CLAIMS

1. A method for manufacturing a glass plate in which shape processing is performed on an edge surface of a glass plate having a disk shape,

the disk-shaped glass plate having a main surface and an edge surface that is perpendicular to the main surface,

the method comprising a step of forming a chamfered surface on ~~processing~~ the edge surface and processing the edge surface into a target shape by irradiating the edge surface with a laser beam while moving the laser beam relative to the edge surface in a circumferential direction of the glass plate having the disk shape,

wherein a cross-sectional intensity distribution of the laser beam with which the edge surface is irradiated is a single mode, and

when a width of luminous flux of the laser beam in a thickness direction of the glass plate at an irradiation position of the edge surface is W1 [mm], a thickness of the glass plate is Th [mm], and a power density of the laser beam is Pd, ~~a cross-sectional intensity distribution of the laser beam with which the edge surface is irradiated is a single mode, and~~ $W1 > Th$ holds true and when Pd × Th is x and the moving speed at which the laser beam moves along the edge surface is y, the value of Pd × Th and the value of the moving speed are adjusted such that y is in a range of $11.2 \times x - 4.7$ or lower and $3.8 \times x - 5.6$ or higher, and

wherein the moving speed is 0.7 [mm/s] or higher, and

the thickness Th is 0.7 [mm] or lower ~~in a range of 0.8 to 3.5 [W/mm] when a width of luminous flux of the laser beam in a thickness direction of the glass plate at an irradiation position of the edge surface is W1 [mm], a thickness of the glass plate is Th [mm], and a power density of the laser beam is Pd~~.

~~2. A method for manufacturing a glass plate in which shape processing is performed on an edge surface of a glass plate having a disk shape,~~

~~the disk-shaped glass plate having a main surface and an edge surface that is perpendicular to the main surface,~~

~~the method comprising a step of processing the edge surface into a target shape by irradiating the edge surface with a laser beam to form a chamfered surface on the edge surface while moving the laser beam relative~~

~~to the edge surface in a circumferential direction of the glass plate having the disk shape,~~

~~wherein a cross-sectional intensity distribution of the laser beam with which the edge surface is irradiated is a single mode, and a value of Pd × Th and a value of a moving speed are adjusted such that W1 > Th holds true when a width of luminous flux of the laser beam in a thickness direction of the glass plate at an irradiation position of the edge surface is W1 [mm], a thickness of the glass plate is Th [mm], and a power density of the laser beam is Pd, and, y is in a range of 11.2 × x − 4.7 or lower when Pd × Th is x and the moving speed at which the laser beam moves along the edge surface is y.~~

2~~3~~. The method for manufacturing a glass plate according to claim 1~~ or 2~~,

wherein the edge surface of the glass plate is irradiated with the laser beam from a normal direction of the edge surface.

3~~4~~. The method for manufacturing a glass plate according to any one of claims 1 or 2~~to 3~~,

wherein, in the shape processing, irradiation conditions of the laser beam are set so as to form, on the edge surface, a side wall surface that is orthogonal to two opposing main surfaces of the glass plate, and chamfered surfaces connecting ends on both sides of the side wall surface and ends of the main surfaces to each other.

4~~5~~. The method for manufacturing a glass plate according to any one of claim 1 to 3~~4~~,

wherein the irradiation conditions of the laser beam are set such that a ratio (C/Th) of a length C of the chamfered surface extending along the main surface relative to the thickness Th is in a range of 0.1 to 0.7.

5~~6~~. The method for manufacturing a glass plate according to any one of claims 1 to 4~~5~~,

wherein a surface roughness Rz of the edge surface formed by the laser beam is 0.3 μm or less, and an arithmetic average roughness Ra thereof is 0.03 μm or less.

6~~7~~. The method for manufacturing a glass plate according to any one of

claims 1 to 5~~6~~,

wherein the luminous flux of the laser beam with which the edge surface is irradiated has an elliptical shape, and a ratio (W2/D) of a length W2 of the luminous flux of the laser beam, in the circumferential direction, with which the edge surface is irradiated, relative to a diameter D of the glass plate is in a range of 0.03 to 0.3.

7~~8~~. The method for manufacturing a glass plate according to any one of claims 1 to 6~~7~~,

wherein the power density Pd is set such that a diameter of the glass plate formed through irradiation with the laser beam is larger than a diameter of the glass plate before being irradiated with the laser beam.

8~~9~~. The method for manufacturing a glass plate according to any one of claims 1 to 7~~8~~,

wherein a moving speed at which the laser beam moves along the edge surface is in a range of 20~~.7~~ to 100 [mm/s].

9~~10~~. The method for manufacturing a glass plate according to any one of claims 1 to 8~~9~~,

wherein the glass plate has a Young's modulus of 70 [GPa] or more.

10~~1~~. The method for manufacturing a glass plate according to any one of claims 1 to 9~~10~~,

wherein the glass plate has a coefficient of linear thermal expansion of 100 $\times 10^{-7}$ [1/K] or less.

~~12. The method for manufacturing a glass plate according to any one of claims 1 to 11,~~

~~wherein the thickness Th is 0.7 mm or less.~~

11~~3~~. The method for manufacturing a glass plate according to any one of claims 1 to 10~~2~~,

the method for manufacturing a glass plate comprising a step of grinding or polishing the main surface of the glass plate subjected to the shape processing,

wherein no edge surface is polished after the shape processing and before the main surface is ground or polished, or even if the edge surface is polished, an amount of machining allowance for polishing the edge surface is 5 μm or less.

124. A method for chamfering a glass plate in which a chamfered surface is formed on an edge surface of a glass plate having a disk shape through irradiation with a laser beam,

wherein the edge surface of the glass plate before the chamfered surface is formed has at least a surface that is perpendicular to a main surface in a central portion of the glass plate in a thickness direction of the glass plate, and

when an edge portion of the edge surface of the glass plate is chamfered into a round shape by softening and/or melting the edge portion by irradiating the edge portion~~surface~~ of the glass plate with a laser beam, ~~and Pd × Th and a moving speed V are controlled~~ when a thickness of the glass plate is Th [mm], a power density of the laser beam is Pd, and the moving speed at which the laser beam moves along the edge surface is V, the relationship between Pd × Th, the moving speed V and the shape of the edge surface after forming the chamfered surface is obtained and based on the relationship the value of Pd × Th and V are controlled such that a surface that is perpendicular to the main surface of the glass plate is also formed on the edge surface after the chamfered surface is formed.

135. A method for chamfering a glass plate in which a chamfered surface is formed on an edge surface of a glass plate having a disk shape through irradiation with a laser beam,

wherein the edge surface of the glass plate before the chamfered surface is formed has at least a surface that is perpendicular to a main surface in a central portion of the glass plate in a thickness direction of the glass plate, and

an edge portion of the edge surface of the glass plate is chamfered into a round shape by softening and/or melting the edge portion of the edge surface by irradiating the edge surface of the glass plate with a laser beam, when a thickness of the glass plate is Th [mm], a power density of the laser beam is Pd, and the moving speed at which the laser beam moves along the edge

surface is V, Pd × Th and the moving speed V are controlled such that a surface that is perpendicular to the main surface of the glass plate is also formed on the edge surface after the chamfered surface is formed,

wherein when Pd × Th is x and the moving speed is y, the value of Pd × Th and the value of the moving speed are adjusted such that y is in a range of 11.2 × x − 4.7 or lower and 5.4 × x − 4.5 or higher.

~~The method for chamfering a glass plate according to claim 14,~~

~~wherein, when the Pd × Th is x, and the moving speed is y,~~

~~a value of the Pd × Th and a value of the moving speed are adjusted such that y is in a range of 11.2 × x − 4.7 or lower and 5.4 × x − 4.5 or higher.~~

1~~4~~6. A method for manufacturing a glass plate,

wherein the edge surface of the glass plate having the disk shape is chamfered using the method for chamfering a glass plate according to claim 1~~2~~4 or 1~~3~~5.

15. The method for manufacturing a glass plate according to claim 14, the method further comprising a step of grinding or polishing the main surface of the glass plate having a disk shape after subjected to the chamfering processing,

wherein no edge surface is polished after the chamfering processing and before the main surface is ground or polished, or even if the edge surface is polished, an amount of machining allowance for polishing an edge surface is 5 μm or less.

16. The method for manufacturing a glass plate according to any one of claim 1 to 11, 14 and 15,

wherein the glass plate having a disk shape is a glass substrate for a magnetic disk having a circular hole at a central position, and

the edge surface is an inner circumferential edge surface or an outer circumferential edge surface of the glass substrate for a magnetic disk.

17. A method for manufacturing a magnetic disk,

wherein a magnetic film is formed on the main surface of the glass plate manufactured using the method for manufacturing a glass plate

according to ~~any one of~~ claim~~s~~ ~~1 to 13 and~~ 16.