WHAT IS CLAIMED IS:

1. A method of processing a plate-shaped workpiece, comprising:

a workpiece supporting step of placing the plate-shaped workpiece on a thermocompression sheet whose area is larger than that of the plate-shaped workpiece, heating the thermocompression sheet to pressure-bond the thermocompression sheet to the plate-shaped workpiece, and supporting the plate-shaped workpiece on only the thermocompression sheet without using an annular frame;

a step of gripping and securing an outer circumferential edge portion of the thermocompression sheet by means of a plurality of clamps;

processing step of processing the plate-shaped workpiece to divide the plate-shaped workpiece into a plurality of chips; and

a pick-up step of picking up the chips from the thermocompression sheet.

2. The method of processing a plate-shaped workpiece according to claim 1, further comprising:

an expanding step of expanding the thermocompression sheet to widen distances between the chips.

3. The method of processing a plate-shaped

workpiece according to claim 1, further comprising:

after the pick-up step, a discarding step of discarding the thermocompression sheet.

4. The method of processing a plate-shaped workpiece according to claim 1, wherein the processing step includes a cutting step of positioning a cutting blade on a region to be divided of the plate-shaped workpiece and cutting the plate-shaped workpiece with the cutting blade.

5. The method of processing a plate-shaped workpiece according to claim 1, wherein the processing step includes a laser ablation step of applying a laser beam having a wavelength absorbable by the plate-shaped workpiece to a region to be divided of the plate-shaped workpiece to form grooves in the plate-shaped workpiece by way of laser ablation.

6. The method of processing a plate-shaped workpiece according to claim 1, wherein the processing step includes a modified layer forming step of applying a laser beam having a wavelength transmittable through the plate-shaped workpiece to a region to be divided of the plate-shaped workpiece while positioning a focused spot of the laser beam within the plate-shaped workpiece, to form modified layers in the plate-shaped workpiece.

7. The method of processing a plate-shaped workpiece according to claim 1, wherein the plate-shaped workpiece is a wafer including a face side having a plurality of devices formed in respective areas demarcated thereon by a plurality of projected dicing lines, the face side of the wafer or a reverse side thereof being placed on the thermocompression sheet.

8. The method of processing a plate-shaped workpiece according to claim 1, wherein the thermocompression sheet is either one of a polyolefin-based sheet and a polyester-based material.

9. The method of processing a plate-shaped workpiece according to claim 8, wherein the polyolefin-based sheet is either one of a polyethylene sheet, a polypropylene sheet, and a polystyrene sheet.

10. The method of processing a plate-shaped workpiece according to claim 9, wherein, if the polyethylene sheet is selected as the thermocompression sheet, a heating temperature to which the thermocompression sheet is heated in the workpiece supporting step ranges from 120°C to 140°C, if the polypropylene sheet is selected as the thermocompression sheet, a heating temperature to which the thermocompression sheet is heated in the workpiece

supporting step ranges from 160°C to 180°C, and if the polystyrene sheet is selected as the thermocompression sheet, a heating temperature to which the thermocompression sheet is heated in the workpiece supporting step ranges from 220°C to 240°C.

11. The method of processing a plate-shaped workpiece according to claim 8, wherein the polyester-based sheet is either one of a polyethylene terephthalate sheet and a polyethylene naphthalate sheet.

12. The method of processing a plate-shaped workpiece according to claim 11, wherein, if the polyethylene terephthalate sheet is selected as the thermocompression sheet, a heating temperature to which the thermocompression sheet is heated in the workpiece supporting step ranges from 250°C to 270°C, and if the polyethylene naphthalate sheet is selected as the thermocompression sheet, a heating temperature to which the thermocompression sheet is heated in the workpiece supporting step ranges from 160°C to 180°C.