figure 1;
Fig. 3 is a perspective view of the disc guiding apparatus in which a holding plate is removed;
Fig. 4 is a perspective view of the disc guiding apparatus viewed from the rear;
Fig. 5 is a perspective view of the disc guiding apparatus from which a plate cover is removed, viewed from the rear;
Fig. 6 is a front view of the disc guiding apparatus;
Fig. 7 is a plan view of the disc guiding apparatus;
Fig. 8 is a left side view of the disc guiding apparatus;
Fig. 9 is a back view of the disc guiding apparatus;
Fig. 10 is a right side view of a disc guiding apparatus;
Fig. 11 is a perspective view in which constituents on the front side where a guide path of the disc guiding apparatus is provided are shown in exploded manner;
Fig. 12 is a perspective view in which constituents on the back side where a sorting path of the disc guiding apparatus is provided are shown in exploded manner;
Fig. 13 is a front view of the disc guiding apparatus; and,
Fig. 14 is a section view along the line B-B in Fig. 13.

[0017] First, in Fig. 1, a hopper 1 has a frame 2, a cylindrical bowl 3 secured to the frame 2 for retaining discs d and a rotary disc (not shown) rotating in a bottom part of the bowl 3 for discharging discs d. The hopper 1 is disclosed, for example, in Japanese Unexamined Pat-

ent Publication JP-A 6-150102. An escalator 5 extending upward is secured to the frame 2. The escalator 5 includes a vertically extending rectangular base 5a, a pair of elongated horizontal spacers having a thickness which is slightly larger than that of disc d (not shown), and a pair of support plates 5b, 5c abutted to the spacers. The interval between the pair of spacers is slightly larger than diameter of disc d. The interval between the support plates 5b, 5c is smaller than the interval between the spacers. By screwing a screw 6 penetrating through the support plate 5b, 5c and the spacers, into the base 5a, they are integrated each other. The space surrounded by the base 5a, the spacers, the support plates 5b, 5c, having a rectangular section and extending vertically defines an escalator guide path 7.

[0018] To the top part of the escalator 5, a sorting device 10 is attached. Next, the sorting device 10 will be explained with reference to Figs. 2 to 14. The sorting device 10 has a function of dispensing each disc d conveyed under guidance of the escalator guide path 7 while sorting it selectively right or left. The sorting device 10 includes a guide path 20, an outlet 30 through which the disc is discharged, a disc discharging means 40, a discharge path 60, an introduction opening 70, a sorting path 80, a first path 90, a second path 110, a path selecting device 120 and a disc sensing means 130. First, the guide path 20 will be explained. The guide path 20 has a function of guiding each disc d conveyed under guidance of the escalator guide path 7 into a predetermined direction. As shown in Figs. 2, 11 and 14, for example, a rectangular base plate 21 having a crank-shaped bottom part is disposed substantially perpendicularly. On the front side 21H of the base plate 21, two spacers 22, 23 having different lengths are disposed in parallel with each other in the vertical direction (see Fig. 3 and Fig. 7). A guide spacer 24 which is a third spacer is disposed on the extended line of the shorter spacer 23.

[0019] As shown in Fig. 6, the longer spacer 22 has a vertically extending rectangular shape including a straight guide part 22a, an oblique guide shape 22b which diagonally bends at a certain angle of inclination, and a straight guide part 22c which is parallel with the straight guide part 22a but shorter than the same. On the outside of an end part of the shorter straight guide part 22c, there is formed a rolling guide part 22e which is curved such that disc d discharged laterally through the outlet 30 in an end part of the guide path 20 (described later) can easily roll downward toward the discharge path 60 as will be described later. On the other hand, the shorter spacer 23 has a vertically extending rectangular shape including a straight guide part 23a, and an oblique guide part 23b formed in an end part of the straight guide. The oblique guide part 23b of the spacer 23 is formed at the same angle with that of the inclined guide part 22b of the spacer 22. The straight guide part 23a of the spacer 23 and the straight guide part 22a of the spacer 22 have substantially the same length.

[0020] In attaching the two spacers 22, 23 to the base plate 21, as shown in Figs. 3 and Fig. 6, the shorter spacer 23 is disposed along one of lateral end edges (left lateral edge) 21L of the base plate 21. Next, the longer spacer 22 is disposed so that the interval with respect to the shorter spacer 23 is slightly larger than diameter of disc d. As a result, a deflection path part 20b is formed in which disc d having traveled straight in the guide path 20 is guided while being curved leftward in Fig. 3 by a deflection guide 22b of the spacer 22 and a guide edge 23b of the spacer 23, when it reaches near the outlet 30 of the guide path 20. On the upstream side of the deflection path part 20b, the straight guide part 22a of the spacer 22 and the straight guide part 23a of the spacer 23 oppose each other to form an inlet path part 20a. On the downstream side of the deflection path part 20b, the straight guide part 22c of the spacer 22 and a path guide cover piece 27k which is bent in the L-shape of a support plate 27 as will be described later (see Fig. 2 and Fig. 11) oppose each other to form an outlet path part 20c having short length.

[0021] Inside a bottom part of the guide spacer 24, an obliquely upward guide edge 24b is formed. The guide spacer 24 is positioned opposite to an end part 22f of the longer spacer 22 to define therebetween the outlet 30 through which disc d is discharged laterally from the end part of the guide path 20. Disc d exiting the guide path 20 is guided to the outlet 30 by the guide edge 24b of the guide spacer 24.

[0022] By disposing the guide spacer 24 and the shorter spacer 23 located below the same while they are vertically distanced from each other, a left side wall of path of the guide path 20 is missing in this distanced region. This missing region, however, is adapted to allow the path guide cover piece 27k of the support plate 27 to be fitted and positioned. That is, for fitting of the guide cover piece 25k, in a left lateral end edge of the base plate 21, an engagement step part 35 (see Fig. 11) is notched. The path guide cover piece 27k of the support plate 27 is fitted into the engagement step part 36, and the missing region between the spacer 23 situated below and the guide spacer 24 situated above is complemented by the guide cover piece 27k to achieve vertical connection, so that the guide path 20 is formed without any missing in the lateral wall of the path. The bending margin of the path guide cover piece 27k complementing the guide path 20 is larger than thickness of the guide path 20.

[0023] The base plate 21 is formed with the introduction opening 70 which further guides each disc d entering the discharge path 60 through the outlet 30 toward the sorting path 80 as will be described later from the discharge path 60. As shown in Fig. 11, on the front face 21H of the base plate, the rectangular support plate 27 is abutted. On the front side 21H of the base plate, a rectangular support plate is abutted to sandwich the spacers 22, 23 and the guide spacer 24. A screw penetrating through the support plate 27, the spacers 22, 23 and the guide spacer 24 (not shown) is screwed into the base plate 21 to integrate them. When the guide spacer

24 is fixed while being sandwiched between the base plate 21 and the support plate 27, the disc discharging means 40 is also fixed on the front side of the support plate 28 by means of the screw for fixing the guide spacer.

[0024] Therefore, by the base plate 21, spacers 22, 23, guide spacer 24 and support plate 27, the guide path 20 extending vertically, having a rectangular section and a bend near the discharge port 30 is formed. The guide path 20 has a width that is slightly larger than diameter of disc d, and a thickness that is slightly larger than thickness of disc d.

[0025] The guide path 20 thus formed has such a structure that it bends toward one side of the base plate 21 near the outlet 30, and the outlet 30 is shifted to either side (left side in Fig. 12) with respect to the inlet 31 of the guide path 20. As a result of bending of the path and shift of the base plate 21 on either (left) side, a space S (see Fig. 3) is created in the adjacent (right) part of the guide path 20. Use of the space S secured on the base plate 21 allows provision of the discharge path 60 for disc d next to the guide path 20. Also, it becomes possible to provide the introduction opening 70 in this space S and to install a disc sensing means 130, the sorting path 80 for disc and the like. Consequently, it becomes possible to house constituents of the sorting device 10 within the width of the plate of the base plate 21, and to make the escalator compact.

[0026] Next, the disc discharging means 40 will be explained with reference to Fig. 11 and the like. The disc discharging means 40 includes a restriction roller 41, an arcuate guide slot 42 which guides reciprocal movement of the restriction roller 41, a rotation lever 44 which rotatably supports the restriction roller 41 on an end shaft 43, an attachment bracket 45 for the rotation lever 44, and a stopper 46 of the rotation lever 44. The guide slot 42 in which the restriction roller 41 is guided is formed in each of the base plate 21 and the support plate 27. As shown in Fig. 3, the rotation lever 44 is biased in the direction of facing with the outlet 30 by a helicoidal spring 48 provided on a stationary axis 47. At this time, the lower end of the end part of the rotation lever 44 is in abutment with a stopper 46 which projects horizontally from the attachment bracket 45 and held horizontally as shown in Figs. 2, 3 and 6. The top face of the stopper 46 is provided with a cushion member 49 (see Fig. 2).

[0027] After traveling along the guide path 20, and reaching the outlet 30 after bent in S-shape at the deflection path part 20b, disc d comes into abutment with the restriction roller 41. The restriction roller 41 is pushed up by disc d and travels along the guide slot 42. Simultaneously, the rotation lever 44 is pushed up and rotated so that it moves away from the outlet 30 against the elasticity of the helicoidal spring 48. When a diametrical part of disc d passes through the discharge port 30 between the restriction roller 41 and the end part 22f of the spacer 22, the rotation lever 44 rotates to return in the direction of the outlet 30 by means of the helicoidal spring 48. At this time, disc d is flipped laterally from the outlet 30 by the restriction roller 41 provided in the tip end of the rotation lever 44, to enter the discharge path 60. In this case, it is preferably that the elasticity of the helicoidal spring 48 is set so that disc d naturally drops into the discharge path 60 through the outlet 30 of the guide path 20. If the elasticity of the helicoidal spring 48 is so strong that it is flipped with such momentum that disc d hits onto the lateral wall of the discharge path 60, deterioration in durability of the apparatus or unsatisfactory sensing because of dancing of disc d in the discharge path 60 will be unfavorably caused.

[0028] The sorting device 10 is secured by a screw (not shown) while an upper end part of the base 5a of the escalator 5 is inserted into a longitudinal space 8 formed between the base plate 21 and lower end parts of the spacers 22, 23 (see Fig. 10). When the sorting device 10 is secured to the end part of the escalator 5, the spacers 22, 23 are situated on the extended line of spacer (not shown) of the escalator device 5. Therefore, the guide path 20 is situated on the extended line of the escalator path 7.

[0029] Next, the discharge path 60 will be explained. The discharge path 60 is a path through which disc d discharged through the outlet 30 by the disc discharging means 40 is dropped and guided. In the course of dropping, disc d enters the later-described introduction opening 70 provided downstream of the discharge path 60.

[0030] The discharge path 60 is disposed and formed in an upper right side region 21R of the base plate 21 (see Fig. 11). That is, as shown in Fig. 11, the discharge path 60 is a space having a rectangular section shape, defined and formed by being surrounded by the base plate 21, an extended face 27m extending in the upper part and right side region of the support plate 27, the spacer 22, and a flange 21F which perpendicularly projects in the right side end of the base plate 21 so as to be opposite to the spacer 22. The space, namely, the discharge path 60 extends vertically. Therefore, the discharge path 60 extends vertically while it is situated lateral adjacent to the guide path 20. The extended face 27m of the support plate 27 is situated so that it covers most of the introduction opening 70. The flange 21F of the base plate also functions as an attachment bracket for the disc sensor 131 as will be described later.

[0031] The lower end of the extended face 27m of the support plate 27 is provided with an introduction guide 29 facing with the introduction opening 70. The introduction guide 29 is formed by bending a lower end part of the extended face 27m of the support plate 27 obliquely downwardly toward the base plate 21. The introduction guide 29 can be formed integrally with the support plate 27 with such a simple technique like bending process. The introduction guide 29 guides disc d from the discharge path 60 to the sorting path 80 situated parallel with and behind the discharge path 60 through the introduction opening 70. Since the introduction guide 29 has width which is somewhat smaller than the overall width of the introduction opening 70, and situated while it bends

toward the introduction opening 70, it also serves as a bottom plate member for closing the lower end opening of the discharge path 60.

[0032] Next, the introduction opening 70 will be explained. The introduction opening 70 is an opening that allows introduction of disc d having dropped to the discharge path 60 into the sorting path 80. As shown in Fig. 11, the introduction opening 70 is formed by largely cutting the upper and right side region 21R of the base plate 21 into a substantially rectangular shape. The upper edge of the introduction opening 70 is formed into a downward oblique window edge 70d having a fitting notch 70c, and the disc sensing means 130 is mounted obliquely while its upper part is fitted within the window edge 70d, for example, as shown in Fig. 3. The width of the introduction opening 70 is larger than maximum diameter of disc d to be used. Height of the introduction opening 70 is preferably 1.5 times to two times diameter of disc d in the elongation direction of discharge path 60 so that disc d is introduced smoothly.

[0033] Then as shown in Fig. 14, in a lower part of the introduction opening 70, the introduction guide 29 is situated such that it closes the bottom end of the discharge path 60, while it extends through the introduction opening 70 to reach and project from the back side of the base plate 21, namely the sorting path 80. Therefore, disc d having dropped through the discharge path 60 slips down by the introduction guide 29, passes through the introduction opening 70, and is guided from the discharge path 60 into the sorting path 80 disposed behind.

[0034] Next, with reference to Figs. 2, 3, 4, 12, 14 and the like, the sorting path 80 will be explained. The sorting path 80 is provided with a device for sorting disc d having entered from the discharge path 60 through the introduction opening 70 selectively into right and left. As shown in Figs. 2, 3, 4 and the like, a guide channel 81 in the shape of a channel is disposed in parallel in the thickness direction of the discharge path 60 on the back side 21I of the base plate 21. As shown in Fig. 12, the guide channel 81 is formed into a channel shape from the base plate 21, a bracket 21B formed by bending the left end part (in Fig. 12) of the base plate 21 at right angle, a L-shaped second bracket 85 secured to the right end part (in Fig. 12) of the base plate 21, and a plate cover 88 interposed between the bracket 21B and the second bracket 85 and situated in parallel with the base plate 21.

[0035] The base plate 21 and the plate cover 88 can be assembled into a channel shape by bringing upper and lower two latch pieces 21x, 21x of inverse L shape formed in the bracket 21B of the base plate 21 as projections, into engagement just like hooks with upper and lower two engagement step parts 88y, 88y formed in the plate cover 88 side as notches. The second bracket 85 is attached and secured to the base plate 21 by means of a screw (not shown) while its attachment flange 85f is brought into abutment with the base plate 21. A stay 88t of the plate cover 88 is attached and secured to the second bracket 85 by means of a screw (not shown).

[0036] Therefore, the sorting path 80 is a space having a rectangular cross section, defined and formed by the base plate 21, the bracket 21B of the base plate, the second bracket 85 and the plate cover 88. The space, namely, the sorting path 80 extends vertically behind the back region 21P of the base plate 21 in parallel with the discharge path 60. Therefore, the discharge path 60 and the sorting path 80 are disposed in parallel in their thickness direction. In a middle part of the plate cover 88, there is a cover part 88c which is formed by partial cutting up to obliquely project toward the sorting path 60. As shown in Fig. 14, the cover part 88c extends obliquely downward toward the base plate 21 side to assume a hood. Therefore, the cover part 88c will hide an upper end part 122u of a path switching plate 122 by making it be situated under the cover part 88c when the later-described path switching plate 122 swings toward the plate cover 88 side and is stopped by the inner face of the plate cover 88. This prevents dropping disc d from getting caught. Therefore, disc d is advanced smoothly into a predetermined path.

[0037] Next, the fist path 90 and the second path 110 will be explained. As shown in Figs. 5, 8, 9, 12, 14 and the like, under the sorting path 80, a rectangular separate plate 73 is disposed between the base plate 21 and the plate cover 88, in which a right oblique first guide plate part 71 (see Figs. 9 and 12) and a left oblique second guide plate part 72 (see Fig. 9) are integrally formed on left and right faces of a perpendicular partition 73D. Integration is achieved by screwing a screw (not shown) penetrating through the left end part of the plate cover 88 and the separate plate 73 into the base plate 21.

[0038] Since this is relatively unstable cantilever fixation in which the plate cover 88 and the separate plate 73 are attached by a screw to either end side (left end side) where attachment holes 78, 78 thereof (see Figs. 5 and 12) are provided, in order to ensure stable fixation, as shown in Fig. 12, a securing rib 74 is projected on upper end face in the right end side of the separate plate 73, and the securing rib 74 is brought into engagement with a retainer for projection 86 formed in a lower end part of the second bracket 85 (Fig. 10).

[0039] The first guide plate part 71 has a diagonally right down first guide face 75 (shown by diagonally right down chain lines in Fig. 9), and is slightly thicker than disc d. Therefore, by the base plate 21 and the separate plate 73, the first path 90 having a first outlet 91 on the right end face in Fig. 9 is defined. The first outlet 91 opens in the left end face when viewed from front side.

[0040] The second guide plate part 72 has opposite orientation to the first guide plate part 71, and has a diagonally left down second guide face 76 (shown by diagonally left down chain lines in Fig. 9), and is slightly thicker than disc d. Therefore, by the plate cover 88 and the separate plate 73, the second path 110 having a second outlet 111 on the left end face in Fig. 9 is defined. The second outlet 111 opens in the right end face when viewed from front side. Therefore, the discharge path 60

and the first path 90 and the second path 110 also form path arrangement in which they are arranged in parallel in the thickness direction. As a result, it is possible to make thickness of the sorting device 20 as thin as possible. Heights of the first path 90, the first outlet 91, the second path 110 and the second outlet 111 are set to be larger than maximum diameter of disc d to be used. Numbers of paths and outlets for disc d may be 3 or more. In such a case, the path selecting device 120 should be designed to allow sorting into that number of paths.

[0041] Next, the path selecting device 120 will be explained. The path selecting device 120 has a function of selectively guiding disc d traveling along the sorting path 80 into the first path 90 or the second path 110. The path selecting device 120 of example is a path switching device 121, and has a rectangular path switching plate 122 and a swing driver 125 thereof. The path switching plate 122 is situated below the sorting path 80, and its lower end part is situated on the extended line of the separate plate 73.

[0042] As shown in Fig. 12, one shaft 122a projecting from the lower end part of the path switching plate 122, and the other shaft 122b are swingably pivoted while they are inserted into a shaft hole 123 provided in a lower end part of the bracket 21B of the base plate 21, and into the shaft hole 126 provided in a lower end part of the second bracket 85, respectively. From the right side end of the path switching plate 122 where the shaft 122b is provided, an operative pin 127 for allowing the path switching plate 122 projecting at a slightly higher position from the shaft 122b to swing. The operative pin 127 is freely fitted into a slot 128 provided in the second bracket 85. The path switching plate 122 is formed into a convex shape in which width of an upper end part 122u is narrowed, and spans over the substantially full width of the sorting path 80.

[0043] The upper end part 122u of the path switching plate 122 is positioned below the cover part 88c when the path switching plate 122 pivots in the clockwise direction in Fig. 14, and hindered under the cover part 88c, to prevent disc d from getting caught by the same. This is because in this position, the path switching plate 122 is elastically held by weak spring, so that even when the path switching plate 12 slightly moves, the upper end part 122u do not deviate from the shade of the cover part 88c and ensure the guidance to a predetermined path.

[0044] Next, the swing driver 125 of the path switch plate 122 will be explained (see Figs. 8 and 9). A crank 52 in the form of tear drop is rotatably supported by a shaft 51 projecting from the second bracket 85. To a shaft 52b fixed to an end part of the crank 52, one end part of an arm 53 is rotatably pivoted. The operative pin 127 projecting laterally from above the shaft 122b of the path switching plate 122 is inserted into a shaft hole 53b provided in the other end part of the arm 53. As a result, when the crank 52 pivots about the shaft 51, the path switching plate 122 is pivoted via the operative pin 127. Preferably, the path switching plate 122, the crank 52 and the arm 53 molded of resin such as nylon for the purpose of weight reduction. When the weight of these parts are reduced, faster movement of the path switching plate 122 is achieved.

[0045] A solenoid 100 is secured to the second bracket 85. To a plunger 101 of the solenoid 100, an operative plate 105 is connected and secured by a securing pin 106. In a middle part of the operative plate 105, a connecting pin 102 for connection with the crank 52 is provided. On one face side of the crank 52, a metal plate (described later) 56 in a substantially L shape is attached. One end part of the metal plate 56 is provided with an attachment hole (not shown) into which the connecting pin 102 of the operative plate 105 is inserted. Therefore, the crank 52 is connected to the operative plate 105 via the connecting pin 102, and the crank 52 swings about the shaft 51 by linear reciprocal motion of the plunger 100. The plunger 101 of the solenoid 100 is always pulled down by a compression spring 104 disposed between the pin 103 secured to a lower end part of the operative plate 105 and a flange 85f bent in the shape of L in a lower end part of the second bracket 85. The solenoid 100 is selectively excited or demagnetized by a controller (not shown). When the solenoid 100 is demagnetized, the plunger 101 is at the lowermost position by the spring 104. Therefore the crank 52 is rotated in the counterclockwise direction in Fig. 8 about the shaft 51 via the connecting pin 102, and the arm 53 proceeds in the right direction in Fig. 8. Therefore, the path switching plate 122 swings within the hole width of the slot 128 via the crank 52, the arm 53, and the operative pin 127, and is at the position shown by chain lines as shown in Fig. 10. Therefore, when the path switching plate 122 is at this position shown by chain lines, the first path 90 is closed by the path switching plate 122, while the second path 110 is open. In this state, the upper end part 122u of the path switching plate 122 is positioned below the introduction guide 29 so that dropping disc d will not get caught.

[0046] When the solenoid 100 is excited, the plunger 101 is pulled up, and the crank 52 is rotated in the clockwise direction about the shaft 51 via the connecting pin 102, and the arm 53 is returned in the left direction in Fig. 8. Therefore, the path switching plate 122 swings in opposite direction within the hole width of the slot 128 via the crank 52, the arm 53, and the operative pin 127, and rotated in the clockwise direction from the position shown by chain lines in Fig. 10. Therefore, by the path switching plate 122, the first path 90 is opened and the second path 110 is closed. At this time, the upper end part 122u of the path switching plate 122 is posited below the cover 88c to prevent dropping disc d from getting caught.

[0047] A position sensing device 280 for grasping the position of path switching plate 122 is provided. The position sensing device 280 is a transmissive sensor 280S for sensing the position of the crank 52. In this example, when the solenoid 100 is demagnetized, the crank 52 is sensed by the sensor. That is, as shown in Fig. 10, on

one face side of the crank 52, the metal plate 56 in a substantially inversed L shape is attached. The metal plate 56 is in a substantially inversed L shape, and in Fig. 10, an operative piece part 56b of the metal plate 56 is positioned within an upwardly open squared U-shape groove 280m of the sensor 280S to shield the optical axis and the operative piece part 56b is sensed. When the solenoid 100 is excited, the crank 52 pivots so that it will not be sensed by the sensor 280S. That is, the crank 52 rotates in the clockwise direction in Fig. 8, and the operative piece part 56b of the crank 52 exits from the groove 280m of the sensor 280S to establish passage of light, and thus the operative piece part 56b is not sensed. However, also reverse phase is possible. The position sensing device 280 is secured to a flange 88f formed by bending at right angle in a lower end part of the plate cover 88.

[0048] Next, the sensing means 130 for disc d will be explained. As the sensing device, a transmissive photoelectric sensor 131 may be used. The sensor 131 has a fork-like casing 131D as shown in Fig. 11, and at end parts of fork casing parts 131a, 131b, a light emitter and a light receiver are provided. As shown in Fig. 3, the sensor 131 is obliquely disposed between the outlet 30 and the introduction opening 70 in the discharge path 60. In this case, the light emitter and the light receiver are arranged while intervened by the discharge path 60. During dropping through the discharge path 60, the optical axis is blocked when disc d passes between the light emitter and the light receiver of the sensor 131. As a result, disc d is sensed, and disc sensor signal is issued by the sensor 131.

[0049] The sensor 131 is attached and secured to a sensor attachment bracket 133 by means of a screw (not shown). An L-shaped flange 133 is formed by bending integrally with the sensor attachment bracket 133f. The base plate 21 is provided with the flange 21F at right angle. Therefore, the L-shaped flange 133f of the sensor attachment bracket 133 is brought into abutment with the flange 21F and secured by a screw (not shown). As a result, the sensor 131 is attached and secured to the base plate 21, as shown in Figs. 2, 3 and the like. The sensor 131 may be implemented by a reflective photoelectric sensor, proximity sensor, micro switch or the like insofar as it can detect a disc.

[0050] Next, operation of example will be explained. First, operation when the path switching plate 122 closes the first path 90 as shown by chain lines in Fig. 14 will be explained. This in other words, is the condition in which the solenoid 100 is demagnetized, and the plunger 101 is pushed down by the spring 104, and as a result the second path 110 is open. In this condition, the rotation disc 4 rotates and sends disc d one by one to the escalator guide path 7. Discs d are aligned in line while their circumferential faces being in contact with each other in the escalator guide path 7.

[0051] Disc d is sequentially pushed up by disc d which is newly sent from the rotation disc 4, and reaches the guide path 20. The disc d that pushes and elevates along the guide path 20 travels while being curved in the left direction by the deflection path part 20b as it comes near the outlet 30, and travels straight under guidance of the outlet path part 20c after exiting from the deflection path part 20b. Then in the guide path 20, the uppermost disc d pushes up the restriction roller 41 to cause it rotate, to thereby make the rotation lever 44 rotate in counterclockwise direction from the position shown in Figs. 3 and 6.

[0052] As disc d is further pushed up and disc d reaches the outlet 30, the rotation lever 44 is rotated further upward. When diametrical part of disc d passes through the outlet 30, disc d is elastically discharged into the discharge path 60 through the outlet 30 by the restriction roller 41 when the rotation lever 44 returns by the helicoidal spring 48.

[0053] Disc d having discharged into the discharge path 60 drops by its own weight, and passes through the fork parts of the sensor 131 where the light emitter and the light receiver are disposed during dropping, and blocks optical axis of the sensor at this time. Therefore, the sensor 131 outputs a sensor signal. The sensor signal is counted by a controller (not shown). Disc d having passed through the sensor 131 reaches the introduction opening 70, while it is guided to the sorting path 80 side by the introduction guide 29 inclined to the sorting path 80. Disc d further drops by its own weight through the sorting path 80, and then guided to the second path 110 by the path switching plate 122. Disc d having reached the second path 110 rolls on the second guide face 76 and then dispensed through the second outlet 111. These operations are continuously conducted, and the controller stops rotation of rotating disc d when the counting number of disc d reaches a predetermined value.

[0054] When disc d is dispensed through the first outlet 91, the solenoid 100 is excited by the controller (not shown), to make the path switching plate 122 rotate and move oppositely (in the clockwise direction) from the chain lines in Fig. 10, and thereby closing the second path 110 and opening the first path 90. As is already described, disc d having entered the discharge path 60 from the guide path 20 is detected by the sensor 131 during dropping by its own weight. Accordingly, the sensor 131 outputs a sensor signal. Upon reception of the sensor signal, a control circuit executes control similarly as described above. Disc d having passed through the sensor 131 is induced and guided to the sorting path 80 from the introduction opening 70 by the introduction guide 29. Then disc d drops by its own weight, and guided to the first path 90 by the path switching plate 122. Disc d having reached the first path 90 rolls on the first guide face 75 and is dispensed through the first outlet 90.

Claims

1. A disc guiding apparatus comprising:

a guide path (20) that guides discs d in line;

a disc discharging means (40) that discharges each disc (d) in its circumferential direction through an outlet (30) of the guide path (20);
a discharge path (60) through which a discharged disc (d) drops under guidance;
a sensing means (130) that senses a disc discharged into the discharge path (60); and
a sorting path (80) through which a disc (d) from the discharge path (60) is sorted and discharged, and
a disc sorting means (120) provided in the sorting path (80).

2. The disc guiding apparatus according to claim 1, further comprising:

a base plate (21) which serves as a passage plate, the guide path (20) being formed along the base plate, wherein the discharge path (60) is formed next to the guide path (20) so that it guides disc (d) discharged from the guide path (20);
a first path (90) and a second path (110) situated below the sorting path (80); and
an introduction opening (70) that introduces discs (d) to the sorting path (80) from the discharge path (60), wherein
the sorting means (120) causes the sorting path (80) to communicate with either one of the first path (90) and the second path (110) by selective switching therebetween, and wherein
the guide path (20) is bent to come nearer to either side with respect to the base plate (21) near the outlet (30) to thereby shift the path, and space (S) over the base plate (21) created by this shift of the guide path (20) is formed with a discharge path (60) having a rectangular section that is arranged in parallel with the guide path (20), and the sorting path (80) is formed in parallel with the discharge path (60).

3. The disc guiding apparatus according to claim 2, wherein the guide path (20) is made up of a rectangular base plate (21), a support plate (27) disposed opposite to the base plate (21), having generally the same shape with the base plate (21), and a pair of spacers (22, 23) disposed between the base plate (21) and the support plate (27) while keeping a clearance corresponding to passing width of the disc d therebetween, and the discharge path (60) is defined between the base plate (21) and the support plate (27), as a space having a rectangular section and running in parallel with the guide path (21), and in end parts of the pair of spacers (22, 23) facing to each other, oblique guides (22b, 23b) are provided for forming a deflection path (20b) deflected from a straight path (20a) of the guide path (21) at a certain angle.

4. The disc guiding apparatus according to claim 2 or 3, wherein the introduction opening 70 (is) provided by forming opening in the base plate (21) constituting a part of the discharge path (60), and the introduction guide (29) is provided by bending a part of the support plate (27) obliquely downward toward the introduction opening (70).

5. The disc guiding apparatus according to any of the preceding claims, wherein the discharge path (60) is provided with the disc sensing means (130), and the introduction opening (70) is disposed downstream of the sensing means (130), while an introduction guide (29) for guiding discs d into the introduction opening (70) is further provided.

Fig.1

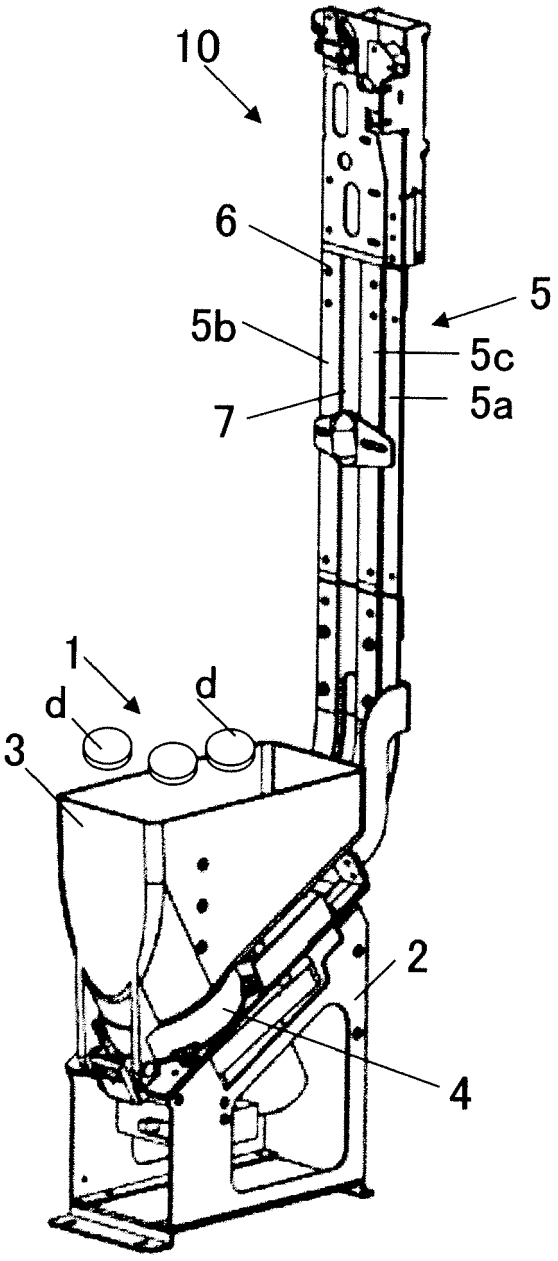
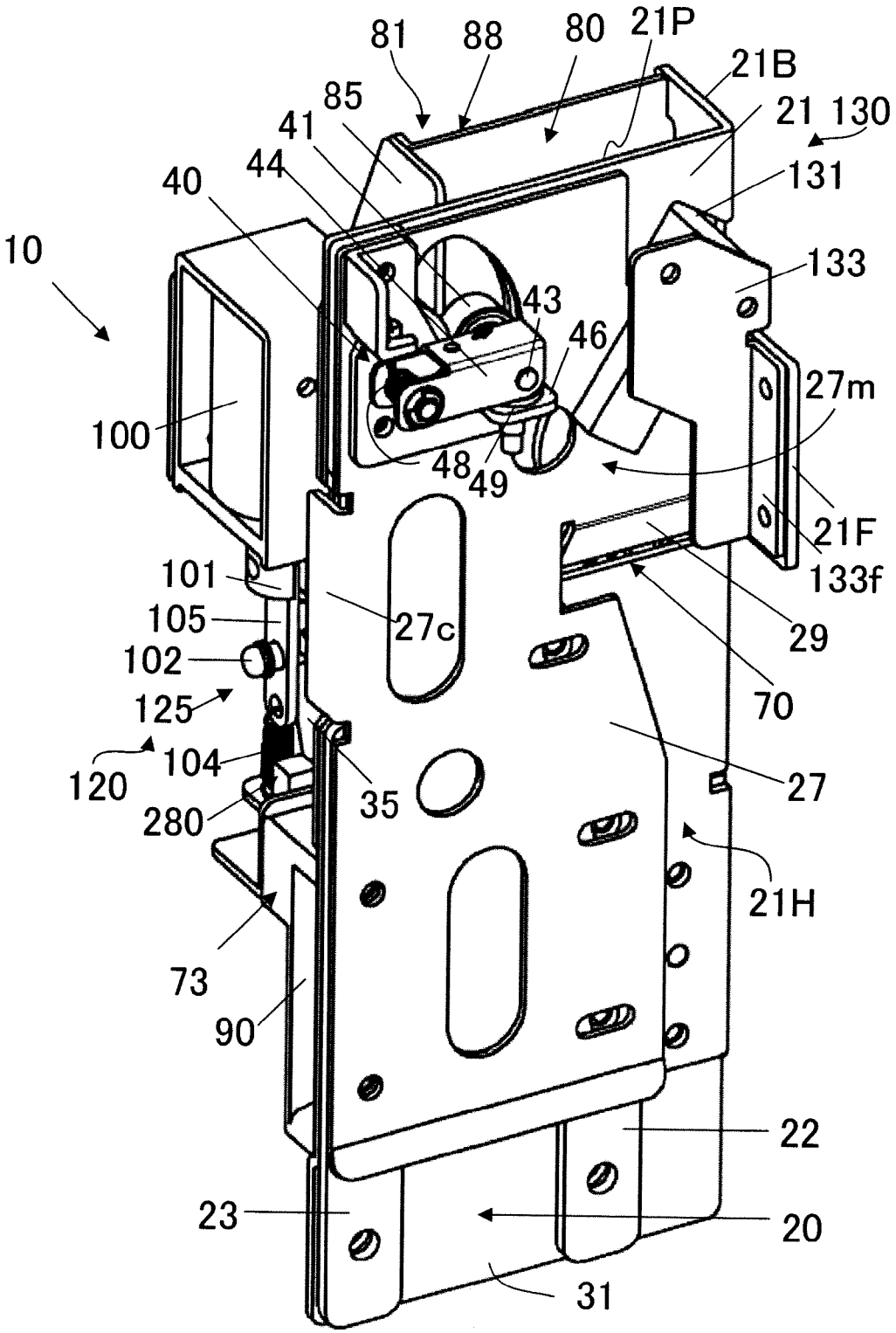


Fig.2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133f
101
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104
27
120
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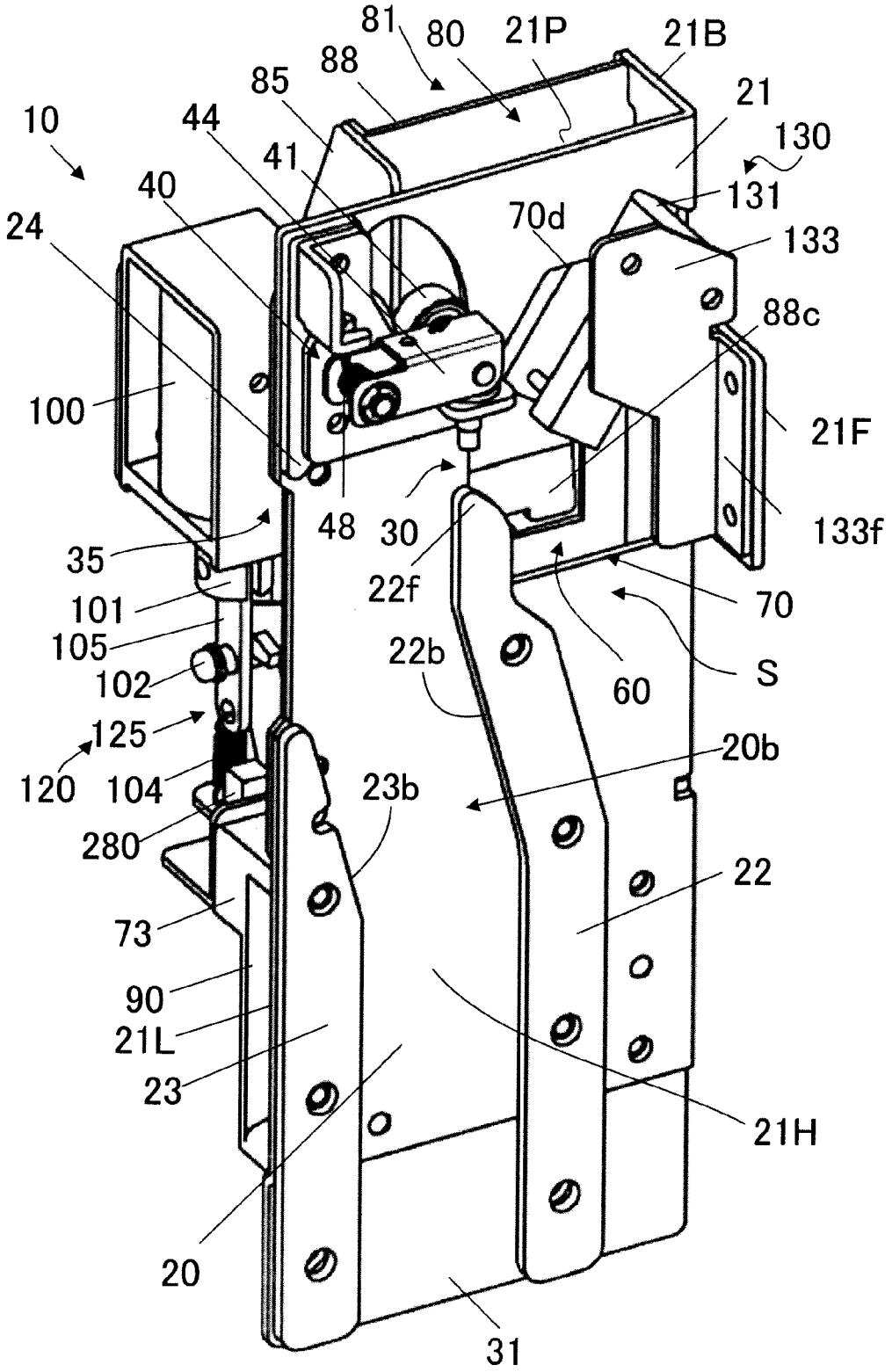
90
22
23
20
31

Fig.3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70
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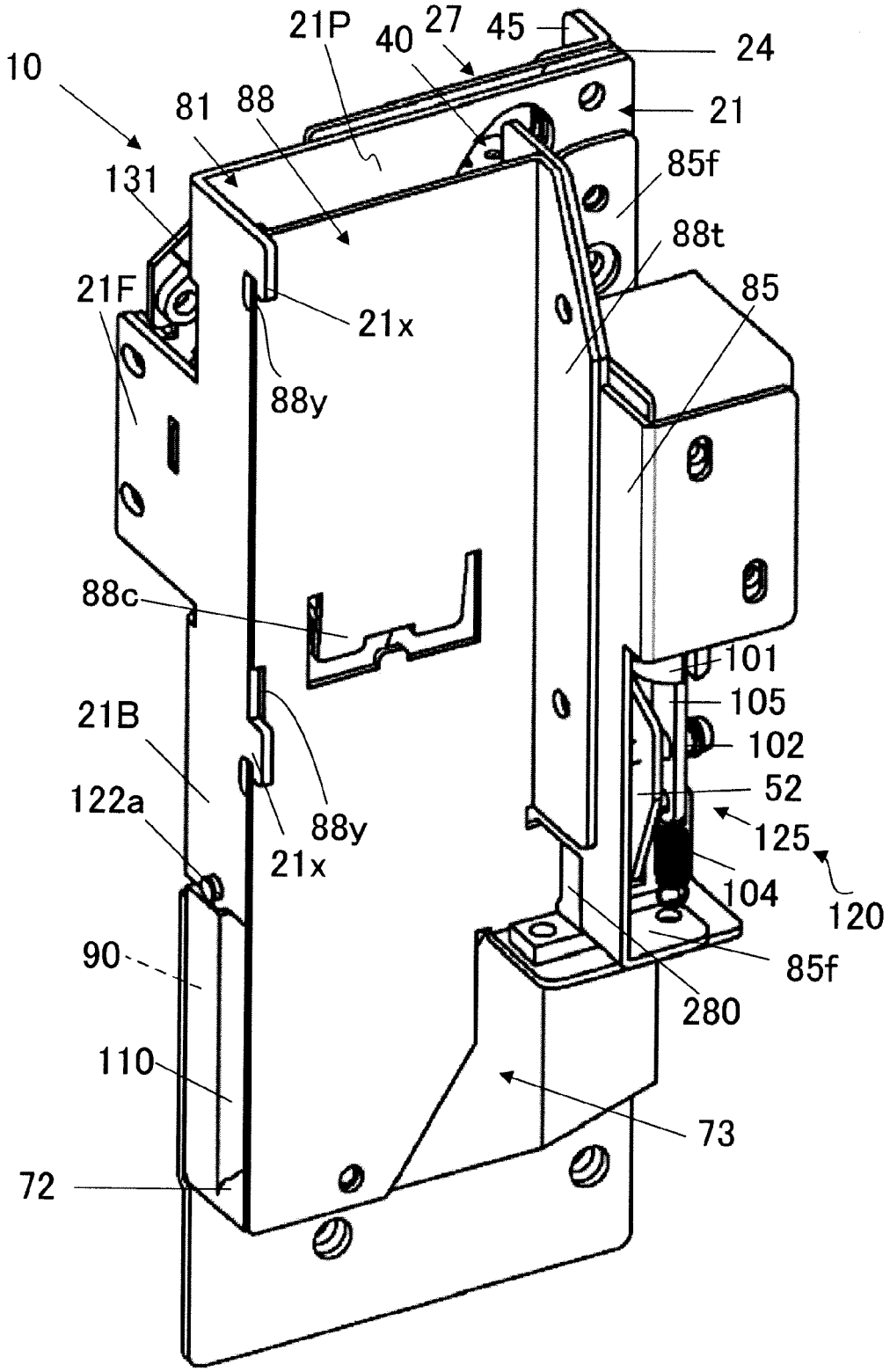
Fig.4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21x
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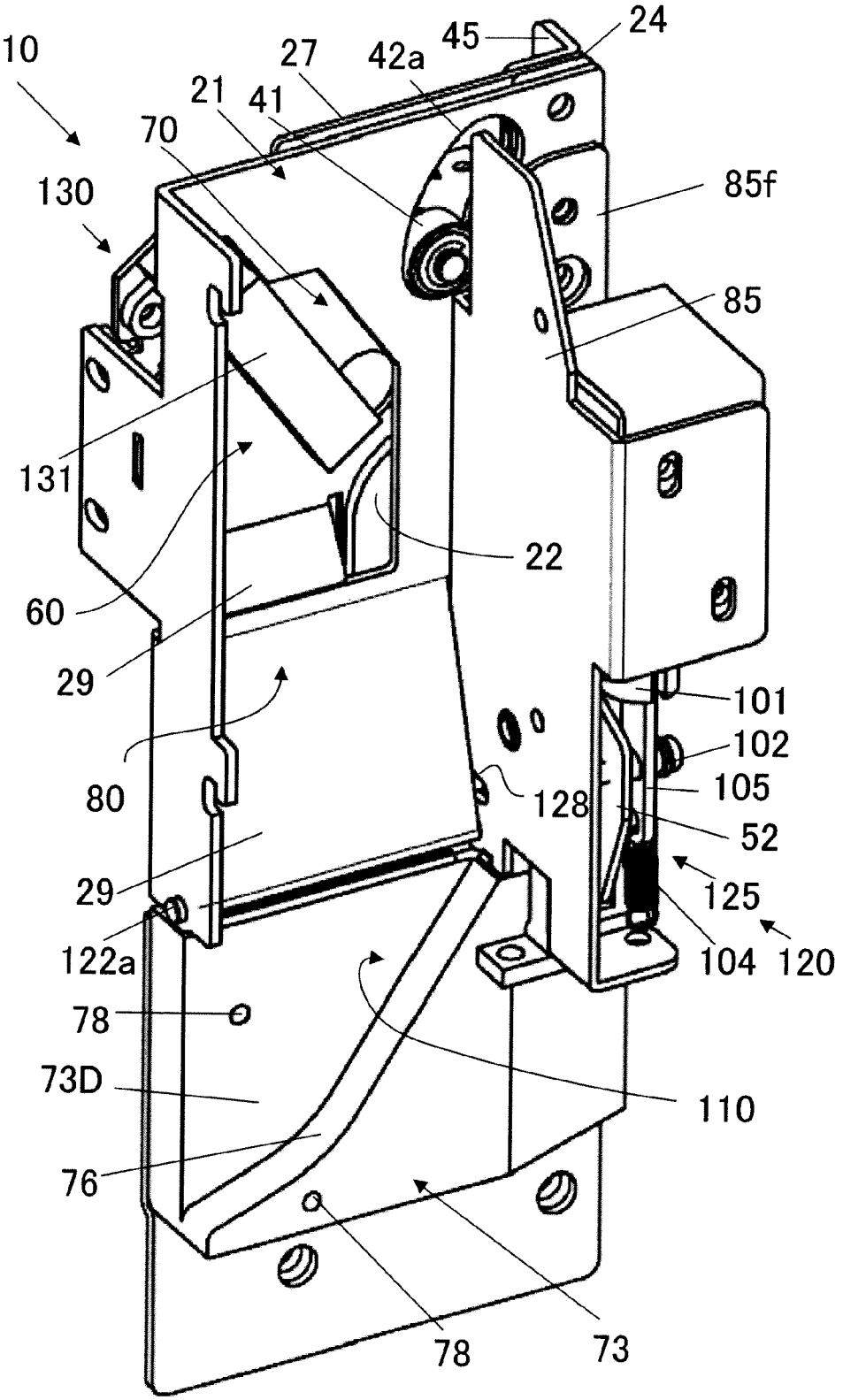
73
72

Fig.5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73D
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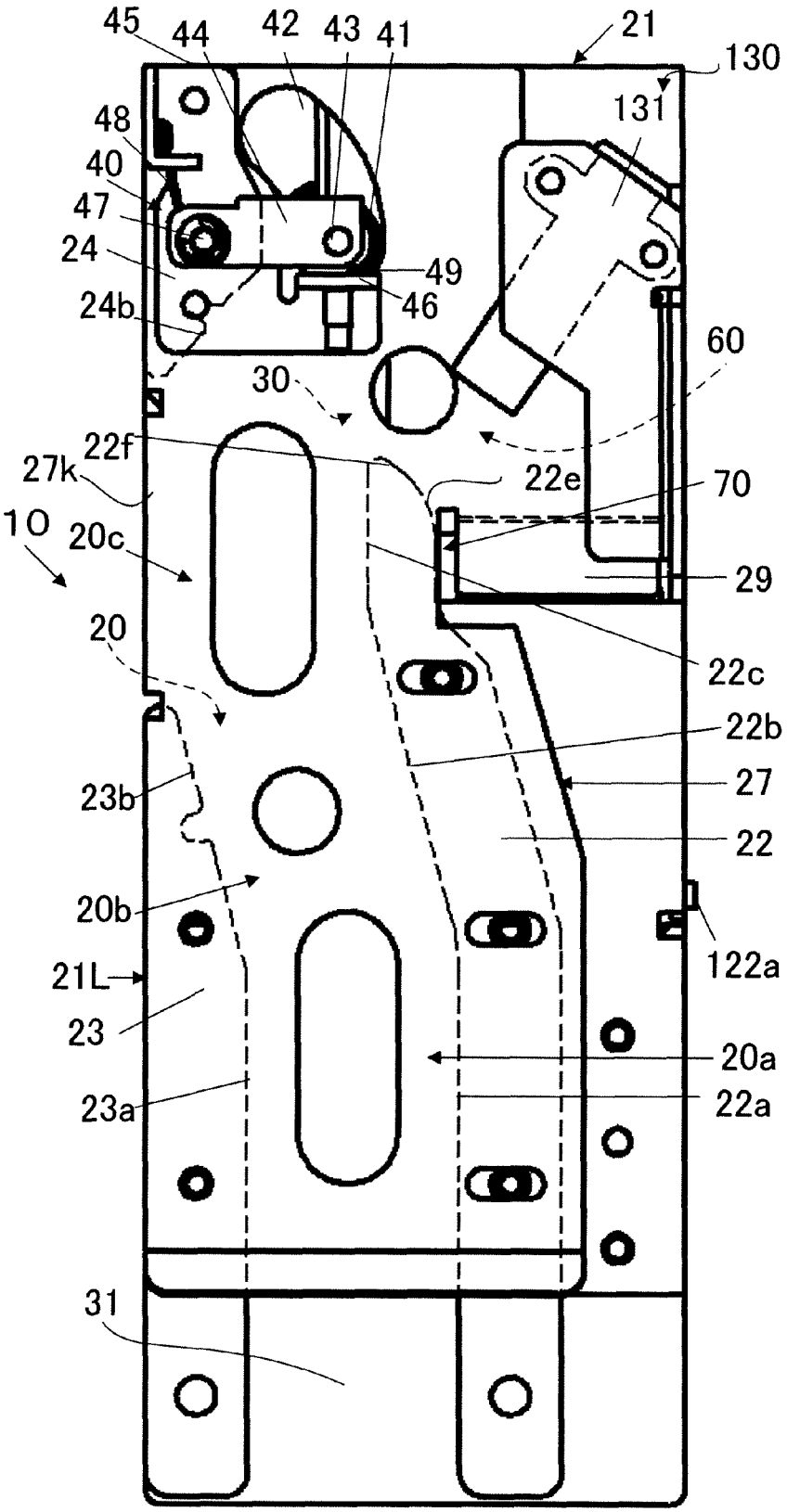
76
78
73

Fig.6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23a
22a
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Fig. 7

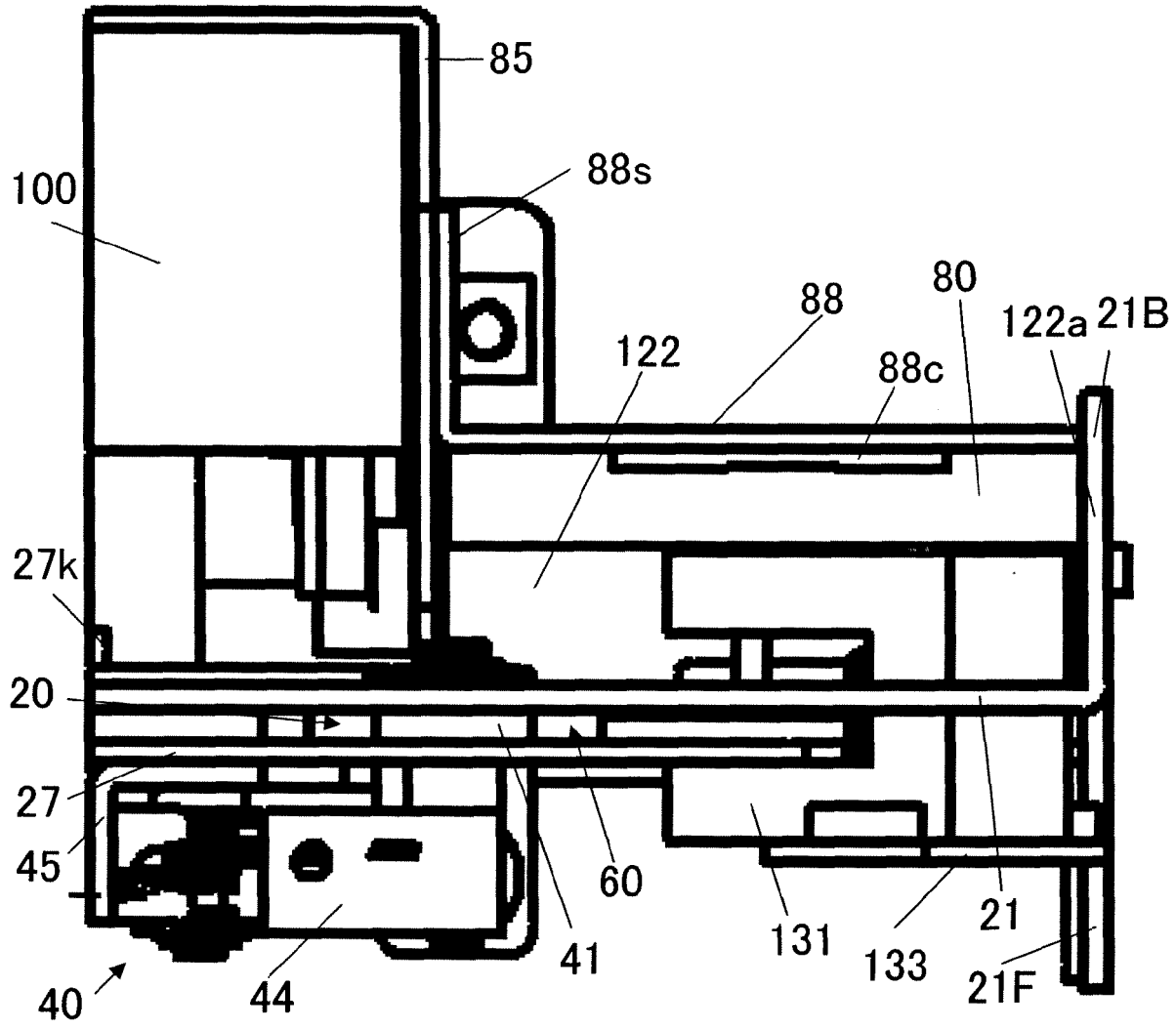
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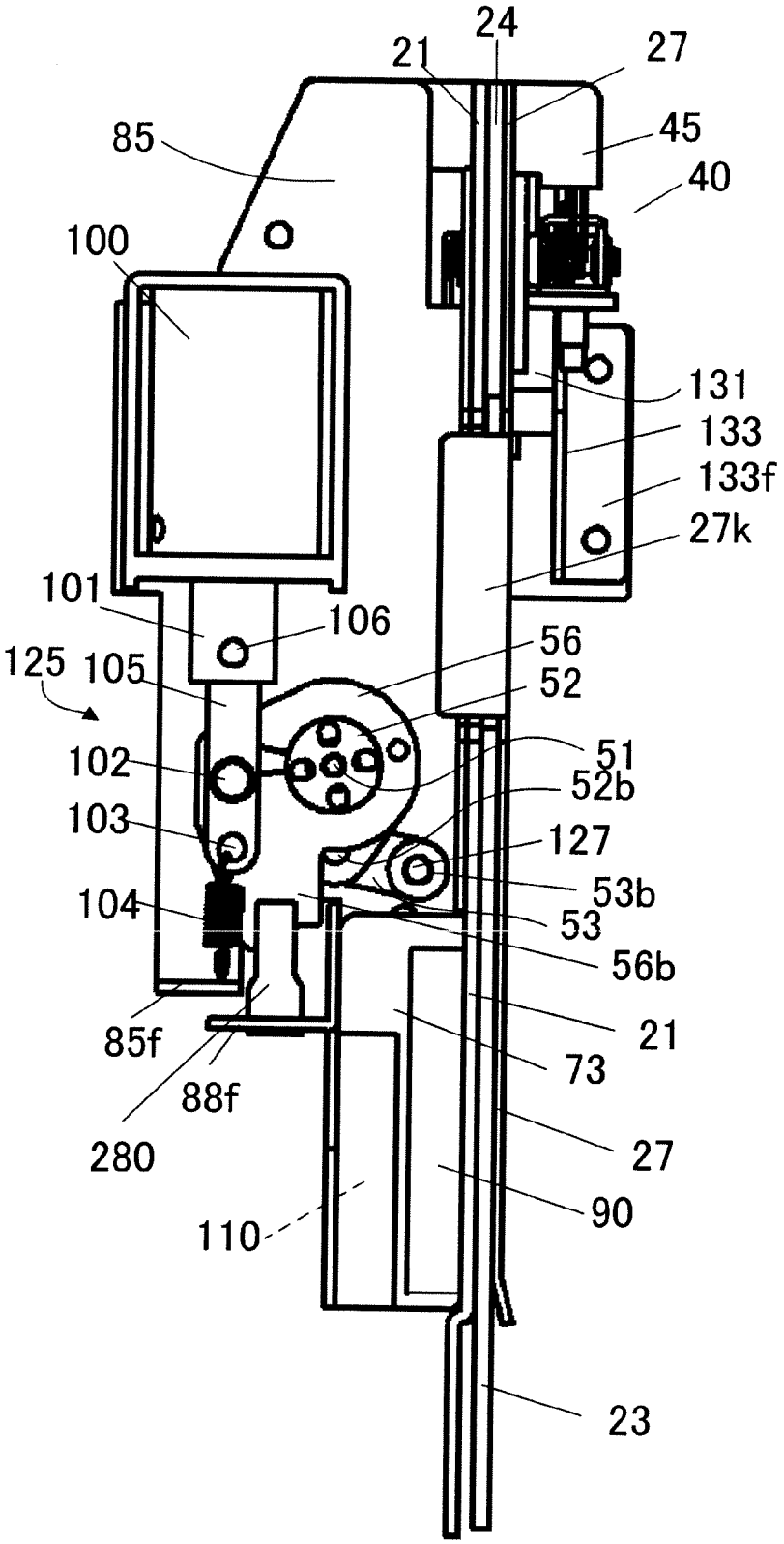
Fig.8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23

Fig.9

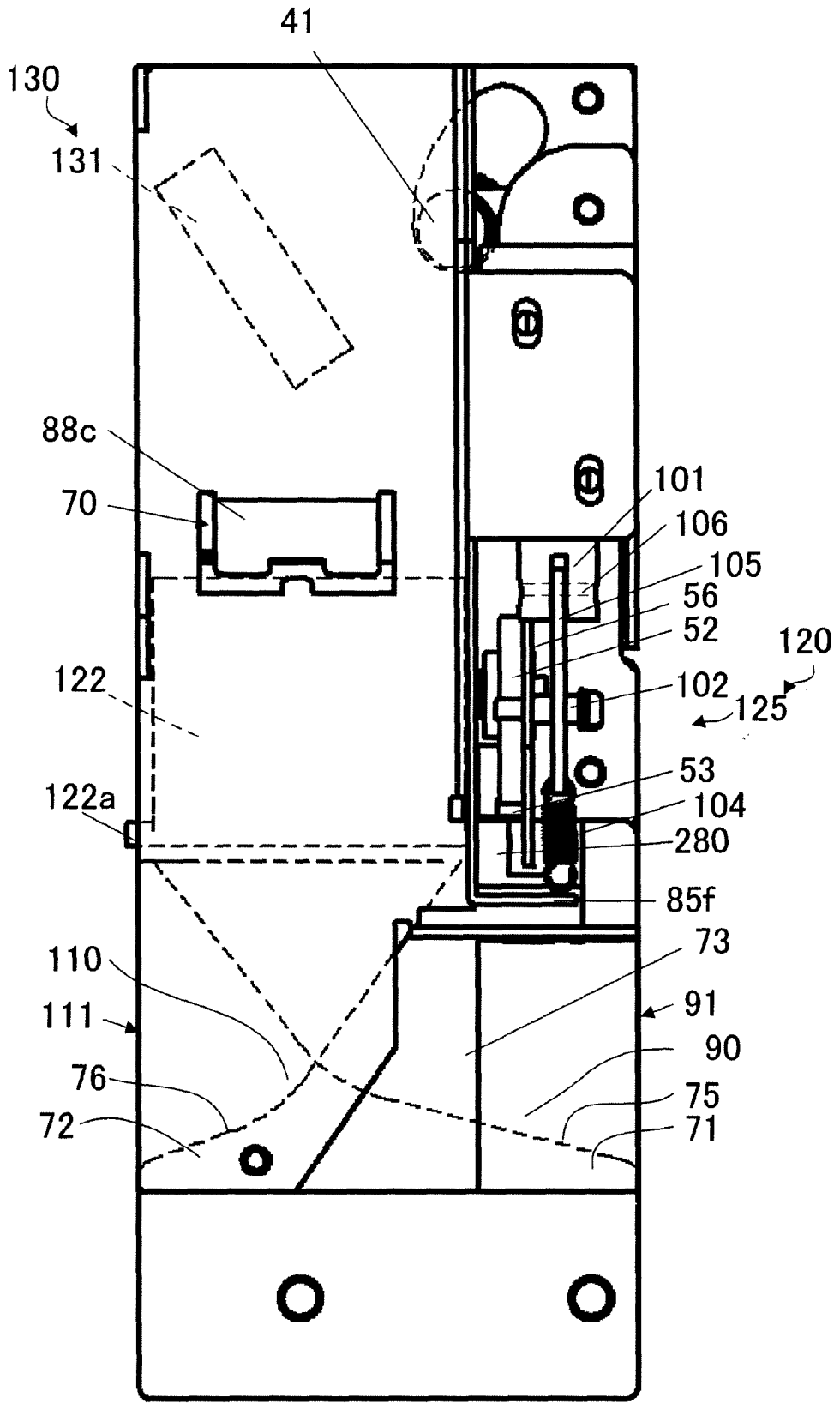
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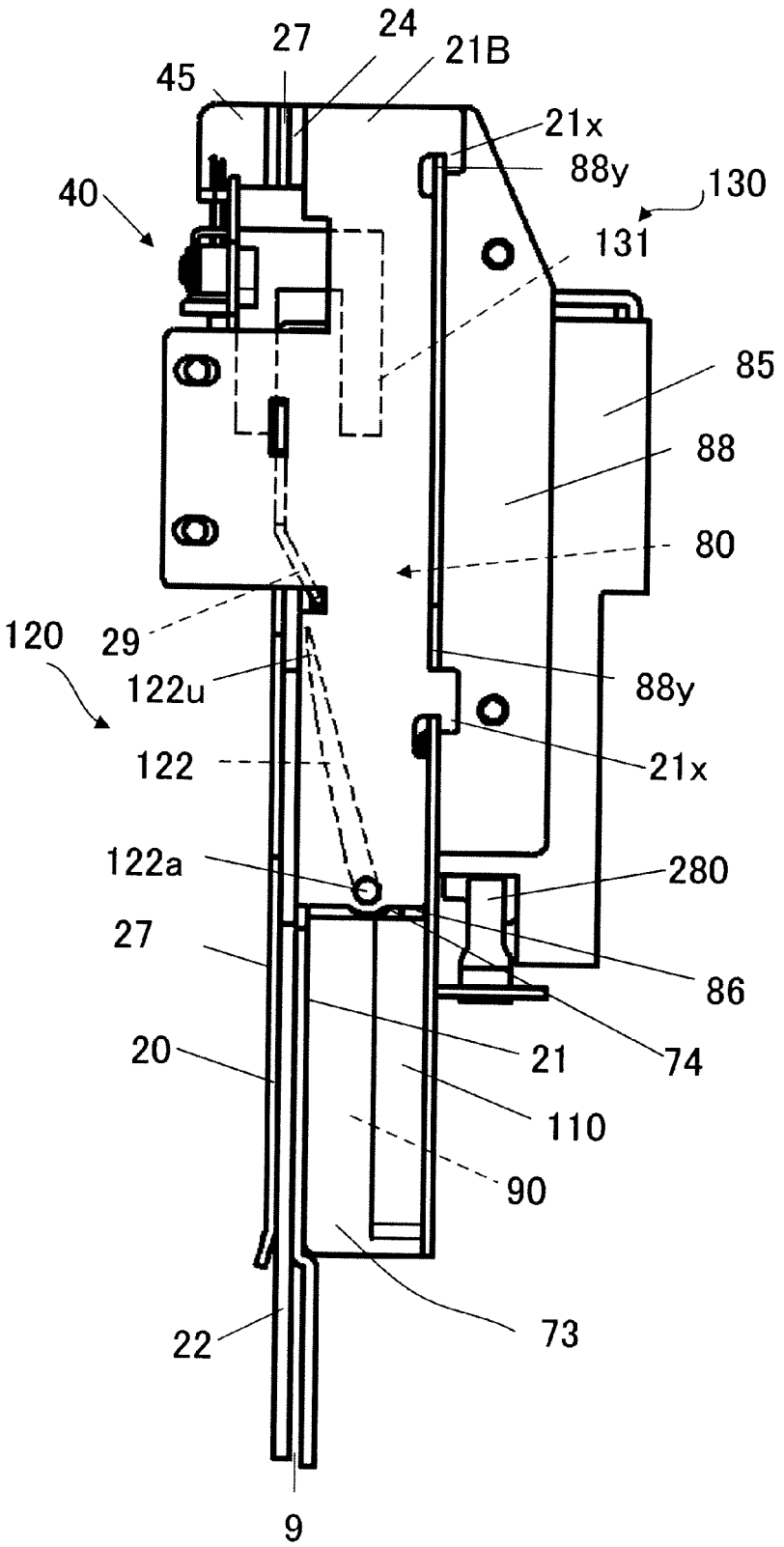
Fig.10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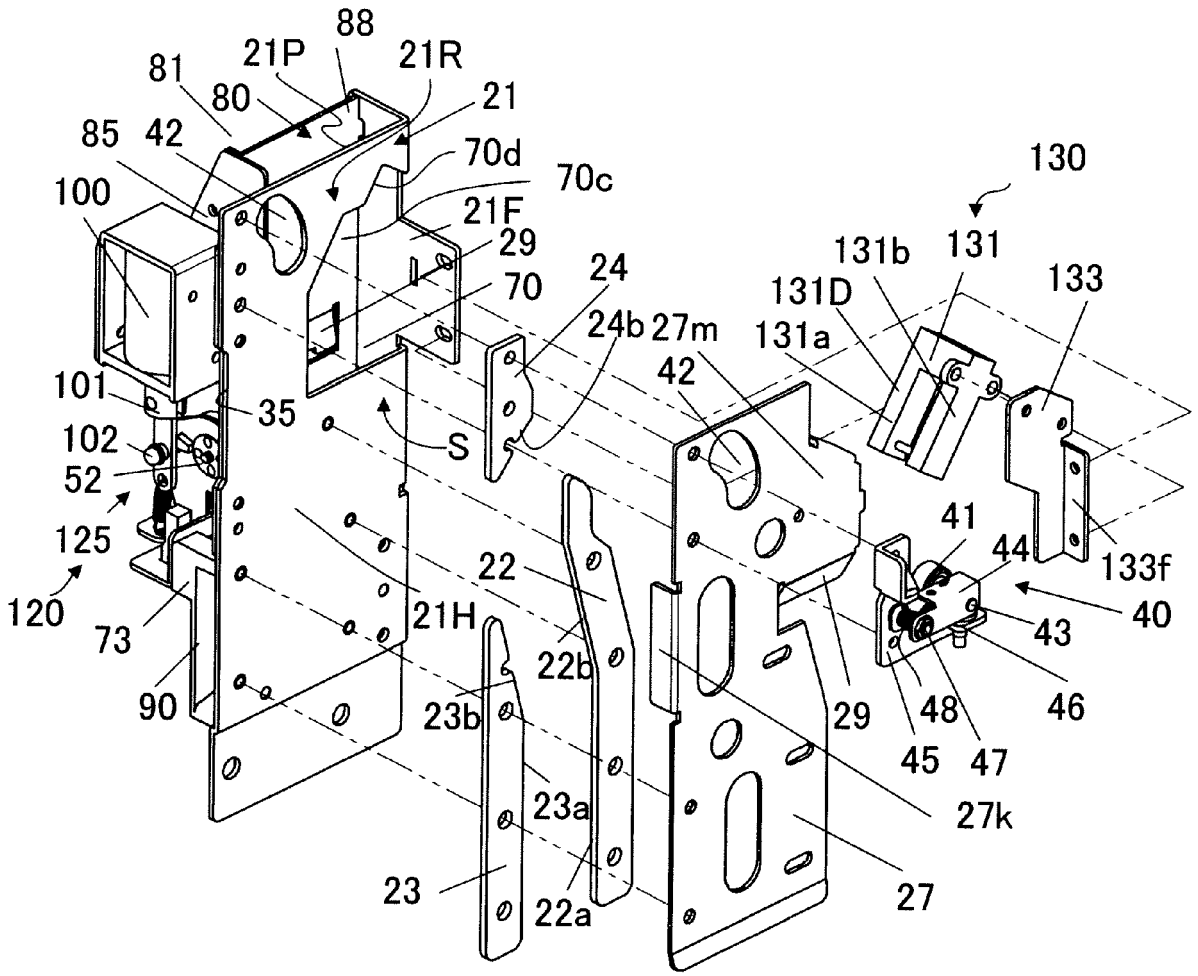
9

Fig.11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27m
131a
101
42
35
102
S
52
41
125
44
133f
22
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23a
27k
23
22a
27

Fig.12

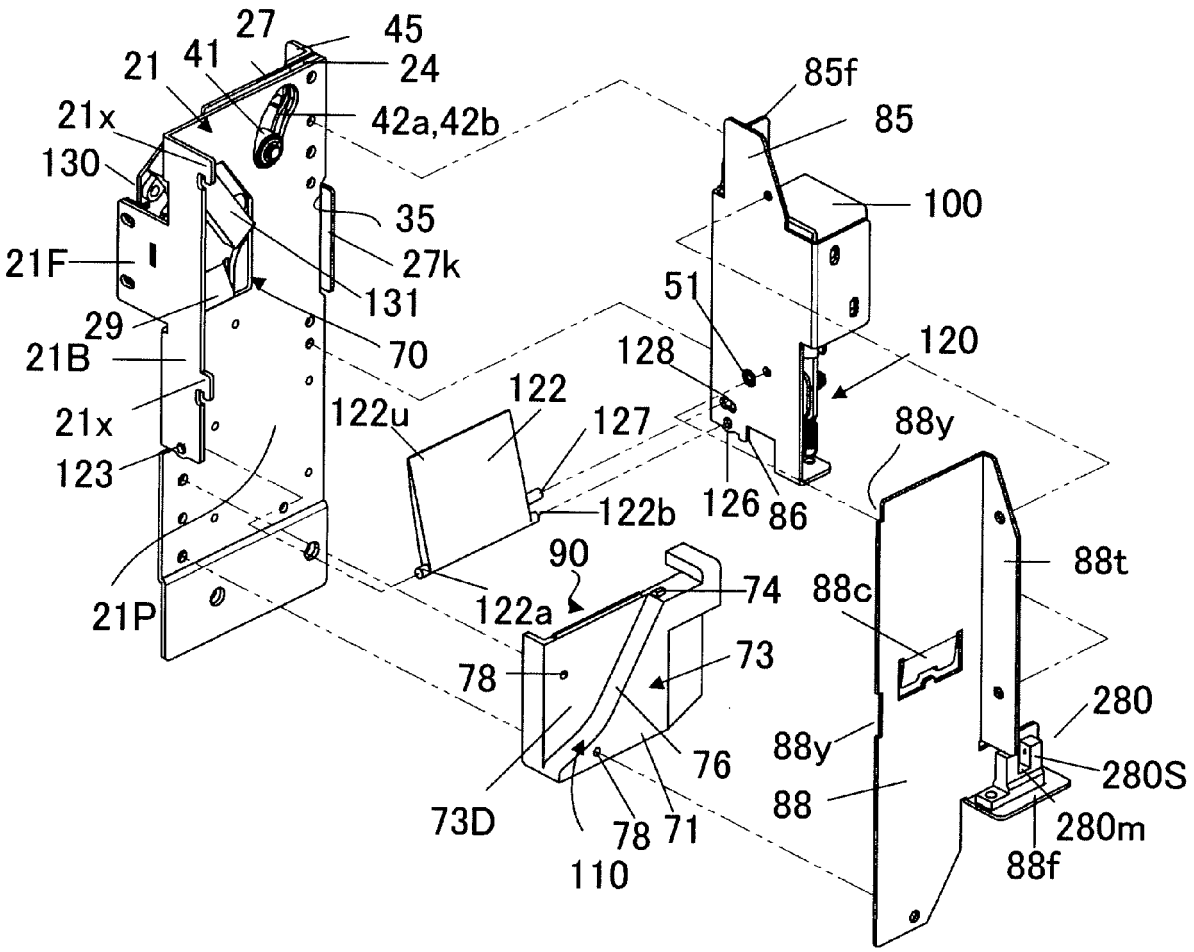
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Fig.13

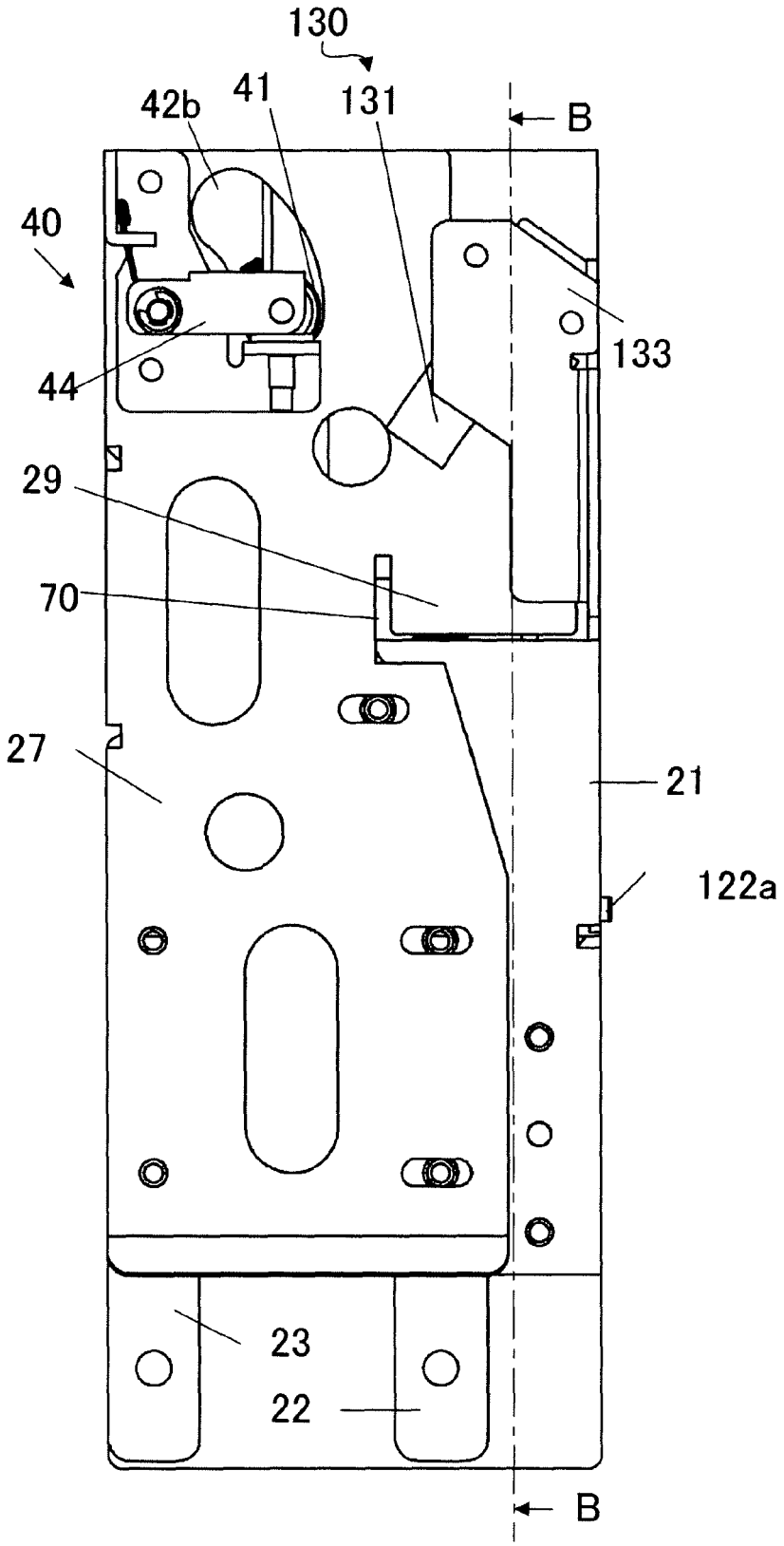
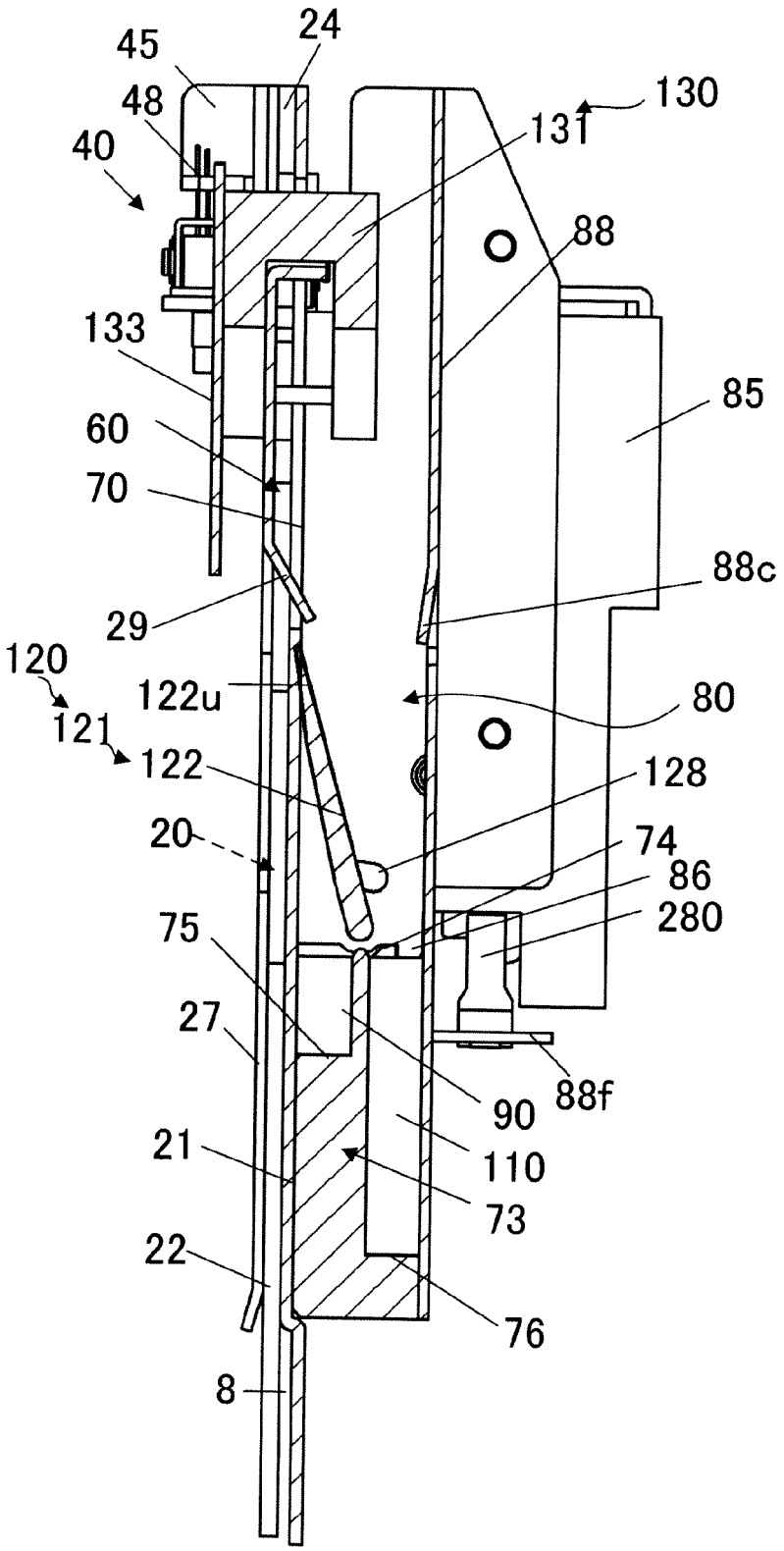


Fig.14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8

REFERENCES CITED IN THE DESCRIPTION

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- JP 6150102 A **[0017]**