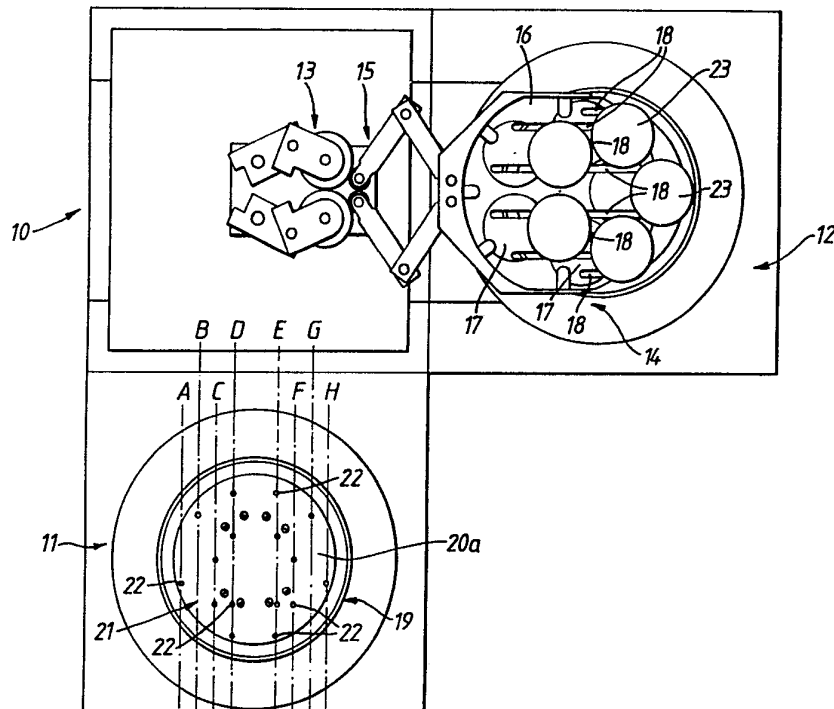




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/GB91/00221 (22) International Filing Date: 14 February 1991 (14.02.91) (30) Priority data: 9006471.8 22 March 1990 (22.03.90) GB (71) Applicant (for all designated States except US): SURFACE TECHNOLOGY SYSTEMS LIMITED [GB/GB]; Prince of Wales Industrial Estate, Abercarn, Newport, Gwent NP1 5AR (GB). (72) Inventor; and (75) Inventor/Applicant (for US only) : BRANCHER, Carl, David, Monnington [GB/GB]; 26 Western Road, Abergavenny, Gwent NP7 7AD (GB). (74) Agents: DUNLOP, Brian, Kenneth, Charles et al.; Wynne-Jones, Laine & James, 22 Rodney Road, Cheltenham, Gloucestershire GL50 1JJ (GB).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB, GB (European patent), GR (European patent), IT (European patent), LU (European patent), NL (European patent), SE (European patent), US. Published With international search report.</p>

(54) Title: LOADING MECHANISMS



(57) Abstract

A processing apparatus (10) has chambers (11 and 12) and a loading mechanism (13) for transferring workpieces into and out of the chambers. The workpieces are carried on a pallet (16) which is slotted so that, when it is inserted into the chambers (11 or 12) the slots are aligned with lines A-H on lifting pins. This arrangement enables the mechanism (13) to withdraw the pallet, whilst the pins (22) are in their erect position.

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LOADING MECHANISMS

This invention relates to batch loading mechanisms and in particular, but not exclusively, to loading mechanisms for use with semi-conductor processing apparatus.

Currently semi-conductor wafers are processed either as single wafers or in batches. Batches can be loaded one at a time, or as a batch on a pallet. Loading a batch one at a time is time consuming and subjects the individual wafers in the batch to varying conditions. Those loaded earliest will have spent longer in the chamber than those loaded last. This will adversely affect the process uniformity across the batch. In extreme cases the first loaded wafers will be spoilt by the wait for the last to load, or the last to load will not be processed properly because they have not achieved the same state as those that have been loaded earlier. This is particularly the case where the process involves heating. In many processes the heat required to achieve a good process is sufficiently high as to cause undesirable side effects and damage if continued for too long. It is therefore important to achieve such a temperature but to minimise the length of time the wafers are at such temperatures. If the batch loading time is significant then either the first to load will have been subjected to excessive time-at-temperature or the last to load have had insufficient time to reach the correct temperature.

The present invention consists in a workpiece loading

mechanism, comprising a work station having a plurality of lifting elements arranged in lines and means for moving the elements between the workpiece lift position and a rest position; a pallet for supporting workpieces and means for moving the pallet into and out of the work station, the pallet having a plurality of slots corresponding to the lines of the elements such that the elements can pass through the slots when the pallet is at the work station, to lift the workpieces off the pallet and such that the pallet can be withdrawn from the work station with the elements in the workpiece lift position.

Preferably the lines are substantially straight and substantially parallel. In some instances single elements may constitute a line for these purposes but at least some of the lines will include a plurality of elements. The elements may be in the form of pins. Conveniently the elements are mounted on a common base for simultaneous movement for example by means of a hydraulic ram.

The invention also consists in a gas reactor having a work station including a vacuum chamber and a mechanism as defined above for loading workpieces through a side wall thereon.

The workpieces may be semi-conductor wafers.

Although the invention has been defined above it is to be understood that it includes any inventive combination of the features set out above or in the following description.

The invention may be performed in various ways and specific embodiments will now be described, by way of

example, with reference to the accompanying drawings, in which:

Figure 1 is a plan view of a dual chamber processing apparatus with one form of loading mechanism, and

Figure 2 is a cross-sectional view of a single chamber apparatus with a different form of loading mechanism.

Referring first to Figure 1 a processing apparatus 10 has chambers 11 and 12 and a loading mechanism generally indicated at 13. The loading mechanism 13 includes a carrier 14 and an actuating mechanism 15 which can move the carrier 14 in a straight line into or out of the chambers 11 and 12 using a "frog legs" mechanism. One example is manufactured by Brooks Automation.

As will be seen a pallet 16 can be placed into the carrier 14. The pallet 16 which has a number of recessed semi-conductor wafer locations 17 and eight slots 18 of different lengths, extending into, and in some cases through, the locations 17 from the leading edge of the pallet 16.

As can best be seen in Figure 2 a work station 19, in chamber 12, has a base 20 on which is positioned an array 21 of pins 22 which are, when viewed in one direction, aligned in a series of parallel lines which are indicated at A-H. A similar array exists in chamber 11 except the lines A-H are orthogonal to those in chamber 12.

In operation the wafers are loaded on the pallet 16 and the pallet 16 is placed on the carrier 14 when it is outside a chamber. The loaded carrier is then fed into the chamber

11 or 12. The base 20 is then lifted so that the pins 22 move up through their respective slots 18 to lift the wafers 23 from the pallet 16 and to support them in that lifted position. Because the slots 18 are aligned with the lines A-H the pallet 16 can then be withdrawn from the chamber and the pins can then be lowered placing the wafers 23 onto a workpiece support table 20a. In some circumstances it may not be necessary to lower the pins.

Unloading is exactly the reverse procedure and again the slots 18 allow the pallet 16 to pass the pins 22.

As can be seen in Figure 2 the base 20 may be mounted on a hydraulic ram 24 to provide the lift for the pins. Other suitable mechanisms may be used and the pins may be arranged to drop back through the workpiece support table 20a within the chamber.

An alternative loading mechanism 25 is illustrated in Figure 2 and in this case the table 16 is mounted for linear movement on a guide from a load chamber 26 into a processing chamber 27. The loading chamber is accessible through a lid 28 and the mechanism is driven by a motor 29.

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Claims

1. A workpiece loading mechanism, comprising a work station having a plurality of lifting elements arranged in lines and means for moving the elements between a workpiece lift position and work position; a pallet for supporting workpieces and means for moving the pallet into and out of the work station, the pallet having a plurality of slots corresponding to the lines of the elements such that the elements can pass through the slot when the pallet is at the work station, to lift workpieces off the pallet, and such that the pallet can be withdrawn from the work station with the elements in the workpiece lift position.

2. A mechanism as claimed in Claim 1, wherein the lines are substantially straight and substantially parallel.

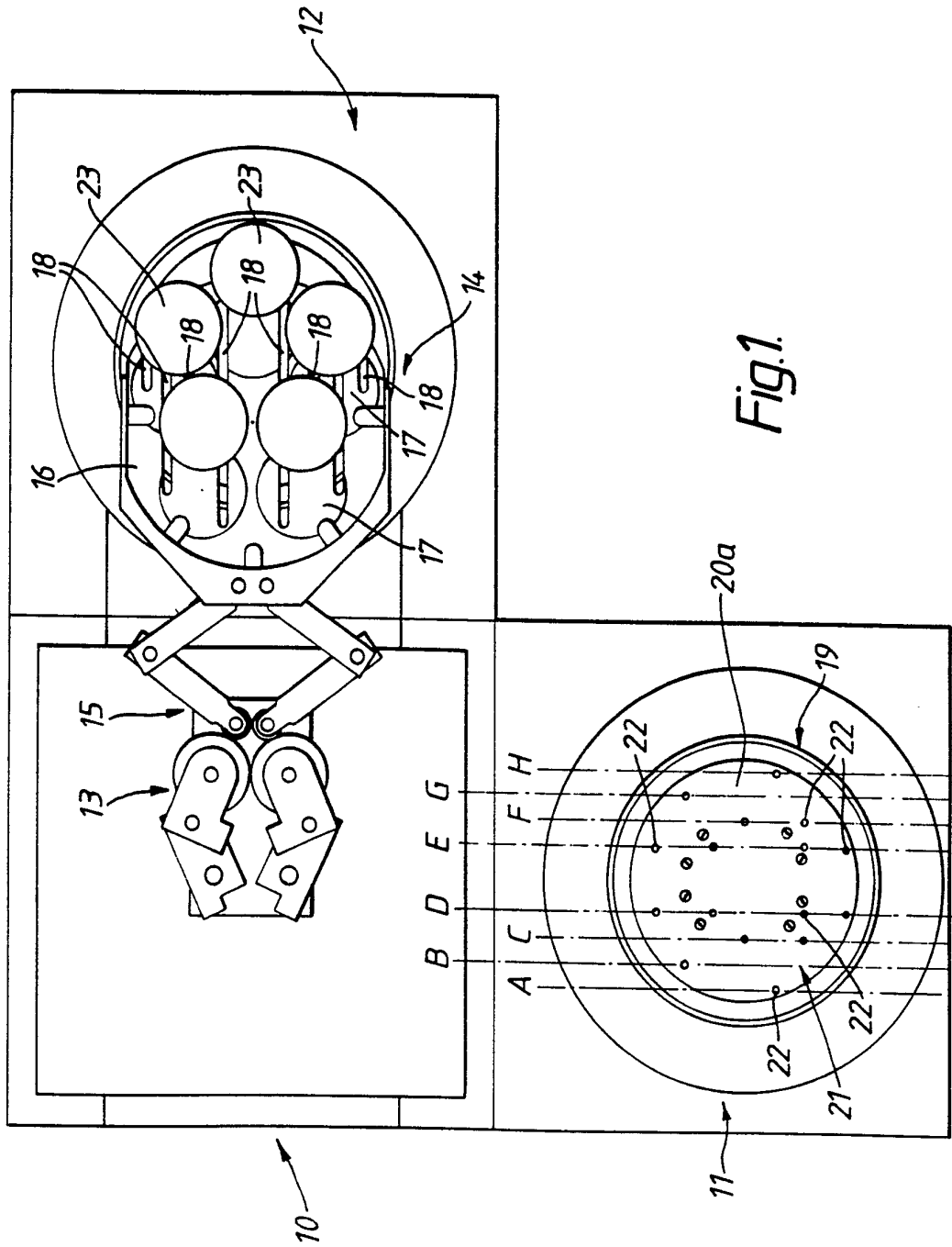
3. A mechanism as claimed in Claim 1 or Claim 2, wherein the elements are in the form of pins.

4. A mechanism as claimed in any one of the preceding Claims, wherein the elements are mounted on a common base for simultaneous movement.

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5. A workpiece loading mechanism substantially as hereinbefore described, with reference to the accompanying drawings.

6. A gas reactor having a work station including a vacuum chamber and a mechanism as claimed in any one of the preceding Claims for loading workpieces through a side wall thereof.



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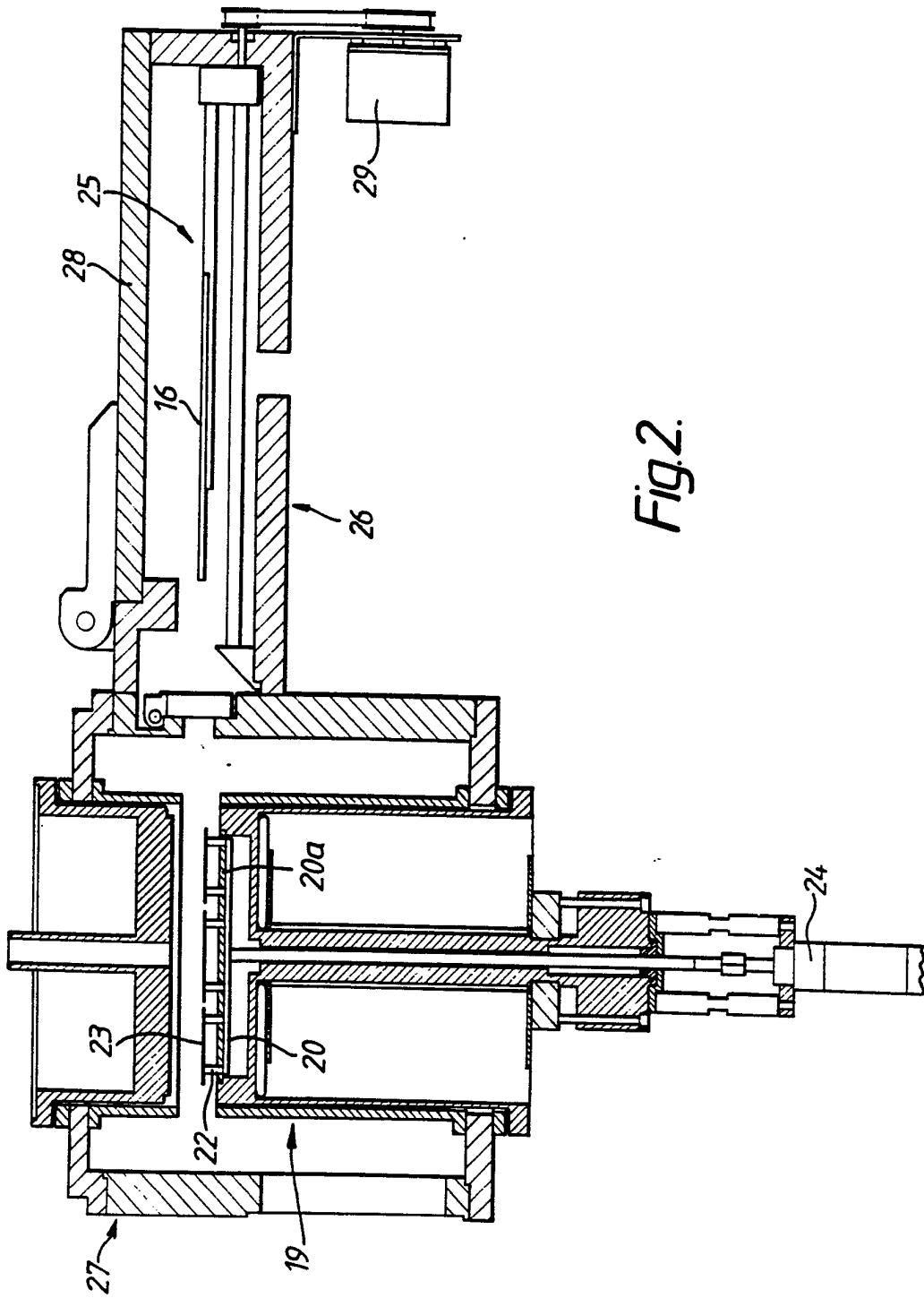


Fig. 2.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 91/00221

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC⁵: H 01 L 21/68, B 65 G 49/07

II. FIELDS SEARCHED

Minimum Documentation Searched †

Classification System |

Classification Symbols

IPC⁵ : H 01 L, B 65 G

Documentation Searched other than Minimum Documentation
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III. DOCUMENTS CONSIDERED TO BE RELEVANT*

Category *	Citation of Document, † with indication, where appropriate, of the relevant passages ‡	Relevant to Claim No. ‡
X	US, A, 4 534 695 (STUMP et al.) 13 August 1985 (13.08.85), see fig. 2,4,7; column 5, lines 38-45; column 6, lines 8,9; column 6, lines 32-60.	1-6
Y	--	
Y	EP, A2, 0 211 292 (HITACHI) 25 February 1987 (25.02.87), see fig. 1-4; column 4, line 5 - column 7, line 21.	1-6
Y	--	
Y	US, A, 4 856 641 (MASUMURA et al.) 15 August 1989 (15.08.89), see fig. 1-3; claims.	1-6
A	--	
A	GB, A, 2 156 582 (PERKIN ELMER) 09 October 1985 (09.10.85), see fig. 1; page 1, line 82 - page 2, line 30.	1, 3

* Special categories of cited documents: †

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IV. CERTIFICATION

Date of the Actual Completion of the International Search

10 May 1991

Date of Mailing of this International Search Report

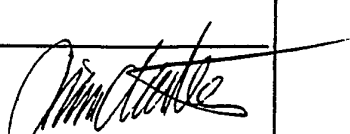
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, " with indication, where appropriate, of the relevant passages	Relevant to Claim No.
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A	GB, A, 2 198 881 (TERADYNE) 22 June 1988 (22.06.88), see fig. 1,2; pages 6-10.	1-6
A	DE, A1, 3 909 669 (CANON) 05 October 1989 (05.10.89), see fig. 1,6A,7; column 4, lines 12-52; column 5, lines 17-48.	1,5,6

ANHANG
zum internationalen Recherchen-
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ANNEX
to the International Search
Report to the International Patent
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ANNEXE
au rapport de recherche inter-
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In diesem Anhang sind die Mitglieder
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