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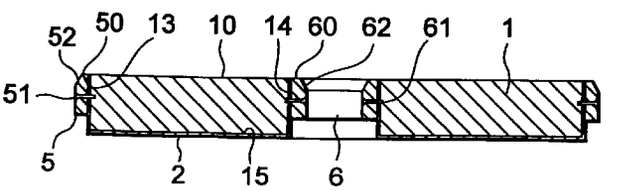
(54) Platen of polishing apparatus and method of adhesion of polishing pad

(57) A platen of a polishing apparatus and a method of adhesion of a polishing pad enables a polishing pad to be adhered to the platen and cut easily and in a short time even by an unskilled worker. Protective rings are attached to the upper part of the outer peripheral surface and upper part of the inner peripheral surface of a platen covered by a protective film over its entire surface other than the pad adhesion surface. At this time, the pad abutting surfaces of the protective rings are set to be level with the pad adhesion surface. An original sheet of a polishing pad larger than the platen is adhered to the pad adhesion surface in this state, then the blade part of a cutter is used to cut the polishing pad while abutting against the slanted surfaces of the protective rings, whereby the polishing pad can be cut to a shape corresponding to the platen.

FIG. 2



EP 0 943 397 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a platen of a polishing apparatus used for a polishing apparatus for polishing a wafer or other workpiece to a mirror surface and to a method of adhesion of a polishing pad.

2. Description of the Related Art

[0002] A polishing apparatus presses a wafer or other workpiece on to a platen on which a polishing pad is adhered and makes the platen and workpiece rotate relative to each other so as to polish the workpiece to a mirror surface by the polishing pad.

[0003] In such a polishing apparatus, acidic or alkaline slurry is used to chemically and mechanically polish the workpiece.

[0004] Accordingly, if a platen formed by stainless steel or a casting is used naked, the platen would rust etc. due to the slurry and might scratch the workpiece.

[0005] For example, if a weakly alkaline slurry is supplied on to a cast platen, the rotation of the platen will cause the slurry to flow to the peripheral surface of the platen, the peripheral surface will rust, and the workpiece will be scratched or contaminated by that rust. Further, when supplying an acidic slurry to a stainless steel platen, the slurry will react with the stainless steel and cause nickel etc. to dissolve out at the peripheral surface of the platen again causing contamination of the workpiece. Further, the nickel etc. may enter into the workpiece and cause the workpiece to become unusable.

[0006] Therefore, in the past, the technique has been adopted of painting the surface of the platen or giving it a polytetrafluoroethylene on coating except at the surface where the polishing pad is to be adhered to prevent in advance any chemical reaction between the slurry and the platen at the time of the polishing work.

[0007] Turning now to the problems to be solved by the invention, there have been the following problems in platens of the above polishing apparatuses of the related art.

[0008] FIGS. 6A and 6B are cross-sectional views illustrating the method of adhesion of a polishing pad of the related art. FIG. 6A shows the state of adhesion of an original sheet of a polishing pad to a platen, while FIG. 6B shows the state of cutting the polishing pad along the shape of the platen.

[0009] In FIG. 6A, reference numeral 1 indicates a platen. The platen 1 is a platen used for a double side polishing apparatus and forms a donut shape as a whole.

[0010] At the surface except the pad adhesion surface 10 of the platen 1 is formed a protective film 2 comprised of a paint or polytetrafluoroethylene coating.

[0011] When adhering a polishing pad 3 on the pad adhesion surface 10 of such a platen 1, an original sheet of the polishing pad 3 larger than the platen 1 is first adhered to the pad adhesion surface 10 by an adhesive etc. Then, as shown in FIG. 6B, a cutter 4 is used to cut the polishing pad 3 along the upper outer edge 11 and upper inner edge 12 of the platen 1.

[0012] In the above cutting work, however, the polishing pad 3 is cut while pressing the blade portion 40 of the cutter 4 against the pad adhesion surface 10 or upper outer edge 11 of the platen 1, so the protective film 2 may be scratched by the blade portion 40 of the cutter 4 and the platen 1 may become exposed.

[0013] Therefore, cutting the polishing pad 3 requires considerable skill and time and a general worker finds it difficult to perform the adhesion and cutting work of the polishing pad 3 easily and in a short time.

SUMMARY OF THE INVENTION

[0014] An object of the present invention is to provide a platen of a polishing apparatus and a method of adhesion of a polishing pad which enables the adhesion of a polishing pad to a platen and the cutting of the same to be handled easily and in a short time even by an unskilled worker.

[0015] According to the aspect of the invention, there is provided a disk-shaped or donut-shaped platen of a polishing apparatus having a polishing pad adhered to a pad adhesion surface of the platen comprising: a protective film covering surfaces of the platen other than the pad adhesion surface; and a protective ring having a pad abutting surface parallel with the pad adhesion surface and made of a material nonreactive with a slurry, the pad abutting surface being fit on a peripheral surface of the platen from the outside of the protective film so as to be substantially level with the pad adhesion surface.

[0016] Due to this configuration, by cutting the original sheet of the polishing pad adhered to the pad adhesion surface of the platen along the peripheral surface of the protective ring by a cuter etc., the cutter etc. will only scratch the protective ring and not the protective film.

[0017] According to the aspect of the invention, the protective ring is formed by a synthetic resin.

[0018] Note that the protective ring has to be made of a material which does not chemically react with the slurry. Any material may be used so long as it has this property. As examples of this, the synthetic resin is a resin selected from the group consisting of a polytetrafluoroethylene, fluoroplastics, an epoxy resin, unsaturated polyester resin, melamine resin, polyvinyl chloride, polyacetal, polyamide, low density polyethylene, polyester resin, polycarbonate, polypropylene, methacrylate resin, and polyvinylidene chloride.

[0019] According to the aspect of the invention, a slanted surface contiguous with the pad abutting sur-

face of the protective ring and inclined outward by a predetermined angle is formed at the peripheral surface of the protective ring.

[0020] Due to this configuration, it is possible to cut the polishing pad by just placing the cutter etc. against the slanted surface of the protective ring and moving it along this slanted surface.

[0021] Further, the invention may be grasped as a method of adhesion of a polishing pad using a protective ring.

[0022] Therefore, according to the aspect of the invention, there is provided a method of adhesion of a polishing pad comprising: a first step of fitting on a peripheral surface of a platen, covered with a protective film over its entire surface other than a pad adhesion surface, a protective ring having a pad abutting surface parallel with the pad adhesion surface and made of a material nonreactive with a slurry in a manner so that the pad abutting surface becomes level with the pad adhesion surface; a second step of adhering an original sheet of a polishing pad larger than the platen after the first step to the pad adhesion surface and the pad abutting surface; and a third step of cutting the polishing pad along the peripheral surface of the protective ring.

[0023] Further, in the aspect of the invention, the protective ring at the first step has at its peripheral surface a slanted surface contiguous with the pad abutting surface of the protective ring and inclined outward by a predetermined angle and the third step is cutting the polishing pad along the slanted surface of the protective ring.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The above and other objects, features, and advantages of the present invention will become more readily apparent from the following description of presently preferred embodiments of the invention taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of the state of the platen of a polishing apparatus according to an embodiment of the present invention without adhesion of a polishing pad;

FIG. 2 is a sectional view along a line A-A of FIG. 1;

FIGS. 3A to 3C are views of the steps of the method of adhesion of a polishing pad to a platen;

FIG. 4 is a cross-sectional view of the state of the blade of a cutter striking against a protective ring;

FIG. 5 is a cross-sectional view of a double side polishing apparatus; and

FIGS. 6A and 6B are cross-sectional views of the method of adhesion of a polishing pad of the related art.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] Preferred embodiments of the present invention will be explained below with reference to the drawings.

[0026] FIG. 1 is a perspective view of the state of the platen of a polishing apparatus according to an embodiment of the present invention without adhesion of a polishing pad; while FIG. 2 is a sectional view along a line A-A of FIG. 1. Note that members the same as those shown in FIGS. 6A and 6B are given the same reference numerals in the explanation.

[0027] As shown in FIG. 1 and FIG. 2, the platen 1 is a large sized platen of for example an outer diameter of 2190 mm used for a double side polishing apparatus and is formed in a donut shape.

[0028] A protective film 2 is coated on the surface of the platen 1.

[0029] Specifically, the outer peripheral surface 13, inner peripheral surface 14, and bottom surface of the platen 1 are coated completely by a protective film 2. Only the pad adhesion surface 10 is left exposed.

[0030] Further, a large diameter protective ring 5 and small diameter protective ring 6 are fit over the outer peripheral surface 13 and inner peripheral surface 14 of the platen 1 covered by the protective film 2 in this way.

[0031] The protective rings 5 and 6 are both formed by Teflon (Du Pont's trade name, polytetrafluoroethylene, fluoroplastics), which is a material which will not react with the slurry. The inside diameter of the protective ring 5 is set to be substantially equal to the diameter of the outer peripheral surface 13, while the outside diameter of the protective ring 6 is set to be substantially equal to the diameter of the inner peripheral surface 14 of the platen 1.

[0032] These protective rings 5 and 6 have pad abutting surfaces 50 and 60 parallel to the pad adhesion surface 10 of the platen 1. These pad abutting surfaces 50 and 60 are affixed to the platen 1 by screws 51 and 61 in a state positioned to be level with the pad adhesion surface 10.

[0033] Further, the outer peripheral surface side of the protective ring 5 and the inner peripheral surface side of the protective ring 6 are formed with slanted surfaces 52 and 62 which are respectively contiguous with the pad abutting surfaces 50 and 60 and incline outward by about 30°.

[0034] The work for adhering the polishing pad to the platen 1 of the above structure proceeds as follows:

[0035] FIGS. 3A to 3C are views of the steps of the method of adhesion of a polishing pad to a platen 1.

[0036] First, as shown in FIG. 3A, a worker adheres an original sheet of the polishing pad 3 larger than the platen 1 on the pad adhesion surface 10 by an adhesive.

[0037] Suitably thereafter, as shown in FIG. 3B, the worker cuts into the polishing pad 3 with the blade por-

tion 40 of a cutter 4. The worker then tilts the blade portion 40 and makes it abut against the slanted surface 52 of the protective ring 5. By cutting the polishing pad 3 while maintaining the state of abutment of the blade portion 40 and slanted surface 52, the outer edge of the polishing pad 3 is cut to a shape corresponding to the outer shape of the platen 1 as shown in FIG. 3C.

[0038] The same is true when cutting the portion of the polishing pad 3 positioned at the center hole of the platen 1. As shown in FIG. 3B, by cutting the polishing pad 3 while making the blade portion 40 of the cutter 4 abut against the slanted surface 62 of the protective ring 6, the center portion of the polishing pad 3 is cut to a shape corresponding to the center hole of the platen 1.

[0039] When an unskilled worker performs this cutting work, however, sometimes when cutting into the polishing pad 3 by the blade portion 40 of the cutter 4 or when cutting the polishing pad 3 along the slanted surfaces 52 and 62, the worker may do something which makes the edge of the blade portion 40 move to the protective film 2 side in a state facing the protective film 2.

[0040] If this happens, then, in the platen of the related art shown in FIGS. 6A and 6B, the edge of the cutter 4 would contact the protective film 2 and shave off the protective film 2. If it were necessary to perform the work while paying attention to the direction of the edge, the work would end up taking a longer time.

[0041] In this embodiment, however, since the protective rings 5 and 6 are provided, the movement of the edge of the cutter 4 is received by the protective rings 5 and 6 as shown in FIG. 4. Accordingly, only the protective rings 5 and 6 will be scratched, so there is no need for the worker to pay attention to the direction of the edge.

[0042] In this way, according to the platen of the present embodiment, since the protective rings 5 and 6 are formed with slanted surfaces 52 and 62, the worker need only cut the polishing pad 3 using as a guide the slanted surfaces 52 and 62 of the protective rings 5 and 6 so as to accurately cut the polishing pad. The cutting work therefore becomes extremely easy.

[0043] Further, since it is possible to cut the polishing pad 3 without having to pay attention to the direction of the edge of the cutter 4, it is possible for even an unskilled worker to perform the work of cutting the polishing pad 3 easily and in a short time.

[0044] Finally, an explanation will be made of the polishing operation of a double side polishing apparatus using the platen of the present embodiment.

[0045] FIG. 5 is a cross-sectional view of a double side polishing apparatus.

[0046] One platen 1 (1-1) of two platens 1 each adhered with the polishing pad 3 shown in FIG. 3C is turned upward and attached to on a platen rotary member 70 as shown in FIG. 5. The other platen 1 (1-2) is turned downward and connected to a shaft 71.

[0047] Next, a carrier 72 carrying a wafer W is placed on the polishing pad 3 of the platen 1-1. By making a sun gear 73 and internal gear 74 rotate in a state with the carrier's teeth engaged with the sun gear 73 and internal gear 74, the carrier 72 is made to revolve around the sun gear 73 while rotating.

[0048] Next, the wafer W is pressed against by the platen 1-2 and slurry is supplied while making the platens 1-1 and 1-2 rotate in opposite directions to each other, whereby the two surfaces of the wafer W are polished to a mirror surface by the polishing pads 3 of the platens 1-1 and 1-2.

[0049] At this time, the rotation of the platens 1-1 and 1-2 causes the slurry to flow out to the outer peripheral surfaces 13 and inner peripheral surfaces 14 of the platens 1-1 and 1-2 and to deposit on the surfaces of the protective rings 5 and 6. If the slurry were to continue to remain deposited on the protective rings 5 and 6 in that state for a long period of time, the slurry would dry and abrasive S would become affixed to the protective rings 5 and 6 as shown in FIG. 5. In particular, if abrasive S became affixed to the protective rings 5 and 6 of the upper platen 1-2, vibration might cause clumps of abrasive to peel off and fall between the platens 1-1 and 1-2 and scratch the wafer W.

[0050] In the present embodiment, however, since the protective rings 5 and 6 are formed by polytetrafluoroethylene, which has a smooth surface, even if depositing on the protective rings 5 and 6, the slurry will fall off from the protective rings 5 and 6 in a short time. Therefore, the problem of the slurry drying and abrasive affixing to the protective rings 5 and 6 will not occur.

[0051] Note that the present invention is not limited to the above embodiment and includes various modifications and changes within the scope of the gist of the invention.

[0052] For example, in the above embodiment, the present invention was applied to a donut-shaped platen 1, but of course it may also be applied to a platen with a disk-shaped center hole. Further, since the platen 1 was a large sized platen of about 2190 mm, the protective film 2 was formed by paint, but in the case of a small sized platen, the protective film 2 may also be formed by a polytetrafluoroethylene coating.

[0053] Further, in the above embodiment, the protective rings 5 and 6 were formed by polytetrafluoroethylene, but when using the platen 1 for an apparatus having only a single platen at the bottom, the problem of abrasive of the slurry becoming affixed to the platen does not occur, so the protective rings 5 and 6 may also be formed by another synthetic resin, for example, fluoroplastics, an epoxy resin, unsaturated polyester resin, melamine resin, polyvinyl chloride, polyacetal, polyamide, low density polyethylene, polyester resin, polycarbonate, polypropylene, methacrylate resin, and polyvinylidene chloride. These resins can also be used to the above-mentioned embodiment.

[0054] Further, while the protective rings 5 and 6 were provided with slanted surfaces 52 and 62, the invention does not exclude protective rings 5 and 6 of rectangular

cross-sections without the slanted surfaces 52 and 62.

[0055] Summarizing the advantageous effects of the present invention, as explained in detail above, according to the polishing apparatus according to the aspects of the invention, the cutter etc. will only scratch the protective rings, made of a material nonreacting with the slurry, at the time of cutting and will not scratch the protective film, so there is the superior advantageous effects that even an unskilled general worker can perform the work of cutting a polishing pad easily and in a short time.

[0056] Further, according to the aspects of the invention, since it is possible to cut the polishing pad while making the cutter etc. abut against the slanted surface of the protective ring, there is the advantageous effect that it is possible to cut the polishing pad easily and accurately.

Claims

1. A disk-shaped or donut-shaped platen of a polishing apparatus having a polishing pad adhered to a pad adhesion surface of the platen comprising:

   a protective film covering surfaces of the platen other than the pad adhesion surface; and
   a protective ring having a pad abutting surface parallel with said pad adhesion surface and made of a material nonreactive with a slurry, the pad abutting surface being fit on a peripheral surface of the platen from the outside of said protective film so as to be substantially level with the pad adhesion surface.

2. A platen of a polishing apparatus as set forth in claim 1, wherein said protective ring is formed by a synthetic resin.

3. A platen of a polishing apparatus as set forth in claim 2, wherein said synthetic resin is a resin selected from the group consisting of a polytetrafluoroethylene, fluoroplastics, an epoxy resin, unsaturated polyester resin, melamine resin, polyvinyl chloride, polyacetal, polyamide, low density polyethylene, polyester resin, polycarbonate, polypropylene, methacrylate resin, and polyvinylidene chloride.

4. A platen of a polishing apparatus as set forth in claim 1, wherein a slanted surface contiguous with the pad abutting surface of the protective ring and inclined outward by a predetermined angle is formed at the peripheral surface of the protective ring.

5. A method of adhesion of a polishing pad comprising:

   a first step of fitting on a peripheral surface of a platen, covered with a protective film over its entire surface other than a pad adhesion surface, a protective ring having a pad abutting surface parallel with said pad adhesion surface and made of a material nonreactive with a slurry in a manner so that said pad abutting surface becomes level with the pad adhesion surface;
   a second step of adhering an original sheet of a polishing pad larger than the platen after the first step to the pad adhesion surface and the pad abutting surface; and
   a third step of cutting the polishing pad along the peripheral surface of the protective ring.

6. A method of adhesion of a polishing pad as set forth in claim 5, wherein

   the protective ring at the first step has at its peripheral surface a slanted surface contiguous with the pad abutting surface of the protective ring and inclined outward by a predetermined angle and
   said third step is cutting the polishing pad along the slanted surface of the protective ring.

FIG. 1

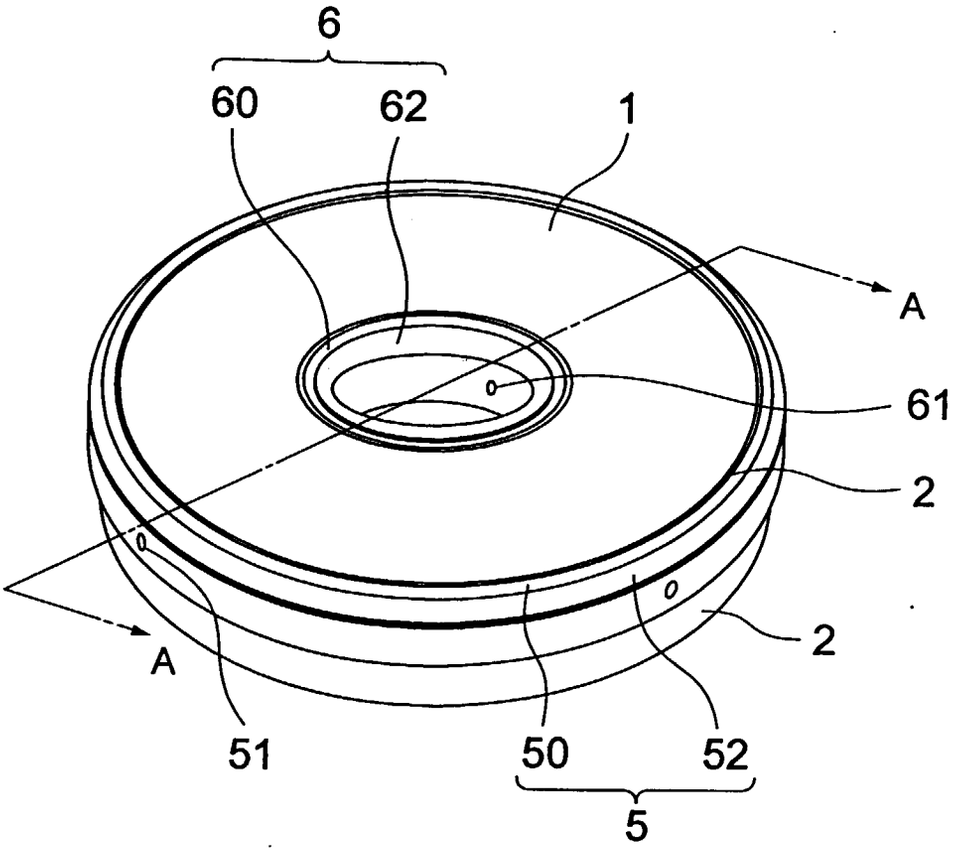


FIG. 2

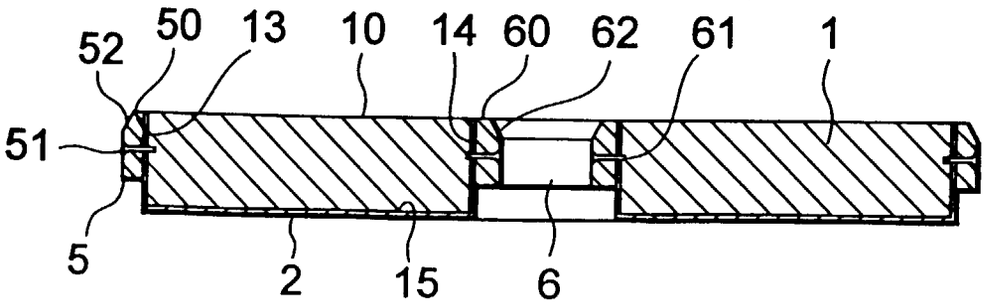


FIG. 3A

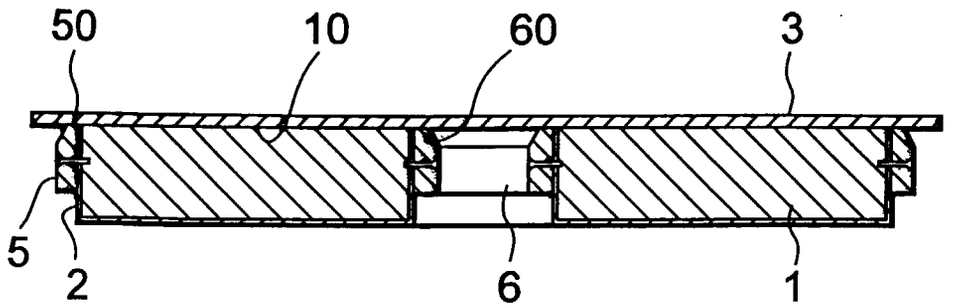


FIG. 3B

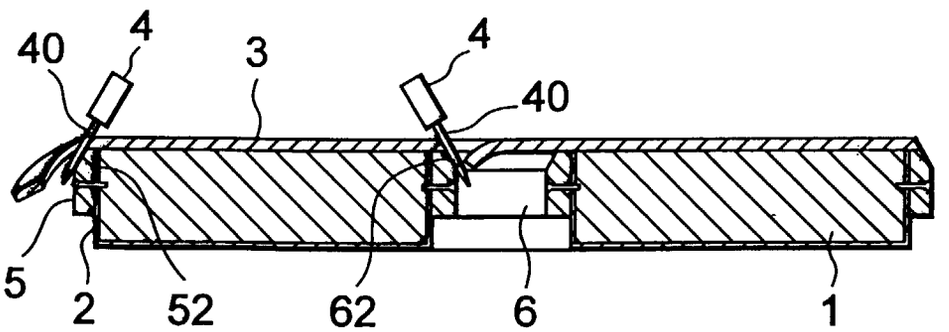


FIG. 3C

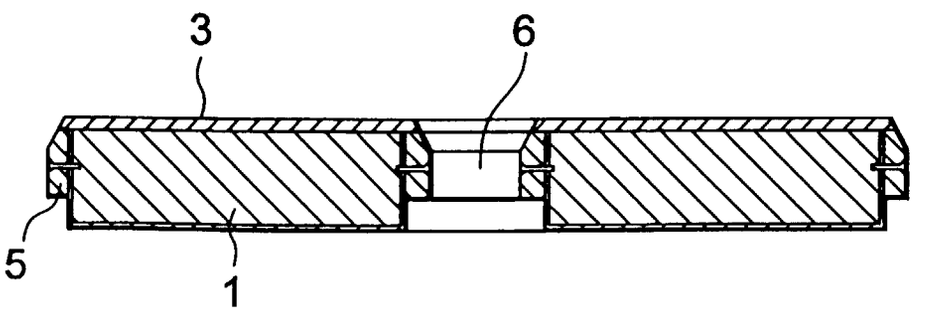


FIG. 4

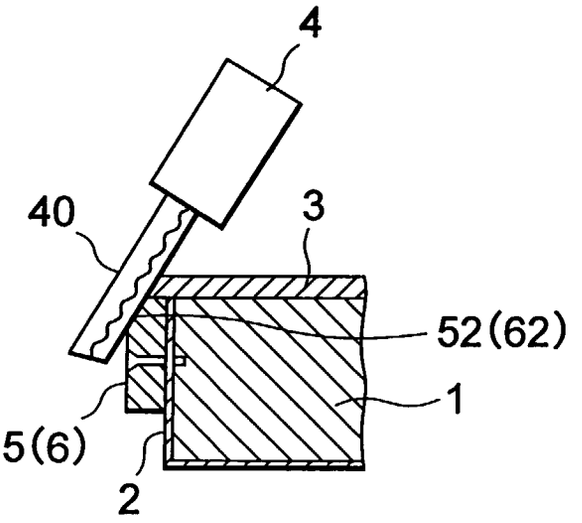


FIG. 5

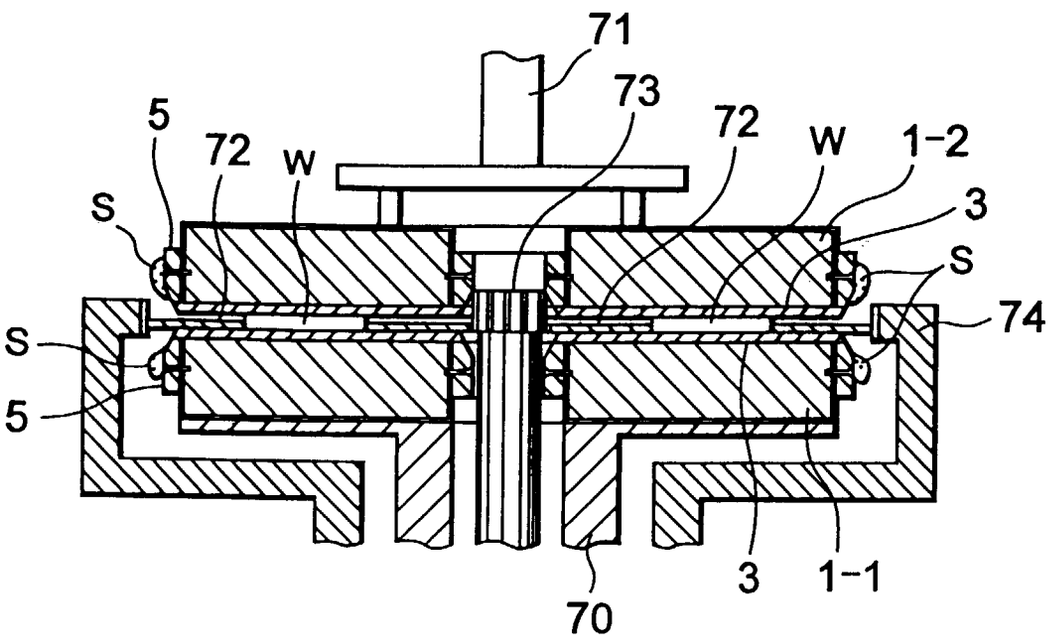


FIG. 6A
(PRIOR ART)

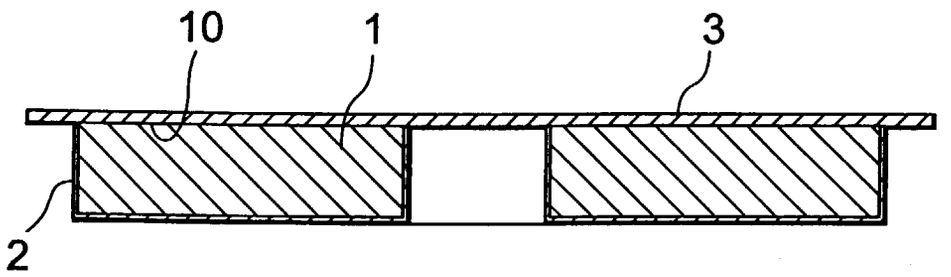


FIG. 6B
(PRIOR ART)