WHAT IS CLAIMED IS:

1. A processing method of a workpiece with a circular disc shape, the processing method comprising:

a tape sticking step of sticking a tape to one surface of the workpiece and integrating the workpiece and a frame through the tape;

a holding step of holding the workpiece by a holding unit with interposition of the tape after the tape sticking step; and

a laser beam irradiation step of irradiating the other surface of the workpiece located on an opposite side to the one surface with a pulsed laser beam having such a wavelength as to be absorbed by the workpiece from a side of the other surface after the holding step, wherein,

in the laser beam irradiation step, the other surface is applied with the laser beam in a circular fashion near the boundary of the wafer, in a state in which orientation of the laser beam is adjusted in such a manner that the laser beam has an angle of incidence formed due to inclination with respect to a normal to the other surface of the workpiece by a predetermined angle, and

wherein

the laser beam irradiation step forms a processing groove in the workpiece by the laser beam and includes a detection step of detecting by a light detection unit whether or not the processing groove has penetrated the workpiece.

2. The processing method of a workpiece according to claim 1, wherein

the workpiece is held in a state in which the other surface is exposed to a lower side in the holding step, and

irradiation with the laser beam that travels from the lower side toward an upper side is executed in the laser beam irradiation step.

3. The processing method of a workpiece according to claim 1, wherein,

in the laser beam irradiation step, an annular processing groove having a predetermined diameter on the side of the other side is formed inside an outer circumferential edge of the workpiece to separate the workpiece with the processing groove being a boundary.

4. The processing method of a workpiece according to claim 1, wherein

the workpiece has, on the side of the other surface, a device region in which a plurality of devices

are formed and an outer circumferential surplus region that surrounds the device region and is extended inwards towards the center of the workpiece by a predetermined distance from an outer circumferential edge of the workpiece,

the workpiece has, on a side of the one surface, a circular recess part corresponding to the device region and an annular projection part that surrounds outside of the circular recess part and corresponds to the outer circumferential surplus region, and

a boundary part between the device region and the outer circumferential surplus region on the side of the other surface is irradiated with the laser beam in the laser beam irradiation step.

5. The processing method of a workpiece according to claim 1, wherein

the workpiece has, on the side of the other surface, a device region in which a plurality of devices are formed and an outer circumferential surplus region that surrounds the device region and is extended inwards towards the center of the workpiece by a predetermined distance from an outer circumferential edge of the workpiece,

the workpiece has, on a side of the one surface, a

circular recess part corresponding to the device region and an annular projection part that surrounds outside of the circular recess part and corresponds to the outer circumferential surplus region, and,

in the laser beam irradiation step, a part corresponding to the outer circumferential surplus region in a thickness direction of the workpiece is subjected to ablation to be removed by irradiating the outer circumferential surplus region with the laser beam.

6. The processing method of a workpiece according to claim 1, wherein,

in the laser beam irradiation step, the other surface is irradiated with the laser beam in a state in which a plane of incidence of the laser beam is set orthogonal to a virtual plane that passes through a center of the other surface and a focal point of the laser beam and is orthogonal to the other surface.

7. The processing method of a workpiece according to claim 6, wherein

a processing groove orthogonal to the other surface is formed by rotating the holding unit with respect to the focal point of the laser beam in the laser beam irradiation step.

8. The processing method of a workpiece according

to claim 1, wherein,

in the laser beam irradiation step, irradiation with the laser beam that travels obliquely with respect to the other surface from a side of a center of the other surface toward outside of the other surface is executed in a state in which a plane of incidence of the laser beam is set parallel to a virtual plane that passes through the center of the other surface and a focal point of the laser beam and is orthogonal to the other surface.

9. The processing method of a workpiece according to claim 8, wherein

in the laser beam irradiation step, the irradiation with the laser beam is executed in the state in which the plane of incidence of the laser beam is set parallel to the virtual plane by controlling an irradiation position of the laser beam by a galvanometer scanner disposed to face the other surface.

10. The processing method of a workpiece according to claim 1, wherein

the detection step comprises detecting the laser beam that has passed through the processing groove by a light detection unit when the processing groove has penetrated the workpiece.

11. The processing method of a workpiece

according to claim 1, wherein

a light source that emits a laser beam downward is disposed above the light detection unit, and

the detection step comprises detecting the laser beam emitted from the light source by the light detection unit when the processing groove has penetrated the workpiece.

12. The processing method of a workpiece according to claim 11, wherein

the laser beam emitted from the light source has low output power compared with the pulsed laser beam in the laser beam irradiation step as to not process the workpiece.