CLAIMS

What is claimed is:

1. A holographic multiplexed recording method for increasing storage capacity, wherein in a holographic recording and reproducing device, a moving direction of a storage medium is not coplanar with a plane where an optical axes of signal light and reference light are located;

wherein a new hologram is recorded and reproduced from the back after the storage medium is flipped, and the recording process specifically comprises the following steps:

S1. recording a two-dimensional hologram array by means of shift multiplexing;

S2. rotating the storage medium at a cross angle α with its surface normal as the axis;

S3. repeating steps S1 and S2 n times, performing cross-shift multiplexing storage, and ending the recording on a first side of the storage medium when n=[360°/α]-1 is satisfied;

S4. flipping the storage medium with an axis perpendicular or parallel to the moving direction; and

S5. repeating steps S1 to S3 on a second side of the storage medium.

2. A holographic multiplexed recording method for increasing storage capacity, wherein in a holographic recording and reproducing device, a relative moving direction of a storage medium and signal light or reference light is not coplanar with a plane where an optical axes of the signal light and the reference light are located;

wherein a new hologram is recorded and reproduced from the back after the storage medium is flipped, and the recording process specifically comprises the

following steps:

S1. recording a two-dimensional hologram array by means of shift multiplexing;

S2. rotating the storage medium at a cross angle α with its surface normal as the axis;

S3. repeating steps S1 and S2 n times, performing cross-shift multiplexing storage, and ending the recording on a first side of the storage medium when n=[360°/α]-1 is satisfied;

S4. flipping the storage medium with an axis perpendicular or parallel to the moving direction; and

S5. repeating steps S1 to S3 on a second side of the storage medium.

3. The holographic multiplexed recording method according to claim 1 or 2, wherein the storage medium rotates with its surface normal as an axis, so that the moving direction thereof forms an angle φ with the plane where the optical axes of the signal light and the reference light are located, and φ is from 5° to 45°.

4. The holographic multiplexed recording method according to claim 3, wherein the angle φ formed by the moving direction of the storage medium and the plane where the optical axes of the signal light and the reference light are located is 30°.

5. The holographic multiplexed recording method according to claim 1 or 2, wherein ~~a~~ the two-dimensional hologram array can be obtained by arranging and recording multiple rows of holograms in parallel, then a new hologram array can be multiplexed and recorded after the storage medium is rotated at a fixed angle, and the fixed angle is called ~~a~~ the cross angle α.

~~6. The holographic multiplexed recording method according to claim 5, wherein the recording process specifically comprises the following steps:~~

~~S1. recording the two-dimensional hologram array by means of shift multiplexing;~~

~~S2. rotating the storage medium at the cross angle α with its surface normal as the axis; and~~

~~S3. repeating steps S1 and S2 n times, and ending when n=[360°/α]-1 is satisfied.~~

~~7.~~6. The holographic multiplexed recording method according to claim 5, wherein the cross angle α at which the storage medium rotates is equal to or greater than 40°.

~~8.~~7. The holographic multiplexed recording method according to claim ~~7~~6, wherein the cross angle α=360°/m, and m is an integer from 1 to 9.

~~9.~~8. The holographic multiplexed recording method according to claim ~~8~~7, wherein the cross angle α is 90°.

~~10. The holographic multiplexed recording method according to claim 1 or 2, wherein a new hologram is recorded and reproduced from the back after the storage medium is flipped.~~

~~11. The holographic multiplexed recording method according to claim 10, wherein the recording process specifically comprises the following steps:~~

~~S1. recording the two-dimensional hologram array by means of shift multiplexing;~~

~~S2. rotating the storage medium at the cross angle α with its surface normal as the axis;~~

~~S3. repeating steps S1 and S2 n times, performing cross-shift multiplexing storage, and ending the recording on a first side of the storage medium when n=[360°/α]-1 is satisfied;~~

~~S4. flipping the storage medium with an axis perpendicular or parallel to the moving direction; and~~

~~S5. repeating steps S1 to S3 on a second side of the storage medium.~~

~~12.~~9. A holographic multiplexed recording method for increasing storage capacity, wherein in a holographic recording and reproducing device, a moving direction of a storage medium is not coplanar with a plane where an optical axes of signal light and reference light are located;~~The holographic multiplexed recording method according to claim 1 or 2,~~

wherein the new hologram is recorded and reproduced by tilting the medium or making the reference light and signal light incident asymmetrically with respect to the storage medium, and a holographic grating vector formed by the interference between the reference light and the signal light on the storage medium forms an angle with the surface of the storage medium, and the recording process specifically comprises the following steps:

S1. recording a two-dimensional hologram array by means of shift multiplexing;

S2. rotating the storage medium at a cross angle α with its surface normal as the axis;

S3. repeating steps S1 and S2 n times, performing cross-shift multiplexing storage, and ending the recording on a first side of the storage medium when n=[360°/α]-1 is satisfied;

S4. flipping the storage medium with an axis perpendicular or parallel to the moving direction; and

S5. repeating steps S1 to S3 on a second side of the storage medium.

~~13.~~10. A holographic multiplexed recording method for increasing storage capacity, wherein in a holographic recording and reproducing device, a relative moving direction of a storage medium and signal light or reference light is not coplanar with a

plane where an optical axes of the signal light and the reference light are located;~~The holographic multiplexed recording method according to claim 12,~~

wherein a new hologram is recorded and reproduced by tilting the medium or making the reference light and signal light incident asymmetrically with respect to the storage medium, and a holographic grating vector formed by the interference between the reference light and the signal light on the storage medium forms an angle with the surface of the storage medium, and the recording process specifically comprises the following steps:

S1. recording ~~the~~ a two-dimensional hologram array by means of shift multiplexing;

S2. rotating the storage medium at ~~the~~ a cross angle α with its surface normal as the axis;

S3. repeating steps S1 and S2 n times, performing cross-shift multiplexing storage, and ending the recording on a first side of the storage medium when n=[360°/α]-1 is satisfied;

S4. flipping the storage medium with an axis perpendicular or parallel to the moving direction; and

S5. repeating steps S1 to S3 on a second side of the storage medium.

~~14.~~11. A storage medium, for use in the holographic multiplexed recording method according to claim 1 or 2, the storage medium comprising a multilayer-multiplexed two-dimensional hologram array, wherein the two-dimensional hologram array comprises an X-axis direction and a Y-axis direction, each layer comprises the recording of arranging multiple rows of holograms in parallel along the X-axis direction, the projection, on a storage medium plane, of a holographic grating vector formed by

the interference between reference light and signal light on the storage medium forms an acute angle φ with the X-axis or Y-axis, and φ is from 5° to 45°.

~~15.~~12. The storage medium according to claim ~~14~~11, wherein a fixed angle α exists between the projections of holographic grating vectors of each layer on the storage medium plane, and α is equal to or greater than 40°.

~~16.~~13. A holographic recording and reproducing device for recording and reproducing a signal on a storage medium, for use in the holographic multiplexed recording method according to claim 1 or 2, the device comprising:

a recording unit, configured to generate signal light and reference light;

a storage medium moving unit, configured to drive the storage medium to move so that the moving direction of the storage medium is not coplanar with the plane where the optical axes of the signal light and the reference light are located;

a storage medium rotating unit, configured to drive the storage medium to rotate with its plane normal as an axis; and

a storage medium flipping unit, configured to drive the storage medium to flip with an axis perpendicular or parallel to the moving direction.

~~17.~~14. The holographic recording and reproducing device according to claim ~~16~~13, further comprising a storage medium tilting unit, configured to drive the storage medium to tilt.

~~18.~~15. The holographic recording and reproducing device according to claim ~~16~~ 13 or ~~17~~14, wherein the recording unit comprises a reference light deflecting device or a signal light deflecting device that changes the incident angle of the reference light or the signal light to make it incident asymmetrically.