CLAIMS

[Claim 1]

A compressor having a cylinder, a piston, and a piston ring mounted on the piston for sealing between a pressurizing side and a non-pressurizing side in the cylinder to generate a compressed fluid by compressing a fluid in the cylinder by the piston, wherein

the piston ring includes a first abutment portion provided on the pressurizing side and a second abutment portion provided on the non-pressurizing side, a first abutment groove is formed in a gap of the first abutment portion, a second abutment groove is formed in a gap of the second abutment portion, an inner circumferential side and an outer circumferential side are prevented from being communicatively connected in the second abutment portion, and a circumferential groove that is communicatively connected to the first abutment groove and is not communicatively connected to the second abutment groove is provided on an outer circumference of the piston ring.

[Claim 2]

The compressor according to claim 1, wherein

the first abutment portion has a step shape in which the inner circumferential side and the outer circumferential side are communicatively connected and the second abutment portion has a lip shape in which the inner circumferential side and the outer circumferential side overlap with each other.

[Claim 3]

The compressor according to claim 1, wherein

the piston ring further includes a communicating groove that sets a piston ring height direction of the circumferential groove to within a height of the second abutment portion and communicatively connects the circumferential groove and the first abutment groove.

[Claim 4]

The compressor according to claim 1, wherein

the piston ring is provided with a plurality of the circumferential grooves, wherein both ends of the circumferential groove on the pressurizing side in the cylinder are communicatively connected to the first abutment groove and the circumferential groove on the non-pressurizing side in the cylinder is not communicatively connected to the second abutment groove, and the circumferential groove on the pressurizing side and the circumferential groove on the non-pressurizing side are connected by a communicating groove or a hole that communicatively connects the circumferential groove to a backface is provided in the circumferential groove on the non-pressurizing side.

[Claim 5]

The compressor according to claim 1, wherein

a shape in a depth direction of an end of the circumferential groove is machined so as to be perpendicular

to an outer circumferential surface of the piston ring.

[Claim 6]

The compressor according to claim 1, wherein

a depth E1 of the circumferential groove is configured such that $E1 > \delta$ is satisfied for a limit wear amount δ of the piston ring.

[Claim 7]

The compressor according to claim 1, wherein

the circumferential groove is provided in a position satisfying $h4 > h5$ when a height from a pressurizing side surface of the piston ring to a pressurizing side end of the circumferential groove is h4 and the height from a non-pressurizing side surface of the piston ring to a non-pressurizing side end of the circumferential groove is h5.

[Claim 8]

The compressor according to claim 1, wherein

the second abutment portion is constructed of a lip portion on an inner side in a radial direction of the piston ring and a lip receiving portion on an outer side and a thickness of the lip receiving portion is configured to be thicker than that of the lip portion.

[Claim 9]

The compressor according to claim 1, wherein

a width of the circumferential groove is configured to be equal to an edge thickness of a cutter for groove machining.

[Claim 10]

The compressor according to claim 1, wherein

the piston ring is provided with a communicating hole that communicatively connect a groove bottom of the circumferential groove and an inner side in a radial direction of the piston ring.

[Claim 11]

The compressor according to claim 8, wherein

the lip portion is configured to have substantially a same dimension in thickness from tip to root and a contact surface with the lip receiving portion is formed substantially concentrically.

[Claim 12]

The compressor according to claim 1, wherein

a member that blocks a communicative connection between the outer circumferential side and the inner circumferential side of the piston ring is provided.

[Claim 13]

The compressor according to claim 12, wherein

the first abutment portion and the second abutment portion have a step shape in which the inner circumferential side and the outer circumferential side are communicatively connected.

[Claim 14]

The compressor according to claim 1, wherein

the circumferential groove has a rectangular shape.

[Claim 15]

A piston ring having a first abutment portion on a pressurizing side of the piston ring, and a second abutment portion on a non-pressurizing side of the piston ring, wherein

a first abutment groove is formed in the first abutment portion, a second abutment groove is formed in the second abutment portion, an inner circumferential side and an outer circumferential side are prevented from being communicatively connected in the second abutment portion, and

a circumferential groove that is communicatively connected to the first abutment groove and is not communicatively connected to the second abutment groove is provided on an outer circumference of the piston ring.

[Claim 16]

The piston ring according to claim 15, wherein

the first abutment portion has a step shape in which the inner circumferential side and the outer circumferential side are communicatively connected and the second abutment portion has a lip shape in which the inner circumferential side and the outer circumferential side overlap with each other.

[Claim 17]

The piston ring according to claim 15, wherein

one end of the circumferential groove is communicatively connected to the first abutment groove and the other end is

formed up to just before the second abutment groove.

[Claim 18]

The piston ring according to claim 15, wherein

the circumferential groove is provided on an outer circumference of the piston ring by avoiding the second abutment groove.

[Claim 19]

A compressor having a cylinder, a piston, and a piston ring mounted on the piston for sealing between a pressurizing side and a non-pressurizing side in the cylinder to generate a compressed fluid by compressing a fluid in the cylinder by the piston, wherein

the piston is formed from a resin, and

the piston ring is provided with an abutment portion and a circumferential groove communicatively connected to the abutment portion.

[Claim 20]

The compressor according to claim 19, wherein

the abutment portion has a step shape in which an inner circumferential side and an outer circumferential side are communicatively connected.

[Claim 21]

The compressor according to claim 19, wherein

a plurality of the piston rings is provided.

CLAIMS

1. A compressor having a cylinder, a piston, and a piston ring mounted on the piston for sealing between a pressurizing side and a non-pressurizing side in the cylinder to generate a compressed fluid by compressing a fluid in the cylinder by the piston, wherein

the piston ring includes a first abutment portion provided on the pressurizing side and a second abutment portion provided on the non-pressurizing side, a first abutment groove is formed in a gap of the first abutment portion, a second abutment groove is formed in a gap of the second abutment portion, an inner circumferential side and an outer circumferential side are prevented from being communicatively connected in the second abutment portion, and a circumferential groove that is communicatively connected to the first abutment groove and is not communicatively connected to the second abutment groove is provided on an outer circumference of the piston ring,

and further the circumferential groove has a structure to guide a pressure on the pressurizing side of the piston ring.

2. The compressor according to claim 1, wherein

the first abutment portion has a step shape in which the inner circumferential side and the outer circumferential side are communicatively connected and the second abutment portion has a lip shape in which the inner circumferential side and the

outer circumferential side overlap with each other.

3. The compressor according to claim 1, wherein

the piston ring further includes a communicating groove that sets a piston ring height direction of the circumferential groove to within a height of the second abutment portion and communicatively connects the circumferential groove and the first abutment groove.

4. The compressor according to claim 1, wherein

the piston ring is provided with a plurality of the circumferential grooves, wherein both ends of the circumferential groove on the pressurizing side in the cylinder are communicatively connected to the first abutment groove and the circumferential groove on the non-pressurizing side in the cylinder is not communicatively connected to the second abutment groove, and the circumferential groove on the pressurizing side and the circumferential groove on the non-pressurizing side are connected by a communicating groove or a hole that communicatively connects the circumferential groove to a backface is provided in the circumferential groove on the non-pressurizing side.

5. The compressor according to claim 1, wherein

a shape in a depth direction of an end of the

circumferential groove is machined so as to be perpendicular to an outer circumferential surface of the piston ring.

6. The compressor according to claim 1, wherein

a depth E1 of the circumferential groove is configured such that $E1 > \delta$ is satisfied for a limit wear amount δ of the piston ring.

7. The compressor according to claim 1, wherein

the circumferential groove is provided in a position satisfying $h4 > h5$ when a height from a pressurizing side surface of the piston ring to a pressurizing side end of the circumferential groove is h4 and the height from a non-pressurizing side surface of the piston ring to a non-pressurizing side end of the circumferential groove is h5.

8. The compressor according to claim 1, wherein

the second abutment portion is constructed of a lip portion on an inner side in a radial direction of the piston ring and a lip receiving portion on an outer side and a thickness of the lip receiving portion is configured to be thicker than that of the lip portion.

9. The compressor according to claim 1, wherein

a width of the circumferential groove is configured to

be equal to an edge thickness of a cutter for groove machining.

10. The compressor according to claim 1, wherein

the piston ring is provided with a communicating hole that communicatively connect a groove bottom of the circumferential groove and an inner side in a radial direction of the piston ring.

11. The compressor according to claim 8, wherein

the lip portion is configured to have substantially a same dimension in thickness from tip to root and a contact surface with the lip receiving portion is formed substantially concentrically.

12. The compressor according to claim 1, wherein

a member that blocks a communicative connection between the outer circumferential side and the inner circumferential side of the piston ring is provided.

13. The compressor according to claim 12, wherein

the first abutment portion and the second abutment portion have a step shape in which the inner circumferential side and the outer circumferential side are communicatively connected.

14. The compressor according to claim 1, wherein

the circumferential groove has a rectangular shape.

15. A piston ring having a first abutment portion on a pressurizing side of the piston ring, and a second abutment portion on a non-pressurizing side of the piston ring, wherein

a first abutment groove is formed in the first abutment portion, a second abutment groove is formed in the second abutment portion, an inner circumferential side and an outer circumferential side are prevented from being communicatively connected in the second abutment portion, and

a circumferential groove that is communicatively connected to the first abutment groove and is not communicatively connected to the second abutment groove is provided on an outer circumference of the piston ring,

and further the circumferential groove has a structure to guide a pressure on the pressurizing side of the piston ring.

16. The piston ring according to claim 15, wherein

the first abutment portion has a step shape in which the inner circumferential side and the outer circumferential side are communicatively connected and the second abutment portion has a lip shape in which the inner circumferential side and the outer circumferential side overlap with each other.

17. The piston ring according to claim 15, wherein

one end of the circumferential groove is communicatively connected to the first abutment groove and the other end is formed up to just before the second abutment groove.

18. The piston ring according to claim 15, wherein

the circumferential groove is provided on an outer circumference of the piston ring by avoiding the second abutment groove.