Tray for receiving and retaining a circular information disc and storage cassette comprising a tray.

The invention relates to a tray for receiving and retaining a circular information disc, which tray comprises a grip member, a receptacle and retaining elements for retaining the information disc to be inserted into the receptacle, the retaining elements being arranged opposite each other at the edge of the receptacle, and one of the retaining elements being arranged near the grip member.

A tray of this type is known from EP-A 0,129,292. The known tray has a receptacle and three radially resilient retaining elements for retaining an information disc inserted into the receptacle. Insertion into or removal from the receptacle by hand is difficult owing to the presence of oppositely acting resilient retaining elements. The known tray is suitable for insertion into a disc-record player disclosed in EP-A 0,129,292, which comprises an intricate release mechanism with three release pins which in conjunction with the three resilient retaining elements can release an information disc situated in the receptacle.

EP-A 0,144,631 discloses elements for receiving and retaining a circular information disc, the elements comprising a tray having a receptacle and intended for insertion into a storage cassette and comprising retaining means for retaining the information disc to be inserted into the receptacle. Such elements constitute inserts for the bottom or the lid of the storage cassette which, like the elements themselves, are constructed as injection-moulded plastics parts. The elements are difficult to remove from the bottom or the lid of the storage cassette; therefore, they merely serve to retain the information disc during storage.

For handling optically readable digital audio

discs (Compact Discs) without touching them when they are loaded into and unloaded from audio players it is also known from "Funkschau", 21/1984, page 38 to employ holders which are U-shaped, the information disc being clamped between the limbs of the U. When such a holder, which may be referred to as a drawer-type insert, is used the information disc should first be removed from its storage cassette and inserted into the holder. A Compact Disc in such a holder is not easy to handle without touching it with the fingers.

It is an object of the invention to provide a solution for the problem of handling information discs when a playing device is to be loaded and unloaded, to facilitate handling of the information disc when it is transferred from a storage cassette into the playing device, in such a way that the disc need not be touched and only a simple loading and unloading mechanism is required to release the information disc.

According to the invention this problem is solved in that the retaining element arranged near the grip member comprises a projection provided on a resilient member which extends parallel to the grip member and the other retaining elements are fixedly arranged, the tray being formed with a recess in which the resilient member, which is secured to the tray, is situated.

As a result of the introduction of the tray the information disc is situated in the tray inside a storage cassette during storage. When it is transferred to a playing device only the tray has to be touched and removed from the cassette. The grip member enables the tray to be easily gripped and transferred to the loading and unloading mechanism. The information disc is transferred by means of the tray. Thus, the tray has a double function, namely retaining the information disc during storage in the storage cassette and transferring the information disc from the cassette into the player without the disc being touched.

Since the information disc is retained by

means of the retaining elements of the tray in accordance with the invention the loading and unloading mechanism can release the disc from the retaining elements when the tray is inserted into the playing device and can bring the disc into the playing position. More in particular, during insertion the information disc is released by the resilient projection, which can be pushed aside by the loading and unloading mechanism.

Since the tray has a recess at the location of the resilient retaining element the resiliently supported projection can move easily during the insertion movement. The overall height of the tray is small because the projection is arranged at the location of the tray bottom.

In an embodiment of the invention the recess has an arcuate bounding edge at the side of the receptacle, which recess is substantially concentric with the information disc to be inserted. In this way the information side of the disc is protected because the information side of the disc can only contact the tray with its outer circumference during insertion into the tray. Moreover, this construction of the bounding edge provides a reinforcement of the bottom of the receptacle. In addition, the information side is also protected against touching from the underside of the receptacle.

In a further embodiment of the invention the arcuate bounding edge has a portion, said receding portion facing the resilient projection. The receding portion has the advantage that a pin of the loading and unloading mechanism can penetrate this portion to urge back the resilient retaining element and thereby release the disc.

In a further embodiment of the invention the projection is arranged in the centre of the resilient member which has its ends secured to the grip member, the recess extending over the entire width and depth of the resilient member. The resilient member then has an adequate elasticity and can be made of a plastics.

In a further embodiment of the invention the

resilient member can bear against spring means in its central area. Since the elasticity of the resilient plastics member may deteriorate, for example at high temperatures, the spring means ensure a satisfactory support and a correct return to the supporting position.

In a further embodiment of the invention the spring means comprise a spring rod which is clamped in at its ends, which is arranged behind the resilient member and which bears against the resilient member at the location of its projection. The spring rod provides a protection against deterioration in elasticity of the plastics member and against adverse temperature effects. The spring rod may be mounted at a later stage or may be embedded during injection-moulding of the tray.

In a further embodiment of the invention the spring means are constructed as resilient projections connected to the grip member. Such resilient projections have the advantage that the tray and the resilient parts can all be made of the same material.

In a further embodiment of the invention the resilient member bears against the bounding edge of the recess. The position of the projection on the resilient member is then always accurately defined before insertion of the disc, so that the disc can always engage correctly behind the projection.

In a further embodiment of the invention the bottom of the receptacle is formed with a further U-shaped recess having a bell-shaped widened portion at the location of the fixedly arranged retaining elements. The further recess serves to enable the disc to cooperate with the turntable of the playing device. The bell-shaped widened portion has the advantage that the recording or read means of the device can move without being obstructed by any parts of the tray.

In a further embodiment of the invention there are provided guide strips which extend perpendicularly to the grip member and which provide insertion guidance for the cooperation with a loading and

unloading mechanism of a playing device. The guide strips guarantee a correct guidance during insertion into the device and, in addition, they preclude incorrect insertion, for example if the tray position is turned through 180°.

In a further embodiment of the invention the tray is a moulded plastics part formed with loading and unloading guides. In such an embodiment further means which facilitate loading and unloading may be readily arranged on the tray.

The invention not only relates to the special construction of the tray but also to a storage cassette comprising a tray in accordance with the invention.

The invention also relates to a combination of a storage cassette comprising a bottom and a lid and provided with a tray in accordance with the invention.

The invention will now be described in more detail with reference to the drawings. In the drawings

Fig. 1 is a plan view of an element constructed as a tray and of an information disc accommodated in this tray,

Fig. 2 shows the element in a view as indicated by the arrow II in Fig. 1,

Fig. 3 shows the element in a side view as indicated by the arrow III in Fig. 1,

Fig. 4 is a sectional view of the element taken on the line IV-IV in Fig. 1,

Fig. 5 is an enlarged-scale sectional view of a part of the element, taken on the line V-V in Fig. 1,

Fig. 6 shows the element in a view as indicated by the arrow VI in Fig. 1,

Fig. 7 is a plan view at the underside of the element of Fig. 1,

Fig. 8 is a sectional view of the element, taken on the line VIII-VIII in Fig. 7,

Fig. 9 shows a part of the element in a modified embodiment,

Fig. 10 shows a modified part of the element of Fig. 1 without information disc,

Fig. 11a shows a modified part of the element of Fig. 1 without information disc,

Fig. 11b shows a resilient member of the element shown in Fig. 11a,

Fig. 12a shows a modified part of the element of Fig. 1 without information disc,

Fig. 12b shows a resilient member of the element shown in Fig. 12a,

Fig. 13 is a sectional view of a combination of a storage cassette and an information-disc tray contained in this cassette,

Fig. 14 is a side view of the combination shown in Fig. 13,

Fig. 15 shows a part of the storage cassette at the location of the hinge between the bottom and the lid, the lid being pivoted through 180° relative to the bottom,

Fig. 16 shows the hinge construction shown in Fig. 15, the lid being pivoted through more than 180° relative to the bottom,

Fig. 17 is a side view of a combination of two stacked elements as shown in Fig. 1.

As is shown in Fig. 1, which is a plan view of an element constructed as a tray 1, this tray 1 comprises a rectangular plate with a grip member 2 (see also Figures 2, 3 and 4). The plate and the grip member are injection-moulded from a plastics. Preferably, the grip member has a ribbed upper surface for a better grip. The same applies to the underside of the tray, in particular at the location of the grip member 2. In its centre the tray 1 is formed with a receptacle 3 which is slightly recessed and whose circumference is slightly larger than an information disc 4. In the present example the information disc is a Compact Disc (an optically readable digital audio disc). At the lateral edges 3a, 3b the receptacle is open in such a way that the edge of the information disc can easily be gripped. Between the edge of the receptacle 3 and the grip member 2 a first recess 5 is formed. This first recess 5

has a specific width. A resilient plastics member 6 is arranged inside the first recess 5 and is preferably integral with the tray. The ends of the resilient member 6 adjoin the grip member. A retaining element in the form of a projection 7 is provided in the middle of the resilient member and projects towards the centre of the tray. The projection 7 is urged inwards as a result of the elasticity of the resilient member. A spring rod 8 (see also Fig. 7) backs up the elasticity of the resilient member 6. The spring rod 8 may be mounted at a later stage or may be embedded during injection-moulding. For subsequent mounting of the spring rod 8 insertion slots are formed in the end portions of the resilient member 6. Further, the resilient member 6 comprises small retaining portions 9 to position the spring rod 8. Towards the receptacle 3 the recess 5 is bounded by an arcuate bounding edge 5a. This bounding edge 5a substantially coincides with the disc edge. In the centre of the arcuate bounding edge 5a a receding portion 5b is formed opposite the retaining element 7, thus interrupting the bounding edge 5a. The receding portion 5b extends towards the tray centre and has a substantially rectangular outline. This receding portion 5b is engageable by a pin of the loading mechanism of a playing device.

As is shown in Fig. 9, the resilient support may alternatively be provided by resilient plastics projections 10 which project from the grip member 2 and bear against the rear of the resilient member 6. Preferably, the resilient projections 10 are injection-moulded together with the tray.

Fig. 10 shows an alternative construction of the resilient member 6, which is such that when the tray contains no disc the resilient member is urged against the arcuate bounding edge by the spring rod 8, so that the retaining element 7 is positioned accurately. After insertion of the disc the member 6 is preferably clear of the bounding edge 5a. In the construction shown in Fig. 10, but also in the other constructions, it is advantageous if the upper side of the retaining element 7 has a bevelled

edge. This bevelled edge serves to facilitate insertion of the disc 4 into the receptacle 3 and engagement of the disc behind the retaining element 7.

Figures 11a and 11b show an alternative in which the retaining element 7 is provided with a blade spring 6a in its central area. The blade spring 6a is a metal spring and provides a satisfactory support for the disc even at higher temperatures. The retaining element 7 is made of a plastics and is moulded or cemented onto the blade spring.

As is shown in Figures 12a and 12b the retaining element 7 may also be provided with a wire spring 6b in its central area. In this respect it is advantageous to provide the spring 6b with a bent portion 6c in the central area and to mount the retaining element by embedding. As another alternative a helical-spring construction may be provided in a manner, not shown, instead of a blade spring or wire spring.

A second recess 11 is formed at the location of the receptacle 3, which recess is U-shaped and is widened at its ends so as to be bell-shaped at the side which is remote from the grip member. Across the U-shaped recess at the side 12 which faces the grip member 2 the tray is provided with a bridge 13. The bridge serves to improve the stability of the side 12. As will be apparent from Fig. 6 the bridge 13 is situated at a slightly higher level than the bottom 14 of the receptacle 3. The bridge 13 has a lateral edge 13a which extends upwardly and is formed with recesses 13b and 13c.

At the location of the recess 11 fixed retaining elements 15 and 16 are arranged in such a way relative to the bottom 14 that the disc 4 is clamped between the bottom 14 and the fixed retaining elements 15, 16. The fixed retaining elements 15, 16 are situated at the location of the bridge 13. The construction of the retaining elements 15, 16 is shown to an enlarged scale in Fig. 5.

Guide strips 17, 18 are arranged at the

location of the lateral edges 3a, 3b and bound the tray at its sides. The guide strips 17, 18 serve to guide the tray 1 during its insertion into the loading and unloading mechanism of the playing device. Since the guide strips are arranged on the underside of the tray 1 they preclude an incorrect insertion of the tray into the loading and unloading mechanism.

First loading and unloading guide means 19 are provided at the location of the lateral guide strips 17, 18 and are formed by interruptions in the guide strips 17, 18. The loading and unloading mechanism is engageable in these first loading and unloading guide means 19, to insert or remove the tray. As is shown in Fig. 7, there are also provided hook-shaped second loading and unloading guide means 20, which serve a similar purpose. Opposite the hook-shaped second loading and unloading guide means there is provided a third loading and unloading guide means, which is heart-shaped. This third loading and unloading guide means 21, which is shown in sectional view in Fig. 8, serves preferably for retaining the tray in a multi-tray holder, not shown, which operates in accordance with the push-push principle. This means that the tray is latched in the holder by pushing a first time and can pop out after pushing a second time. Further, there are provided gear-rack guide means 22 which extend in the direction of insertion and which are adapted to cooperate with gear wheels of an insertion mechanism. In the bottom there are provided locating holes 23, 24. The locating hole 23 is circular and the locating hole 24 is slightly elongate. These holes enable the tray to be positioned reliably and accurately in the playing device after the loading operation.

The underside of the grip member 2 is formed with portions 25 which project substantially perpendicularly from the grip member. Since the portions 25 project freely, they are slightly flexible. The portions 25 carry latching projections 26 (Figures 3 and 7) which protrude outwardly.

As is shown in Fig. 3, the side 12 of the tray 1 facing the grip member 2 is formed with a bevelled edge 27. This bevelled edge 27 serves to facilitate insertion of the tray into a storage cassette 28 (Figures 13 and 14). This storage cassette 28 comprises a bottom 29 and a lid 30. The bottom 29 and the lid 30 are pivotally connected to each other by means of a hinge 31. The hinge 31 comprises hinge openings 32 in the bottom section 29 and hinge pins 33 which engage these openings 32 and which are arranged on limbs 30a of the lid. In the same way as the hinge pins 33 the latching projections 26 engage in the hinge openings 32 in the bottom section at the side which is remote from said limbs. The openings 32 thus have two functions, namely to latch the tray in the bottom section 29 and to connect the lid pivotally to the bottom.

The side walls 34 of the bottom carry projecting portions 35 behind which the guide strips 17, 18 can engage. Thus, the tray 1 is also connected to the bottom 29 at the side which is remote from the grip member 2. The side walls 34 of the bottom section are also formed with lateral openings to facilitate insertion of the information disc 4.

The inner sides of the limbs 30a carry push-up projections 36. At the location of the openings 32 the side walls 34 should be slightly thinner in order not to obstruct the push-up projections 36 during the pivotal movement. As is shown in Fig. 15, the push-up projections 36 abut against abutment portions 2a on the grip member 2 after a pivotal movement through 180°, so that the grip member and hence the tray is pushed up from the bottom in the direction indicated by an arrow A in Fig. 16. Pushing up is effected when the lid 30 is pivoted through an angle of more than 180° in the direction indicated by the arrow B in Fig. 16. The grip member 2 is then easy to grip by hand in order to remove the tray 1 from the bottom section 29. The guide strips 17, 18 become disengaged from the projection portions 35 during lifting. Thus, the tray 1 is released.

After removal of the tray with the disc 4 from the storage cassette 28 the tray can be inserted into the loading and unloading mechanism. The retaining element 7 is then pressed back and the disc is freed.

Thus, the tray has two functions, namely to retain the information disc and to assist in loading and unloading of the disc into/from the player. The tray makes it possible to replace the insert in a conventional storage cassette. Preferably, the tray 1 is made of a mixture of synthetic resins such as polycarbonate. This material ensures that the tray has a good stability.

As is shown in Fig. 17, the trays in accordance with the invention can be stacked by adapting the geometries of the upper sides and lower sides of the trays. The bevelled edge 27 of the first tray then adjoins the bevelled edge 2a of the grip member 2 of the second tray after the trays have been turned through 180° relative to each other. The central portion of the lateral edge 13a of the second tray engages the recess 5 of the first tray and the lateral portions of the edge 13a engage elongate recesses 37, formed in the bottom of each tray, as is shown in Fig. 7. This precludes a displacement of the stacked trays relative to each other.

CLAIMS:

1. A tray for receiving and retaining a circular information disc, which tray comprises a grip member (2), a receptacle (3) and retaining elements for retaining the information disc to be inserted into the receptacle, the retaining elements being arranged opposite each other at the edge of the receptacle, and one of the retaining elements being arranged near the grip member, characterised in that the retaining element arranged near the grip member comprises a projection (7) provided on a resilient member (6) which extends parallel to the grip member and the other retaining elements (15, 16) are fixedly arranged, the tray being formed with a recess (5) in which the resilient member, which is secured to the tray, is situated.

2. A tray as claimed in Claim 1, characterised in that at the side of the receptacle (3) the recess (5) has an arcuate bounding edge (5a) which is substantially concentric with the information disc (4) to be inserted.

3. A tray as claimed in Claim 2, characterised in that the arcuate bounding edge (5a) has a portion (5b), said receding portion (5b) facing the resiliently supported projection (7).

4. A tray as claimed in any one of the Claims 1 to 3, characterised in that the projection (7) is arranged in the centre of the resilient member (6) which has its ends secured to the grip member, the recess (5) extending over the entire width and depth of the resilient member (6).

5. A tray as claimed in Claim 4, characterised in that the resilient member is constructed as a metal spring (6a; 6b) on which the projection (7) is moulded in the central area.

6. A tray as claimed in Claim 4, characterised in that in its central area the resilient member (6) can bear against spring means (8, 10).

7. A tray as claimed in Claim 6, characterised in

that the spring means comprise a spring rod (8) which is clamped in at its ends, which is arranged behind the resilient member (6) and which bears against the resilient member (6) at the location of its projection (7).

8. A tray as claimed in Claim 6, characterised in that the spring means are constructed as resilient projections (10) connected to the grip member (2).

9. A tray as claimed in Claims 2 and 4, characterised in that the resilient member (6) bears against the bounding edge (5a) of the recess (5).

10. A tray as claimed in any one of the Claims 1 to 9, characterised in that the bottom of the receptacle (3) is formed with a further U-shaped recess (11) having a bell-shaped widened portion at the location of the fixedly arranged retaining elements (15, 16).

11. A tray as claimed in any one of the preceding Claims, characterised in that there are provided guide strips (17, 18) which extend perpendicularly to the grip member and which provide insertion guidance for the cooperation with a loading and unloading mechanism of a playing device.

12. A tray as claimed in Claim 11, characterised in that the tray is a moulded plastics part formed with loading and unloading guides (19, 20, 21, 22).

13. A tray as claimed in any one of the Claims 1 to 12, characterised in that at the location of the recess (5) the bottom of the tray (1) is formed with elongate recesses (37), the upper side of the tray, at the side (12) facing the grip member (2), is formed with an upwardly extending lateral edge (13a) having lateral portions, and by adapting the geometries of the upper side and the lower side of each tray the trays can be stacked after they have been turned through 180° relative to one another, the lateral portions (13a) of a first tray engaging the elongate recesses (37) of a second tray after stacking.

14. A tray as claimed in any one of the preceding Claims, characterised in that the tray (1) is made of a heat-proof plastics predominantly consisting of a

polycarbonate.

15. A storage cassette (28) comprising a tray (1) as claimed in any one of the preceding Claims.