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SELF-POSITIONING COMBINATION WORK HOLDER AND DRESSING RING FOR FLAT LAPPING MACHINES

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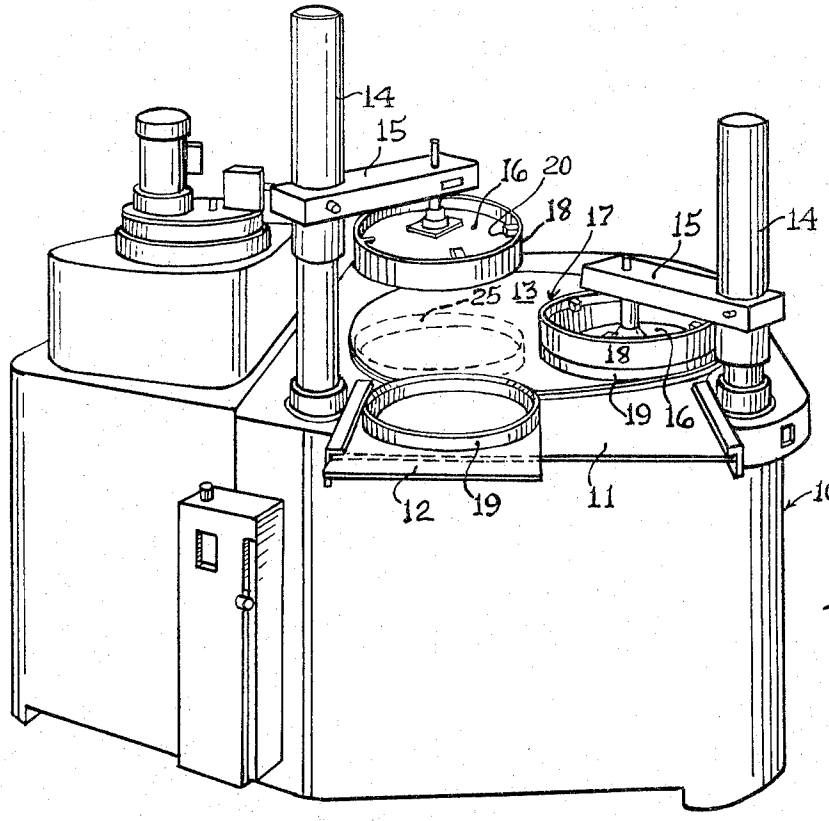


Fig. 1.

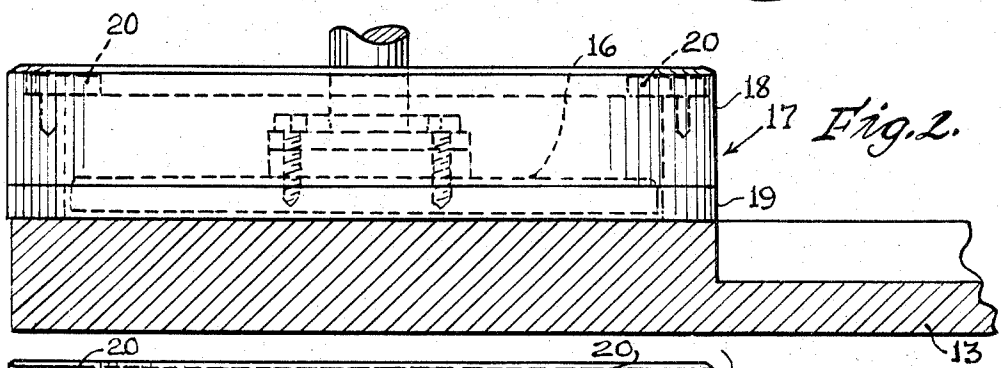


Fig. 2.

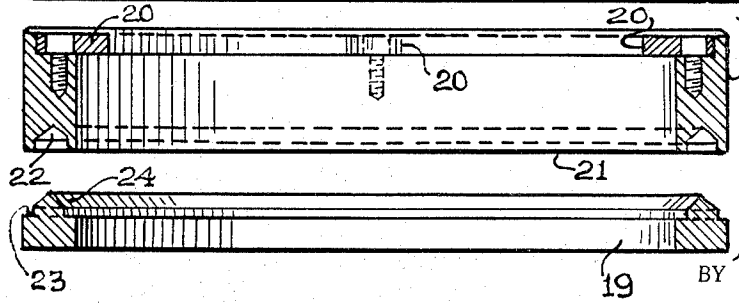


Fig. 3.

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SELF-POSITIONING COMBINATION WORK HOLDER AND DRESSING RING FOR FLAT LAPPING MACHINES

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ABSTRACT OF THE DISCLOSURE

A lapping machine having a rotatable lap plate and a pressure plate movable vertically with respect to the lap plate through a dressing ring and into a work loader, the dressing ring being connected to and movable with the pressure plate into and out of superimposed relation with respect to the work loader by a lost motion connection between the pressure plate and the dressing ring so that there results a free limited vertical movement between such parts and independent rotational movement of the dressing ring and the work loader when the latter two parts are in superimposed relation with respect to each other.

Summary of the invention

The flat lapping machines now generally in commercial use employ a rotatable lap plate on which are supported one or more dressing rings. In addition to dressing the lap plate these dressing rings are employed for retaining work, within their confines, to be lapped by the lap plate and are generally rotated about a fixed axis by the rotation of the lap plate.

Within the dressing ring and upon the work being lapped, is arranged a pressure plate. This pressure plate is moved from and into position within the ring and upon the work by hydraulic lifting means in a manner such as is disclosed in Patent No. 3,032,937, dated May 8, 1962.

The operator utilizes a loading ring which is of the same size and shape as the dressing ring. The loading ring is placed upon a shelf of the machine at which time the work is confined therein. After being loaded, the operator slides the loading ring with the work confined therein from the shelf onto the lap plate. After attempting to accurately align the loading ring beneath the elevated dressing ring and pressure plate, he then removes the loading ring leaving the work remaining on the lap. After this has been done he then lowers the pressure plate which in turn lowers the dressing ring. When the dressing ring is in lowered position, it will encircle the work upon the lap if the work has been properly aligned with the dressing ring. The lap plate is then rotated to effect lapping of the work.

If the work is not in alignment with the dressing ring there is a possibility that as such ring is lowered to confine the work, the dressing ring will strike the work and damage the same. This is particularly true with respect to delicate work such as thin silicon wafers or the like.

It is therefore a principal object of my invention to provide a self-positioning work holder and dressing ring, comprising superimposed sections which cooperate with each other in such a manner that such sections will automatically align themselves to avoid damaging the work confined therein.

Other objects will appear hereinafter.

The invention consists in the novel combination and arrangement of parts to be hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings showing the preferred form of construction, and in which:

FIG. 1 is a perspective view of a lapping machine showing my invention associated therewith;

FIG. 2 is a fragmentary sectional detail view of a lapping plate showing my improved ring associated therewith; and

FIG. 3 is a sectional detail view of the ring embodying my invention showing the parts thereof in exploded position.

The self-positioning combination work holder and dressing ring embodying my invention is especially designed for use in a lapping machine of the type shown in Patent No. 3,032,937, dated May 8, 1962. The lapping machine there disclosed includes a base **10**, a supporting plate **11** which is adapted to slidably support a work-loading shelf **12**. The base **10** rotatably supports a lap **13**.

Hydraulically movable a supporting posts **14** each include a laterally extending arm **15** supporting a pressure plate **16**. The post **14**, of which there may be several, when moved upwardly under hydraulic pressure will move therewith the pressure plate **16**.

My improved self-positioning ring is indicated at **17**. It comprises two superimposed sections **18** and **19**. The top ring section **18** has inwardly extending lugs **20** which are adapted to be engaged by the pressure plate **16** whereby movement of the pressure plate will impart movement to the ring section **18** upon engagement of the pressure plate with the lugs **20**.

The ring **18** in its bottom peripheral edge **21** has formed therein an inverted V-shaped groove **22**. The bottom ring **19** has formed on its top peripheral edge portion **23** a V-shaped rib **24** which is adapted to interfit in the groove **22** when the ring section **18** is positioned on the ring section **19**.

In use the operator positions the ring section **18** in an upper position as shown in FIG. 1. He places the ring section **19** upon the shelf **12**. The top surface of the shelf **12** is in the same plane as the top surface of the lap plate **13**. While the ring section **19** is upon the shelf **12**, the operator will arrange in the ring section **19** the work pieces to be lapped such, for example, the silicon wafers.

After he has arranged the work pieces in the section **19**, he will slide the ring section with the work therein off of the shelf onto the lap plate to the position shown in dotted lines **25**. He will attempt to align the ring section **19** with the ring section **18** as accurately as is possible. He next lowers the ring section **18** upon the ring section **19** with the pressure plate **16** positioned within the ring section **19** upon the work contained therein. The lap plate is now rotated in the manner shown in Patent No. 3,032,937.

If, however, the operator should fail to accurately align the ring sections **18** and **19** upon lowering of the pressure plate and the section **18**, the rib **24** will engage the groove **22** of the section **18** in such a manner as to shift the ring section **19** and the work contained therein into proper alignment with the section **18**.

By this simple arrangement, the work to be lapped is prevented from being struck or contacted in a manner such as would damage the work as would the case where the conventional dressing ring is used. By constructing a combination work holder and dressing ring in the manner I have described I am able to lap relatively delicate and thin work without subjecting the work to possible breakage by contact of the dressing ring therewith.

The foregoing construction is highly efficient in use and economical in manufacture.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. A lapping machine having a rotatable lap plate, a stationary loading area to one side of the lap plate, a hydraulically operated lift arm adjacent to the lap plate and loading area and a pressure plate carried by the lift arm, wherein the improvement comprises:

(a) a dressing ring carried by the pressure plate and movable therewith through a substantially vertical plane with respect to the lap plate,

(b) a work loader in the form of a ring and of a size to be positioned on the work loading area and freely movable therefrom onto the lap plate beneath said dressing ring,

(c) said work loader and said dressing ring having equal inner diameters so that when said work loader is moved onto the lap plate and said dressing ring is moved vertically with the pressure plate by said lift arm into a superimposed position, said pressure plate will move freely therethrough,

(d) means for connecting said dressing ring to the pressure plate for moving the dressing ring vertically with respect to said work loader and for permitting independent movement of the pressure plate by the lift arm vertically through the dressing ring and into said work loader and independent rotational movement of the dressing ring and the work loader about the pressure plate,

(e) and means provided by said work loader and said dressing ring cooperating to align their inner diameters vertically when said work loader and said dressing ring are in a superimposed relation so that the pressure plate may be moved by the lift arm through said dressing ring and said work loader.

2. A lapping machine as defined by claim 1 wherein said means provided by said work loader and said dressing ring cooperating to align their inner diameters, comprising a substantially V-shaped groove formed in one confronting surface of said dressing ring, and a substantially V-shaped rib formed in the other confronting surface of said work loader, with said rib and said groove adapted to interfit when said dressing ring is moved into superimposed position upon said work loader by the pressure plate.

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