

[54] **DEVICE FOR TEMPORARILY
HOLDING ARTICLES OF DIFFERENT
SIZES**

[75] Inventor: **Bernhard Gnoth**, Donau, Germany
[73] Assignee: **Licentia Patent-Verwaltungs-
G.m.b.H.**, Frankfurt am Main, Ger-
many
[22] Filed: **Oct. 26, 1970**
[21] Appl. No.: **83,978**

[30] **Foreign Application Priority Data**

Oct. 25, 1969 Germany.....P 19 53 900.5

[52] U.S. Cl.**269/21**
[51] Int. Cl.**B25b 11/00**
[58] Field of Search 269/21, 22; 401/215; 251/368

[56]

References Cited
UNITED STATES PATENTS

3,307,818	3/1967	Cocito.....	269/21 X
3,340,894	9/1967	Williams.....	251/368 X
2,572,640	10/1951	Lovegrove.....	269/21 X
3,383,296	5/1968	Trager.....	269/21 X
3,406,938	10/1968	Muir.....	248/363
3,593,983	7/1971	Csenyi.....	269/21

Primary Examiner—Robert C. Riordon
Assistant Examiner—E. F. Desmond
Attorney—Spencer & Kaye

[57]

ABSTRACT

A device for temporarily holding articles of different sizes has a receiving surface with apertures therein connected by passages to a source of suction, means being provided for reducing the suction to those apertures which are not covered or insufficiently covered by the article to be held.

3 Claims, 3 Drawing Figures

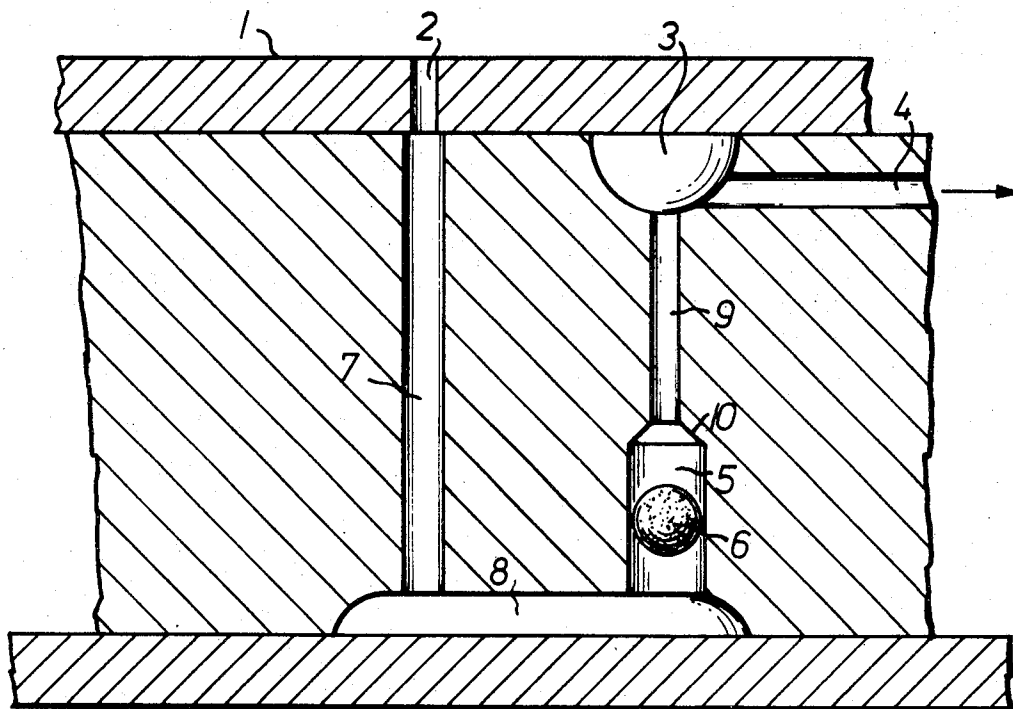


Fig. 1

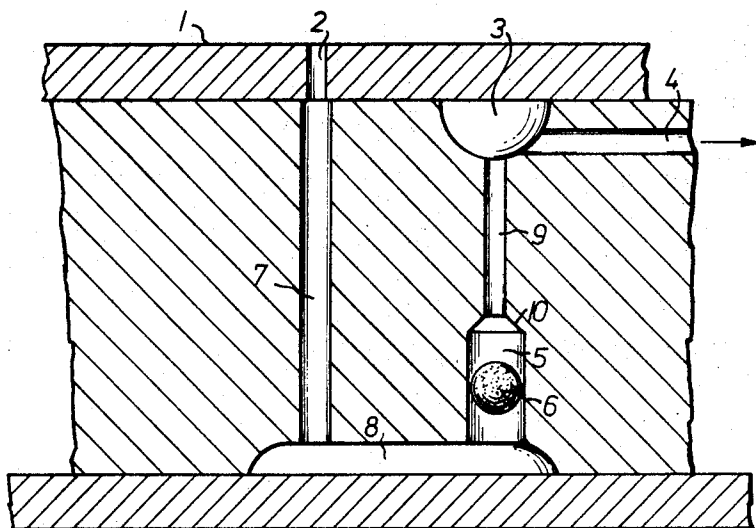


Fig. 2

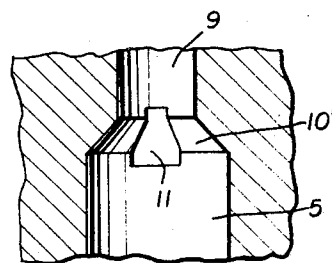
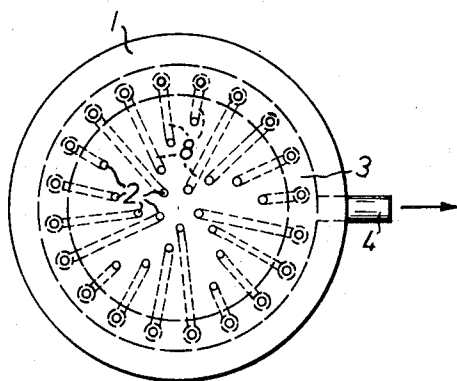


Fig. 1a

Inventor:

Bernhard Gnath

Spencer & Kage
ATTORNEYS

DEVICE FOR TEMPORARILY HOLDING ARTICLES OF DIFFERENT SIZES

BACKGROUND OF THE INVENTION

The invention relates to a device for temporarily holding articles of different sizes to be worked.

When working very small components, it is already known to attract these to a carrier by means of partial vacuum and so to hold them. The advantage of such a method of holding it that it can be released at any time and that mechanical damage to the component to be held is largely avoided. Hitherto, it has been usual to adapt the receiver of such a vacuum holding device specifically to the component.

SUMMARY OF THE INVENTION

It is the object of the present invention to provide a novel holding device by means of which components of different sizes and shapes can be held temporarily in a simple manner.

According to the invention, there is provided a device for temporarily holding articles of different sizes comprising a holding body, a receiving surface on said holding body for receiving the articles to be held and defining a plurality of apertures therein, passage means for connecting said apertures with a source of suction, and suction reducing means in said passage means for reducing the suction to any of said apertures not covered or insufficiently covered by an article to be held.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in greater detail, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a sectional view of part of a holding device in accordance with the invention,

FIG. 1a is an enlarged view of the valve seat shown in FIG. 1 illustrating the notch 11 therein, and

FIG. 2 is a plan view of the receiving surface of the device shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Basically, in a holding device having a plurality of suction apertures, it is proposed that means should be provided in the passages leading to at least some of the apertures, which means partially seal off the passages to prevent an unnecessary suction flow when the associated aperture in the receiving surface is inadequately covered by an article. In a preferred embodiment, it is proposed according to the invention that valves actuated by the partial vacuum should be mounted in the passages.

An important advantage of the device according to the invention is seen in that a pump having a lower delivery can be used for the holding device and that disturbing suction noises are largely avoided even when holding articles of different sizes and shape.

Referring now to the drawings, there is shown a holding device such as is particularly suitable for holding small electrical components, particularly semiconductor components.

Only a portion of the holding device according to the invention is illustrated in FIG. 1, only one single suction

aperture 2 in the receiving surface 1 being illustrated. The suction aperture 2 is connected, by the main passage 4, to a vacuum pump through a passage arrangement which, in the example illustrated, comprises the passage portions 7, 8, 9, 5, 3 and 4 for example. The main passage 4 leads, for example first into a relatively large distributor passage 3 from which a plurality of further passages may lead to further suction apertures.

According to the invention, mounted in the passage leading to the suction aperture 2, in the chamber 5 of the passage 9, is a partially sealing valve which consists substantially of a light, porous ball 6, which bears against the upper annular seat 10 of the chamber 5 when a suction pump is connected to the main passage 4. As a result of the suction stream which develops in the receiving surface 1 through the aperture 2, the porous valve ball 6 is drawn upwards and bears against the seat 10 of the chamber 5 in the passage 9. Thus the suction stream through the aperture 2 is substantially reduced.

If an article to be held is placed over the receiving surface 1 and closes the aperture 2, this article is attracted by the reduced suction flow and so held, as a result of which the action of the valve ball 6 is largely eliminated and the ball thus drops down.

It is of decisive importance for the action of the device according to the invention that the valve should not be absolutely tight in the passage leading to the suction aperture 2 when it is uncovered but allows a small quantity of air to flow through even in the closed state. The valve is merely intended to prevent too large a stream of indrawn air from developing when the suction aperture 2 in the receiving surface 1 is not covered by an article.

From the view in FIG. 2 of the device according to the invention, it can be seen that the distributor passage 3 to which there is connected the main passage 4, for connection to the air pump, is in communication with a plurality of suction apertures 2 through passages 8. Only four such passages are shown in broken lines for the sake of clarity. All suction apertures 2 are naturally connected to the main passage 3. It is clear that if the valves according to the invention were not present in the individual suction passages or at least a large proportion of the individual suction passages, a very large stream of air would be drawn in through the numerous suction apertures 2 which means that a very powerful pump would have to be connected to the main passage 4. As a result of the valves according to the invention, which cause a considerable reduction in these streams of indrawn air, an air pump with a relatively low capacity is capable of maintaining a sufficient partial vacuum. If an article to be held, for example an Si wafer for an integrated circuit, is placed on this receiving surface, it covers some of the apertures and closes these entirely. As a result, the wafer is attracted to the receiving surface 1 and held firmly so that it can be processed. The valves which are associated with the passages associated with the suction apertures covered by the Si wafer are put out of operation insofar as there is substantially no longer any stream of air in these passages so that the valves open fully, for example by the ball 6 in FIG. 1 dropping down. The suction apertures not covered by the Si wafer have a small stream of air which is limited by the valves according to the invention which do not seal off completely.

3

A preferred embodiment of such a valve which reduces the stream of indrawn air consists in that, as illustrated in FIG. 1, a ball of a porous and partially air-permeable material is mounted in an appropriate chamber in the passage. Such a ball allows a certain stream of air through even when it is attracted to the seat. In a preferred embodiment, such a valve ball consists of a foam plastics such as is known under the trade name "Styropor." The degree of the reduction in the stream of air can be adjusted by selecting the porosity of the foam plastics.

Another preferred embodiment of the device according to the invention is illustrated in FIG. 1a. In this embodiment a ball or the like is used consisting of a material which is impermeable to air and that the seat 10' against which the ball is drawn is provided with an irregularity or a groove 11 which prevents this valve ball from having an absolutely tight fit.

It will be understood that the description of the present invention is susceptible to various modifications changes and adaptations.

What is claimed is:

1. In an apparatus for temporarily holding objects of different sizes which are to be worked, comprising at least one support surface for holding the objects, said surface being provided with a plurality of openings connected via passage means with a device producing a subatmospheric pressure in such a manner that the objects which are placed onto the supporting surface and which cover at least one of the openings are held against that surface by suction and valve means for each said opening disposed in the passage means and actuated by the subatmospheric pressure to partially seal the passage means in order to prevent excess suction flow when the associated opening in the supporting surface is not sufficiently covered by an object, the improvement wherein said passage means for at least one said opening include: a first passage extending downwardly from, and communicating with, its associated opening; a connecting passage communicating with the lower end of said first passage; a second passage extending upwardly from, and communicating with, said connecting passage and defining a chamber containing said valve means; and a distributor passage

4

communicating with the upper end of said second passage; and wherein said valve means include a valve ball consisting of porous material and a seat for said valve ball formed in the upper end of said chamber, said valve ball being drawn upwardly against said seat under the influence of suction when its associated opening is uncovered and falling downwardly out of contact with said seat due to the reduced air flow when its associated opening is covered.

2. In an apparatus for temporarily holding objects of different sizes which are to be worked, comprising at least one support surface for holding the objects, said surface being provided with a plurality of openings connected via passage means with a device producing a subatmospheric pressure in such a manner that the objects which are placed onto the supporting surface and which cover at least one of the openings are held against that surface by suction and valve means for each said opening disposed in the passage means and actuated by the subatmospheric pressure to partially seal the passage means in order to prevent excess suction flow when the associated opening in the supporting surface is not sufficiently covered by an object, the improvement wherein said passage means for at least one said opening include: a first passage extending downwardly from, and communicating with, its associated opening; a connecting passage communicating with the lower end of said first passage; a second passage extending upwardly from, and communicating with, said connecting passage and defining a chamber containing said valve means; and a distributor passage communicating with the upper end of said second passage; and wherein said valve means include a valve ball and a seat for said valve ball formed in the upper end of said chamber, said seat being provided with an irregular portion which prevents an air tight fit of the valve ball against said seat, said valve ball being drawn upwardly against said seat under the influence of suction when its associated opening is uncovered and falling downwardly out of contact with said seat due to the reduced air flow when its associated opening is covered.

3. An arrangement as defined in claim 2 wherein the irregularity is in the form of a groove.

* * * * *

50

55

60

65