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(54) **Polishing apparatus**

Poliergerät

Appareil de polissage

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- **PATENT ABSTRACTS OF JAPAN vol. 12, no. 485 (M-777) 19 December 1988 & JP-A-63 207 559 (DISCO ABRASIVE SYST LTD) 26 August 1988**
- **PATENT ABSTRACTS OF JAPAN vol. 8, no. 80 (M-289) 12 April 1984 & JP-A-58 223 561 (DEISUKO : KK) 26 December 1983**

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Description

BACKGROUND OF THE INVENTION

Field of the Invention:

[0001] The present invention relates to a polishing apparatus, and more particularly to a polishing apparatus which has a polishing unit for polishing a workpiece such as a semiconductor wafer, a washing unit for washing the workpiece which has been polished and a universal transfer robot for transferring the workpiece.

Description of the Related Art:

[0002] Recent rapid progress in semiconductor device integration demands smaller and smaller wiring patterns or interconnections and also narrower spaces between interconnections which connect active areas. One of the processes available for forming such interconnection is photolithography. Though the photolithographic process can form interconnections that are at most 0.5 μm wide, it requires that surfaces on which pattern images are to be focused on by a stepper be as flat as possible because the depth of focus of the optical system is relatively small.

[0003] It is therefore necessary to make the surfaces of semiconductor wafers flat for photolithography. One customary way of flattening the surfaces of semiconductor wafers is to polish them with a polishing apparatus.

[0004] Conventionally, such a polishing apparatus has a single function of polishing a semiconductor wafer. Therefore, in case of washing a semiconductor wafer after polishing, the semiconductor wafer is required to be transferred or transported from the polishing apparatus to a washing apparatus. Further, in case of polishing a semiconductor wafer again under a different condition after polishing, the semiconductor wafer is required to be transferred or transported from one polishing apparatus to another polishing apparatus. In these cases, the semiconductor wafers are manually transferred or transported by a movable container in which they are immersed in water to keep them from drying during transportation. However, since various apparatuses including a polishing apparatus and a washing apparatus are independently installed and the semiconductor wafers are transferred or transported by the movable container containing water therein, it is difficult to install the polishing apparatus, the washing apparatus and the like in a clean room of a semiconductor manufacturing plant and to automate various processes including a polishing process and a washing process completely.

[0005] In order to solve the above problems, there has been proposed an apparatus which has a polishing unit and a washing unit housed in a common housing. Further, if necessary, there is a possibility that a plurality of polishing units are housed in a common housing.

[0006] In the polishing apparatus which has a polishing unit and a washing unit, or a plurality of polishing units in a common housing, it is conceivable to construct a cluster type of polishing apparatus which integrates a plurality of units including a polishing unit and a washing unit, as adopted in a semiconductor manufacturing process such as etching or chemical vapor deposit (CVD).

[0007] However, in case of constructing a cluster type of polishing apparatus which integrates a plurality of units and incorporates a universal transfer robot at a central position of the units, it is necessary to handle a dirty and wet semiconductor wafer soiled with abrasive slurry or particles generated by polishing operation or a clean and dry semiconductor wafer which is placed on a loading unit or an unloading unit. Therefore, a conventional robot incorporated in a cluster type of a semiconductor manufacturing processing apparatus cannot be used in a cluster type of polishing apparatus because the robot does not have such function that it can handle a clean semiconductor wafer and a dirty semiconductor wafer separately. If the conventional robot is incorporated in the polishing apparatus, a washing process and a drying process of the robot or a robot arm are additionally required, thus lowering throughput.

[0008] Further, in case of leaving the robot or the robot arm for a long time as it is, abrasive material or particles generated by polishing operation adheres to the robot or the robot arm, resulting in contaminating subsequent semiconductor wafers or respective units of the polishing apparatus.

[0009] Patent Abstract of Japan, vol. 12, no. 485 (M-777) and JP-A-63 207 559 disclose an automatic wafer grinding device. US-A-5,329,732 discloses a wafer polishing apparatus according to the preamble of claim 1 and a method of polishing, washing and drying a workpiece, respectively.

SUMMARY OF THE INVENTION

[0010] It is therefore an object of the present invention to provide a polishing and washing apparatus which can be installed in a clean room.

[0011] In accordance with the present invention an apparatus for polishing and then washing a workpiece as set forth in claim 1 and a method for polishing and then washing a workpiece as set forth in claim 4 are provided. Preferred embodiments of the invention are disclosed in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

FIG. 1 is a schematic plan view of a polishing apparatus according to an embodiment of the present invention;

FIG. 2A is a schematic plan view showing partially

a polishing apparatus according to an embodiment of the present invention;

FIG. 2B is a schematic plan view showing a washing unit in a polishing apparatus according to an embodiment of the present invention;

FIG. 3 is a cross-sectional view taken along line A1-A2 of FIG. 2A;

FIG. 4 is a cross-sectional view taken along line B1-B2 of FIG. 2A;

FIG. 5 is a cross-sectional view taken along line D1-C3-C2-C1 of FIG. 2A;

FIG. 6 is a cross-sectional view taken along line D1-D2 of FIG. 2A;

FIG. 7 is a schematic plan view of a polishing apparatus according to the second embodiment of the present invention;

FIG. 8 is a schematic plan view of a polishing apparatus according to the third embodiment of the present invention;

FIG. 9 is a schematic plan view of a polishing apparatus according to the fourth embodiment of the present invention;

FIG. 10 is a schematic plan view of a polishing apparatus according to the fifth embodiment of the present invention; and

FIG. 11 is a schematic plan view of a polishing apparatus according to the sixth embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] A polishing apparatus according to an embodiment of the present invention will be described below with reference to FIG. 1. In the embodiments, description will be made using a semiconductor water as a workpiece to be polished. As shown in FIG. 1, a polishing apparatus has a center robot 10 having arms 10-1 and 10-2 at a central part thereof. The center robot 10 constitutes a universal transfer robot. Around the center robot 10 and in the area where the arm 10-1 can access, there are provided a loading unit 11 for placing thereon a semiconductor wafer S to be polished, an unloading unit 12 for placing thereon the semiconductor wafer S which has been polished, polishing units 13 and 14 each for polishing the semiconductor wafer S and a washing unit 15 for washing the semiconductor wafer S.

[0014] The polishing unit 13 has a polishing head supporting arm 13-3, a turntable 13-4 and a top ring rotatably provided on the polishing head supporting arm 13-3. The polishing unit 14 has a polishing head supporting arm 14-3, a turntable 14-4 and a top ring rotatably provided on the polishing head supporting arm 14-3. An abrasive cloth is attached to respective upper surfaces of the turntables 13-4 and 14-4. Each of the polishing head supporting arms 13-3 and 14-3 constitutes an exclusive transferring device for transferring the semiconductor wafer S from a loading position 13-1, 14-1 of the polishing unit to the turntable 13-4, 14-4. Further, each of the polishing head supporting arms 13-3 and 14-3 constitutes an exclusive transferring device for transferring the semiconductor wafer S from the polishing unit 13, 14 to the washing unit 15. The polishing apparatus has a table 16 for placing a dressing tool for dressing the abrasive cloth on the turntable 13-4 and a table 17 for placing a dressing tool for dressing the abrasive cloth on the turntable 14-4.

[0015] In the polishing apparatus, the semiconductor wafer S to be polished is picked up under vacuum by the arm 10-1 of the center robot 10, reversed to make a surface to be polished downward, and transferred to the loading position 13-1 of the polishing unit 13. The top ring of the polishing head supporting arm 13-3 holds the semiconductor wafer S and presses the semiconductor wafer S against the abrasive cloth attached to the upper surface of the turntable 13-4. At this time, the turntable 13-4 is rotated, and the top ring is rotated about its own axis and swung on the turntable 13-4 by the polishing head supporting arm 13-3, whereby the semiconductor wafer S is polished.

[0016] After a polishing process, the semiconductor wafer S is transferred to a loading position 15-1 of the washing unit 15 by the polishing head supporting arm 13-3. The polishing head supporting arm 13-3 which releases the semiconductor wafer S at the loading position 15-1 chucks a dressing tool 16-1 on the table 16 and presses the dressing tool 16-1 against the abrasive cloth on the turntable 13-4, thereby dressing the abrasive cloth. This dressing work may be performed by an exclusive dressing mechanism.

[0017] The semiconductor wafer S which has been transferred to the loading position 14-1 of the polishing unit 14 by the arm 10-1 of the center robot 10 is also held by the top ring of the polishing head supporting arm 14-3 and pressed against the abrasive cloth attached to the upper surface of the turntable 14-4. After a polishing process, the semiconductor wafer S is transferred to a loading position 15-2 of the washing unit 15. Further, the polishing head supporting arm 14-3 which releases the semiconductor wafer S chucks a dressing tool 17-1 on the table 17 and presses the dressing tool 17-1 against the abrasive cloth on the turntable 14-4, thereby dressing the abrasive cloth.

[0018] The semiconductor wafer S transferred to the loading position 15-1 or the loading position 15-2 is washed in the washing unit 15, and then transferred to an unloading position 15-3. The cleaned semiconductor wafer S is transferred from the unloading position 15-3 to the unloading unit 12 by the arm 10-2 of the center robot 10. The above entire operations are performed automatically.

[0019] Next, the polishing unit 14 and the washing unit 15 will be described in detail with reference to FIGS. 2 through 6. FIGS. 2 through 6 show the first embodiment of the present invention as well as FIG. 1. However, a dressing tool and a table for placing the dressing tool

are not provided, but an exclusive dressing mechanism 15-11 is provided.

[0020] As shown in FIG. 2, the semiconductor wafer S placed on the loading unit 11 is picked up by the arm 10-1 of the center robot 10, reversed to make a surface to be polished downward by a reversing mechanism 11-2 and transferred to the loading position 14-1 of the polishing unit 14. As shown in FIG. 3, the semiconductor wafer S is held under vacuum by the top ring 14-5 provided at the forward end of the polishing head supporting arm 14-3 and moved above the turntable 14-4. Thereafter, the top ring 14-5 is lowered, and the semiconductor wafer S held by the top ring 14-5 is pressed against the abrasive cloth on the turntable 14-4, whereby the semiconductor wafer S is polished. Incidentally, the turntable 14-4 is rotated by a motor 14-6 through a timing belt 14-7 (see FIG. 4). As shown in FIG. 5, after a polishing process, the semiconductor wafer S is put into a washing receptacle 15-4 which is standing by at an opening of the loading position 15-2 of the washing unit 15, and washed by clearing solvent. During a washing process, the opening of the loading position 15-2 is closed by a shutter 15-5. The top ring 14-5 which releases the semiconductor wafer S is washed at the loading position by a washing mechanism of the washing unit 15.

[0021] After a washing process, the semiconductor wafer S is moved in a direction of (a) and transferred to a reversing mechanism 15-6 by which the semiconductor wafer S is reversed to make a surface which has been polished upward and supplied to a primary washing station 15-7. A primary washing process is carried out using clearing solvent such as pure water at the primary washing station 15-7. Thereafter, the semiconductor wafer S is picked up by a transfer robot 15-8 in the washing unit 15, moved in a direction of arrows b and c and fed to a secondary washing station 15-9. A secondary washing process is carried out using clearing solvent such as pure water at the secondary washing station 15-9.

[0022] After the secondary washing process, the semiconductor wafer S is picked up by the arm 10-2 of the center robot 10, moved in a direction of arrows d and e as shown in FIG. 6, and transferred to the unloading unit 12. As shown in FIG. 2, there is provided a dressing mechanism 15-11 for dressing the abrasive cloth on the turntable 14-4. The dressing mechanism 15-11 has a rotating brush 15-12 as shown in FIG. 3.

[0023] According to the first embodiment, the polishing apparatus comprises a center robot 10 having arms 10-1 and 10-2 and constituting a universal transfer robot for transferring the semiconductor wafer S to the respective units, a plurality of units disposed around the center robot 10 and including a loading unit 11 for placing thereon the semiconductor wafer S to be polished, an unloading unit 12 for placing thereon the semiconductor wafer S which has been polished, polishing units 13 and 14 each for polishing the semiconductor wafer S and a washing unit 15 for washing the semiconductor wafer S. The polishing apparatus further comprises a polishing head supporting arm 13-3 having a top ring for transferring the semiconductor wafer S between two adjacent units and a polishing head supporting arm 14-3 having a top ring for transferring the semiconductor wafer S between two adjacent units. The center robot 10 handles a clean and dry semiconductor wafer S, and the polishing head supporting arms 13-3 and 14-3 handle a dirty and wet semiconductor wafer S.

[0024] The center robot 10 has the arm 10-1 which is exclusively used for loading the semiconductor wafer to be polished and the arm 10-2 which is exclusively used for unloading the semiconductor wafer which has been polished. This arrangement is preferable for such a case where cleanliness of the semiconductor wafer S transferred from the loading unit 11 is different from that of the semiconductor wafer S transferred to the unloading unit 12.

[0025] Next, a polishing apparatus according to the second embodiment of the present invention will be described below with reference to FIG. 7. The parts shown in FIG. 7 which are identical to those of FIG. 1 are denoted by identical reference numerals. A polishing apparatus has a center robot 10 having arms 10-1 and 10-2 at a central part thereof. Around the center robot 10 and in the area where the arm 10-1 can access, there are provided a loading unit 11, an unloading unit 12, polishing units 13 and 14, a washing unit 15, and auxiliary spaces 18 and 19 for installing additional units, in a hexagonal arrangement.

[0026] In the auxiliary spaces 18 and 19, for example, a thickness meter for measuring a thickness of the semiconductor wafer is installed. In this case, the semiconductor wafer S is held by the arm 10-1 of the center robot 10 and fed to the thickness meter in the auxiliary space 18. Before a polishing process, a thickness of the semiconductor wafer S is measured by the thickness meter, and then transferred to the loading position 13-1 of the polishing unit 13.

[0027] After a polishing process, the semiconductor wafer S is transferred to the washing unit 15 in the same manner as the first embodiment, and washed in the washing unit 15. After a washing process, the semiconductor wafer S is fed to the thickness meter in the auxiliary space 18 by the arm 10-1 of the center robot. After measuring a thickness of the semiconductor wafer S which has been polished, the semiconductor wafer S is transferred to the unloading unit 12 by the arm 10-2 of the center robot 10.

[0028] FIG. 8 shows a polishing apparatus according to the third embodiment of the present invention. The parts shown in FIG. 8 which are identical to those of FIG. 1 are denoted by identical reference numerals. Around a center robot 10 having arms 10-1 and 10-2 and in the area where the arm 10-1 can access, there are provided a loading unit 11, an unloading unit 12, two polishing units 13 and 13, a polishing unit 14, a washing unit 15

provided between the polishing units 13 and 13, and a washing unit 15 provided between the polishing unit 14 and the unloading unit 12, in a hexagonal arrangement. This arrangement is preferable for such a case where a polishing time of the polishing unit 13 requires twice as much as that of the polishing unit 14.

[0029] In this case, the transfer of the semiconductor wafer S from the polishing units 13 and 13 to the washing unit 15 and the transfer of the semiconductor wafer S from the polishing unit 14 to the washing unit 15 are performed by not the center robot 10 but another transfer means such as the polishing head supporting arms 13-3 and 14-3. However, the loading of the semiconductor wafer to the polishing units 13, 13 and 14 and the picking of the semiconductor wafer from the washing units 15 and 15 are performed by the arms 10-1 and 10-2 of the center robot 10. That is, the center robot 10 does not handle the semiconductor wafer polished by the polishing units 13, 13 and 14 so that the arms 10-1 and 10-2 of the center robot 10 are not contaminated by the semiconductor wafer which has been polished and to which abrasive slurry adheres.

[0030] FIG. 9 shows a polishing apparatus according to the fourth embodiment of the present invention. The parts shown in FIG. 9 which are identical to those of FIG. 1 are denoted by identical reference numerals. The polishing apparatus is provided with a center robot 10 having only an arm 10-1. In case of providing only the arm 10-1, exclusive transferring devices are provided between the polishing units 13 and 14, and between the polishing units 13, 14 and the washing unit 15. This system is applicable to such a case where cleanliness of the semiconductor wafer which is picked up from the loading unit 11 is substantially the same as that of the semiconductor wafer which is transferred to the unloading unit 12.

[0031] FIG. 10 shows a polishing apparatus according to the fifth embodiment of the present invention. The parts shown in FIG. 10 which are identical to those of FIG. 1 are denoted by identical reference numerals. Around a center robot 10 having arms and in the area where the arms can access, there are provided a loading unit 11, four polishing units 13, 14, 21 and 22, and a washing unit 15, in a hexagonal arrangement. An unloading unit 12 is disposed at the end of the washing unit 15. Further, a storage 23 is disposed adjacent to the loading unit 11 and the unloading unit 12. An automatic guided vehicle 24 is used to take the semiconductor wafer S, which has been polished, out of the storage 23 and to convey the semiconductor wafer to be polished into the storage 23.

[0032] Loading of the semiconductor wafer S to the polishing units 13, 14, 21 and 22 and the washing unit 15 and picking the semiconductor wafer S from the loading unit 11 and the polishing units 13, 14, 21 and 22 are entirely carried out by the center robot 10. Further, the transfer of the semiconductor wafer from the washing unit 15 to the unloading unit 12 is carried out by the center robot 10. The center robot 10 is provided with an arm for exclusively handling a clean semiconductor wafer (hereinafter referred as clean wafer handling arm) and an arm for exclusively handling a dirty semiconductor wafer (hereinafter referred as dirty wafer handling arm). The transfer of the semiconductor wafer from the loading unit 11 to one of the polishing units 13, 14, 21 and 22 and the transfer of the semiconductor wafer from the washing unit 15 to the unloading unit 12 are carried out by the clean wafer handling arm, and the transfer of the semiconductor wafer between the polishing units 13, 14, 21 and 22 and the transfer of the semiconductor wafer from one of the polishing units 13, 14, 21 and 22 to the washing unit 15 are carried out by the dirty wafer handling arm. For example, in case of using the center robot 10 of FIG. 1, the arm 10-1 serves as the clean wafer handling arm and the arm 10-2 serves as the dirty wafer handling arm. This structure prevents the semiconductor wafer from being contaminated as much as possible.

[0033] According to the fifth embodiment, the polishing apparatus comprises a center robot 10 having arms 10-1 and 10-2 and constituting a universal transfer robot for transferring a semiconductor wafer S to the respective units, a plurality of units disposed around the center robot 10 and including a loading unit 11 for placing thereon the semiconductor wafer S to be polished, an unloading unit 12 for placing thereon the semiconductor wafer S which has been polished, polishing units 13, 14, 21 and 22 each for polishing the semiconductor wafer S and a washing unit 15 for washing the semiconductor wafer S. The center robot 10 is provided with an arm for exclusively handling a clean semiconductor wafer and an arm for exclusively handling a dirty semiconductor wafer. The arm for exclusively handling a dirty semiconductor wafer is washed by a washing mechanism provided in the washing unit 15 after handling the dirty semiconductor wafer.

[0034] FIG. 11 shows a polishing apparatus according to the sixth embodiment of the present invention. The parts shown in FIG. 11 which are identical to those of FIG. 1 are denoted by identical reference numerals. In this embodiment, the polishing apparatus comprises a center robot 10A for exclusively handling a clean semiconductor wafer and a center robot 10B for exclusively handling a dirty semiconductor wafer. Further, the polishing apparatus comprises two polishing units 13, 14 and a washing unit 15.

[0035] With the above structure, a semiconductor wafer S is picked up from a loading unit 11 by the center robot 10A, and transferred to a loading position 13-1 of the polishing unit 13. After a polishing process, the semiconductor wafer S is picked up from the polishing unit 13 by the center robot 10B and transferred to a loading position 15-1 of the washing unit 15. After a washing process, the semiconductor wafer S is picked up from a loading position 15-3 of the washing unit 15 by the center robot 10A and transferred to an unloading unit 12. By the above manner, a polishing process and a

washing process are carried out. A polishing process by the polishing unit 14 is carried out in the same manner as the above.

[0036] According to the polishing apparatus of this embodiment, the semiconductor wafers S are polished simultaneously or with a certain timelag by the polishing units 13 and 14, and each of the semiconductor wafers S polished by the polishing units 13 and 14 is washed by the washing unit 15. That is, it is possible to deal with two semiconductor wafers by one washing unit relative to two polishing units. Especially, in the case where processing interval of the semiconductor wafer by the washing unit, i.e. time interval from a washing process of the preceding semiconductor wafer to a washing process of the subsequent semiconductor wafer is sufficiently shorter than the time required to polish semiconductor wafers, there is no waiting time in the polishing process by restriction caused by the washing process, thus preventing processing speed from lowering and enabling the total system to become compact in size.

[0037] Further, the polishing units 13 and 14 can be set to polish a semiconductor wafer under a different condition, and selected in accordance with properties of the semiconductor wafer. Furthermore, the semiconductor wafer can be polished by the polishing unit 13, washed by the washing unit 15, and then polished by the polishing unit 14. Thereafter, the semiconductor wafer S can be washed by the washing unit 15. That is, the semiconductor wafer can be polished twice. Incidentally, the polishing apparatus has auxiliary spaces 18 and 19 as shown in FIG. 11.

[0038] According to the sixth embodiment, the polishing apparatus comprises two center robots 10A, 10B each constituting a universal transfer robot for transferring a semiconductor wafer S to the respective units, a plurality of units disposed around the center robots 10A and 10B and including a loading unit 11 for placing thereon the semiconductor wafer S to be polished, an unloading unit 12 for placing thereon the semiconductor wafer S which has been polished, polishing units 13 and 14 each for polishing the semiconductor wafer S and a washing unit 15 for washing the semiconductor wafer S which has been polished. The center robot 10A handles only a clean semiconductor wafer, and the center robot 10B handles only a dirty semiconductor wafer. The center robot 10B is washed by a washing mechanism provided in the washing unit 15 after handling the dirty semiconductor wafer.

[0039] According to the polishing apparatus of the first through sixth embodiments, since at least one polishing unit for performing chemical mechanical polishing and at least one washing unit are disposed around a center robot, the whole system becomes compact in size. Therefore, by providing a housing to cover the whole system and an exhaust duct, the polishing apparatus can be installed in the clean room without lowering cleanliness of the clean room. Further, saving of installation space of the polishing apparatus in the clean room can be achieved.

[0040] In the above embodiments, although the loading unit 11 and the unloading unit 12 are separately provided, the loading unit 11 and the unloading unit 12 may be integrally provided. For example, in the case where a semiconductor wafer is picked up from a basket containing semiconductor wafers and put into the same basket after a polishing process and a washing process, the loading unit and the unloading unit are integrally formed.

[0041] A cluster type of polishing apparatus which integrates a plurality of units including a polishing unit and a washing unit and uses a universal transfer robot can be constructed. Thus, in the polishing apparatus which performs a series of processes including a polishing process and a washing process, saving of installation space and improvement of processing speed can be achieved, and a plurality of units including at least one polishing unit and at least one washing unit can be efficiently combined. To be more specific, in the case where polishing time is longer than time interval of washing process, it is possible to deal with a plurality of semiconductor wafers by one washing unit relative to a plurality of polishing units. On the contrary, in the case where time interval of washing process is longer than polishing time, it is possible to deal with a plurality of semiconductor wafers by one polishing unit relative to a plurality of washing units. Further, one or more polishing processes and one or more washing processes can be fully automated and change of processes can be easily effected.

[0042] Furthermore, since exclusive means for handling a clean semiconductor wafer and exclusive means for handling a dirty semiconductor wafer are separately provided, contamination of subsequent semiconductor wafers or respective units of the polishing apparatus caused by the dirty semiconductor wafer can be prevented.

Claims

1. An apparatus for polishing and then washing a workpiece, said apparatus comprising:

   a loading unit for receipt of a workpiece to be polished;
   a polishing unit for polishing said workpiece;
   a washing unit for washing said workpiece;
   a transfer means for transferring said workpiece in a clean and dry condition to an unloading unit,
   characterized in that the polishing unit and the washing unit are mounted within a common housing.

2. An apparatus according to claim 1, further comprising another transfer means for transferring said

workpiece in a wet condition from said polishing unit to said washing unit.

3. An apparatus according to claim 1 or 2, wherein said housing is installed in a clean room.

4. A method for polishing and then washing a workpiece, said method comprising:

introducing a workpiece into a housing;
polishing said workpiece within said housing to form a polished workpiece;
washing said polished workpiece within said housing to form a clean polished workpiece;
drying said clean polished workpiece within said housing to form a clean and dry polished workpiece; and
removing said clean and dry polished workpiece from said housing to an exterior of said housing.

5. A method according to claim 4, wherein said housing is installed in a clean room.

Patentansprüche

1. Vorrichtung zum Polieren und anschließenden Waschen eines Werkstücks, wobei die Vorrichtung folgendes aufweist:

ein Ladeeinheit zur Aufnahme eines zu polierenden Werkstücks;
eine Poliereinheit zum Polieren des Werkstücks;
ein Wascheinheit zum Waschen des Werkstücks;
Übertragungsmittel zum Übertragen des Werkstücks in einem sauberen und trockenen Zustand zu einer Entladeeinheit;
dadurch gekennzeichnet, daß die Poliereinheit und die Wascheinheit in einem gemeinsamen Gehäuse angebracht sind.

2. Vorrichtung gemäß Anspruch 1, wobei die Vorrichtung ferner weitere Übertragungsmittel aufweist zum Übertragen des Werkstücks in nassem Zustand von der Poliereinheit zur der Wascheinheit.

3. Vorrichtung gemäß Anspruch 1 oder 2, wobei das Gehäuse in einem Reinraum installiert ist.

4. Verfahren zum Polieren und anschließenden Waschen eines Werkstücks, wobei das Verfahren die folgenden Schritte aufweist:

Einführen eines Werkstücks in ein Gehäuse;
Polieren des Werkstücks in dem Gehäuse, um ein poliertes Werkstück vorzusehen;
Waschen des polierten Werkstücks in dem Gehäuse, um ein sauberes poliertes Werkstück vorzusehen;
Trocknen des sauberen polierten Werkstücks in dem Gehäuse, um ein trockenes sauberes poliertes Werkstück vorzusehen; und
Entfernen des trockenen sauberen polierten Werkstücks aus dem Gehäuse nach außerhalb des Gehäuses.

5. Verfahren gemäß Anspruch 4, wobei das Gehäuse in einem Reinraum installiert ist.

Revendications

1. Dispositif pour polir, puis laver une pièce à usiner, ledit dispositif comprenant :

une unité de chargement pour recevoir une pièce à usiner devant être polie;
une unité de polissage servant à polir ladite pièce à usiner;
une unité de lavage pour laver ladite pièce à usiner;
des moyens de transfert pour transférer ladite pièce à usiner dans un état propre et sec jusqu'à une unité de déchargement,
caractérisé en ce que l'unité de polissage et l'unité de lavage sont montées dans un boîtier commun.

2. Dispositif selon la revendication 1, comprenant ne outre d'autres moyens de transfert pour transférer ladite pièce à usiner dans un état humide depuis ladite unité de polissage jusqu'à ladite unité de lavage.

3. Dispositif selon la revendication 1 ou 2, dans lequel ledit boîtier est installé dans une salle propre.

4. Procédé pour polir, puis laver une pièce à usiner, ledit procédé comprenant :

l'introduction d'une pièce à usiner dans un boîtier;
le polissage de ladite pièce à usiner à l'intérieur dudit boîtier pour former une pièce à usiner polie;
le lavage de ladite pièce polie à l'intérieur dudit boîtier pour obtenir une pièce à usiner polie propre;
le séchage de ladite pièce à usiner polie propre dans ledit boîtier pour obtenir une pièce à usiner polie propre et sèche; et
le retrait de ladite pièce à usiner polie propre et sèche dudit boîtier pour l'amener à l'extérieur

dudit boîtier.

5. Procédé selon la revendication 4, selon lequel ledit boîtier est installé dans une salle propre.

FIG. 1

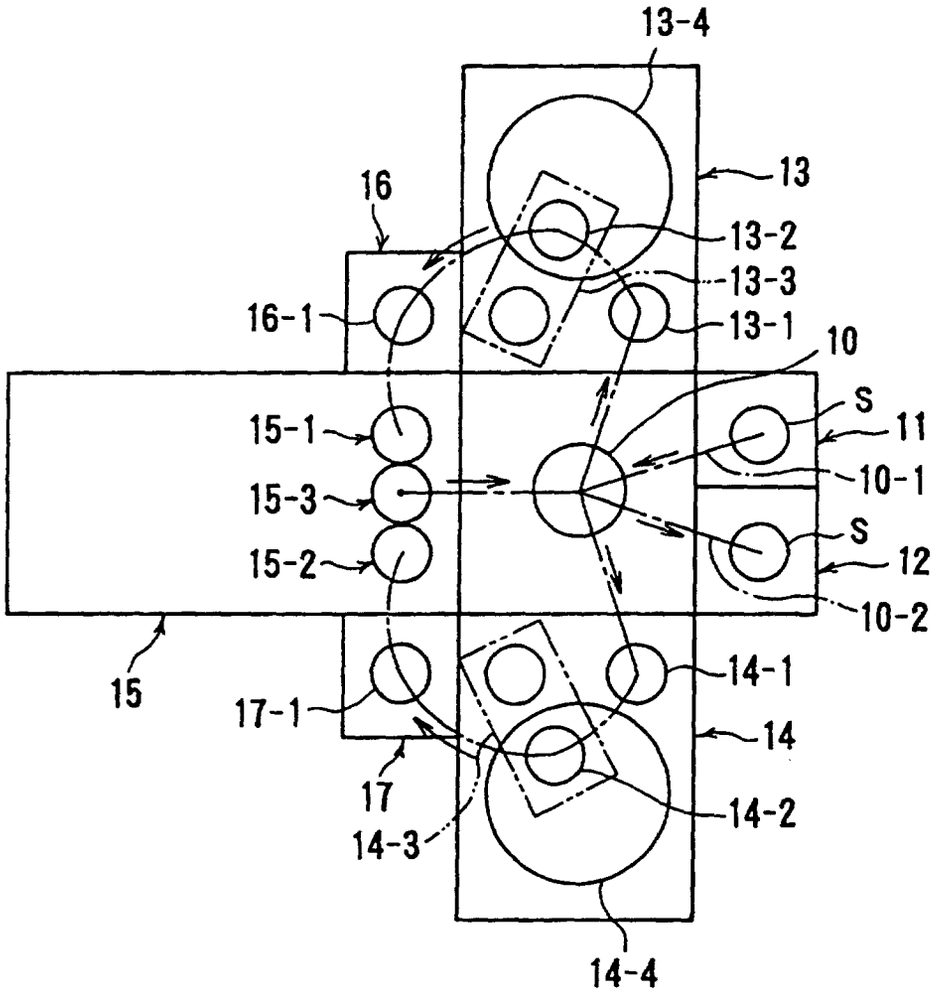

13-4
13
16
13-2
13-3
16-1
13-1
10
S
11
15-1
15-3
10-1
S
15-2
12
10-2
15
14-1
17-1
14
17
14-2
14-3
14-4

FIG. 2B

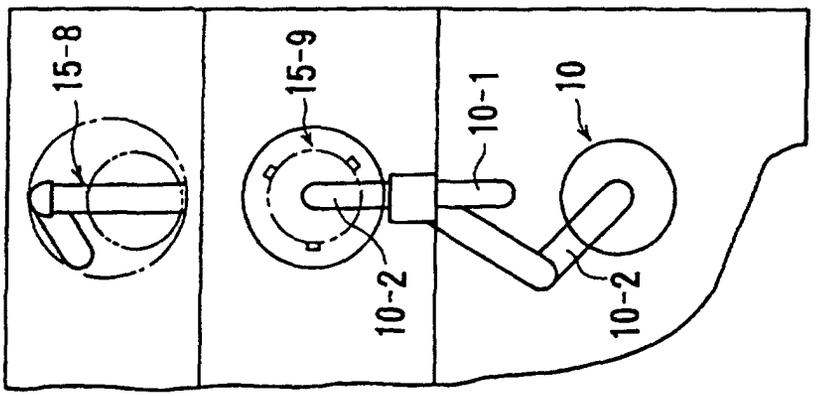

15-8
15-9
10-1
10
10-2
10-2

FIG. 2A

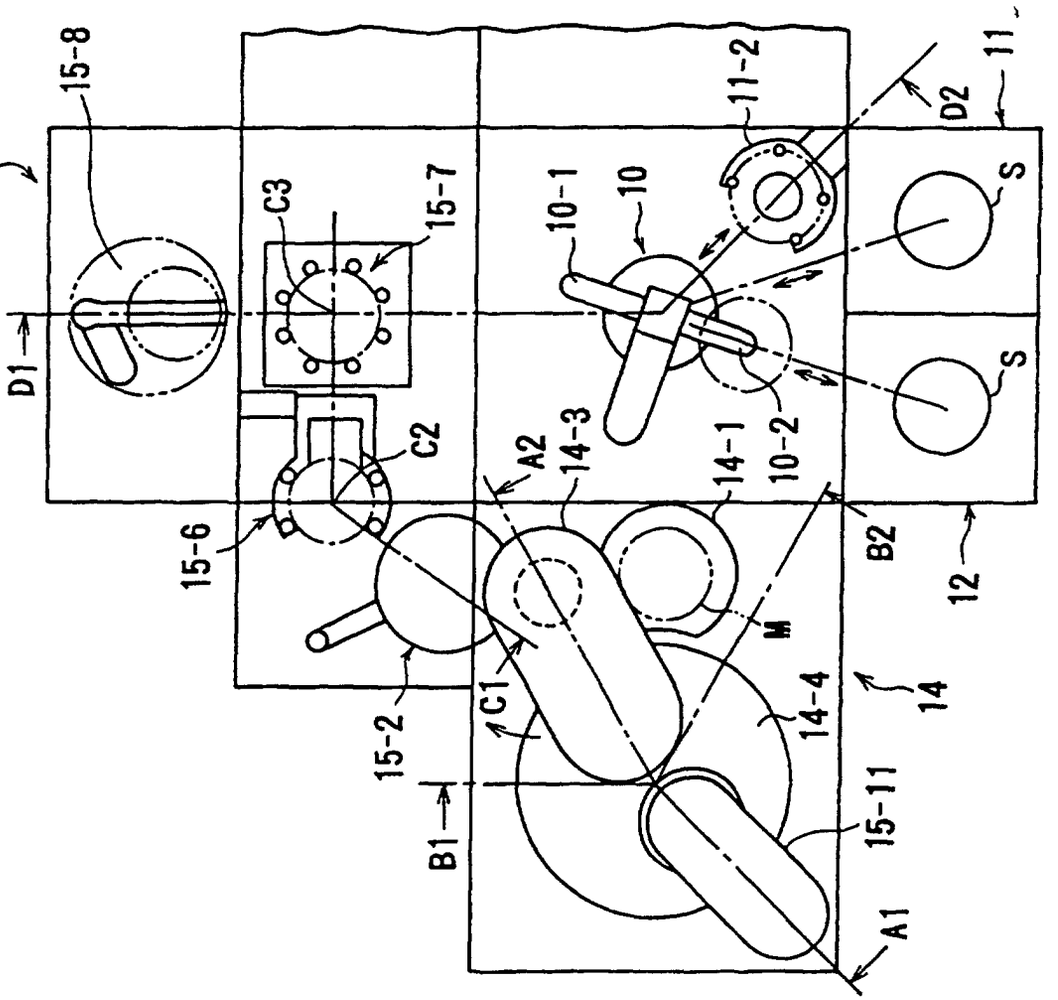

15
15-8
C3
15-7
10-1
10
11-2
D2
11
S
D1
S
C2
A2
14-3
14-1
10-2
15-6
B2
12
M
C1
14-4
14
15-2
15-11
B1
A1

FIG. 3

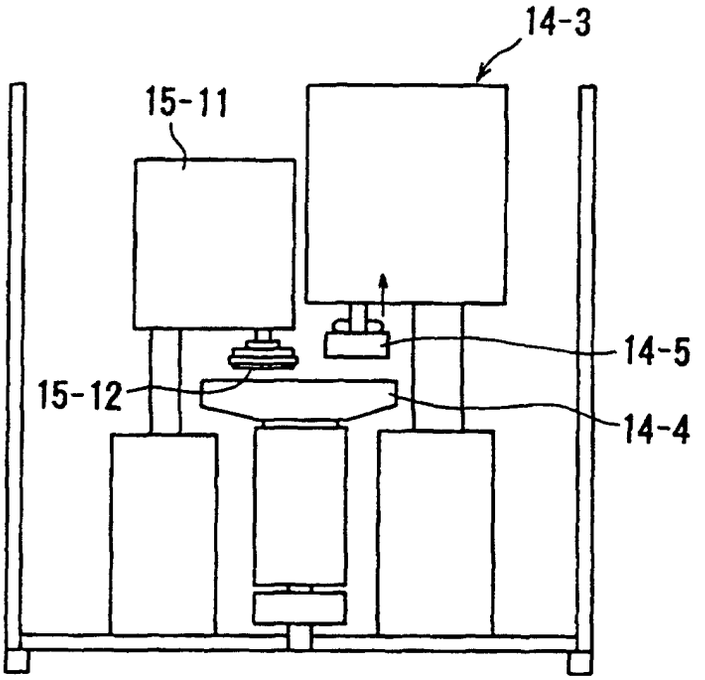


FIG. 4

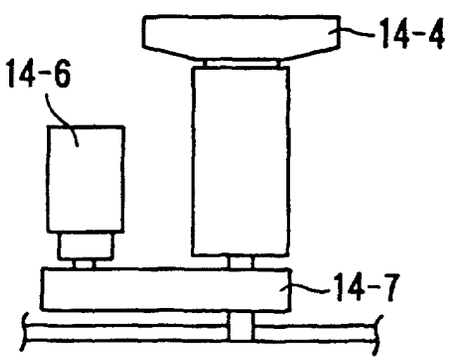


FIG. 5

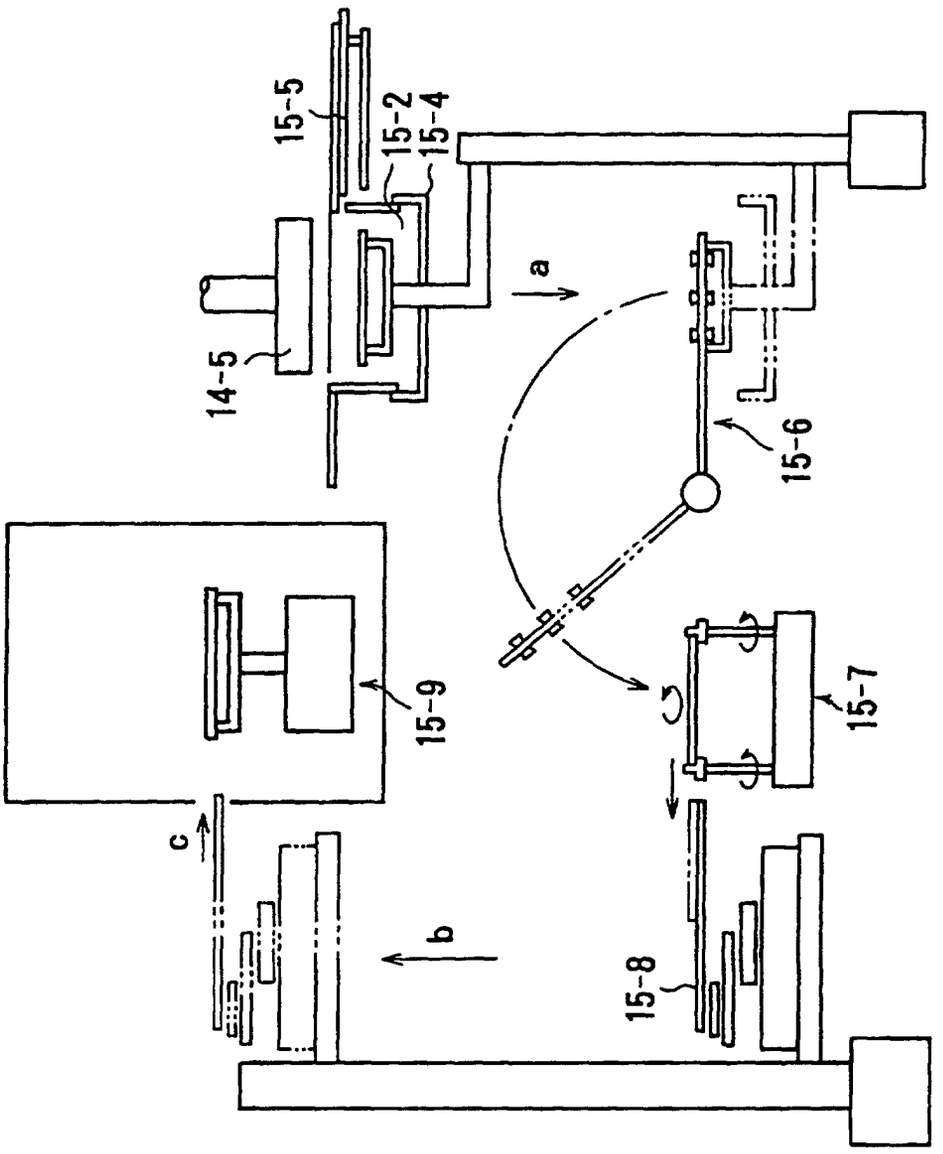


FIG. 6

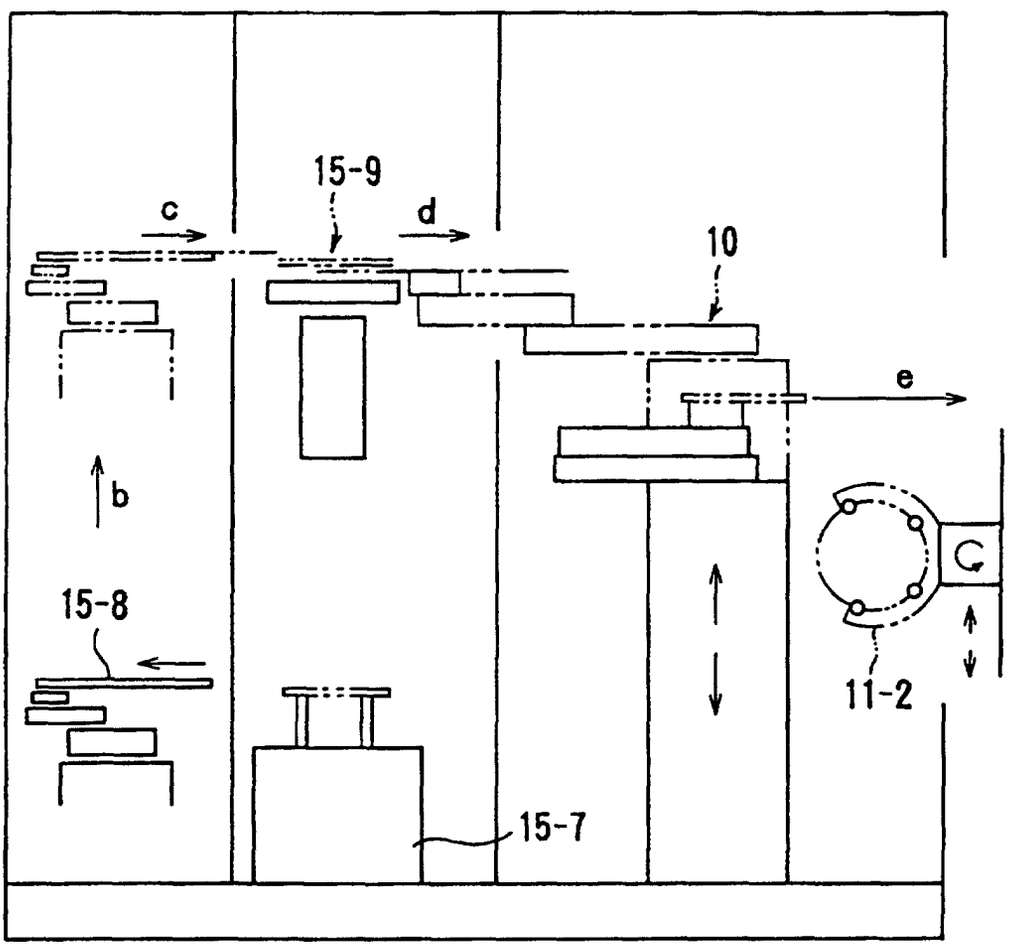


FIG. 7

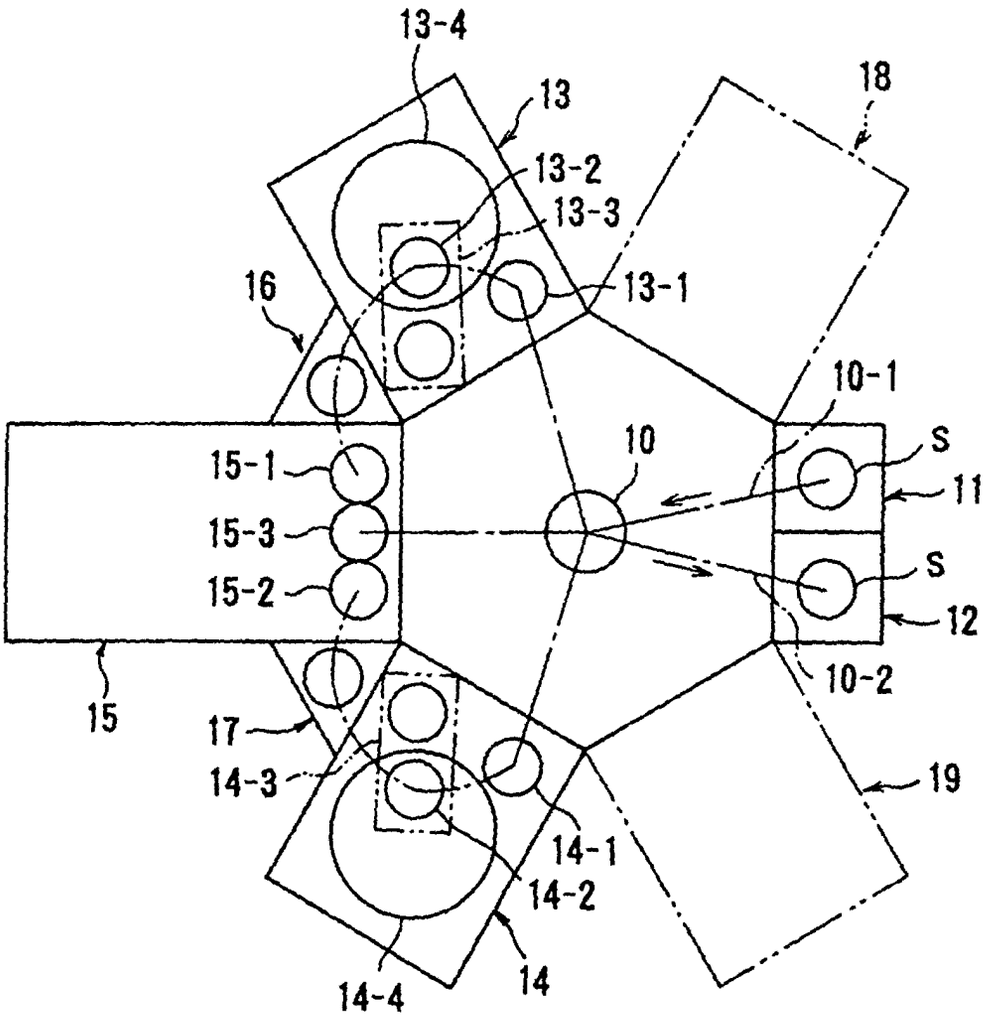

13-4
13
18
13-2
13-3
16
13-1
10-1
10
S
15-1
11
15-3
S
15-2
12
10-2
15
17
19
14-3
14-1
14-2
14
14-4

FIG. 8

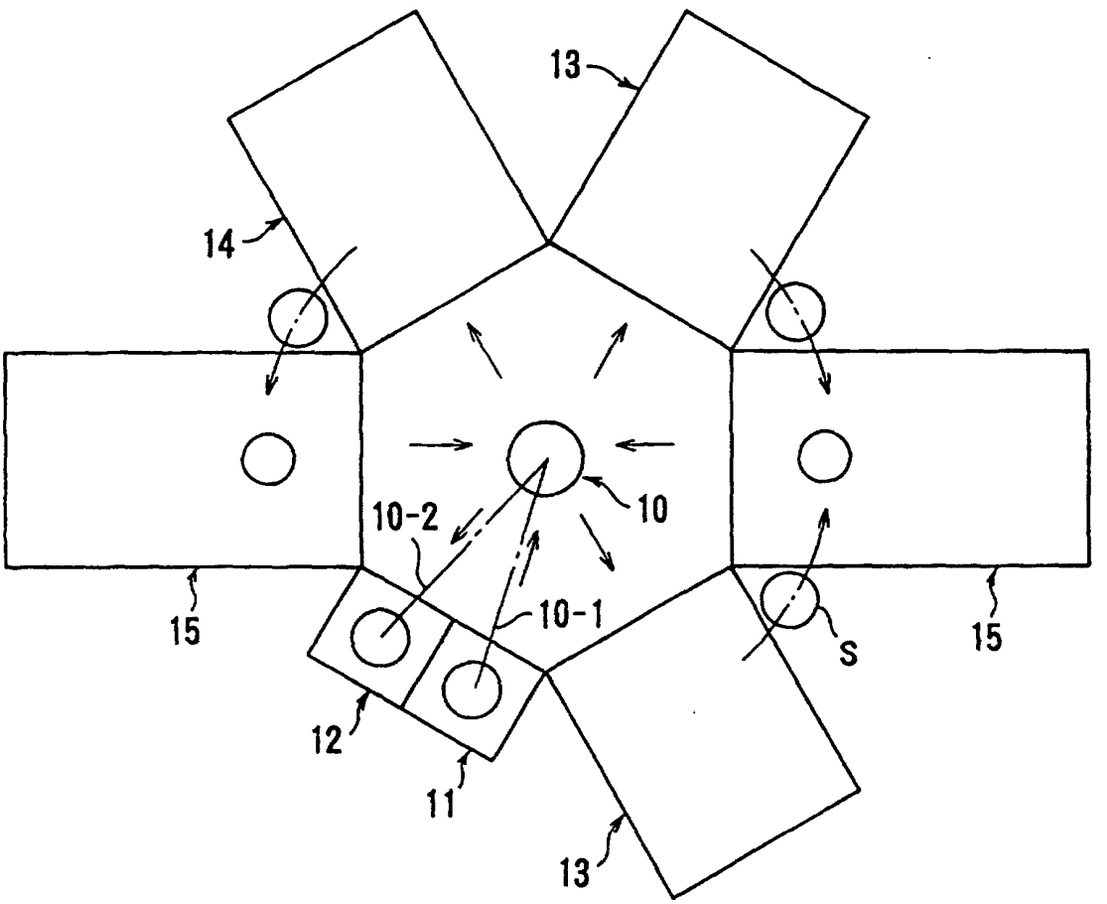


FIG. 9

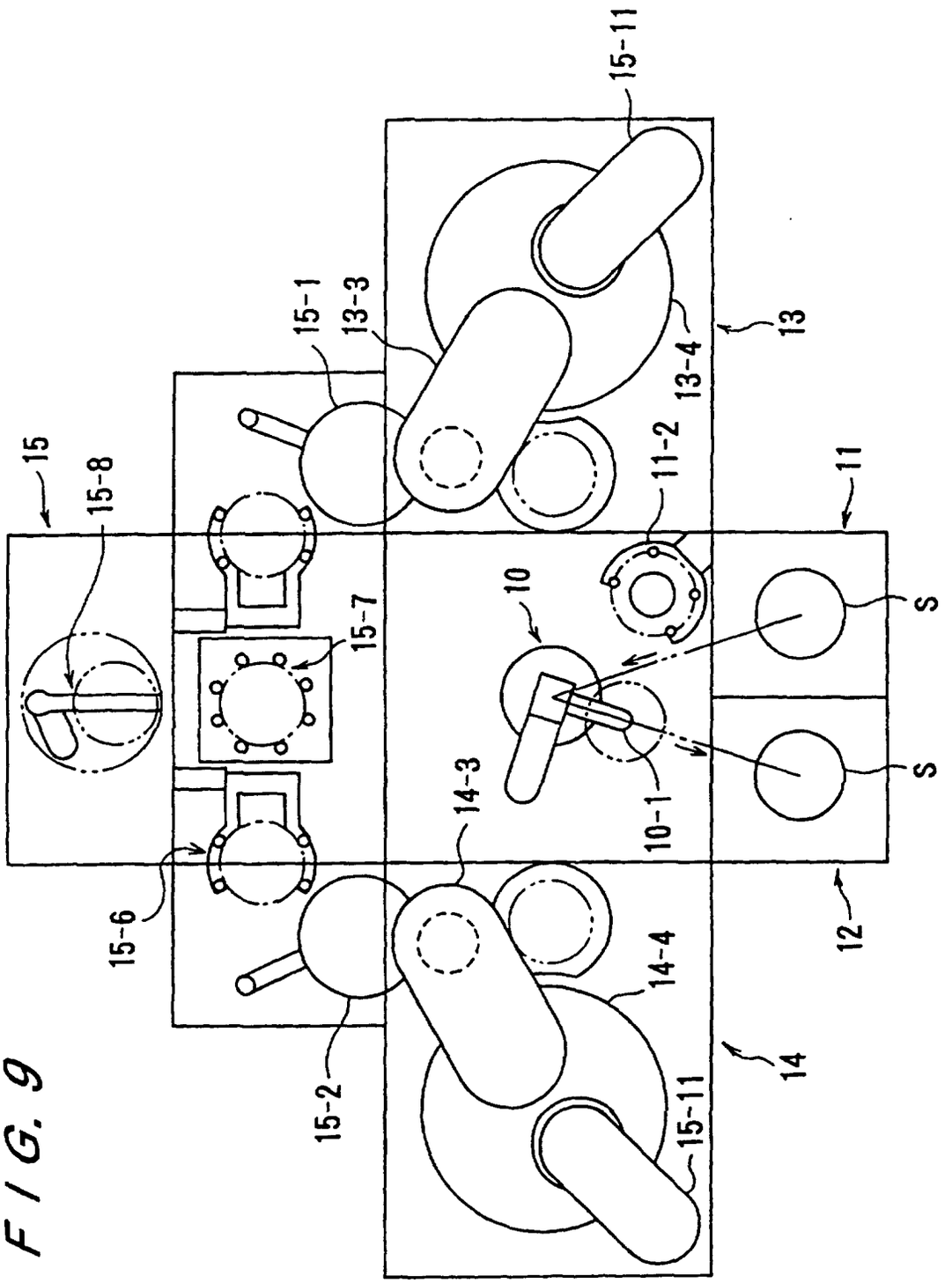

15
15-8
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13-4
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11
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S
S
14-3
10-1
15-6
14-4
12
15-2
15-11
14

FIG. 10

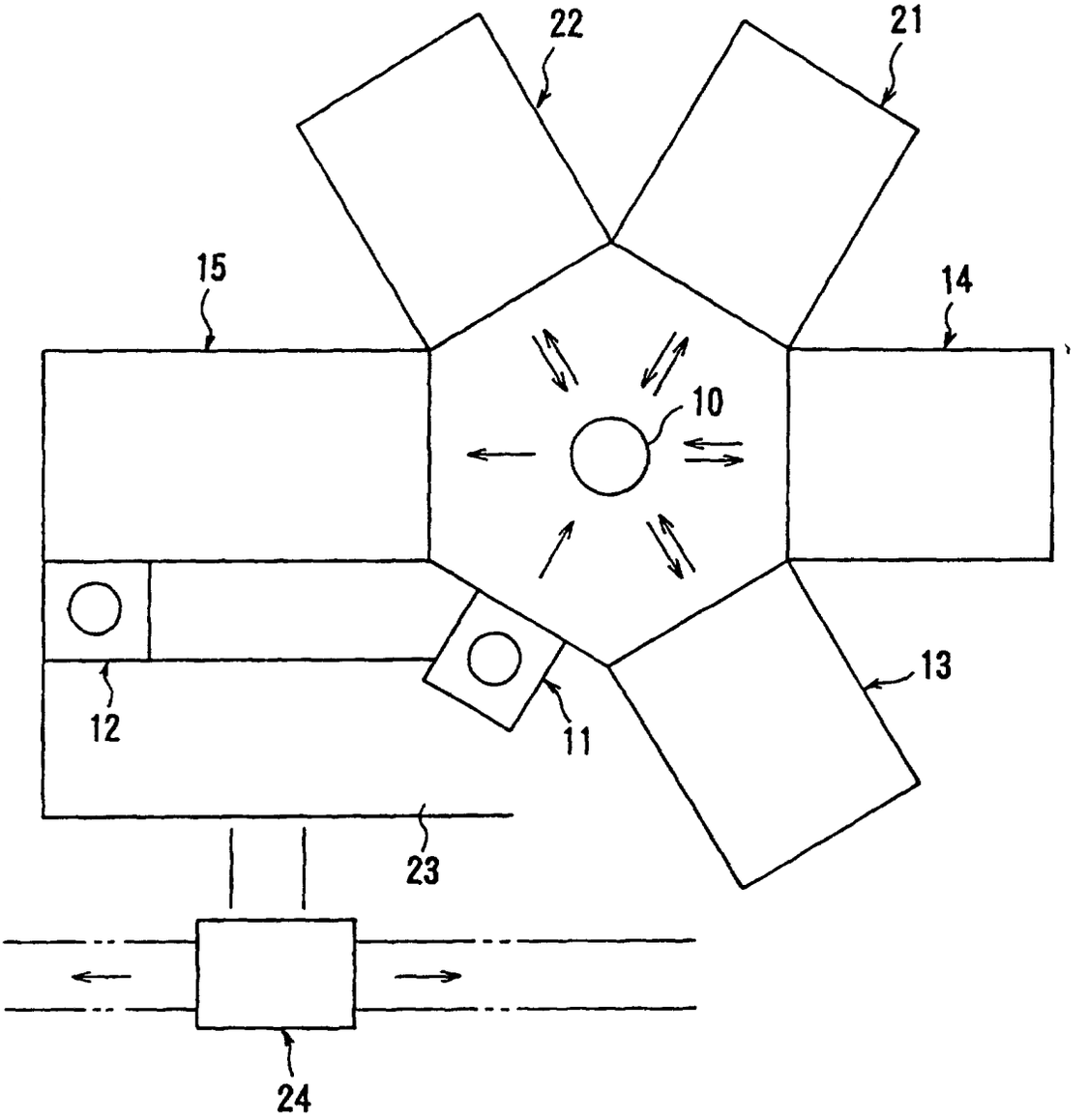


FIG. 11

