



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.04.2010 Bulletin 2010/14

(51) Int Cl.:
B24B 9/14 (2006.01) **B24B 55/03 (2006.01)**
B04B 1/08 (2006.01)

(21) Application number: **09012421.5**

(22) Date of filing: **30.09.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL
PT RO SE SI SK SM TR
Designated Extension States:
AL BA RS

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(30) Priority: **01.10.2008 JP 2008256895**

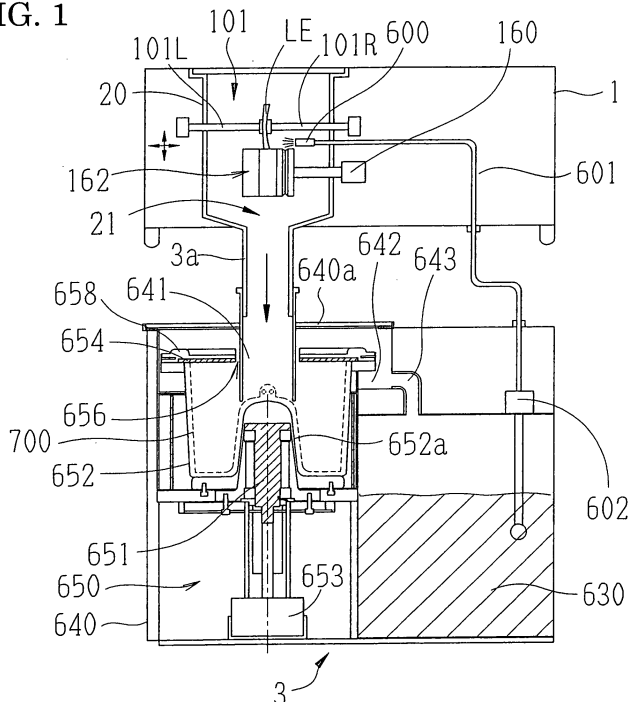
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(54) **Eyeglass lens processing refuse disposal apparatus**

(57) A processing refuse disposal apparatus for processing an eyeglass lens, the apparatus comprising: a centrifugal separator (650) including a dewatering drum (652) to which grinding water containing processing refuse is led from an eyeglass lens processing apparatus (1), a driving motor (653) for rotating the dewatering drum (652), and a filter (654); a tank (630) for accumulating the grinding water passing through the filter; and a

processing refuse container (700, 800, 900) which is formed of resin and has a shape resembling a shape of side and bottom surfaces (652b, 652c) of an interior of the dewatering drum, the processing refuse container being placed in the interior of the dewatering drum. The side wall portion of the processing refuse container has a strength good enough to maintain the shape thereof when the dewatering drum in which the processing refuse container is placed is rotated.

FIG. 1



Description**BACKGROUND OF THE INVENTION**

[0001] The present invention relates to a processing refuse disposal apparatus having a centrifugal separator for separating processing refuse from discharged grinding water has being used for processing eyeglass lenses.

[0002] In processing a peripheral edge of an eyeglass lens, grinding water is supplied to a contact portion between a grinding wheel and a lens for cooling the contact portion. Processing refuse (waste) produced as a result of processing the peripheral edge of the lens is discharged from a grinding apparatus together with grinding water. As a method for disposing grinding water and processing refuse which are discharged from a grinding apparatus, there is known a centrifugal separator in which processing refuse is separated from grinding water by rotating a dewatering drum into which grinding water is introduced, and the grinding water is drained to the outside of the dewatering drum (JP-2004-243452A, JP-2002-283236A, JP-2008-178969A).

[0003] In the centrifugal separator, since when a large amount of processing refuse is accumulated in an interior of the dewatering drum, the filtering capability of the centrifugal separator is reduced, an operator is required to periodically remove the accumulated processing refuse from the dewatering drum. However, powder-like processing refuse agglomerate and build up in the dewatering drum, which causes a problem that the operator has to spend some time removing the processing refuse directly from the dewatering drum. Further, there is a problem in which a hand of the operator tends to get dirty by the processing refuse.

Although a method has been tried in which a plastic bag is placed in the dewatering drum, the plastic bag tends to wrinkle easily, and it is difficult to dispose the plastic bag within the dewatering drum uniformly. When the plastic bag wrinkles, processing refuse builds ununiformly, whereby abnormal vibrations are generated during rotation of the dewatering drum, and noise is increased.

[0004] The invention has been made in view of the problem inherent in the related-art processing refuse disposal apparatus, and a technical problem to be solved by the invention is to provide a processing refuse disposal apparatus which enables an easy removal of processing refuse from a dewatering drum of a centrifugal separator and which can suppress the generation of abnormal vibrations during rotation of the dewatering drum. Further, another technical problem to be solved by the invention is to provide a processing refuse disposal apparatus which can reduce the possibility of the hands of an operator getting dirty.

SUMMARY OF THE INVENTION

[0005] With a view to solving the technical problems, the invention is characterized by having the following ar-

rangement.

[0006]

(1) A processing refuse disposal apparatus for processing an eyeglass lens, the apparatus comprising:

a centrifugal separator (650) including a dewatering drum (652) to which grinding water containing processing refuse is led from an eyeglass lens processing apparatus (1), a driving motor (653) for rotating the dewatering drum (652), and a filter (654); and
a tank (630) for accumulating the grinding water passing through the filter,
characterized by
a processing refuse container (700, 800, 900) which is formed of resin and has a shape resembling a shape of side and bottom surfaces (652b, 652c) of an interior of the dewatering drum, the processing refuse container being placed in the interior of the dewatering drum,
wherein a side wall portion of the processing refuse container has a strength good enough to maintain the shape thereof when the dewatering drum in which the processing refuse container is placed is rotated.

(2) The apparatus according to (1), **characterized in that** the processing refuse container is formed such that a gap in a range of 0.2 to 1.0 mm is formed between a side surface of the processing refuse container and a side surface of the interior of the dewatering drum.

(3) The apparatus according to (2), **characterized in that** the processing refuse container includes, at a center bottom portion or an upper end portion thereof, an engagement portion (702, 802, 901) to be caught by a hook of a jig or a finger of an operator when the operator attempts to remove the processing refuse container from the dewatering drum.

(4) The apparatus according to (1), **characterized in that** the processing refuse container is formed with a flange at an upper end portion thereof and is supported by the dewater drum by the flange.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

Fig. 1 is an exemplary sectional view showing an eyeglass lens processing apparatus main body, a water supply mechanism and a filtering apparatus. Fig. 2A is a partially sectional perspective view of a centrifugal separator.

Fig. 2B is an enlarged view of an upper end face of

the centrifugal separator.

Fig. 3A is a perspective view of a processing refuse container and a jig.

Fig. 3B is a sectional view of an engagement portion of the processing refuse container.

Fig. 4 is an explanatory diagram explaining a processing refuse remove method.

Fig. 5A is a perspective view of a processing refuse container according to a modified example.

Fig. 5B is an explanatory diagram of a removal jig for the processing refuse container shown in Fig. 5A.

Fig. 6 is an exemplary diagram explaining a state in which the processing refuse container is removed by the removal jig.

Fig. 7A is a diagram showing the configurations of a processing refuse container and a removal jig according to another modified example.

Fig. 7B is enlarged views of an upper end face of the processing refuse container and the removal jig which are shown in Fig. 7A.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0008] Hereinafter, an embodiment of the invention will be described based on the drawings. Fig. 1 is an exemplary sectional view which depicts the configurations of an eyeglass lens processing apparatus main body, a water supply mechanism and a filtering apparatus.

A carriage portion is placed in an eyeglass lens processing apparatus main body 1, and a peripheral edge of an eyeglass lens LE which is held by left and right lens chuck shafts 101L, 101R provided on a carriage 101 is brought into press contact with a grinding wheel 162 for processing. The grinding wheel 162 is made up of a rough grinding wheel for plastics and a finishing grinding wheel. The grinding wheel 162 is mounted on a grinding wheel spindle and is rotated by a motor 160. The lens LE is processed by the grinding wheel 162 by the lens chuck shafts 101L, 101R being rotated and the carriage 101 being shifted vertically and horizontally based on processing data. A technique described in, for example, JP-A-2006-305698 can be utilized for the configuration of the processing apparatus main body 1 and a control for processing the lens LE.

[0009] A grinding water and processing refuse disposal apparatus 3 having a centrifugal separator 650 and a tank 630 for accumulating therein grinding water is disposed below the apparatus main body 1. Discharged water containing grinding water used in the apparatus main body 1 and processing refuse is led to the centrifugal separator 650 via a discharged water drainpipe 3a. A nozzle 600 for injecting grinding water to a contact portion between the grinding wheel 162 and the lens LE is disposed on a side wall of a processing chamber 20 disposed in an interior of the apparatus main body 1. Discharged water containing processing refuse is introduced from a drain port 21 which is provided in a bottom

side of the processing chamber 30 into the drainpipe 3 for drainage. A tube 601 is connected to the nozzle 600, the tube 601 is connected to a pump 602, and grinding water accumulated in the tank 630 is drawn by a pump 602.

[0010] The centrifugal separator 650 for separating grinding water and processing refuse from each other is disposed in an interior of a housing 640 of the disposal apparatus 3. The configuration of the centrifugal separator 600 will be described with reference to Figs. 1, 2A and 2B. Fig. 2A is a partially sectional perspective view of the centrifugal separator 650, and Fig. 2B is an enlarged view of an upper end face of the centrifugal separator 650.

[0011] The centrifugal separator 650 includes a rotating shaft 651 and a substantially cylindrical dewatering drum 652 which is fixed to the rotating shaft 651. The dewatering drum 652 is made to open at an upper end thereof and has a shape in which a circumference of the drum is increased as the drum extends upwards. The rotating shaft 651 is disposed at a central portion of the dewatering drum 652. A protuberance 652a which is raised higher than a peripheral portion is formed at a central portion of a bottom surface 652b of the dewatering drum 651. The protuberance 652a is formed in such a manner as to extend to approximately one half the height of the dewatering drum. The rotating shaft 651 extends as deep as an interior of the protuberance 652a. By the protuberance 652a being so formed, the height of a center of gravity of the dewatering drum 652 becomes higher than a case where a bottom portion of the dewatering drum 652 has a uniform height, the stability of the dewatering drum 652 while it is rotating being thereby increased. In addition, in the event that the stability of the dewatering drum 652 while it is rotating is ensured, the protuberance 652 does not necessarily have to be formed, and hence, the bottom surface 652b of the dewatering drum 652 may be formed flat. A driving motor 653 is disposed below the dewatering drum 652, and the rotating shaft 651 is rotated by the driving motor 653.

[0012] A processing refuse container 700 which enables the removal of processing refuse is placed removably in the interior of the dewatering drum 652. The configuration of the processing refuse container 700 will be described in detail later. An annular filter 654 is disposed at an upper portion of the dewatering drum 652 for filtering out grinding water from discharged water containing processing refuse so as to promote the dewatering efficiency of processing refuse. The filter 654 has a filtering function to allow the passage of grinding water while preventing the passage of processing refuse of the order of 15 μm or larger in order to make filtered grinding water substantially clear in appearance. For example, the filter 654 is made up a nonwoven fabric and preferably has an air permeability of 60 to 110 ($\text{cm}^3/\text{cm}^2\text{-sec}$). In the event that the air permeability surpasses 110 ($\text{cm}^3/\text{cm}^2\text{-sec}$), the turbidity of grinding water is increased, and bubbles are made easy to be produced

within the tank 630 by such turbid grinding water being circulated. On the contrary, in the event that the air permeability is lowered below $60 \text{ (cm}^3\text{/cm}^2\text{-sec)}$, the filter 654 is made easy to be clogged by processing refuse, which decreases an amount of grinding water which can pass through the filter 654, whereby the dewatering efficiency is decreased. A drainpipe 641 is passed through an upper side of the filter 654, and an annular lid member 658 having a large number of slots or holes which allow the passage of grinding water is disposed on the upper side of the filter 654.

[0013] In addition, lock mechanisms 659 are provided in three locations on an edge portion 657 of the dewatering drum 652 which expands radially outwards from an upper portion of the dewatering drum 652. By levers 659b of the lock mechanisms 659 being rotated counter-clockwise, as is shown in Fig. 2B, the lid member 658 is fixed to the dewatering drum 652 by the lock mechanisms 659 in such a state that the filter 654 and a flange portion 701 of the container 700 are held between the lid member 658 and the edge portion 657 of the dewatering drum 652. When the lock mechanisms 659 are unlocked, the lid member 658 and the filter 654 are made able to be removed from the dewatering drum 652, and further, the processing refuse container 700 is also made able to be removed from the dewatering drum 652. Note that in a simple configuration, the lock mechanism 659 is made up of a screw or the like which can be rotated manually by an operator, and a known mechanism can be adopted therefor.

[0014] In addition, in Fig. 1, an upper cover 640a is attached to an upper portion (above the lid member 658 of the dewatering drum 652) of the housing 640 which accommodates therein the centrifugal separator 650 in such a manner as to be opened and closed. The drainpipe 3a extending from the apparatus main body 1 is connected to the drainpipe 641 attached to the upper cover 640a. The drainpipe 641 is positioned at a rotational center of the centrifugal separator 650 and has such a length that the drain pipe 641 passes through a central opening 658b formed through the lid member 658 and a central opening 654b formed through the filter 654 so as to extend as far as an interior of the centrifugal separator 652. The opening 658b of the lid member 658 and the opening 654b of the filter 654 are formed to have substantially the same diameter and are formed larger diametrically than outside diameter of the drainpipe 641. With this configuration, a gap 656 for allowing the escape of grinding water is formed between center-side ends of the lid member 658 and the filter 654 and the drainpipe 641.

[0015] A lower opening of the drainpipe 641 is disposed in such a manner as to cover the protuberance 652a from thereabove, whereby discharged water flowing downwards through an upper portion of the drainpipe 641 bounces against the protuberance 652a and is directed downwards, so that grinding water is easily subjected to centrifugal action, and processing refuse are

built up efficiently within the dewatering drum 652. The upper cover 640a also functions as a member which receives water drained from the filter 654, as well as water caused to splash from the gap 656 formed between the filter 641 and the lid member 658 and the drainpipe 641 so as to direct them downwards. A water collecting case 642 is provided on the outside of the dewatering drum 652 in such a manner as to surround the dewatering drum 652. Water received by the water collecting case 642 is led to the tank 630 by way of a pipe 643.

[0016] Next, the configuration of the processing refuse container 70 and the configuration of a removal jig (a container removal jig) 750 which is used in removing the refuse container 700 from the dewatering drum 652 will be described. Fig. 3A is a perspective view of the container 700 and the jig 750. In Fig. 3A, the container 700 is depicted as being partially cutaway.

[0017] The container 700 has an external shape which resembles an interior shape of the dewatering drum 652. Namely, the container 700 has a side wall portion 700c, a bottom portion 700b and a protuberant portion 700a whose shapes match an inner side surface 652c, the bottom surface 652b and the protuberance 652a, respectively. However, an outside diameter of the side wall portion 700c is formed slightly smaller than an inside diameter of the inner side surface of the dewatering drum 652. An outer circumference of the side wall portion 700c is preferably formed to a size which ensures a slight gap Δd (for example, a width of the order of 0.5 mm) that is formed between the inner side surface 652c of the dewatering drum 652 and itself when the container 700 is disposed in the interior of the dewatering drum 652 (refer to Fig. 2B). This gap Δd is set to a dimension such that even in the event that the container 700 is subjected to a slight thermal expansion due to a change in ambient atmosphere, the container 700 is prevented from being brought into close contact with the inner side surface 652c of the dewatering drum 652, whereas even in the event that the container 700 is subjected to a slight thermal contraction due to a change in ambient atmosphere, the container 700 is prevented from getting loosened largely in the interior of the dewatering drum 652 so as not to produce vibrations while the dewatering drum 652 is rotating. By the gap Δd being ensured, frictional resistance is reduced that would otherwise be produced between the inner side surface 652c of the dewatering drum 652 and the container 700, thereby making it possible to easily lift up the container 700 in which processing refuse are built up. In addition, also when placing the container 700 in the interior of the dewatering drum 652, the placing operation is made easy. The center of gravity of the container 700 is made to coincide substantially with a rotational axis of the dewatering drum 652.

[0018] The gap Δd is preferably formed in a range of 0.2 to 1.0 mm (namely, when expressing the gap Δd based on a difference between the inside diameter of the inner side surface 652c of the dewatering drum 652 and the outside diameter of the side wall portion 700c, the

gap Δd is in a range of 0.4 to 2.0 mm in diameter). In the event that the gap Δd is smaller than 0.2 mm, the degree of friction due to contact between the inner side surface 652c of the dewatering drum 652 and the side wall portion 700c of the container 700 is increased, resulting in a large force being required in removing the container 700 in which processing refuse are accumulated from the dewatering drum 652. On the contrary, in the event that the gap Δd is larger than 1.0 mm, the eccentricity G of the container with respect to the rotational center of the dewatering drum 652 becomes large, resulting in abnormal vibrations being increased while the dewatering drum 652 is rotating. Note that the gap Δd is also formed between the protuberance 652a of the dewatering drum 652 and the protuberant portion 700a of the container 700.

[0019] The container 700 is formed integrally of a resin such as polypropylene, ABS (acrylonitrile/butadiene/styrene), polystyrene and polycarbonate, for example. The side wall portion 700c of the container 700 is formed with a thickness t which ensures a strength good enough to maintain the shape thereof even when the side wall portion 700c is subjected to a load resulting from a centrifugal force produced when the dewatering drum 652 is rotated. For example, the container 700 of the grinding water and processing refuse disposal apparatus 3 is formed with a thickness of 0.8 mm. When the container 700 is formed of a resin such as polypropylene or ABS, the container 700 preferably has a thickness of 0.3 to 4.0 mm. In the event that the thickness of the container 700 is thinner than 0.3 mm, the shape of the side wall portion 700c cannot be maintained properly when the dewatering drum 652 is rotating, whereby the gap Δb described above becomes difficult to be ensured and the side wall portion 700c becomes easy to be broken. On the other hand, in the event that the thickness t becomes thicker than 0.3 mm, the strength is increased. However, in the event that the thickness t becomes too thick, the container 700 becomes difficult to be molded integrally. In addition, in the event that the thickness t is too thick, an amount of processing refuse to be accumulated within the container 700 is reduced, which is disadvantageous. With a view to facilitating the integral molding of the container 700, the thickness t is preferably 4.0 mm or thinner.

[0020] The flange portion 701 extended radially outwards is provided integrally on an upper peripheral edge of the side wall portion 700c. The flange portion 701 is held together with the filter 654 by the dewatering drum 652 and the lid member 658 and is fixed in place by the lock mechanisms 659. Because of this, when the dewatering drum 652 is rotating, not only can the loosening of the container 700 be suppressed, but also the container 700 is allowed to rotate together with the dewatering drum 652. An annular projecting portion 703 is provided on an upper surface of the flange portion 701. A radial width of the projecting portion 703 is formed smaller than a radial width of the flange portion 701. When the lid member is attached, the lid member 658 and the filter 654 are press

fitted to each other by the projecting portion 703 (refer to Fig. 2B). Namely, by the filter 654 being held between the projecting portion 703 and the lid member 658 to thereby be collapsed, the filter 654 also functions as a packing for preventing grinding water from flowing from a gap between the container 700 and the lid member 658. With this configuration, the flow of grinding water which is discharged through the filter 654 into the gap Δd is suppressed as much as possible during centrifugal separation. Minute processing refuse which cannot be filtered out by the filter 654 are contained in grinding water, and in the event that such grinding water is allowed to flow in between the dewatering drum 652 and the container 700, fine processing refuse are allowed to remain in the dewatering drum 652 even after the removal of the container 700. In the event that the amount of processing refuse allowed to so remain is increased, those processing refuse then come to disturb the insertion of the container 700 into the dewatering drum 652 when the former is attempted to be inserted into the latter. With this configuration, since grinding water is prevented from flowing into the gap Δd , labor hours required to clean the dewatering drum 652 after the removal of the container 700 are reduced remarkably.

[0021] In this embodiment, the flange portion 701 protruding radially outwards from the side wall portion 700c is formed to have a width of 10 mm, and the projecting portion 703 is formed to have a radial width of 1 mm. The projecting portion 703 is formed to have a height of 1 mm. In the case of the thickness of the filter 654 which is made of a nonwoven fabric being 3 mm, the filter 654 is collapsed to 2 mm in thickness by the flange portion 701 and the lid member 658 and is further compression collapsed to 1 mm in thickness by being press fitted by the projecting portion 703 and the lid member. In the event that the filter 654 is collapsed to 1 mm in thickness, almost no grinding water which is scattered by centrifugal force is allowed to pass through the filter 654, whereby the filter 654 is allowed to function as the packing. Although the height of the projecting portion 703 can be changed in accordance with the thickness of the filter 654, in this case, in the event that the height of the projecting portion 703 is formed 1/2 to 1/3 of the thickness T of the filter 654, the filter 654 is allowed to be clogged. In addition, the radial width of the projecting portion 703 is preferably in a range of 0.8 mm to 3 mm. In the event that the radial width of the projecting portion 703 is less than 0.8 mm, the fabrication of the projecting portion 703 becomes difficult, and the strength thereof is not maintained. On the contrary, in the event that the radial width surpasses 3 mm, the lock mechanisms 659 need to apply a large magnitude of force to the lid member 658 in order to fix the lid member 658 to the dewatering drum 652, which requires the lock mechanisms 659 to be enlarged in size, and at this time, the operator is not allowed to simply operate the lock mechanisms 659 by operator's hand.

[0022] Note that the projecting portion 703 may be

formed on a lower surface side of the lid member 658 in a position which corresponds to the flange portion 701 in place of the projecting portion 703 being formed on the flange portion 701 side of the container 700. Although the filter 654 is made to function as the packing, in a centrifugal separator in which no filter 654 is provided, a packing made of an annular elastic member may be provided in such a manner as to be held between the flange portion 701 and the lid member 658. By the packing being so provided, the flow of grinding water into the gap Δd is prevented.

[0023] In Fig. 3A, a removal jig 750 includes a holding portion 752 to be held by the hand of the operator and two hooks (hook members) 751 which are fixed to a distal end of a shaft 753 which extends from the holding portion 752. On the other hand, an engagement portion 702 to be caught by (which is brought into engagement with) the hooks 751 of the removal jig 750 is formed at an upper end of the protuberant portion 700a which is situated at the center of the container 700. In this embodiment, since the removal jig 750 includes the two hooks 751, the engagement portion 702 is made up of two holes 702a so as to match the hooks so provided. When the operator attempts to remove the container 700 from the dewatering drum 652, the operator hooks the hooks 751 in the engagement portion 702 and lifts up the removal jig 750 by holding the holding portion 752 to thereby remove the container 700 from the dewatering drum 652. By the holding portion 752 being formed to have such a length that the holding portion 752 is situated further upwards than an upper portion of the dewatering drum 652 when the hooks 751 are brought into engagement with the engagement portion 702, the operator is allowed to remove the container 700 from the dewatering drum 652 without touching processing refuse. Note that the distal end of the shaft 753 of the removal jig 750 may be formed into any shape, provided that it is constructed in such a manner as to be brought into engagement with the engagement portion 702 so that the container 700 can be lifted up, for example, a construction in which the engagement portion 702 is held by the distal end of the shaft 753.

[0024] Also in a construction in which the protuberant portion 700a is not formed in the container 700, the engagement portion 702 may be disposed substantially at the center of the bottom surface 700b of the container 700. Processing refuse introduced into the container 700 is built up into an annular shape close to the side wall portion 700c side by virtue of rotation of the dewatering drum 652. Because of this, the engagement portion 702 is prevented from being buried under refuse, and the hooks 751 of the jig 750 can be hooked in the engagement portion 702. When processing refuse are disposed of, since the hooks 751 of the jig 750 are attached to the engagement portion 702 which lies at the center of the container 700 where refuse are not built up, the attaching work of the jig to the engagement portion becomes simple, and the hand of the operator is prevented from getting dirty when processing refuse are disposed of.

[0025] The operator does not necessarily have to use the jig 750 when attempting to remove the container 700 from the dewatering drum 625. This is because the operator can also lift up the container 700 by holding the engagement portion 702 by operator's fingers since the gap Δd is provided in the way described above. As is shown in Fig. 3B, the engagement portion 702 is formed into a substantially T-shape in section, and projecting portions 702b which project to both sides are made easy to be hooked by the fingers of the operator. There may be provided a single hole 702a which is formed into a shape which allows the entrance of a finger of the operator. Since processing refuse is not built up in the vicinity of the engagement portion 702 at the center of the container 700, the possibility of the hand of the operator getting dirty is reduced.

[0026] Next, a filtering operation of grinding water by the centrifugal separator 650 which includes the above-described configuration and removal operation of processing refuse will be described. As an initial step of the preparation of the centrifugal separator 650, the operator sets the container 700 in the interior of the dewatering drum 652. At this time, since the container 700 has the shape which resembles the interior shape of the dewatering drum 652 and the gap Δd is ensured, the operator can simply place the container 700 in the predetermined position in the interior of the dewatering drum 652 only by putting the container 700 in the dewatering drum 652 in such a manner as to follow the interior shape thereof. Next, the operator places the filter 654 on the flange portion 701 of the container 700 and then places the lid member 658 on the filter 654. Thereafter, the operator fixes the lid member 658 using the lock mechanisms 659. At this time, the lid member and the filter 654 are press fitted together by the projecting portion 703. In this state, by inserting the drainpipe 641 attached to the upper cover 640a into the interior of the dewatering drum 652 (the container 700) through the openings of the lid member 658 and the filter 654, the preparation of the centrifugal separator 650 is completed.

[0027] Water containing processing refuse from the processing apparatus main body 1 is caused to flow into the container 700 within the dewatering drum 652 through the drainpipe 641. When the dewatering drum 652 rotates, discharged water is subjected to the influence of centrifugal force produced by the dewatering drum 652 so rotating. Refuse is forced towards the side wall portion 700c of the container 700 by virtue of the action of the centrifugal force and are then built up into an annular shape along the side wall portion 700c. Since the processing refuse is built up sequentially along the side wall portion 700c in a uniform fashion, the generation of vibrations is suppressed that would otherwise take place should processing refuse not be built up uniformly. Grinding water separated from processing refuse whose specific weight is heavy (processing refuse whose particle size is large) is pushed upwards along the container 700 and is then filtered by the filter 654. Grinding water

that has been filtered by the filter 654 is collected into the water collecting case 642. In addition, water that is not filtered by the filter 654 is forced to scatter from the gap 656 formed between the filter 654 and the drainpipe 641 and is then received by the water collecting case 642. Water within the water collecting case 642 is led into the tank 630 via the pipe 643. Since an end portion of the filter 654 is press fitted by the projecting portion 703 of the container 700 and the lid member 658, grinding water which is pushed towards an outer circumferential side of the filter 654 is restricted from flowing into the gap Δd , whereby the infiltration of grinding water and fine processing refuse into the interior of the dewatering drum 652 is suppressed.

[0028] A large amount of processing refuse is accumulated along the inner wall of the container 700 as a result of lenses being processed by the processing apparatus main body 1 repeatedly. Then, since when the amount of processing refuse so built up reaches or surpasses a certain level, the normal filtration becomes impossible, and the processing refuse so built up needs to be removed. In the event that the dewatering drum 652 is left rotating for a sufficient length of time even after the drainage of discharged water from the processing apparatus main body 1 is stopped, grinding water within the container 700 is forced to scatter to the outside of the container 700, the dewatering of processing refuse left within the container 700 is promoted. The operator unlocks the lock mechanisms 659, and after removing the lid member 658 and the filter 654, the operator removes the processing refuse so left in the container 700.

[0029] Fig. 4 is an explanatory diagram explaining a refuse remove method. Processing refuse is accumulated into an annular shape in the interior of the container 700. The operator hooks the hooks 751 of the removal jig 750 in the engagement portion 702 and holds the holding portion 752 so as to lift up the jig 750, whereby the operator can remove the container 700 from the dewatering drum 652 without getting operator's hand dirty. Alternately, the operator can hold directly the engagement portion 702 by one of operator's hands so as to remove the container 700. At this time, since the container 700 is not closely attached to the dewatering drum 652 by the gap Δb being provided between the dewatering drum 652 and the container 700, the operator can easily draw out the container 700 from the dewatering drum 652 without applying a large magnitude of force to the holding portion 752 of the jig 750 or the engagement portion 702 of the container 700. By the container 700 being formed of a similar type of material (a resin such as polypropylene as described above) to eyeglass plastic lenses, the container 700 can be disposed of directly in a disposal bag together with processing refuse.

[0030] In the above embodiment, while the engagement portion 702 is provided in the substantially center position of the container 700, the invention is not limited thereto.

[0031] Figs. 5A and 5B show a processing refuse con-

tainer and a removal jig according to a modified example. Fig. 5A is a diagram showing the configuration of a refuse container 800 according to the modified example, and Fig. 5B is a diagram showing the configuration of a removal jig (a container removal jig) 860 according to the modified example.

[0032] Engagement portions 802 in which distal end portions 861 of jigs 860 are to be hooked are provided on an upper end portion of a container 800 in two locations which are symmetrical across a rotational center of the container 800. An opening 803 into which the distal end portion of the jig 860 is inserted is provided in the engagement portion 802. Here, although the engagement portions 802 are described as being provided in the two locations, the engagement portions 802 may be provided in more than two locations, provided that the engagement portions 802 are disposed in positions which divide equally a circumference of the upper end face of the container 800 and that the center of gravity of the container 800 is situated in a position which constitutes a center position of the locations where the engagement portions 802 are so provided. In this example, the engagement portion 802 is constructed in such a manner as to be bent inwards of the container 800 by a hinge provided in a position which coincides with a side wall of the container 800. By the container 800 being placed in the dewatering drum 652 in such a state that the engagement portion 802 is bent inwards, the distal end portion 861 of the removal jig 860 is allowed to be inserted into the opening 803. Restricting members 805 for restricting the rotation of the engagement portions 802 are provided on an inside of the container 800, whereby the sinking of the engagement portions 802 is prevented by the restricting members 805. After the container 800 is placed in the dewatering drum 652, the filter 654 and the lid member 658 are disposed on the engagement portion 802.

[0033] The reason the engagement portions 802 are initially formed into a shape in which they project towards an outer circumferential side of the container 800 is that the engagement portions 802 can be molded integrally with the container 800 by a mold, and the engagement portions 802 may be configured in such a state that they are initially bent inwards of the container 800. In addition, the engagement portions 802 may be left projecting towards the outer circumferential side of the container 800, provided that portions for accommodating the engagement portions 802 are formed on the edge portion 657 side of the dewatering drum 652, so that the distal end portions 861 of the removal jig 860 can be inserted into the openings 803 in the engagement portions 802.

[0034] In Fig. 5B, the jig 860 is made up of a shaft 862 which is fabricated by a rod-like member, the distal end portion 861 which extends from the shaft 862, which is placed into the opening 803 and which constitutes a hook which is hooked in the opening 803, a grip (a grip portion) 863 which is formed by bending the shaft 862, and a support portion which is brought into abutment with the

edge portion 657 of the dewatering drum 652. The distal end portion 861 is slightly bent upwards from an extension of the shaft 862 so as to be locked in the opening 803 easily when the distal end portion 861 is placed into the opening 803. The supporting portion 865 is provided on the shaft 862 in a position lying in the vicinity of the distal end portion 861, and the supporting portion 865 is brought into abutment with the edge portion 657 and supports the shaft 862, and an abutment portion 867 is provided at a lower end of an extension 866 which extends downwards from the shaft 862. Although it will be described in detail later, the abutment portion 866 is brought into abutment with the edge portion 675 so as to constitute a fulcrum in the principle of leverage and the extension 866 plays a role of extending the fulcrum downwards. A cutout 869 is provided in the center of the extension 866, and the cutout 869 constitutes a locking portion for locking the container 800 when lifting up the container 800.

[0035] Next, a method will be described for removing the container 800 from the dewatering drum 652 by the use of the jig 800. Fig. 6 is an exemplary diagram of part of the periphery of the dewatering drum 652 which illustrates a state in which the container 800 is removed by the jig 860. Two jigs 860 are used so as to match the engagement portion 802 provided in the two locations. The operator grips on the grips 863 of the jigs 860 with the left and right hands thereof so as to operate the jigs 860. When the distal end portions 861 of the jigs 860 are placed into the openings 803, the abutment portion 867 of the supporting portion 865 are brought into abutment with the edge portion 657. In this state, when the jigs 860 are caused to fall radially outwards, the container 800 in which processing refuse are built up is lifted upwards by virtue of a leverage action resulting from the cooperation of the jigs 860 with the edge portion 657. Note that the jig 860 may be constructed to have hooks 751 which are the same as those shown in Fig. 3A, and at this time, the jigs 860 may be lifted up with the hooks 751 hooked in the openings 803. Of course, in this example, too, the operator may hold the two engagement portions 802 with the fingers of operator's left and right hands so as to remove the container 800 without using the jigs 860. Also, in this case, compared with a case where processing refuse are removed directly from the dewatering drum 652, the operator can remove the container 800 without getting operator's hands dirty to a large extent.

[0036] Fig. 7A is a diagram showing the configurations of a refuse container and a removal jig according to another modified example. In this example, U-shaped engagement portions 901 are provided at an upper end of an inner side wall of a processing refuse container 900 in two locations which are symmetrical across a rotational center of the container. Fig. 7B is an enlarged view of one of the engagement portions 901. An opening 902 is formed by the inner side wall of the container 900 and the engagement portion 901 provided thereon. A jig 950 includes a rod-like holding portion 952 on which the op-

erator grips with operator's hand and a hook 951 which is attached to a distal end of the holding portion 952 in such a manner as to extend therefrom. The hook 951 is hooked in the opening 902 in the engagement portion 901. When removing the container 900, the operator holds the two jigs 951 with operator's corresponding hands and forces the hooks 951 into the corresponding engagement portions 901 from outside so that the hooks 951 are hooked in the corresponding openings 902. In addition, although processing refuse are accumulated on the peripheries of the engagement portions 901, by the processing refuse which are accumulated on the peripheries of the engagement portions 901 being scraped out by the hooks 951, the hooks 951 can be hooked in the openings 902. When the hooks 951 are managed to be hooked in the openings 902, both the jigs 950 are gripped on and are then lifted upwards, whereby the operator can lift up the container 900 from the dewatering drum 652 without getting operator's hands dirty. The engagement portions 901 may be provided in three or more locations in place of being provided in the two locations as described above, provided that the center of gravity of the container 900 substantially coincides with a center of the engagement portions 901 so provided.

Claims

1. A processing refuse disposal apparatus for processing an eyeglass lens, the apparatus comprising:

a centrifugal separator (650) including a dewatering drum (652) to which grinding water containing processing refuse is led from an eyeglass lens processing apparatus (1), a driving motor (653) for rotating the dewatering drum (652), and a filter (654); and
a tank (630) for accumulating the grinding water passing through the filter,

characterized by

a processing refuse container (700, 800, 900) which is formed of resin and has a shape resembling a shape of side and bottom surfaces (652b, 652c) of an interior of the dewatering drum, the processing refuse container being placed in the interior of the dewatering drum, wherein a side wall portion of the processing refuse container has a strength good enough to maintain the shape thereof when the dewatering drum in which the processing refuse container is placed is rotated.

2. The apparatus according to claim 1, **characterized in that** the processing refuse container is formed such that a gap in a range of 0.2 to 1.0 mm is formed between a side surface of the processing refuse container and a side surface of the interior of the dewatering drum.

tering drum.

3. The apparatus according to claim 2, **characterized in that** the processing refuse container includes, at a center bottom portion or an upper end portion thereof, an engagement portion (702, 802, 901) to be caught by a hook of a jig or a finger of an operator when the operator attempts to remove the processing refuse container from the dewatering drum.
4. The apparatus according to claim 1, **characterized in that** the processing refuse container is formed with a flange at an upper end portion thereof and is supported by the dewater drum by the flange.

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FIG. 1

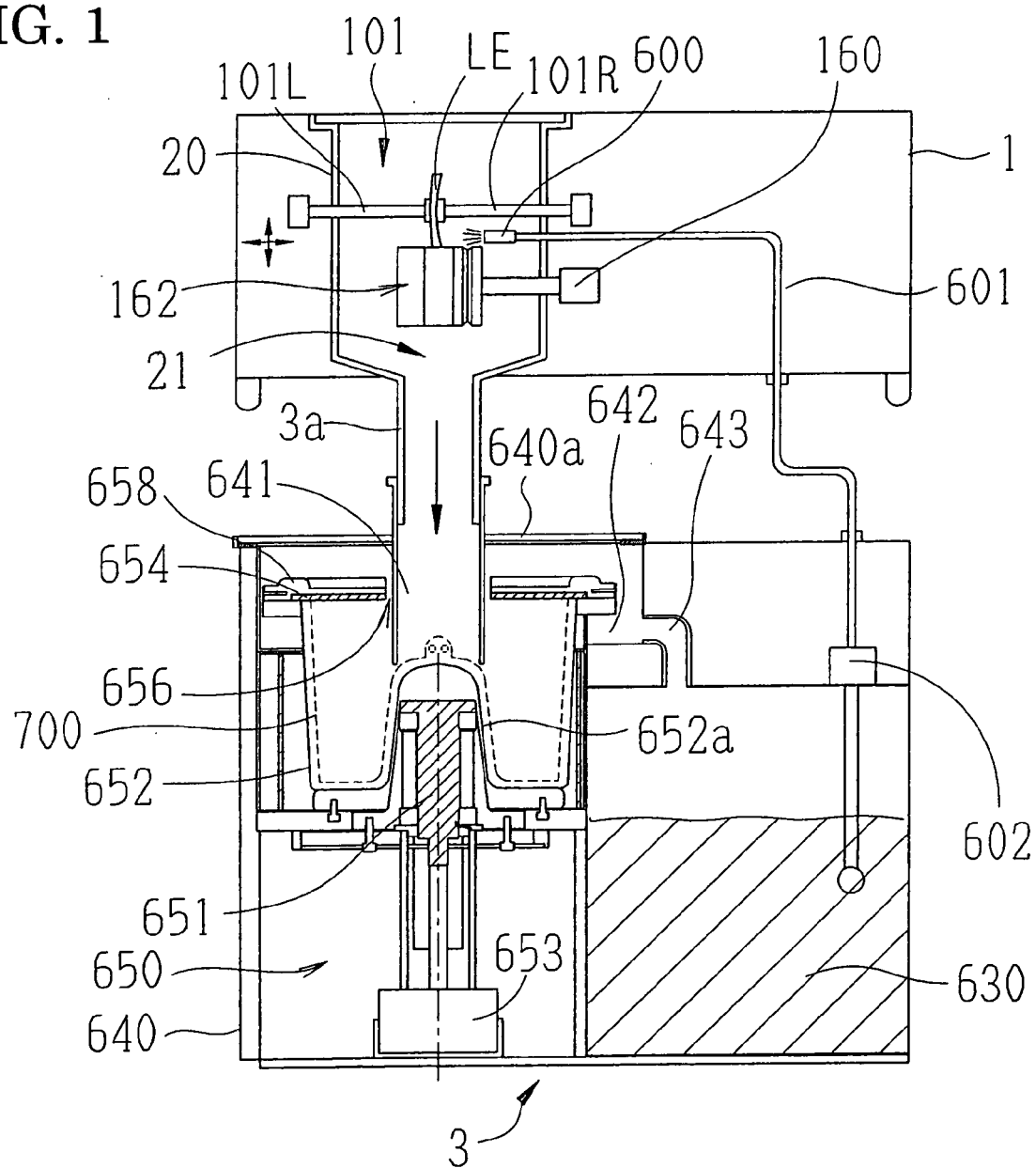


FIG. 2A

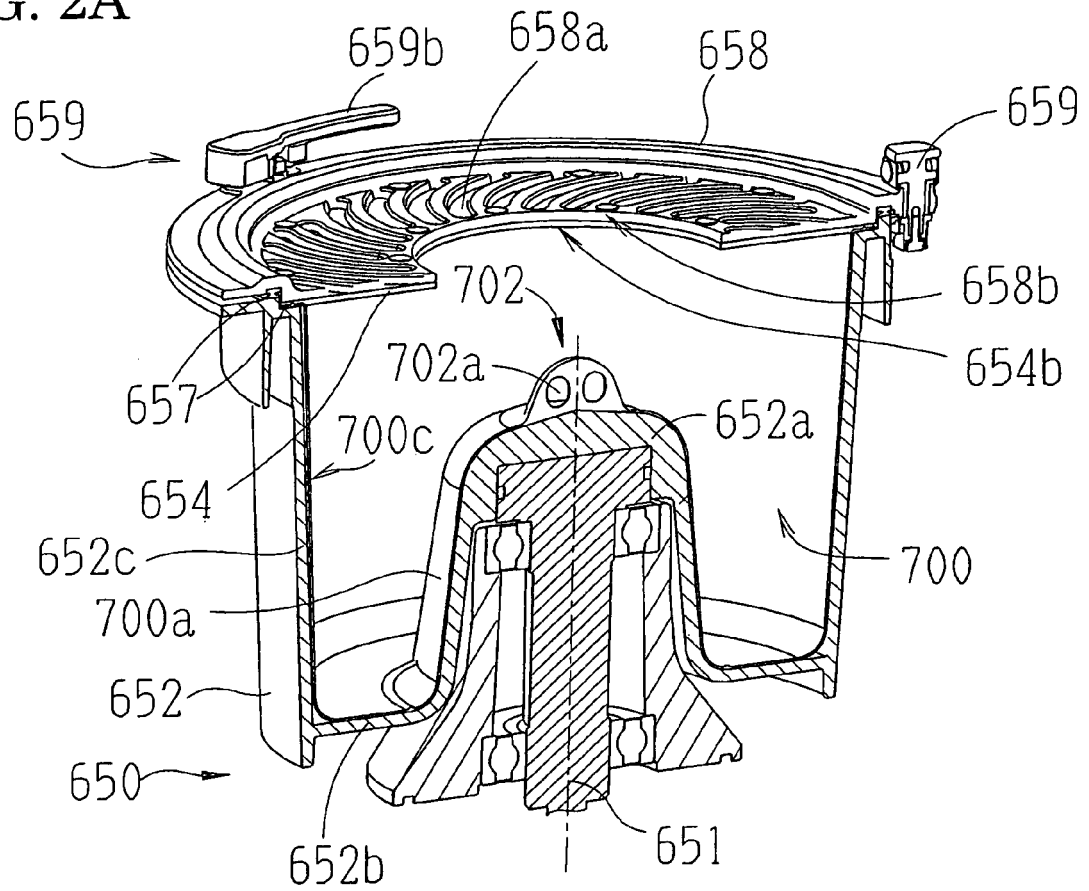


FIG. 2B

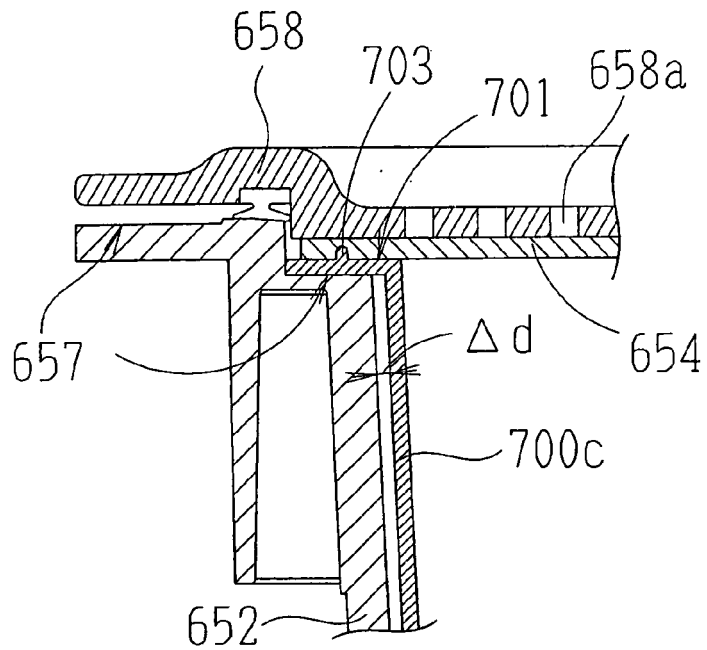


FIG. 3A

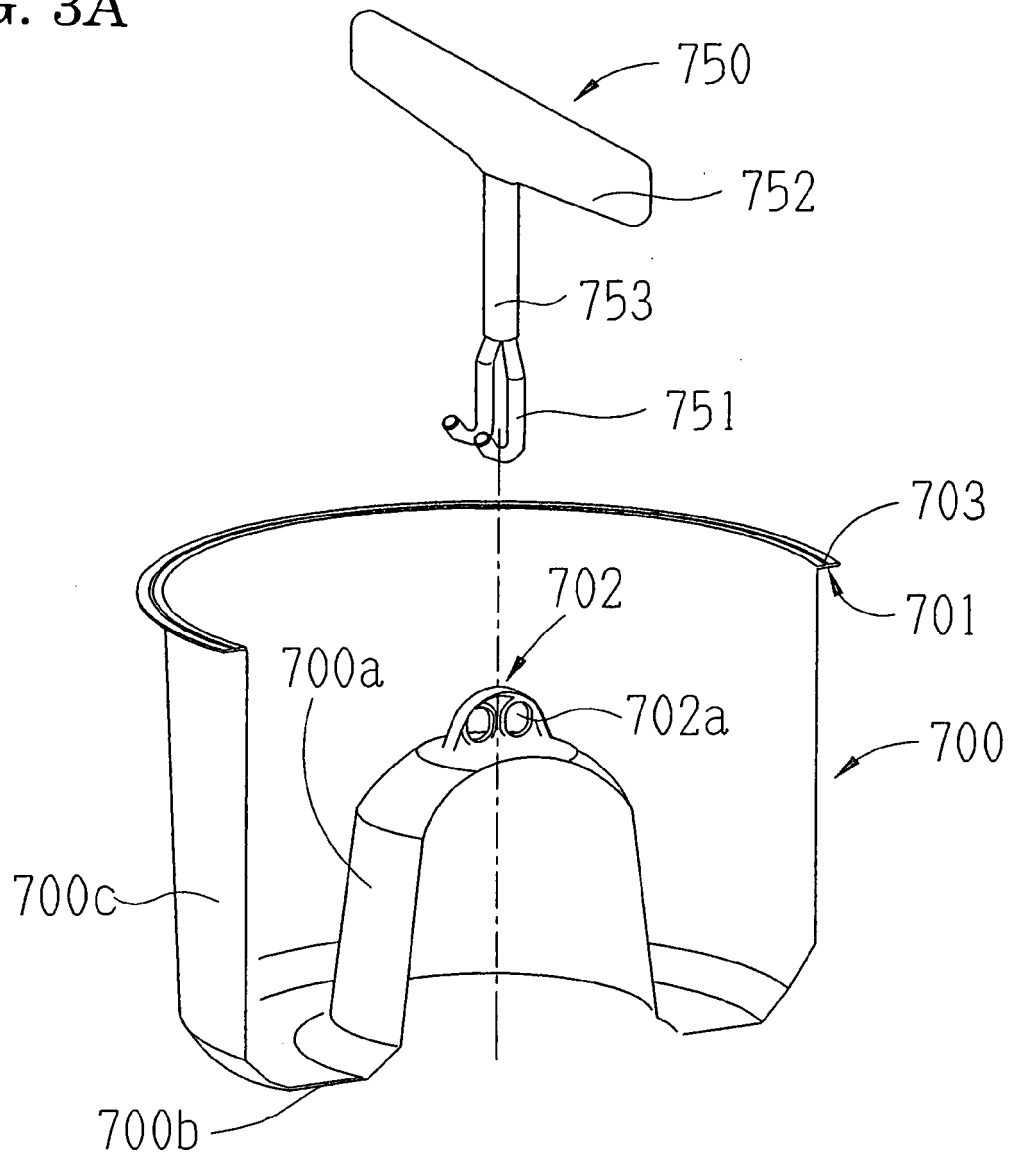


FIG. 3B

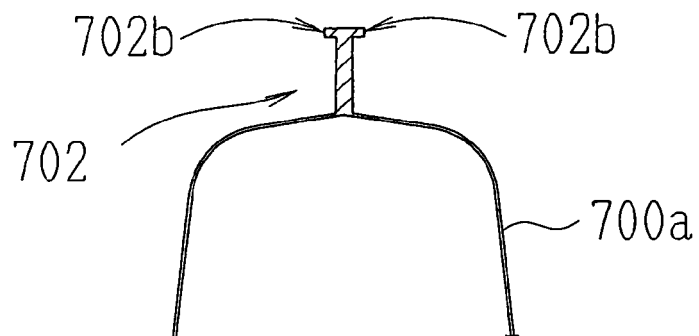


FIG. 4

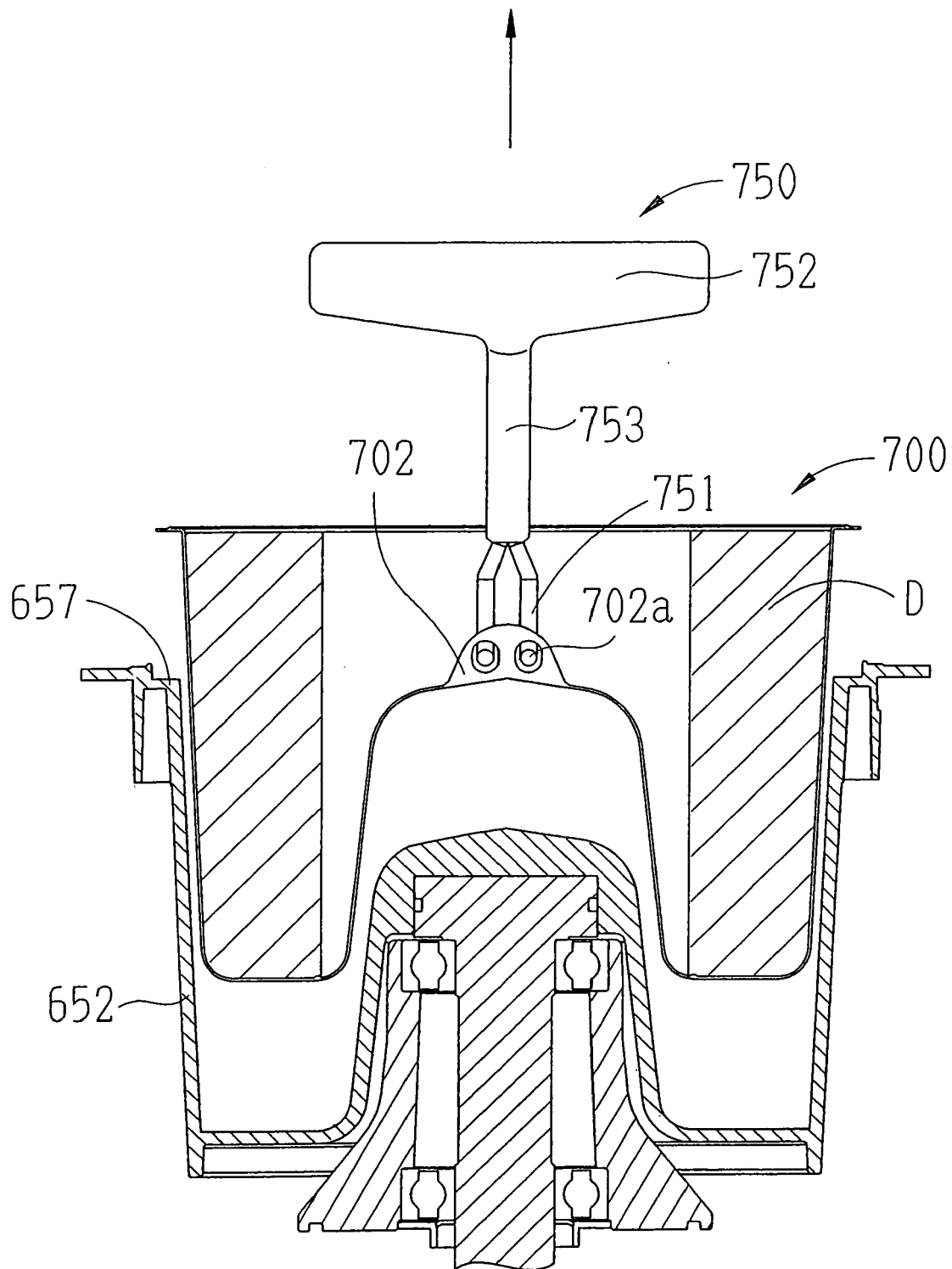


FIG. 5A

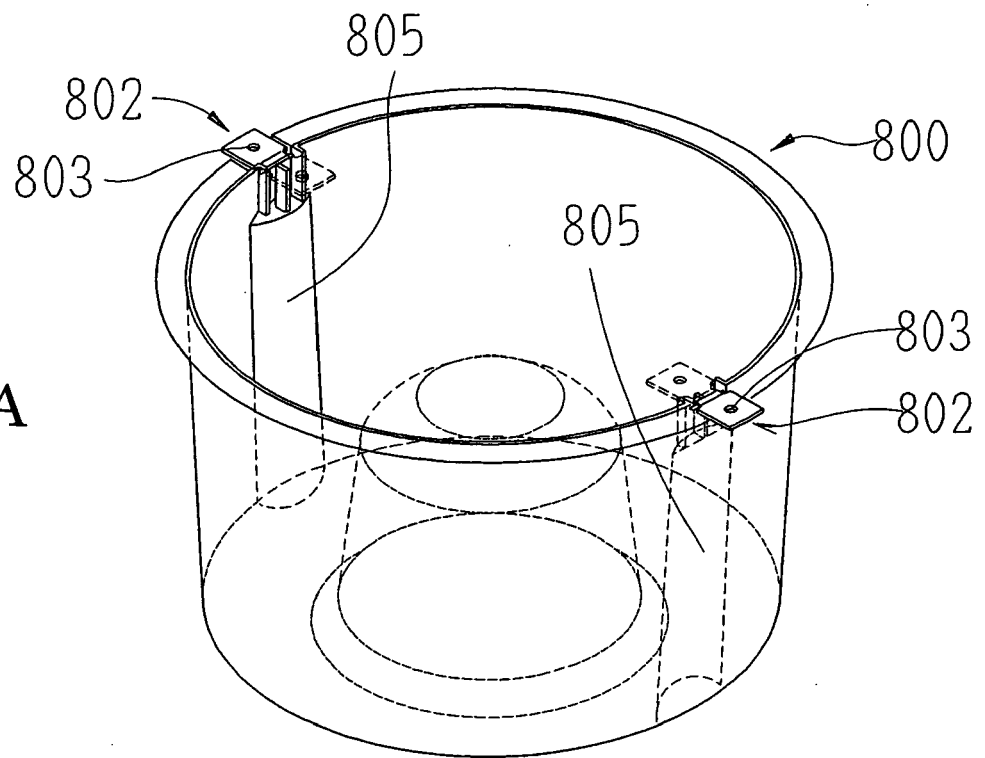


FIG. 5B

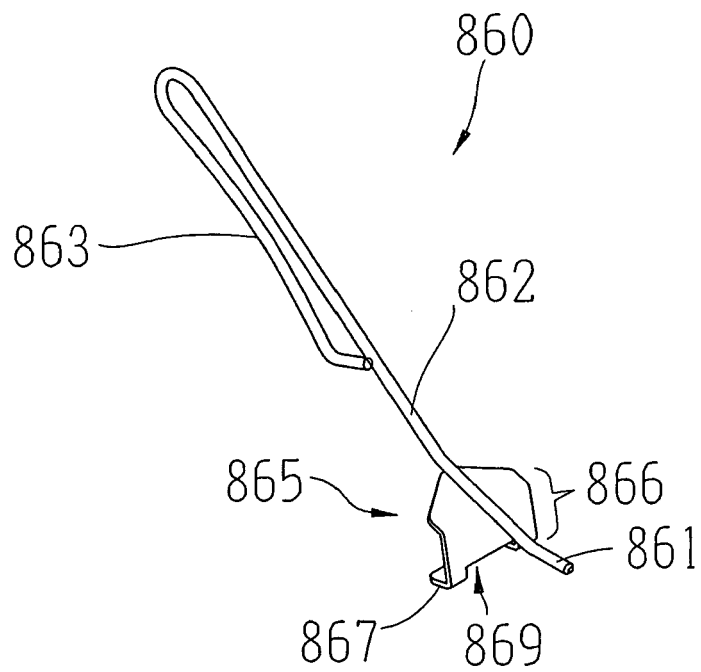


FIG. 6

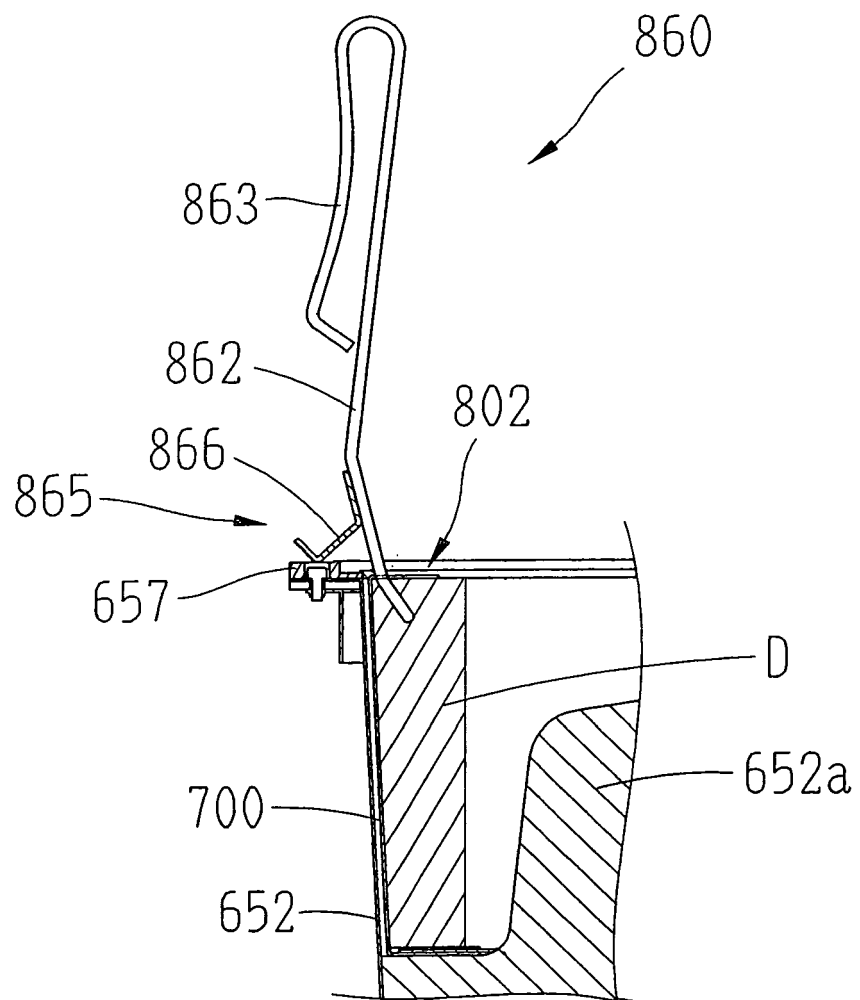


FIG. 7A

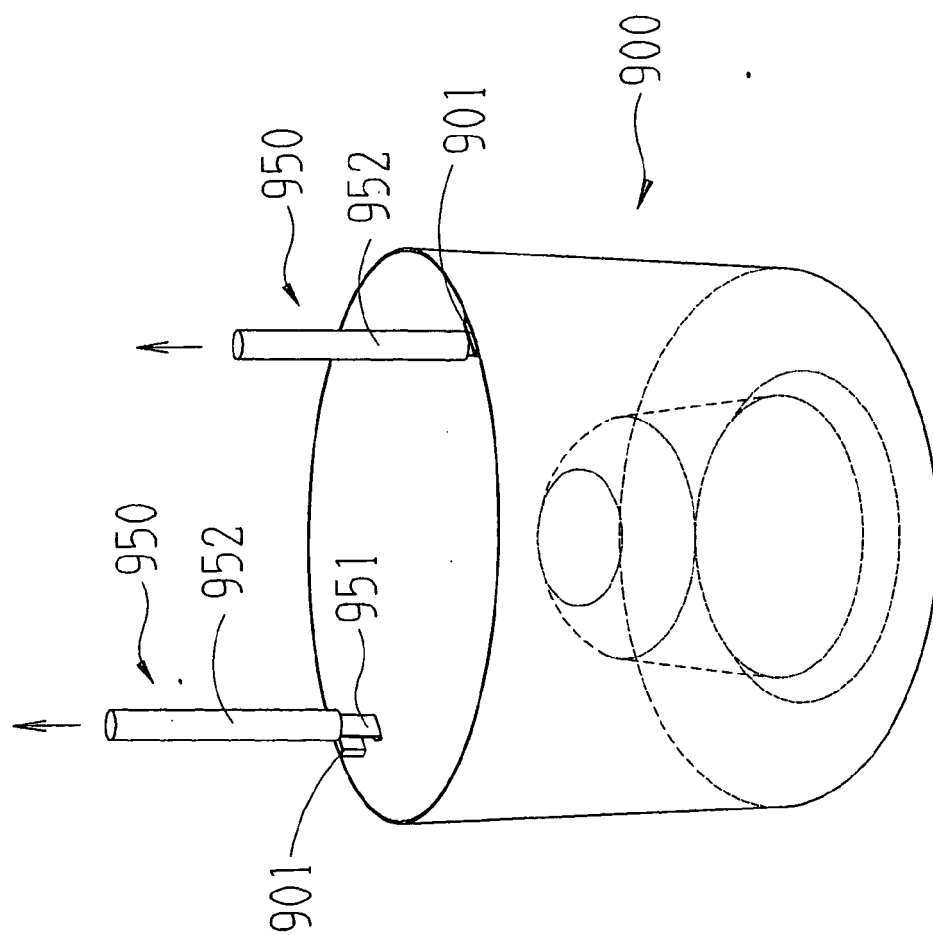
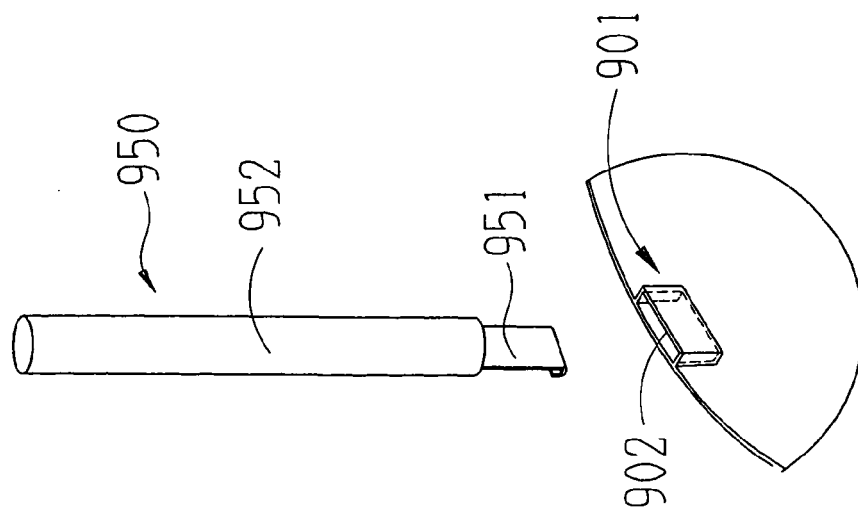


FIG. 7B





EUROPEAN SEARCH REPORT

Application Number
EP 09 01 2421

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 894 671 A (NIDEK KK [JP]) 5 March 2008 (2008-03-05)	1,4	INV. B24B9/14 B24B55/03 B04B1/08
A	* paragraphs [0015], [0016], [0021], [0053] - [0056]; figures 1-3,8-11 * -----	2,3	
A	US 4 302 332 A (HAYAKAWA NOBORU ET AL) 24 November 1981 (1981-11-24) * abstract; figures 8,9,12 * -----	1-4	
A	GB 1 398 042 A (HEIN LEHMANN AG; KRAUSS MAFFEI AG) 18 June 1975 (1975-06-18) * page 1, lines 24-36; figure 3 * -----	1-4	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B04B B24B
Place of search		Date of completion of the search	Examiner
Munich		15 January 2010	Zeckau, Jochen
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EPO FORM 1503 03/82 (P04C01)

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EP 09 01 2421

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15-01-2010

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