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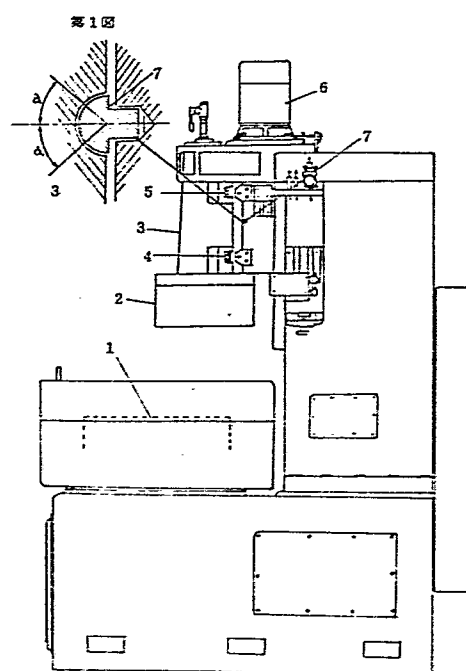
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④⑤ **SPINDLE TILTING CONTROL DEVICE FOR PLANE AND SPHERICAL ROTARY GRINDING MACHINE, FINE GLIDING MACHINE, LAPPING MACHINE, AND POLISHING MACHINE.**

④⑦ A spindle tilting control device for a plane and spherical rotary grinding machine, fine gliding machine, lapping machine and polishing machine, which are super precise machines for manufacturing microminiature electronic part components, which device employs a joint (7) for tilting a spindle, can perpendicularly secure a rotary table (1) with respect to the spindle (3) by clamping crank bolts (4), (5), tilts a grind-stone or surface plate (2) with a spindle tilting joint (7), thereby machining a spherical surface together with electric and chemical methods. This machine can extremely precisely machine semiconductor material, magnetic material, ceramics, superhard alloys, or the like.

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Specification

Title of the Invention

Spindle tilting control device for plane and spherical rotary grinding machine, fine gliding machine, lapping machine and polishing machine.

Field of the Art

According to the advance of electronics, the development of semiconductors has remarkably progressed. It has been necessary to gradually miniaturize computers, microcomputers and office computers by the shift from miniaturization and precision to microminiaturization and super precision, namely the shift from transistors to ICs, ICs to LSIs and LSIs to super LSIs. Super precise machines have been required for producing these microminiature electronic part components.

This invention is to provide a spindle tilting control device for a plane and spherical rotary grinding machine, fine gliding machine, lapping machine and polishing machine, which device can machine these semiconductor materials such as silicon, magnetic materials such as ferrite and Sendust, ceramics and hard metals or the like, to a super precise planeness or sphericity.

Background of the Art

These processing had been chiefly done by hands and depended on the skilled in the art. After a flat lapping machine was invented in the United States in 1919, several kinds of grinding machines, lapping machines and polishing machines have subsequently appeared, and the processing is now being in rapid progress of the mechanization.

Disclosure of the Invention

A device of this invention is to provide improved models of a conventional plane and spherical rotary grinding machine, fine gliding machine, lapping machine and polishing machine and is developed in order to achieve a super precise plane and an extreme machining precision by freely tilting its spindle in four quarter directions.

Brief Description of the Drawings

The drawings show an embodiment according to this invention.

Fig. 1 is a right side view of a spindle tilting control device of this invention,

Fig. 2 is a front view of the spindle tilting control device of this invention.

In these drawings, numeral 1 represents a rotary table, numeral 2 represents a grindstone or surface plate, numeral 3 represents a spindle head, numeral 4 and 5 represent clamp bolts, numeral 6 represents a motor and numeral 7 represents a joint for tilting a spindle.

Best Form for Working the Invention

The actions and effects of the device according to this invention will be explained with reference to these drawings, as follows.

Numeral 1 represents a rotary table for retaining a work magnetically or by vacuum and revolving the work, numeral 2 represents a grindstone or a lapping or polishing surface plate for grinding, lapping or polishing the work, numeral 3 represents a spindle head for revolving the grindstone or surface plate 2, numerals 4 and 5 represent clamp bolts for clamping on tilting the spindle head in one of four quarter

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directions or on setting the spindle completely perpendicular to the rotary table and numeral 6 represents a motor for driving a spindle head 3.

The device according to this invention is thus composed and can be used for a spherical grinding machine as the angle between the rotary table and a spindle shaft can be adjusted within a degree of a by tilting the spindle head 3 in one of four quarter directions with use of a joint 7 provided for tilting the spindle as illustrated in a detailed drawing in Fig. 1 differing from those in the conventional plane, spherical and rotary grinding machines, and also can achieve a complete planeness or sphericity of the work as the plane of the grindstone or the lapping or polishing surface plate and the plane of the rotary table can be kept completely in parallel to each other by setting the spindle completely perpendicular to the rotary table 1.

Applicability in Industry

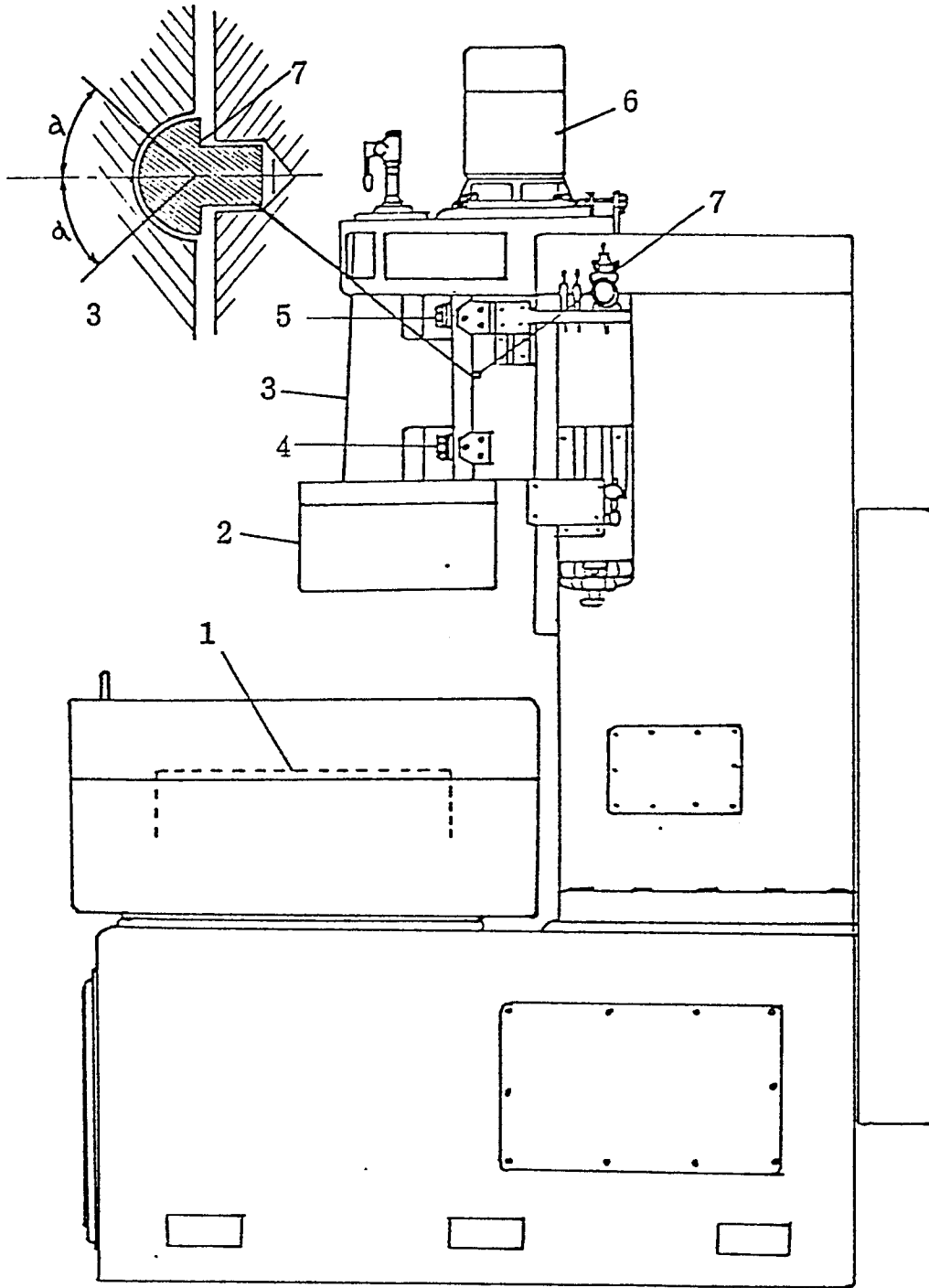
The device according to this invention will be required to be improved with a growing necessity for higher-grade machine tools for producing further extremely precise microminiature electronic part components, and the development for such improved machines is an urgent necessity.

Claim

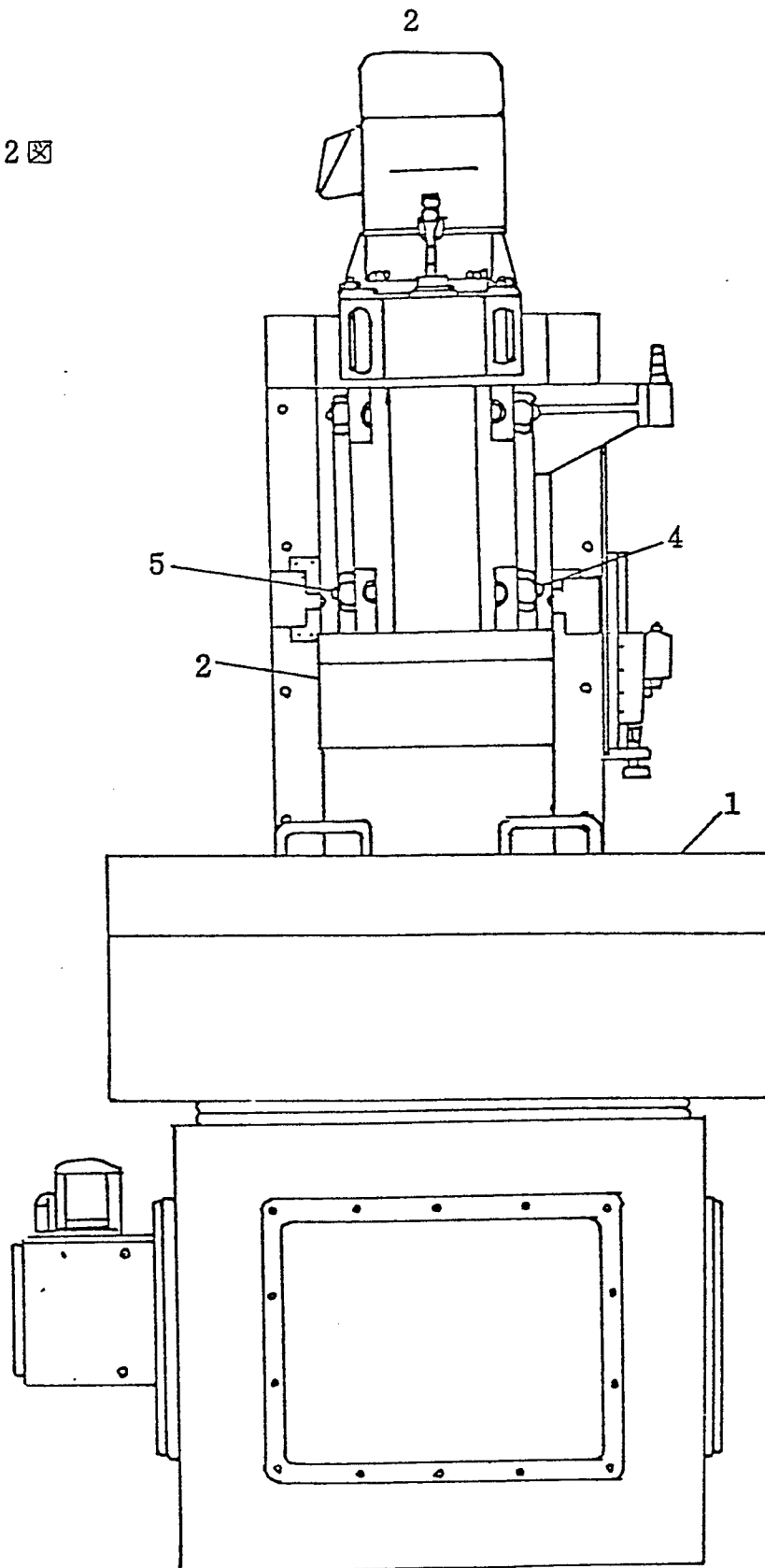
A spindle tilting control device for a plane and spherical rotary grinding machine, fine gliding machine, lapping machine and polishing machine, which device can perpendicularly secure a spindle with respect to a rotary table by clamp bolts and can machine a spherical surface by tilting the spindle employing a - - spindle tilting joint with use of electric and chemical methods.

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第1図



第 2 図



INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP81/4406

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³			
According to International Patent Classification (IPC) or to both National Classification and IPC			
Int. Cl. ³ B24B 41/04			
II. FIELDS SEARCHED			
Minimum Documentation Searched ⁴			
Classification System	Classification Symbols		
I P C	B24B 41/04		
I P C	B24B 37/04		
I P C	B24B 7/00 - 7/08		
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵			
Jitsuyo Shinan Koho		1927 - 1981	
Kokai Jitsuyo Shinan Koho		1971 - 1981	
Kokai Tokkyo Koho		1971 - 1981	
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴			
Category ⁶	Citation of Document, ¹⁵ with indication, where appropriate, of the relevant passages ¹⁷		Relevant to Claim No. ¹⁸
X	GB,A, 971336 1961-1-26 H.E. SJOSTRAND		1
X	GB,A, 674718 1950-12-1 VICTORIA MACHINE TOOL CO., Ltd.		1
* Special categories of cited documents: ¹⁹ "A" document defining the general state of the art "E" earlier document but published on or after the international filing date "L" document cited for special reason other than those referred to in the other categories "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but on or after the priority date claimed "T" later document published on or after the international filing date or priority date and not in conflict with the application, but cited to understand the principle or theory underlying the invention "X" document of particular relevance			
IV. CERTIFICATION			
Date of the Actual Completion of the International Search ²		Date of Mailing of this International Search Report ²	
April 23, 1981 (23.04.81)		May 18, 1981 (18.05.81)	
International Searching Authority ²		Signature of Authorized Officer ²⁰	
Japanese Patent Office			