CLAIMS

1. A ring-shaped glass spacer to be arranged in contact with a magnetic disk in a hard disk drive apparatus,

wherein a glass material of the glass spacer has a surface resistivity of 10^3 to 10^9 [Ω/sq] at 22 [°C], and~~.~~

a surface roughness Rz of an outer circumferential edge surface of the glass spacer that does not come into contact with the magnetic disk is at least 1.5 [μm].

2. A ring-shaped glass spacer to be arranged in contact with a magnetic disk in a hard disk drive apparatus,

wherein a glass material of the glass spacer has a surface resistivity of 10^3 to 10^9 [Ω/sq] at 22 [°C], and ~~surface resistivity of a surface of a glass material of the glass spacer at 22 [°C] is lower than a surface resistivity of an inner portion of the glass material at 22 [°C].~~

grooves that extend along an outer circumference of the glass spacer are formed in an outer circumferential edge surface of the glass spacer that does not come into contact with the magnetic disk.

3. A ring-shaped glass spacer to be arranged in contact with a magnetic disk in a hard disk drive apparatus, ~~The glass spacer according to claim 2,~~

~~wherein the~~ a glass material of the glass spacer has a surface resistivity of 10^3 to 10^9 [Ω/sq] at 22 [°C~~].~~], and

a skewness of an outer circumferential edge surface of the glass spacer that does not come into contact with the magnetic disk is preferably not larger than 1.2.

4. The glass spacer according to claim 2,

wherein a surface roughness Rz of an outer circumferential edge surface

of the glass spacer that does not come into contact with the magnetic disk is at least 1.5 [μm].

~~The glass spacer according to any one of claims 1 to 3,~~

~~wherein the glass spacer contains at least one oxide selected from the group consisting of TiO_2, Nb_2O_5, WO_3, and Bi_2O_3, as a glass component.~~

5. The glass spacer according to claim 3,~~any one of claims 1 to 4,~~

wherein a surface roughness Rz of an outer circumferential edge surface of the glass spacer that does not come into contact with the magnetic disk is at least 1.5 [μm]. ~~Ra of a main surface of the glass spacer that comes into contact with the magnetic disk is not larger than 1.0 [μm].~~

6. The glass spacer according to claim 3,~~any one of claims 1 to 5,~~

grooves that extend along an outer circumference of the glass spacer are formed in an outer circumferential edge surface of the glass spacer that does not come into contact with the magnetic disk.~~wherein a surface roughness Rz of an outer circumferential edge surface of the glass spacer that does not come into contact with the magnetic disk is at least 1.5 [μm].~~

7. The glass spacer according to claim 4,~~claim 6,~~

wherein ~~the~~ a skewness of an outer circumferential edge surface of the glass spacer that does not come into contact with the magnetic disk is preferably not larger than 1.2.~~surface roughness Rz of the outer circumferential edge surface is not larger than 20 [μm].~~

8. A ring-shaped glass spacer to be arranged in contact with a magnetic disk in a hard disk drive apparatus,

wherein the surface resistivity of a surface of the glass material of the spacer at 22 [°C] is lower than the surface resistivity of an inner portion of the glass material at 22 [°C].~~The glass spacer according to any one of claims 1 to 7,~~

~~wherein grooves that extend along an outer circumference of the glass spacer are formed in an outer circumferential edge surface of the glass spacer that does not come into contact with the magnetic disk.~~

9. The glass spacer according to claim 8,~~any one of claims 1 to 8,~~

wherein the glass material of the glass spacer has a surface resistivity of 10^3 to 10^9 [Ω/sq] at 22 [°C].~~a skewness of an outer circumferential edge surface of the glass spacer that does not come into contact with the magnetic disk is not larger than 1.2.~~

10. The glass spacer according to any one of claims 1 to 9,

wherein the glass spacer contains at least one oxide selected from the group consisting of TiO_2, Nb_2O_5, WO_3, and Bi_2O_3, as a glass component.~~A hard disk drive apparatus comprising the glass spacer according to any one of claims 1 to 9 and the magnetic disk.~~

11. The glass spacer according to any one of claims 1 to 10,

wherein a surface roughness Ra of a main surface of the glass spacer that comes into contact with the magnetic disk is not larger than 1.0 [μm].

~~The hard disk drive apparatus according to claim 10,~~

~~wherein the magnetic disk includes a glass substrate and a magnetic film that is formed on the glass substrate.~~

12. The glass spacer according to any one of claims 1 to 11,,

wherein the surface roughness Rz of the outer circumferential edge surface is not larger than 20 [μm].~~The hard disk drive apparatus according to claim 11,~~

~~wherein a surface roughness Ra of a main surface of the magnetic disk is not larger than 0.3 [nm].~~

13. A~~The~~ hard disk drive apparatus comprising the glass spacer according to any one of claims 1 to 12 and the magnetic disk. ~~according to any one of claims 10 to 12,~~

~~wherein eight or more magnetic disks are installed in the hard disk drive apparatus.~~

14. The hard disk drive apparatus according to claim 13,

wherein the magnetic disk includes a glass substrate and a magnetic film that is formed on the glass substrate.

~~A method for manufacturing a ring-shaped glass spacer to be arranged in contact with a magnetic disk in a hard disk drive apparatus, the method comprising:~~

~~manufacturing a glass spacer blank that is a blank for the glass spacer; and~~

~~reducing a surface resistivity of a surface of the glass spacer blank by performing reduction treatment on the surface.~~

15. The hard disk drive apparatus according to claim 14,

wherein a surface roughness Ra of a main surface of the magnetic disk is not larger than 0.3 [nm].

~~The method for manufacturing a glass spacer according to claim 14,~~

~~wherein the glass spacer contains at least one oxide selected from the group consisting of TiO_2, Nb_2O_5, WO_3, and Bi_2O_3, as a glass component.~~

16. The hard disk drive apparatus according to any one of claims 13 to 15,

wherein eight or more magnetic disks are installed in the hard disk drive apparatus.

17. A method for manufacturing a ring-shaped glass spacer to be arranged in contact with a magnetic disk in a hard disk drive apparatus, the method

comprising:

manufacturing a glass spacer blank that is a blank for the glass spacer; and

reducing a surface resistivity of a surface of the glass spacer blank by performing reduction treatment on the surface.

18. The method for manufacturing a glass spacer according to claim 17,

wherein the glass spacer contains at least one oxide selected from the group consisting of TiO_2, Nb_2O_5, WO_3, and Bi_2O_3, as a glass component.