

STAMPER FOR TWO LAYERED DISCField Of The Invention

This invention relates to the manufacture of compact discs in which two layers of optical data are read from one side
5 of the disc. In particular the invention relates to a process for molding data pits onto such a product.

Background Of The Invention

Compacts discs, called DVD (Digital Versatile Disc) have been proposed in which there are two surfaces of data both
10 of which can be read from a single side of the disc. This is obtained by putting a semi-transmissive coating on the top of the bottom layer and using an optically clear adhesive to glue both sides together. The top side is then coated with a normal amount of aluminum.

15 The various steps in the manufacturing of the data surfaces by photo lithographic and molding processes are well known and employ the construction of masters. The DVD double-sided disc would have a capacity of about ten gigabytes of data and have two 0.6 mm thickness discs, having a reflective layer on
20 a signal layer and bonded so that the signal layers face each other with a small space of bonding resin layer.

One problem is in the sense of rotation of the second side. It has to be the same as the sense of rotation of the first side. This is accomplished by reversing the spindle motor

during mastering.

Brief Description Of The Invention

The reversal of the spindle motor during mastering, which produces a distinct master usable only in the manufacture of a particular data surface of the two surfaced disc is avoided
5 by employing the mother image formed during electro-forming as a stamper in the injection molding process.

This provides the advantage that two stamper libraries (one clockwise, one counterclockwise) don't have to be
10 maintained. Furthermore the two sides of the disc may be interchangeable during the manufacturing process allowing additional combinations of information during that process. Perhaps most important, existing libraries of metal masters that has been generated in the past for the original CD or CD-ROM can
15 be used without having to cut a new master.

Brief Description Of The Drawings

Fig. 1-a depicts in cross section a 2-layer DVD disc.

Fig. 1-b depicts in cross section the top layer of a DVD disc pressed from a stamper with the read side on top.

20 Fig. 1-c depicts in cross section the second layer of the DVD disc pressed from a Mother with the read side on top.

Fig. 2 is a schematic representation of the orientation of a bit pattern on the various generations and on the DVD discs obtained by using them as molds.

Detailed Description Of A Preferred Embodiment

In the manufacture of a 2-layer DVD disc, geometry dictates that the pit structure on the second layer must be reversed with respect to the first layer, while the same
5 direction of pit track layout must be present on each layer. In the past, this has been dealt with by reversing the direction of mastering on the second layer. However the requisite geometry may be achieved by using a Mother as a Stamper for the second layer.

10 In a 2-layer DVD disc, the pit geometry of the first layer is the same as the geometry of a standard CD, albeit with 0.6 mm thickness of polycarbonate instead of 1.2 mm. The metalization on the first layer is semi-transparent and is separated from the second layer by an optically transparent
15 adhesive. The pits on the second layer are also placed at a distance of approximately 0.6 mm from the read side of the DVD disc, and the metalization layer is read directly - effectively, on the second layer the DVD lens reads what would be the "inside" of a CD's pits. The flat side of the second layer - the "read"
20 side on the top disc, or any normal CD - is the "print" side of the CD disc.

Consider a selection consisting of a Master cut with a single pit. A 2-layer DVD disc that consists of the same data (Fig 1-a) is constructed. On a stamper, the mastering pit
25 becomes a "bump". The bump presses a pit into the molded disc.

This disc is metalized, and the laser reads a "bump" through the flat face of the disc (Fig. 1-b).

In the Mother of this same selection, the pit is replicated as a pit. When this Mother is then used as a Stamper
5 in the molding process, the replica will consist of a single "bump". This "bump" is then metalized. In a normal CD player, the laser would read the "bump" as a pit. But in the second layer of the DVD disc, the metalization layer is read directly, so the "bump" is read as a "bump" (Fig. 1-c). Thus both layers
10 of this DVD disc contain the same information, which is the expectation desired.

Consider a master consisting of the numbers 1,2,3,4,5 spiraling in a clockwise direction from center to edge. The stamper will consist of the reversed images of the numbers
15 1,2,3,4,5 spiraling in a counter-clockwise direction from center to edge, while the Mother will be identical in appearance to the Master. When the Stamper is used to make a disc, the disc as seen by the laser will consist of the numbers 1,2,3,4,5 spiraling in a clockwise direction from center to edge. When the Mother is
20 used to press the second-layer DVD disc, the metalized side will be seen by the DVD laser to also consist of the numbers 1,2,3,4,5 spiraling in a clockwise direction from center to edge. (Fig. 2)

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to
25 preferred embodiments thereof, it will be understood that various

omissions and substitutions and changes in the form
and details of the device illustrated and in its
operation may be made by those skilled in the art
without departing from the spirit of the invention
as defined in the claims.

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I claim:

1. A two layer compact disc viewable
from only one side and formed by bonding separately
fabricated compact discs wherein data is present on
5 each surface of the disc, the data on an inner sur-
face of one side of the disc having been impressed
in a molding process using a negative of the mold of
the stamper generation.

10 2. The method of forming a disc viewable
from only one side comprising impressing the data on
an inner surface of one side of the disc in a mold-
ing process using a negative of the mold of the
stamper generation, and bonding the separately fab-
15 ricated compact disc to form a composite wherein the
data on each data surface is readable from a single
side of the disc.

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