WHAT IS CLAIMED IS:

1. A processing apparatus that removes a ring-shaped reinforcing part with a projection shape from a wafer in which the ring-shaped reinforcing part is formed into the projection shape on a back surface corresponding to an outer circumferential surplus region, the processing apparatus comprising:

a wafer cassette table on which a wafer cassette in which a plurality of wafers are housed is placed;

a wafer carrying-out unit that carries out the wafer from the wafer cassette placed on the wafer cassette table;

a wafer table that supports a front surface side of the wafer carried out by the wafer carrying-out unit;

a frame housing unit that houses a plurality of annular frames in which an opening part that houses the wafer is formed;

a frame carrying-out unit that carries out the annular frame from the frame housing unit;

a frame table that supports the annular frame carried out by the frame carrying-out unit;

a tape sticking unit that is disposed over the frame table and sticks a tape to the annular frame;

a tape-attached frame conveying unit that conveys

the annular frame to which the tape is stuck to the wafer table, and positions the opening part of the annular frame to the back surface of the wafer supported by the wafer table, and places a tape-attached frame on the wafer table;

a tape pressure bonding unit that executes pressure bonding of the tape of the tape-attached frame to the back surface of the wafer;

frame unit carrying-out means that carries out a frame unit in which the tape of the tape-attached frame and the back surface of the wafer are pressure-bonded by the tape pressure bonding unit from the wafer table;

a reinforcing part removing unit that cuts and removes the ring-shaped reinforcing part from the wafer of the frame unit carried out by the frame unit carrying-out means;

ring-free unit carrying-out means that carries out a ring-free unit resulting from the removal of the ring-shaped reinforcing part from the reinforcing part removing unit; and

a frame cassette table on which a frame cassette that houses the ring-free unit carried out by the ring-free unit carrying-out means is placed, wherein

the reinforcing part removing unit includes

a removal detecting unit that detects whether or not the ring-shaped reinforcing part has been removed.

2. The processing apparatus according to claim 1, wherein

the frame unit carrying-out means includes

a frame unit holding part having a wafer holding part that holds the wafer and a frame holding part that holds the annular frame, and

a conveying part that conveys the frame unit holding part to a temporary placement table.

3. The processing apparatus according to claim 2, wherein

the reinforcing part removing unit includes

a laser beam irradiation unit that irradiates a root of the ring-shaped reinforcing part formed at outer circumference of the wafer with a laser beam to form a cut groove,

a first raising-lowering table that holds and raises the frame unit temporarily placed on the temporary placement table and positions the frame unit to the laser beam irradiation unit, and

a separating part that separates the ring-shaped reinforcing part from the cut groove,

the separating part includes

an ultraviolet irradiation part that irradiates the tape corresponding to the cut groove with ultraviolet to reduce an adhesive force of the tape,

a second raising-lowering table that sucks and holds inside of the wafer in such a manner that the ring-shaped reinforcing part is exposed from outer circumference, and supports the annular frame,

a separator that acts on outer circumference of the ring-shaped reinforcing part and separates the ring-shaped reinforcing part, and

a discard part by which the ring-shaped reinforcing part separated is discarded,

the removal detecting unit is disposed adjacent to the ultraviolet irradiation part,

the reinforcing part removing unit has a cut groove detecting unit that detects the cut groove, and

the first raising-lowering table temporarily places the frame unit in which the cut groove is formed on the temporary placement table, the temporary placement table is positioned below the separating part by a temporary placement table conveying part, and the second raising-lowering table supports the frame unit temporarily placed on the temporary placement table.