WHAT IS CLAIMED IS:

1. A method of processing a single-crystal substrate to divide the single-crystal substrate along a plurality of preset division lines, comprising:

a shield tunnel forming step of applying a pulsed laser beam to the single-crystal substrate along the division lines to form shield tunnels, which each include a fine hole and an amorphous region shielding the fine hole, in the single-crystal substrate along the division lines, wherein the pulsed laser beam has a wavelength that is configured to permeate through the single-crystal substrate;

a protective member adhering step of adhering a protective member to the single-crystal substrate; and

a grinding step of holding the protective member on the single-crystal substrate, to which the shield tunnel forming step and the protective member adhering step have been performed, on a chuck table of a grinding apparatus, grinding a reverse surface of the single-crystal substrate to bring the single-crystal substrate to a predetermined thickness, and dividing the single-crystal substrate along the division lines along which the shield tunnels have been formed,

wherein the amorphous regions and the fine holes of the shield tunnels are formed by the pulsed laser beam during the shield tunnel forming step.

2. The method of processing the single-crystal substrate according to claim 1, wherein the pulsed laser beam used in the shield tunnel forming step has a peak energy density set to a value in a range from 1 TW/cm^2 to 100 TW/cm^2.

3. The method of processing the single-crystal substrate according to claim 1, wherein the protective member adhering step is performed before the shield tunnel forming step.

4. The method of processing the single-crystal substrate according to claim 1, wherein the protective member adhering step is performed after the shield tunnel forming step.

5. The method of processing the single-crystal substrate according to claim 1, wherein the amorphous region extends from a front surface of the single-crystal substrate to the reverse surface of the single-crystal substrate.

6. The method of processing the single-crystal substrate according to claim 1, wherein the amorphous region extends from a front surface of the single-crystal substrate towards the reverse surface of the single-crystal substrate.

7. The method of processing the single-crystal substrate according to claim 1, wherein the pulsed laser beam used in the shield tunnel forming step has a pulse width within the range of 0.7 ps to 63 ps.

8. The method of processing the single-crystal substrate according to claim 1, wherein the pulsed laser beam used in the shield tunnel forming step has a spot diameter of 10 μm.

9. The method of processing the single-crystal substrate according to claim 1, wherein the pulsed laser beam used in the shield tunnel forming step has an average output power of 5 W.

10. The method of processing the single-crystal substrate according to claim 1, wherein the pulsed laser beam used in the shield tunnel forming step has:

a pulse width within the range of 0.7 ps to 63 ps;

a spot diameter of 10 μm; and

an average output power of 5 W.

11. The method of processing the single-crystal substrate according to claim 1, wherein the fine holes formed during the shield tunnel forming step are formed at predetermined intervals.

12. The method of processing the single-crystal substrate according to claim 11, wherein each of the predetermined intervals is 10 μm.

13. The method of processing the single-crystal substrate according to claim 1, wherein the fine hole in each of said shield tunnels has a diameter of about 1 μm.

14. The method of processing the single-crystal substrate according to claim 13, wherein the amorphous region surrounding the fine hole in each of said shield tunnels has a diameter of about 10 μm.

15. The method of processing the single-crystal substrate according to claim 1, wherein the amorphous region of each of said shield tunnels is generally cylindrical-shaped.