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Substrate Disk

Description

The present invention relates to a substrate disk comprised of two substrates connected to one another and having a center hole.

Substrate disks of this kind are, for example, known as so-called digital video disks (also abbreviated DVD), and are comprised of two substrates or partial substrates having digital information, such as digital video information, stored on one respective surface thereof and connected by gluing the information-free sides to one another. For connecting the two substrates to form a substrate disk, for example, a digital video disk, very precisely operating devices are required because the substrates not only must be positioned precisely one above the other, but also the gluing process must be uniform over the entire substrate surfaces and without inclusion of air bubbles and producing adhesive layers of different thickness. This is necessary in order to provide error-free substrate disks. Furthermore, the conventional devices for gluing two substrates are very complicated in their construction and require a large space. For the step of gluing, the two substrates must be aligned very precisely relative to one another, which is very difficult to achieve. Furthermore, there is the risk that during use the two substrates forming the substrate disk can accidently separate from one another. For example, when removing a DVD from a DVD player that can accommodate multiple DVDs, it may occur that the DVD to be removed is canted so that the substrates will separate from one another. A further disadvantage of the gluing process is that the adhesive or glue lacquer can enter the center hole since one substrate is pressed onto the other after application of the adhesive in the inner area of the other substrate. This results in changes of the inner diameter of the center hole and diminishes the quality of the substrate disk.

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EP-A-0 305 199 discloses a magnetic recording disk having a centering hub, according to which the receiving medium is stretched over a rigid, annular support. The receiving medium is stretched over inner and outer raised edges.

JP-A-081 38 340 furthermore discloses a magnetic disk that is connected by connecting a magnetic surface element with an annular flange portion of a central hub.

It is therefore an object of the present invention to provide a substrate disk which can be produced with minimal reject rate and which has improved quality and service life.

This object is inventively solved in that one of the substrates forming the substrate disk is provided at the circumference of the center hole with at least one projection projecting from the substrate face, and engaging at least partially in a central opening of the other substrate. This has the advantage that upon connection, for example, by gluing, of the substrates a precise centering is possible without additional centering measures or devices. During the gluing step of the substrate disk, the adhesive is applied in the vicinity of the center hole onto one of the substrates. The other substrate is then placed thereon and pressed against the first substrate to a greater or lesser degree. In conventional substrate disks the adhesive can reach the center hole during this process so that the dimensional specifications of the disk can no longer be maintained and the quality specifications are no longer met. The projection at the circumference of the center hole of one of the substrates prevents the adhesive from flowing into the center hole. Furthermore, the substrate disk, because of the presence of the projection at the circumference of the center hole of one of the substrates, is protected to a greater extent with respect to accidental separation of the two substrates from one another when the substrates, for example, upon lifting from the receiving pin of the DVD player, are canted.

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In one advantageous embodiment of the invention the projection of the one substrate extends over the entire circumference of the center hole. This ensures that the adhesive or adhesive lacquer, after pressing one substrate on to the other substrate, cannot penetrate at any location of the circumference of the center hole into the circumferential wall surface of the center hole. Furthermore, with the additional gluing of the circumferential wall surface of the center hole an especially stable connection of the two substrates is achieved.

In another advantageous embodiment of the present invention, the other substrate without projection is provided at the inner edge of the center hole, facing the substrate that has the projection, with a recess which can be, for example, concave. This recess serves as a reservoir for the adhesive or the adhesive lacquer which will flow, upon pressing of the substrates onto one another, in the direction of the center hole of the substrate disk.

In yet another advantageous embodiment of the invention, the transition portion between the face of the substrate and the projection is slanted or rounded. This allows an easier flow of the plastic material during manufacture of the substrate during the molding process in comparison to a right angle embodiment of the transition portion so that the substrate homogeneity and thus the quality of the substrate disk are improved. Furthermore, such an embodiment of the invention significantly reduces the risk of breakage of the projection and thus increases the stability of the substrate disk.

The present invention will now be described in detail with the aid of a specific embodiment utilizing the only Figure 1.

The figure shows two substrates 1, 2, each with a center hole 3, 4, which are glued together to form a substrate disk, for example a DVD. In the figure, only the central portion of the two substrates 1, 2 are shown.

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The upper substrate 1 has at the circumference of the center hole 3 an annular projection 5 which projects from the face 6 facing the other substrate 2 so that the projection faces the lower substrate 2. The inner diameter of the projection 5 defines the diameter of the center hole 3 of the finished substrate disk. For DVDs the diameter is conventionally 15 mm. The transition portion 7 between the projection 5 and the face 6 of the substrate 1 is at a slant in the shown embodiment. This facilitates not only the manufacturing process when producing the substrate 1 by molding, but also increases the stability and strength of the projection 5.

The lower substrate 2 has no projection, and accordingly the diameter of its center hole 4 is slightly greater than the outer diameter of the projection 5. Thus, the projection 5 of the upper substrate 1, when the substrates 1 and 2 are combined, is positioned in the center hole 4 of the lower substrate 2.

When producing the substrate disk by gluing of the two substrates 1, 2, the lower substrate 2 is provided in the vicinity of the center hole 4 with adhesive in an approximately circular pattern. Subsequently, the upper substrate 1 is placed and pressed onto the lower substrate 2 before the two substrates 1, 2 resting on one another are rotated so that the adhesive is distributed uniformly to the outer edge of the substrates 1, 2 by centrifugal force and a uniform layer of adhesive of uniform thickness is formed. Methods and devices for gluing substrates to produce substrate disks are, for example, known from applicant's not pre-published German Patent Application DE 197 18 471 A1.

During application of the upper substrate 1 onto the lower substrate 2 and/or the application of a certain pressure before the rotation process, adhesive is also forced in the direction toward the center hole 4 and reaches the area of the center hole 4 so that in conventional substrate disks contamination of this area will occur and no defined

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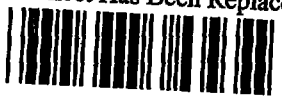
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center hole diameter is ensured. The projection 5 prevents the adhesive from reaching the circumferential wall surface of the center hole because the projection 5 does not allow flow of the adhesive into this area. In order to ensure and also in order to be able to have great tolerances with regard to the amount of adhesive to be applied, the lower substrate 2, at the edge of the center hole 4 facing the upper substrate 1, is provided with a recess or a cutout 8 which in the shown embodiment is embodied as a concave groove. This recess 8 serves as a receiving space for excess adhesive so that a flowing out and contamination of the center hole of the substrate disk is reliably prevented even when the amount of excess adhesive is great.

The projection 5 according to the shown embodiment projects preferably to such an extent from the face 6 of the substrate 1 that in the connected state of the two substrates 1, 2 the circumferential wall surface of the center hole 4 of the lower substrate 2 is completely covered by the projection. In this manner, in comparison to conventional substrate disks, a defined inner wall of the center hole 3 of the finished disk with smooth surfaces free of adhesive is produced. This is very advantageous when using these disks, for example in respective disk players, with respect to their manipulation. The projection 5 also protects the connecting area between the two substrates, and the risk of separation of the two substrates forming the disk during use, especially when removing the disk from the pin of the disk player, is minimal.

The invention has been disclosed by describing a preferred embodiment. However, to a person skilled in the art other embodiments and developments of the invention and the disclosed embodiment will be obvious without leaving the gist of the invention. For example, in contrast to the illustrated embodiment, it is possible to use the substrate 1 with projection 5 as the lower substrate during the manufacturing process and to place onto it the adhesive and subsequently the substrate 2 without

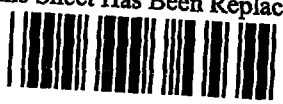
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projection. In this case a secure alignment of the two substrates relative to one another is still reliably provided by the projection 5 without the need for further alignment means.

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Patent Claims

1. Substrate disk comprised of two substrates (1, 2) that are connected to one another and that have a center hole (3), characterized in that one of the substrates (1, 2) forming the substrate disk is provided at the edge or circumference of the center hole with at least one projection (5) that projects from the substrate face (6), that engages at least partially in a central opening of the other substrate.

2. Substrate disk according to claim 1, characterized in that the projection (5) extends over the entire periphery of the center hole (3).

3. Substrate disk according to claim 1, characterized in that a number of projections (5) are provided that are spaced from one another by the same circumferential angle.

4. Substrate disk according to one of the preceding claims, characterized in that the projection (5) of the substrate (1) covers at least a portion of the inner surface of the center hole when the substrate (1, 2) are placed upon one another.

5. Substrate disk according to one of the preceding claims, characterized in that the diameter of the center hole of the substrate (2), which has no projection (5), is slightly greater than the outer circumference of the projection (5) of the substrate (1) that is provided with the projection (5).

6. Substrate disk according to one of the preceding claims, characterized in that the inner edge of the projection-free substrate (2) that faces the one substrate (1) is provided with a recess (8).

7. Substrate disk according to claim 6, characterized in that the recess (8) has a concave shape.

8. Substrate disk according to one of the preceding claims, characterized by a slanted transition portion (7) between the substrate face (6) and the projection (5).

9. Substrate disk according to one of the claims 1 to 8, characterized by a rounded

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transition between the substrate face (6) and the projection (5).

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