WHAT IS CLAIMED IS:

1. A conductive ball arraying apparatus comprising:

an arraying jig having ball insertion parts at a predetermined array pattern;

a ball cup that has an opening part on a lower surface thereof and is capable of housing a plurality of conductive balls;

moving means that moves the arraying jig and the ball cup relatively, the moving means moving the ball cup relatively along an upper surface of the arraying jig and dropping off the conductive balls into the ball insertion parts of the arraying jig;

upper limit detection means and lower limit detection means that detect a quantity of the conductive balls in the ball cup and detects as to whether the quantity of the conductive balls in the ball cup reaches an upper limit and a lower limit, respectively, when the moving means moves the arraying jig and the ball cup relatively; and

leakage detection means that detects leakage of the conductive balls from a clearance between the ball cup and the arraying jig on a back side in a relative movement direction of the ball cup.

2. The conductive ball arraying apparatus according to claim 1,

wherein the moving means is movable reciprocatively, and

wherein the upper limit detection means, lower limit detection means and the leakage detection means each includes two sets thereof such that they are opposed to each other in a moving direction of the ball cup, each sets of the upper limit detection means, the lower limit detection means and the leakage detection means being alternately switched in accordance with the moving direction of the ball cup.

3. A conductive ball arraying apparatus comprising:

an arraying jig having ball insertion parts at a predetermined array pattern;

a ball cup that has an opening part on a lower surface thereof and is capable of housing a plurality of conductive balls;

moving means that moves the arraying jig and the ball cup relatively, the moving means moving the ball cup relatively along an upper surface of the arraying jig and dropping off the conductive balls into the ball insertion parts of the arraying jig; and

lower limit detection means that detects a quantity of the conductive balls in the opening part in a vicinity of an inner wall of the ball cup on a side which the ball cup moves and detects as to whether the quantity of the conductive balls in the ball cup reaches the lower limit when the moving means moves the arraying jig and the ball cup relatively.

4. The conductive ball arraying apparatus according to claim 3, further comprising a ball supply means that supplies the conductive balls into the ball cup,

wherein the ball supply means resupplies the conductive balls when the lower limit detection means detects the reaching of the lower limit.

5. The conductive ball arraying apparatus according to claim 3,

wherein the moving means is movable reciprocately, and

wherein the lower limit detection means includes two sets of the lower limit detection means such that they are opposed to each other in the moving direction of the ball cup, each sets of the lower limit detection means being alternately switched in accordance with a

moving direction of the ball cup.

6. The conductive ball arraying apparatus according to claim 3,

wherein the lower limit detection means detects the quantity of the conductive balls in the ball cup from light quantity of reflection light from the conductive balls.

7. A conductive ball arraying apparatus comprising:

an arraying jig having ball insertion parts at a predetermined array pattern;

a ball cup that has an opening part on a lower surface thereof and is capable of housing a plurality of conductive balls;

moving means that moves the arraying jig and the ball cup relatively, the moving means moving the ball cup relatively along an upper surface of the arraying jig and dropping off the conductive balls into the ball insertion parts of the arraying jig; and

upper limit detection means that detects a quantity of the conductive balls in a vicinity of an inner wall surface of the ball cup on a side opposite to which the ball cup moves and detects as to whether the quantity

of the conductive balls in the ball cup reaches the upper limit when the moving means moves the arraying jig and the ball cup relatively.

8. The conductive ball arraying apparatus according to claim 7,

wherein the moving means is movable reciprocately, and

wherein the upper limit detection means includes two sets of the upper limit detection means such that they are opposed to each other in the moving direction of the ball cup, each sets of the upper limit detection means being alternately switched in accordance with the moving direction of the ball cup.

9. The conductive ball arraying apparatus according to claim 7,

wherein the upper limit detection means detects the quantity of the conductive balls in the ball cup from light quantity of reflection light from the conductive balls.

10. A conductive ball arraying apparatus comprising:

an arraying jig having ball insertion parts at a

predetermined array pattern;

a ball cup that has an opening part on a lower surface thereof and is capable of housing a plurality of conductive balls;

moving means that moves the arraying jig and the ball cup relatively, the moving means moving the ball cup relatively along an upper surface of the arraying jig and dropping off the conductive balls into the ball insertion parts of the arraying jig; and

detection means that detects a quantity of the conductive balls in the ball cup and detects as to whether the quantity of the conductive balls in the ball cup reaches an upper limit and a lower limit when the moving means moves the arraying jig and the ball cup relatively.

11. The conductive ball arraying apparatus according to claim 10,

wherein the moving means is movable reciprocately, and

wherein the detection means includes two sets thereof such that they are opposed to each other in a moving direction of the ball cup, each sets of the detection means being alternately switched in accordance with the moving direction of the ball cup.

12. A conductive ball arraying apparatus comprising:

an arraying jig having ball insertion parts at a predetermined array pattern;

a ball cup that has an opening part opposed to the upper surface of the arraying jig on a lower surface thereof and is capable of housing a plurality of conductive balls;

moving means that moves the arraying jig and the ball cup relatively, the moving means moving the ball cup relatively along an upper surface of the arraying jig and dropping off the conductive balls into the ball insertion parts of the arraying jig; and

leakage detection means that detects leakage of the conductive balls from a clearance between the ball cup and the arraying jig on a back side in a relative movement direction of the ball cup.

13. The conductive ball arraying apparatus according to claim 12,

wherein the leakage detection means includes two sets thereof such that they are alternately switched in accordance with a moving direction of the ball cup.

14. The conductive ball arraying apparatus

according to claim 12, further comprising alarm means that activates an alarm when the leakage detection means detects the leakage of the conductive balls.

15. The conductive ball arraying apparatus according to claim 12, further comprising stopping means that stops the arraying operation when the leakage detection means detects the leakage of the conductive balls.

What is claimed is:

1. A conductive ball arraying apparatus comprising:

an arraying jig having ball insertion parts at a predetermined array pattern;

a ball cup that has an opening part on a lower surface thereof and is capable of housing a plurality of conductive balls;

moving means that moves the arraying jig and the ball cup relatively, the moving means moving the ball cup relatively along an upper surface of the arraying jig and dropping off the conductive balls into the ball insertion parts of the arraying jig;

upper limit detection means that detect a quantity of the conductive balls in the ball cup and detects whether the quantity of the conductive balls in the ball cup reaches an upper limit when the moving means moves the arraying jig and the ball cup relatively;

lower limit detection means that detect a quantity of the conductive balls in the ball cup and detects whether the quantity of the conductive balls in the ball cup reaches a lower limit when the moving means moves the arraying jig and the ball cup relatively; and

leakage detection means that detects leakage of the conductive balls from a clearance between the ball cup and the arraying jig on a back side in a relative movement direction of the ball cup, and

wherein the each of the upper limit detection means, lower limit detection means and the leakage detection means includes a pair of means for the advance direction of the ball cup and for the retreat direction of the ball cup such that one of each pair thereof is opposed to another one of each pair thereof in a moving direction of the ball cup.

2. The conductive ball arraying apparatus according to claim 1,

wherein the moving means is movable reciprocately in forward and backward directions so as to move the ball cup in advance and retreat directions,

wherein each of the pairs of the upper limit detection means, the lower limit detection means and the leakage detection means moves integrally with the ball cup and is alternately switched in accordance with the moving direction of the ball cup such that:

one of the pair of the upper limit detection means works when the ball cup moves in the advance direction, and another one of the pair of the upper limit detection means works when the ball cup moves in the retreat direction;

one of the pair of the lower limit detection means works when the ball cup moves in the advance direction, and another one of the pair of the lower limit detection means works when the ball cup moves in the retreat direction; and

one of the pair of the leakage detection means works when the ball cup moves in the advance direction, and another one of the pair of the leakage detection means works when the ball cup moves in the retreat direction.

3. A conductive ball arraying apparatus comprising:

an arraying jig having ball insertion parts at a predetermined array pattern;

a ball cup that has an opening part on a lower surface thereof and is capable of housing a plurality of conductive balls;

moving means that moves the arraying jig and the ball cup relatively, the moving means moving the ball cup relatively along an upper surface of the arraying jig and dropping off the conductive balls into the ball insertion parts of the arraying jig;

lower limit detection means, which is provided to the be moved integrally with the moving means, and which detects a quantity of the conductive balls in the opening part in a vicinity of an inner wall of the ball cup on a side which the ball cup moves so as to detect whether the quantity of the conductive balls in the ball cup reaches the lower limit when the moving means moves the arraying jig and the ball cup relatively;

a ball supply means that supplies the conductive balls into the ball cup so as to resupply the conductive balls when the lower limit detection means detects the reaching of the lower limit,

wherein the moving means is movable reciprocately so as to move the ball cup in advance and retreat directions,

wherein the lower limit detection means includes a pair of means thereof such that a first one of the pair is opposed to a second one of the pair in the moving direction of the ball cup, and

wherein each of the pair of the lower limit detection means moves integrally with the ball cup and is alternately switched in accordance with a moving direction of the ball cup such that the first one of the pair of the lower limit detection means works when the ball cup moves in the advance direction and the second one of the pair of the lower limit detection means works when the ball cup moves in the retreat direction.

4. The conductive ball arraying apparatus according to claim 3,

wherein the lower limit detection means detects the quantity of the conductive balls in the ball cup from light quantity of reflection light from the conductive balls.

5. A conductive ball arraying apparatus comprising:

an arraying jig having ball insertion parts at a predetermined array pattern;

a ball cup that has an opening part on a lower surface thereof and is capable of housing a plurality of conductive balls;

moving means that moves the arraying jig and the ball cup relatively, the moving means moving the ball cup relatively along an upper surface of the arraying jig and dropping off the conductive balls into the ball insertion parts of the arraying jig; and

upper limit detection means, which is provided to be moved integrally with the moving means, and which detects a quantity of the conductive balls in a vicinity of an inner wall surface of the ball cup on a side opposite to which the ball cup moves so as to detect whether the quantity of the conductive balls in the ball cup reaches the upper limit when the moving means moves the arraying jig and the ball cup relatively, and

wherein the upper limit detection means includes a pair of the upper limit detection means such that a first one of the pair is opposed to a second one of the pair in the moving direction of the ball cup.

6. The conductive ball arraying apparatus according to claim 5,

wherein the moving means is movable reciprocately in forward and backward directions so as to move the ball cup in advance and retreat directions,

wherein each of the pair of the upper limit detection means is alternately switched in accordance with the moving direction of the ball cup such that the first one of the pair of the upper limit detection means works when the ball cup moves in the advance direction and the second one of the pair of the lower limit detection means works when the ball cup moves in the retreat direction.

7. The conductive ball arraying apparatus according to claim 5,

wherein the upper limit detection means detects the quantity of the conductive balls in the ball cup from light quantity of reflection light from the conductive balls.

8. A conductive ball arraying apparatus comprising:

an arraying jig having ball insertion parts at a predetermined array pattern;

a ball cup that has an opening part on a lower surface thereof and is capable of housing a plurality of conductive balls;

moving means that moves the arraying jig and the ball cup relatively, the moving means moving the ball cup relatively along an upper surface of the arraying jig and dropping off the conductive balls into the ball insertion parts of the arraying jig; and

detection means, which is provided to be moved integrally with the moving means, and which detects a quantity of the conductive balls in the ball cup so as to detect whether the quantity of the conductive balls in the ball cup reaches an upper limit and a lower limit when the moving means moves the arraying jig and the ball cup relatively, and

wherein the detection means includes a pair thereof such that a first one of the pair thereof is opposed to a second one of the pair thereof in a moving direction of the ball cup.

9. The conductive ball arraying apparatus according to claim 8,

wherein the moving means is movable reciprocately in forward and backward directions so as to move the ball cup in advance and retreat directions,

wherein each the pair of the detection means is alternately switched in accordance with the moving direction of the ball cup such that the first one of the pair of the detection means works when the ball cup moves in the advance direction and the second one of the pair of the detection means works when the ball cup moves in the retreat direction.

10. A conductive ball arraying apparatus comprising:

an arraying jig having ball insertion parts at a predetermined array pattern;

a ball cup that has an opening part opposed to the upper surface of the arraying jig on a lower surface thereof and is capable of housing a plurality of conductive balls;

moving means that moves the arraying jig and the ball cup relatively, the moving means moving the ball cup relatively along an upper surface of the arraying jig and dropping off the conductive balls into the ball insertion parts of the arraying jig; and

leakage detection means that detects leakage of the conductive balls from a clearance between the ball cup and the arraying jig on a back side in a relative movement direction of the ball cup, and

wherein the moving means is movable reciprocately in forward and backward directions so as to move the ball cup in advance and retreat directions,

wherein the leakage detection means includes a pair thereof, such that a first one of the pair thereof is for the advance direction of the ball cup and a second one of the pair thereof is for the retreat direction of the ball cup, and

wherein each of the pair of the leakage detection means is alternately switched in accordance with a moving direction of the ball cup such that the first one of the pair of the leakage detection means works when the ball cup moves in the advance direction and the second one of the pair of the leakage detection means works when the ball cup moves in the retreat direction.

11. The conductive ball arraying apparatus according to claim **10**, further comprising alarm means that activates an alarm when the leakage detection means detects the leakage of the conductive balls.

12. The conductive ball arraying apparatus according to claim **10**, further comprising stopping means that stops the arraying operation when the leakage detection means detects the leakage of the conductive balls.