What is claimed is:

1. A method for manufacturing a glass blank for magnetic disk, the method including a forming process of press-forming a lump of molten glass using a pair of dies, the method comprising:

obtaining a correlation between a difference in temperature of a pair of dies in press-forming the molten glass and flatness of the glass blank obtained after press forming, the difference being measured at positions of the pair of dies facing each other;

determining a difference in temperature of the pair of dies based on the correlation, the difference enabling flatness required for the glass blank; and

performing the forming process so that a difference in temperature of the pair of dies is within the determined difference in temperature.

2. The method for manufacturing a glass blank for magnetic disk according to claim 1, wherein the flatness required for the glass blank is equal to flatness of a magnetic disk, the flatness of the magnetic disk being determined to prevent a head from touching the magnetic disk when the magnetic disk is mounted in a hard disk device.

3. The method for manufacturing a glass blank for magnetic disk according to claim 1 or 2, wherein in the forming process, the lump of molten glass while falling is press-formed in a direction orthogonal to the falling direction using the pair of dies.

4. The method for manufacturing a glass blank for magnetic disk according to any one of claims 1 to 3, wherein in the forming process, press forming is performed so that the temperature of portions of the pair of dies, which contact the molten glass, is substantially the same.

5. The method for manufacturing a glass blank for magnetic disk according to any one of claims 1 to 4, wherein the temperature of the pair of dies is kept lower than a glass transition point (Tg) of the molten glass during a period of time until the glass blank is separated from the die after beginning to contact the die.

6. The method for manufacturing a glass blank for magnetic disk according to any one of claims 1 to 5, wherein in the forming process, press forming is performed without attaching a mold

release material to the die.

7. The method for manufacturing a glass blank for magnetic disk according to any one of claims 1 to 6, wherein a thermal expansion coefficient at 100°C to 300°C of the glass blank obtained after press forming is in a range of 30×10^{-7} to $100 \times 10^{-7}(K^{-1})$.

8. The method for manufacturing a glass blank for magnetic disk according to any one of claims 1 to 7, wherein in the forming process, the lump of molten glass is press-formed so that flatness of the glass blank is 8 μm or less.

9. A method for manufacturing a glass blank for magnetic disk, the method comprising a forming process of press-forming a lump of molten glass using a pair of dies, wherein in the forming process, the lump of molten glass is press-formed so that a difference in temperature of the pair of dies is 10°C or less, the difference being measured at positions of the pair of dies facing each other.

10. A method for manufacturing a glass blank for magnetic disk, the method comprising a forming process of press-forming a lump of molten glass using a pair of dies, wherein in the forming process, the lump of molten glass is press-formed so that flatness of the glass blank is 8 μm or less.

11. A method for manufacturing a glass substrate for magnetic disk, including a polishing process for polishing a glass blank with a machining allowance of 50 μm or less to manufacture a glass substrate for magnetic disk, the glass blank being manufactured with the method for manufacturing a glass blank for magnetic disk according to any one of claims 1 to 10.

12. A method for manufacturing a glass substrate for magnetic disk, wherein a glass substrate for magnetic disk is manufactured using a glass blank for magnetic disk, the glass blank being obtained with the method for manufacturing a glass blank for magnetic disk according to any one of claims 1 to 10.

13. A glass blank for magnetic disk, which has flatness substantially the same as flatness

required for the magnetic disk, the flatness required for the magnetic disk being determined to prevent a head from touching the magnetic disk when the magnetic disk is mounted in a hard disk device.

14. The glass blank for magnetic disk according to claim 13, which is manufactured with press forming.

15. The glass blank for magnetic disk according to claim 13 or 14, wherein the flatness has a value of 4 μm or less when measuring over an area of 65 mm in diameter selected on a principal face of the glass blank.

16. The glass blank for magnetic disk according to any one of claims 13 to 15, wherein the surface roughness (Ra) of a pair of principal faces is 0.1 μm or less.

17. The glass blank for magnetic disk according to any one of claims 13 to 16, wherein glass compositions of a pair of principal faces are substantially the same.

18. The glass blank for magnetic disk according to any one of claims 13 to 17, wherein a difference between the maximum value and the minimum value of thickness is 8 μm or less when measuring over an area of 65 mm in diameter selected on a principal face of the glass blank.

19. The glass blank for magnetic disk according to any one of claims 13 to 18, wherein thickness in cross-sectional shape of the glass blank decreases as going from the outer circumference side toward the center side.

20. A method for manufacturing a glass blank for magnetic disk, the method including a forming process of forming a plate-shaped glass blank by press-forming a falling molten glass in a direction orthogonal to the falling direction using a pair of dies, wherein the forming process comprises a thermally equalizing process for reducing a difference in temperature of the pair of dies during a period of time until a new molten glass is press-formed after the dies are opened.

21. The method for manufacturing a glass blank for magnetic disk according to claim 20,

wherein the thermally equalizing process is a process of bringing a thermally equalizing material into contact with at least one of the pair of dies.

22. The method for manufacturing a glass blank for magnetic disk according to claim 20 or 21, wherein in the forming process, press forming is performed so that the temperature of portions of the pair of dies, which contact the molten glass, is substantially the same.

23. The method for manufacturing a glass blank for magnetic disk according to any one of claims 20 to 22, wherein the temperature of the pair of dies is kept lower than a glass transition point (Tg) of the molten glass during a period of time until the glass blank is separated from the die after beginning to contact the die.

24. The method for manufacturing a glass blank for magnetic disk according to any one of claims 20 to 23, wherein in the forming process, press forming is performed without attaching a mold release material to the die.

25. A method for manufacturing a glass substrate for magnetic disk, including a polishing process for polishing a glass blank with a machining allowance of 50 μm or less to manufacture a glass substrate for magnetic disk, the glass blank being manufactured with the method for manufacturing a glass blank for magnetic disk according to any one of claims 20 to 24.

26. A method for manufacturing a glass substrate for magnetic disk, wherein a glass substrate for magnetic disk is manufactured using a glass blank for magnetic disk, the glass blank being obtained by the method for manufacturing a glass blank for magnetic disk according to any one of claims 20 to 24.

27. A method for manufacturing a glass blank for magnetic disk, the method comprising:

performing a forming process of forming a plate-shaped glass blank by press-forming a falling molten glass in a direction orthogonal to the falling direction using a pair of dies;

performing, after the forming process, a detachment process of detaching from the die the glass blank attached to the die is performed without causing a difference in temperature of the pair of dies; and

performing, after the detaching process, the forming process by press-forming the next molten glass.

28. The method for manufacturing a glass blank for magnetic disk according to claim 27, wherein in the detachment process, at least a part of the outer circumferential portion of the glass blank is cooled while both the dies and the glass blank are in contact with each other.

29. The method for manufacturing a glass blank for magnetic disk according to claim 28, wherein in the detachment process, at least a part of the outer circumferential edge portion of the glass blank is cooled by supplying a gas to the glass blank.

30. The method for manufacturing a glass blank for magnetic disk according to claim 29, wherein the gas is supplied immediately before or concurrent with time at which the pair of dies having been closed starts to open.

31. The method for manufacturing a glass blank for magnetic disk according to any one of claims 27 to 30, wherein in the forming process, press forming is performed so that the temperature of portions of the pair of dies, which contact the molten glass, is substantially the same.

32. The method for manufacturing a glass blank for magnetic disk according to any one of claims 27 to 31, wherein the temperature of the pair of dies is kept lower than a glass transition point (Tg) of the molten glass during a period of time until the glass blank is separated from the die after beginning to contact the die.

33. The method for manufacturing a glass blank for magnetic disk according to any one of claims 27 to 32, wherein in the forming process, press forming is performed without attaching a mold release material to the die.

34. The method for manufacturing a glass blank for magnetic disk according to any one of claims 27 to 33, wherein surface roughness (Ra) of each of the pair of dies is 0.1 μm or less.

35. A method for manufacturing a glass blank for magnetic disk, the method comprising a

forming process of forming a plate-shaped glass blank by press-forming a falling molten glass in a direction orthogonal to the falling direction using a pair of dies, wherein each of the pair of dies includes a passage for introducing a gas to a space formed by closing of the pair of dies, and in the forming process, the gas is supplied to the space through the passage of each die while the pair of dies are closed.

36. A method for manufacturing a glass substrate for magnetic disk, including a polishing process for polishing a glass blank with a machining allowance of 50 μm or less to manufacture a glass substrate for magnetic disk, the glass blank being manufactured with the method for manufacturing a glass blank for magnetic disk according to any one of claims 27 to 35.

37. A method for manufacturing a glass substrate for magnetic disk, wherein a glass substrate for magnetic disk is manufactured using a glass blank for magnetic disk, the glass blank being obtained by the method for manufacturing a glass blank for magnetic disk according to any one of claims 27 to 35.

What is claimed is:

1. A method for manufacturing a glass blank for magnetic disk, the method including a forming process of press-forming a lump of molten glass using a pair of dies, the method comprising:

obtaining a correlation between a difference in temperature of a pair of dies in press-forming the molten glass and flatness of the glass blank obtained after press forming, the difference being measured at positions of the pair of dies facing each other;

determining a difference in temperature of the pair of dies based on the correlation, the difference enabling flatness required for the glass blank; and

performing the forming process so that a difference in temperature of the pair of dies is within the determined difference in temperature to form the glass blank, surface roughness (Ra) of the glass blank being 0.2 μm or less.

2. The method for manufacturing a glass blank for magnetic disk according to claim 1, wherein the flatness required for the glass blank is equal to flatness of a magnetic disk, the flatness of the magnetic disk being determined to prevent a head from touching the magnetic disk when the magnetic disk is mounted in a hard disk device.

3. The method for manufacturing a glass blank for magnetic disk according to claim 1 or 2, wherein in the forming process, the lump of molten glass while falling is press-formed in a direction orthogonal to the falling direction using the pair of dies.

4. The method for manufacturing a glass blank for magnetic disk according to any one of claims 1 to 3, wherein in the forming process, press forming is performed so that the temperature of portions of the pair of dies, which contact the molten glass, is substantially the same.

5. The method for manufacturing a glass blank for magnetic disk according to any one of claims 1 to 4, wherein the temperature of the pair of dies is kept lower than a glass transition point (Tg) of the molten glass during a period of time until the glass blank is separated from the die after beginning to contact the die.

6. The method for manufacturing a glass blank for magnetic disk according to any one of claims 1 to 5, wherein in the forming process, press forming is performed without attaching a mold release material to the die.

7. The method for manufacturing a glass blank for magnetic disk according to any one of claims 1 to 6, wherein a thermal expansion coefficient at 100°C to 300°C of the glass blank obtained after press forming is in a range of 30×10^{-7} to $100 \times 10^{-7}(K^{-1})$.

8. The method for manufacturing a glass blank for magnetic disk according to any one of claims 1 to 7, wherein in the forming process, the lump of molten glass is press-formed so that flatness of the glass blank is 8 μm or less.

9. The method according to any one of claims 1 – 8 wherein in the forming process, the lump of molten glass is press-formed so that a difference in temperature of the pair of dies is 10°C or less, the difference being measured at positions of the pair of dies facing each other.

10. A method for manufacturing a glass substrate for magnetic disk, including a polishing process for polishing a glass blank with a machining allowance of 50 μm or less to manufacture a glass substrate for magnetic disk, the glass blank being manufactured with the method for manufacturing a glass blank for magnetic disk according to any one of claims 1 to 9.

11. A method for manufacturing a glass substrate for magnetic disk, wherein a glass substrate for magnetic disk is manufactured using a glass blank for magnetic disk, the glass blank being obtained with the method for manufacturing a glass blank for magnetic disk according to any one of claims 1 to 9.

12. A glass blank for magnetic disk having a pair of principal faces, each having flatness substantially the same flatness as target flatness required for the magnetic disk, the target flatness being determined to prevent a head from touching the magnetic disk when the magnetic disk is mounted in a hard disk device wherein surface roughness (Ra) of a pair of each of the principal faces is 0.2 μm or less, and the glass compositions of the pair of principal faces are substantially the

same.

13. The glass blank for magnetic disk according to claim 12, which is manufactured with press forming.

14. The glass blank for magnetic disk according to claim 12 or 13, wherein the flatness has a value of 4 μm or less when measuring over an area of 65 mm in diameter selected on a principal face of the glass blank.

15. The glass blank for magnetic disk according to any one of claims 12 to 14, wherein the surface roughness (Ra) of a pair of principal faces is 0.1 μm or less.

16. The glass blank for magnetic disk according to any one of claims 12 to 15, wherein a difference between the maximum value and the minimum value of thickness is 8 μm or less when measuring over an area of 65 mm in diameter selected on a principal face of the glass blank.

17. The glass blank for magnetic disk according to any one of claims 12 to 16, wherein thickness in cross-sectional shape of the glass blank decreases as going from the outer circumference side toward the center side.

18. A method for manufacturing a glass blank for magnetic disk, the method including a forming process of forming a plate-shaped glass blank by press-forming a falling molten glass in a direction orthogonal to the falling direction using a pair of dies, wherein the forming process comprises a thermally equalizing process for reducing a difference between temperature of the pair of dies at the time when the formed glass blank being to fall down from the pair of dies and temperature of the pair of dies at the time when the subsequent molten glass is press-formed.

19. The method for manufacturing a glass blank for magnetic disk according to claim 18, wherein the thermally equalizing process is a process of bringing a thermally equalizing material into contact with at least one of the pair of dies.

20. The method for manufacturing a glass blank for magnetic disk according to claim 18 or 19, wherein in the forming process, press forming is performed so that the temperature of portions of the pair of dies, which contact the molten glass, is substantially the same.

21. The method for manufacturing a glass blank for magnetic disk according to any one of claims 18 to 20, wherein the temperature of the pair of dies is kept lower than a glass transition point (Tg) of the molten glass during a period of time until the glass blank is separated from the die after beginning to contact the die.

22. The method for manufacturing a glass blank for magnetic disk according to any one of claims 18 to 21, wherein in the forming process, press forming is performed without attaching a mold release material to the die.

23. A method for manufacturing a glass substrate for magnetic disk, including a polishing process for polishing a glass blank with a machining allowance of 50 μm or less to manufacture a glass substrate for magnetic disk, the glass blank being manufactured with the method for manufacturing a glass blank for magnetic disk according to any one of claims 18 to 22.

24. A method for manufacturing a glass substrate for magnetic disk, wherein a glass substrate for magnetic disk is manufactured using a glass blank for magnetic disk, the glass blank being obtained by the method for manufacturing a glass blank for magnetic disk according to any one of claims 18 to 22.

25. A method for manufacturing a glass blank for magnetic disk, the method comprising:

performing a forming process of forming a plate-shaped glass blank by press-forming a falling molten glass in a direction orthogonal to the falling direction using a pair of dies;

performing, after the forming process, a detachment process of detaching from the die the glass blank attached to the die is performed without causing a difference in temperature of the pair of dies; and

performing, after the detaching process, the forming process by press-forming the next molten glass.

26. The method for manufacturing a glass blank for magnetic disk according to claim 25, wherein in the detachment process, at least a part of the outer circumferential portion of the glass blank is locally cooled while both the dies and the glass blank are in contact with each other.

27. The method for manufacturing a glass blank for magnetic disk according to claim 26, wherein in the detachment process, at least a part of the outer circumferential edge portion of the glass blank is cooled by supplying a gas to the glass blank.

28. The method for manufacturing a glass blank for magnetic disk according to claim 27, wherein the gas is supplied immediately before or concurrent with time at which the pair of dies having been closed starts to open.

29. The method for manufacturing a glass blank for magnetic disk according to any one of claims 25 to 28, wherein in the forming process, press forming is performed so that the temperature of portions of the pair of dies, which contact the molten glass, is substantially the same.

30. The method for manufacturing a glass blank for magnetic disk according to any one of claims 25 to 29, wherein the temperature of the pair of dies is kept lower than a glass transition point (Tg) of the molten glass during a period of time until the glass blank is separated from the die after beginning to contact the die.

31. The method for manufacturing a glass blank for magnetic disk according to any one of claims 25 to 30, wherein in the forming process, press forming is performed without attaching a mold release material to the die.

32. The method for manufacturing a glass blank for magnetic disk according to any one of claims 25 to 31, wherein surface roughness (Ra) of each of the pair of dies is 0.1 μm or less.

33. A method for manufacturing a glass blank for magnetic disk, the method comprising a forming process of forming a plate-shaped glass blank by press-forming a falling molten glass in a

direction orthogonal to the falling direction using a pair of dies, wherein each of the pair of dies includes a passage for introducing a gas to a space, the space being formed when each of the pair of dies contacts with the molton glass with closing of the pair of dies, and wherein in the forming process, the gas is supplied to the space through the passage of each die while the pair of dies are closed.

34. A method for manufacturing a glass substrate for magnetic disk, including a polishing process for polishing a glass blank with a machining allowance of 50 μm or less to manufacture a glass substrate for magnetic disk, the glass blank being manufactured with the method for manufacturing a glass blank for magnetic disk according to any one of claims 25 to 33.

35. A method for manufacturing a glass substrate for magnetic disk, wherein a glass substrate for magnetic disk is manufactured using a glass blank for magnetic disk, the glass blank being obtained by the method for manufacturing a glass blank for magnetic disk according to any one of claims 25 to 33.

36. The method according to any one of claims 1 to 9, wherein surface roughness (Ra) of each of the pair of dies is 0.1 μm or less.