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SPECIFICATION

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1. TITLE OF THE INVENTION

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

2. 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, the object of this invention is to provide 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.

3. BRIEF DESCRIPTION OF THE INVENTION

According to this invention, although the metallic mold coated with graphite or amorphous type carbon has required flatness, 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.

In this invention, ion injection is performed to at least as much as a depth of 0.5 μm of the surface, and thereafter carbon coating is performed as much as 0.1-1μm thickness on the ion-injected surface. Also, the surface is treated so that the flatness reaches 2/1000-8/1000.

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

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4. BRIEF DESCRIPTION OF THE DRAWINGS

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

5. DETAILED DESCRIPTION OF THE INVENTION

The embodiment of this invention is described in detail as follows. Herein, a metallic mold made of super-hard material, having a surface plane of more than 8/1000 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 as much as 0.5μm of the surface of a super-hard alloy by ion injection, and then carbon coat is provided in a depth as much as 0.1-1μm on the ion-injected layer, and the last layer of the surface is flattened so as to keep the flatness in the range of 2/1000-8/1000.

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 as deep as at least 0.5 into the surface layer of the metallic mold by keeping ionizing current at 10mA, ion irradiation at 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-injection, 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.

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What is claimed is:

1. A metallic mold for pressing a molded glass substrate for computer memory, in which a required flatness is secured by coating the surface of said metallic mold made of super-hard material with carbon, characterized in that said surface of said metallic mold is ion injected and said surface layer is modified in advance of carbon coating.

2. A metallic mold for pressing a molded glass substrate for computer memory as claimed in claim 1, wherein said surface of said mold is ion-injected at least as much as a depth of 0.5μm into said surface layers thereof.

3. A metallic mold for pressing a glass plate as claimed in claim 1, wherein said carbon coating is as much as 0.1-1μm thickness on said ionized layer.

4. Molded glass plate for glass substrate for computer memory press-formed by using a metallic mold made of super-hard material, said metallic mold being provided with required flatness by carbon coating on said surface thereof, and said surface being modified by ion injection in advance of carbon coating.

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