CLAIMS:

1. A clamp apparatus comprising:

a first clamp coupled to an outer side of any one of a filter head and a filter housing of a filter assembly;

a second clamp coupled to the outer side of the remaining one of the filter head and the filter housing; and

a third clamp which applies a force to a rear surface of the first clamp or the second clamp to press the first clamp and the second clamp in a coupling direction in which the first clamp and the second clamp move toward each other;

wherein the third clamp includes:

a first pressing member of which one side is provided with a first pressing part which is in contact with the rear surface of the second clamp and applies a pressure to the rear surface in the coupling direction; and

a fixing arm to which the first pressing member is rotatably coupled.

2. The clamp apparatus of claim 1, wherein the third clamp is coupled to the first clamp, is in contact with the rear surface of the second clamp, and applies the force to the rear surface in the coupling direction in which the first clamp and the second clamp move toward each other.

3. The clamp apparatus of claim 2, wherein the third clamp further includes a second pressing member provided with a second pressing part which is in contact with a rear surface of the first pressing part and applies the pressure to the rear surface in the coupling direction.

4. The clamp apparatus of claim 3, wherein the third clamp further includes a cylinder which provides driving power so that the first pressing member rotates.

5. The clamp apparatus of claim 4, wherein:

the cylinder includes a cylinder body and a push rod and is extended or contracted as the push rod is reciprocated by driving of the cylinder driving part so that the first pressing member is rotated;

the second pressing member is rotatably connected to an end of the push rod and a rear surface of the first pressing member; and

the second pressing part protrudes toward one side of the second pressing member.

6. The clamp apparatus of claim 5, wherein the second pressing part perpendicularly protrudes toward one side from a straight line connecting a connection portion of the second pressing member and the push rod and a connection portion of the second pressing member and the first pressing member.

7. The clamp apparatus of claim 5, wherein, in the cylinder, the push rod is positioned in a direction in which the push rod faces the filter assembly and reciprocates in directions to move in a direction toward or away from the filter assembly.

8. The clamp apparatus of claim 5, wherein:

in a case in which the push rod extends, the second pressing member rotates in an inward direction, and presses the rear surface of the first pressing member first in the coupling direction through a connection portion, which is connected to the first pressing member, of the second pressing member, and the second pressing part secondarily presses a rear surface of the first pressing part in the coupling direction, and accordingly, the first pressing member rotates in the inward direction, the first pressing part presses the rear surface of the second clamp in the coupling direction, and the first clamp and the second clamp are clamped; and

in a case in which the push rod contracts, the second pressing member rotates in an outward direction, accordingly, the pressure applied to the rear surface of the first pressing member by the second pressing part is released, the first pressing member rotates in the outward direction, the pressure applied to the rear surface of the second clamp by the first pressing part is released at the same time, and the clamping of the first clamp and the second clamp is released.

9. The clamp apparatus of claim 5, wherein an operation state of the third clamp includes:

an unclamping step which is a state in which the push rod is contracted and the first pressing member and the second pressing member are completely separated from the rear surface of the second clamp;

a first clamping step which is a state in which the first pressing part is in contact with the rear surface of the second clamp, the second pressing member is positioned at a first angular position, and the second pressing part is separated from the rear surface of the first pressing member; and

a second clamping step which is a state in which the first pressing part is in contact with the rear surface of the second clamp, the second pressing member is positioned at a second angular position, and the second pressing part is in contact with the rear surface of the first pressing member,

wherein the first angular position is an angular position at which the second pressing member rotates in an outward direction from a vertical angular position perpendicular to a horizontal plane, and the second angular position is an angular position at which the second pressing member rotates in an inward direction from the vertical angular position.

10. The clamp apparatus of claim 9, wherein:

as the push rod extends, the operation state of the third clamp sequentially proceeds to the unclamping step, the first clamping step, and the second clamping step; and

as the push rod contracts, the operation state of the third clamp sequentially proceeds to the second clamping step, the first clamping step, and the unclamping step.

11. The clamp apparatus of claim 10, wherein:

in a case in which the operation state of the third clamp proceeds from the first clamping step to the second clamping step, a position of the first pressing member is maintained in a state in which the first pressing part is in contact with the rear surface of the second clamp, and accordingly, the second pressing member rotates from the first angular position to the second angular position in a state in which a position of a connection portion of the second pressing member and the first

pressing member is fixed so that an arc-shaped trajectory, in which a rotary shaft of a connection portion of the second pressing member and the push rod and the end of the push rod connected to the rotary shaft rotate in the inward direction, move vertically upward, and move downward, is formed; and

in a case in which the operation state of the third clamp proceeds from the second clamping step to the first clamping step, the position of the first pressing member is fixed in the state in which the first pressing part is in contact with the rear surface of the second clamp, and accordingly, the second pressing member rotates from the second angular position to the first angular position in the state in which the position of the connection portion of the second pressing member and the first pressing member is fixed so that the arc-shaped trajectory in which the rotary shaft of the connection portion of the second pressing member and the push rod and the end of the push rod connected to the rotary shaft rotate in the outward direction, move vertically upward, and move downward, is formed.

12. The clamp apparatus of claim 5, wherein the fixing arm includes:

a fixing part fixedly coupled to the first clamp; and

a cylinder support part which is coupled to the fixing part and to which the cylinder body is rotatably connected.

13. The clamp apparatus of claim 12, wherein the first pressing member is rotatably connected to the fixing part.

14. The clamp apparatus of claim 5, further comprising a link member of which both ends are rotatably connected to the fixing arm and the end of the push rod.

15. The clamp apparatus of claim 14, wherein a rotation plane formed by rotation of the link member is formed to be parallel to a vertical plane including a reciprocation track of the push rod.

16. The clamp apparatus of claim 15, wherein:

a second rotary shaft which is a rotary shaft of a connection portion at which the fixing part and the first pressing member are connected, a third rotary shaft which is a rotary shaft of a connection portion at which the first pressing member and the second pressing member are connected, a fourth rotary shaft which is a rotary shaft of a connection portion at which the end of the push rod and the second pressing member are connected, a fifth rotary shaft which is a rotary shaft of a connection portion at which the fixing part and the link member are coupled, and a sixth rotary shaft which is a rotary shaft of a connection portion at which the end of the push rod and the link member are connected are provided; and

a sum of a length between the fifth rotary shaft and the third rotary shaft and a length between the third rotary shaft and the fourth rotary shaft is greater than a length between the fifth rotary shaft and the sixth rotary shaft.

17. The clamp apparatus of claim 16, wherein the fourth rotary shaft and the sixth rotary shaft share the same rotary shaft.

18. The clamp apparatus of claim 14, wherein:

a knob extending from the link member is provided; and

a user grips and pushes or pulls the knob using a hand to rotate the link member about a rotary shaft of a connection portion of the link member and the fixing part.

19. The clamp apparatus of claim 18, wherein the user pushes the knob in a direction toward the filter assembly to clamp the third clamp to the first clamp and the second clamp and pulls the knob in a direction away from the filter assembly to release the clamping of the third clamp.

20. The clamp apparatus of claim 18, wherein:

the link member includes a pair of link members connected to both sides of each of the fixing part and the push rod; and

both ends of the knob extend from the pair of link members and are disposed between and connected to the pair of link members.

21. The clamp apparatus of claim 5, wherein a rotation plane formed by rotation of the first pressing member and the second pressing member is formed to be parallel to a vertical plane including a reciprocation track of the push rod.

22. The clamp apparatus of claim 1, wherein the first clamp and the second clamp are formed in ring shapes and each coupled to a circumference of one of the filter head and the filter housing; and

the third clamp is provided as a plurality of third clamps which are clamped at predetermined intervals along circumferences of the first clamp and the second clamp.

23. The clamp apparatus of claim 1, wherein an observation window is provided in at least one of the first clamp and the second clamp at a position at which a coupling portion of the filter housing and the filter head is visually checkable.

24. The clamp apparatus of claim 23, wherein the observation window is formed in a coupling surface of the second clamp and the first clamp.

25. The clamp apparatus of claim 23, wherein the observation window is formed as a plurality of observation windows along a circumference of the coupling portion of the filter housing and the filter head.