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Mold for pressing and molded glass substrate for computer mem ory by using it

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(56) Related Art
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ABSTRACT

In advance of carbon coating, by injecting ion into the shaped surface of metallic mold made of super-hard materials, it becomes possible to increase the adhesiveness of the carbon coat onto the mold material, and to increase the life of the mold. In a metallic pressing mold with the required flatness secured by carbon coating on the surfaces, it is characterized in that the surface layer of the shaped surfaces is modified by ion injection in advance of carbon coating.

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AUSTRALIA

Patents Act 1990

ORIGINAL

COMPLETE SPECIFICATION

STANDARD PATENT

Invention Title: MOLD FOR PRESSING AND MOLDED GLASS SUBSTRATE FOR COMPUTER MEMORY BY USING IT

The following statement is a full description of this invention, including the best method of performing it known to me:

GH&CO REF: P24564-A:RPW:RK

TITLE OF THE INVENTION

Mold for pressing and molded glass substrate for computer memory by using it.

BACKGROUND OF THE INVENTION

This invention relates to a mold for pressing glass plates for hard disks for computer memory and molded glass substrates for computer memory pressed by using it.

Up to the present, generally hard disks made of aluminum substrate coated with magnetic materials were used. But because many grinding processes are required to obtain a specified surface roughness on the aluminum substrate, production costs are high.

In consideration of the above, it would be advantageous if at least preferred embodiments of this invention provided press molds that are able to obtain a specified surface roughness, and a glass substrate for computer memory devices pressed by the press molds, both at low cost.

BRIEF DESCRIPTION OF THE INVENTION

According to the present invention, there is provided a method of manufacturing a molded glass plate substrate for a computer memory, the method comprising the steps of:

preparing a metallic mold by ion implanting the surface of said mold to a depth of at least 0.5μm thereby to modify said surface and coating the modified surface with a carbon layer of thickness at least 0.1 to 1μm; and

molding said glass plate substrate using said mold.

According to this invention, although the metallic mold coated with graphite or amorphous type carbon has required flatness, an ion (e.g. nitrogen ion) is injected onto the surfaces of the super-hard mold material just before carbon coating, and the surface layer of the mold is modified.

Due to this process, it becomes possible to increase the adhesiveness of the carbon onto the mold and the life of the mold can be greatly extended.

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Also, the surface is treated so that the roughness reaches 2/1000-8/1000 mm.

Further, according to this invention, glass plates for glass substrates for computer memory are molded by using the metallic mold on which the surface has been modified by injecting ion before coating with carbon of graphite or amorphous diamond types.

The invention will be described below with reference to the exemplary embodiments and the accompanying drawings, in which:

Fig. 1 shows a glass substrate for computer memory molded by using a metallic mold according to this invention.

The embodiment of this invention is described in detail as follows. Herein, a metallic mold made of super-hard material, having a surface roughness of more than 8/1000mm is modified in forming Gauss distribution on the surface layer by ion injection such as a Nitrogen atomic ion in advance of coating with graphite or amorphous diamond-type carbon.

Namely, an ion-injected layer is shaped to a depth of at least 0.5 μm of the surface of a super-hard alloy by ion injection, and then carbon coat is provided in a depth 0.1-1μm on the ion-injected layer, and the last layer of the surface is flattened so as to keep the roughness in the range of 2/1000-8/1000 mm.

By applying the metallic mold according to this invention, it becomes possible to mold a glass substrate 1 for computer memory shown in the drawings.

In the ion-injection method applying high frequency discharging (105-107Hz) it becomes possible to inject ion to a depth of at least 0.5μm into the surface layer of the metallic mold by keeping ionizing current at 10mA, ion irradiation at 1×10^2 ions/cm^2 (100 doses), temperature at 300-500°C, and time for 10-40 seconds, and then the metallic mold is coated with an amorphous diamond type of carbon as much as a thickness of 0.1-1μm on the ionized layer.

For example, if pressing about 63mmφ glass plate by applying the metallic mold according to this invention, at first the glass plate preshaped in a circular disk is heated to the softening temperature of glass material, then the heated glass plate is charged in the metallic mold heated to the same temperature, and then pressed. After pressing, the pressed

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glass plate is gradually cooled over 15-20 minutes and cooled down to room temperature. Despite repeating 100,000 shots of this operation, peeling off of the carbon coat from the surface of the metallic mold was never seen. The effectiveness of this invention is recognized by the actual results.

The reason that the life of the metallic mold was considerably extended appears to be that the fatigue of the metallic mold is decreased by keeping glass temperature and mold temperature at the same degree, together with the improved peeling off property of the metallic mold owing to the ion radiation.

As described above in detail, in this invention, in advance of carbon coating, the shaped surface of the metallic mold is modified in the surface layer thereof by ion-implantation, then it becomes possible to greatly increase the adhesiveness of carbon coat onto the metallic mold and to extend the life of the metallic mold, and further to eliminate the polishing step of the pressed products owing to the high-graded flatness of the molded glass plates.

After obtaining glass substrate by using the mold according to this invention, the surface of the glass substrate is coated with magnetic materials.

In the claims which follow and in the preceding description of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprising" is used in the sense of "including", i.e. the features specified may be associated with further features in various embodiments of the invention.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of manufacturing a molded glass plate substrate for a computer memory, the method comprising the steps of:

preparing a metallic mold by ion implanting the surface of said mold to a depth of at least 0.5μm thereby to modify said surface and coating the modified surface with a carbon layer of thickness at least 0.1 to 1μm; and

molding said glass plate substrate using said mold.

2. A method of manufacturing a molded glass plate substrate for a computer memory substantially as hereinbefore described with reference to the accompanying drawings.

3. A molded glass plate substrate for a computer memory manufactured according to the method of claim 1 or 2.

Dated this 1st day of February 2000

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By his Patent Attorneys

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FIG. 1(a)

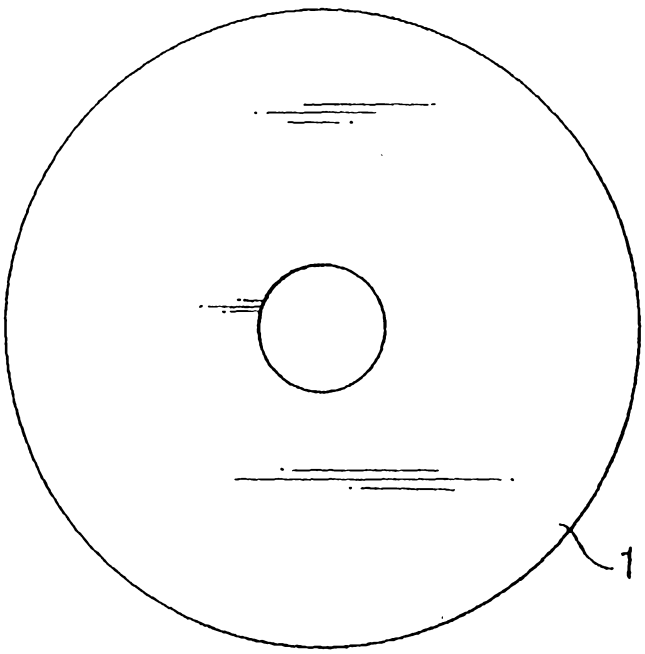


FIG. 1(b)

