WHAT IS CLAIMED IS:

1. A laser processing method for a workpiece to perform laser processing on a workpiece having a plurality of streets set on a top surface of the workpiece along the streets by using a laser processing apparatus,

the laser processing apparatus including

a chuck table configured to hold the workpiece under suction,

a laser beam irradiating unit including a condenser configured to irradiate the workpiece held on the chuck table with a laser beam,

a processing feed unit configured to move the chuck table and the laser beam irradiating unit relative to each other in a processing feed direction,

an indexing feed unit configured to move the chuck table and the laser beam irradiating unit relative to each other in an indexing feed direction, and

a control unit configured to control each of the units,

the laser processing method comprising:

a protective member affixing step of affixing a protective member to the top surface or an undersurface of the workpiece;

a suction holding step of holding the workpiece through the protective member under suction on the chuck table;

a positioning step of positioning the workpiece such that a direction in which the streets extend is in parallel with the processing feed direction;

a first laser processing step of

positioning, after the positioning step is performed, a condensing point of the laser beam at an unprocessed and outermost street among a plurality of streets set in one half region ranging from one edge to a center of the workpiece in the indexing feed direction,

sequentially repeating a processing feed that moves the workpiece and the condensing point of the laser beam relative to each other in the processing feed direction and an indexing feed that moves the workpiece and the condensing point of the laser beam relative to each other in the indexing feed direction orthogonal to the processing feed direction, and

performing the laser processing on a predetermined number of streets inward from the unprocessed and outermost street among the plurality of streets set in the one half region; and

a second laser processing step of

positioning, after the first laser processing step is performed, the condensing point of the laser beam at an unprocessed and outermost street among a plurality of streets set in another half region ranging from another edge to the center of the workpiece in the indexing feed direction,

sequentially repeating the processing feed that moves the workpiece and the condensing point of the laser beam relative to each other in the processing feed direction and the indexing feed that moves the workpiece and the condensing point of the laser beam relative to each other in the indexing feed direction orthogonal to the processing feed direction, and

performing the laser processing on a predetermined number of streets inward from the unprocessed and outermost street among the plurality of streets set in the other half region,

a suction hold releasing step of releasing compressive stress generated in the workpiece, by releasing suction hold of the workpiece on the chuck table after the first laser processing step and the second laser processing step are performed;

a re-suction holding step of holding the workpiece under suction on the chuck table again after the suction

hold releasing step is performed; and

returning to the first laser processing step, when the re-suction holding step is completed,

wherein

the laser processing is performed on all of the streets set on the workpiece by alternately repeating the first laser processing step, the second laser processing step, the suction hold releasing step, and the re-suction holding step.

2. The laser processing method for a workpiece according to claim 1, further comprising:

an end determining step, after the suction holding releasing step, of determining whether or not to end the laser processing.

3. The laser processing method for a workpiece according to claim 2, wherein

in the end determining step,

when determined that modified layers are formed in all of the streets, the laser processing ends; and

when there still remain streets in which the modified layers are not formed in a central portion of the workpiece, the re-suction holding step is performed after the suction hold releasing step.

4. The laser processing method for a workpiece

according to claim 1, wherein

the number of streets on which the laser processing is performed in the second laser processing step is the same as the number of streets on which the laser processing is performed in the first laser processing step.

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

after the re-suction holding step, when the workpiece is displaced in a horizontal direction with respect to the chuck table in the suction hold releasing step, the positioning step is performed again.

6. The laser processing method for a workpiece according to any one of the preceding claims, wherein

a vacuum suction path of the chuck table is divided for each of a plurality of regions of a holding surface of the chuck table.

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

only in the regions of the chuck table which correspond to regions in which the laser processing has been performed in the first laser processing step and the second laser processing step, the suction hold is released in the suction hold releasing step, and

the suction hold is performed again in the re-suction holding step.

8. The laser processing method for a workpiece according to any one of the preceding claims, wherein

the laser processing apparatus is configured to automatically determine, by the control unit, millimeters at which the processing is performed in each of the first laser processing step and the second laser processing step, that is, a timing of switching processing directions.

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

the control unit is configured to obtain the position of a target set at the center of the workpiece from an imaging unit, and perform control to switch the processing directions when the target is displaced by a predetermined amount.

10. The laser processing method for a workpiece according to claim 9, wherein

the target set at the center of the workpiece comprises

an element included in a pattern surface of the top surface of the workpiece, or

a grinding trace present on the undersurface of the

workpiece, or

an element included in a top surface of the protective member.