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Apparatus for holding a compact disk

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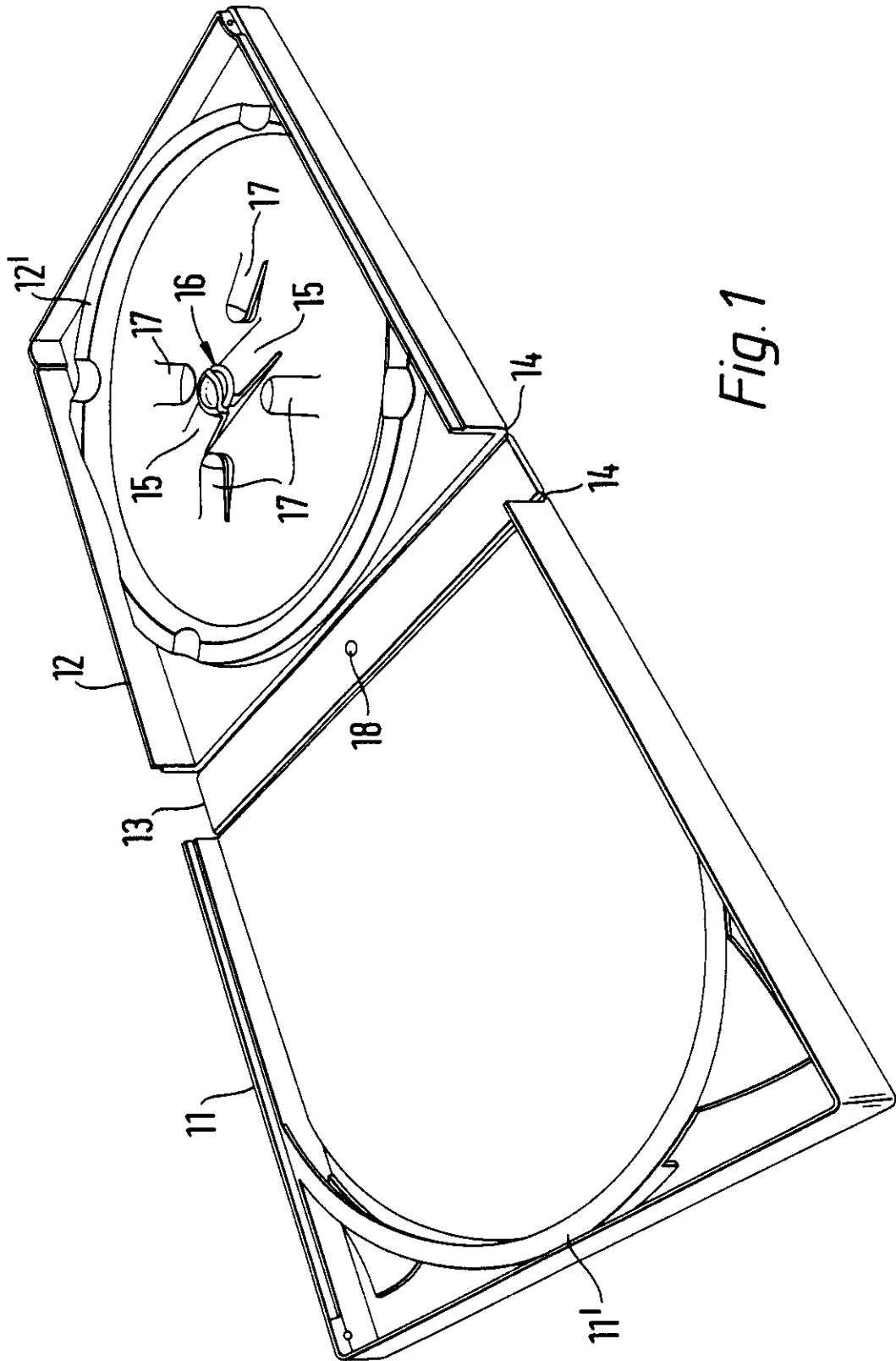


Fig. 1

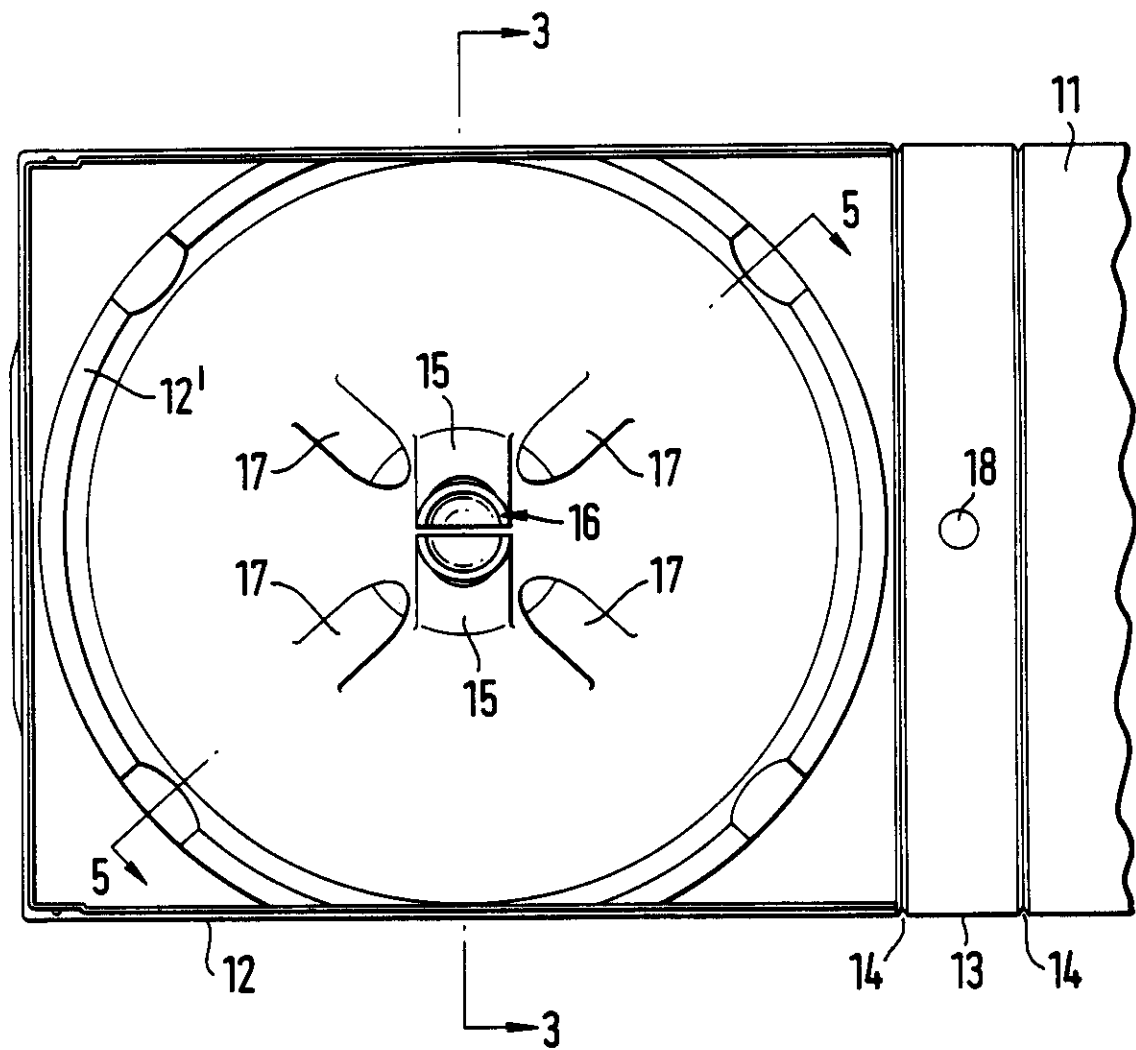


Fig. 2

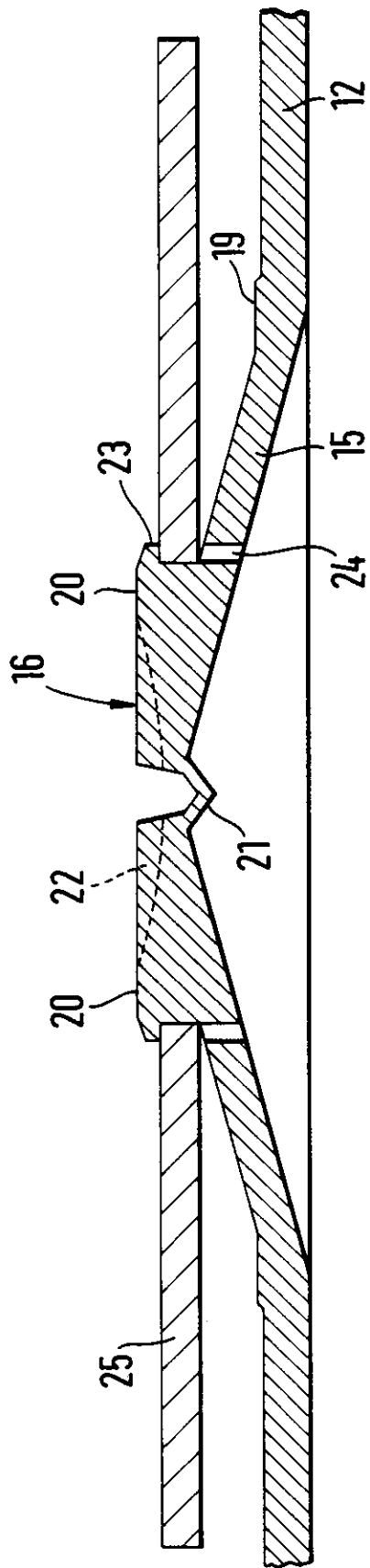


Fig. 3

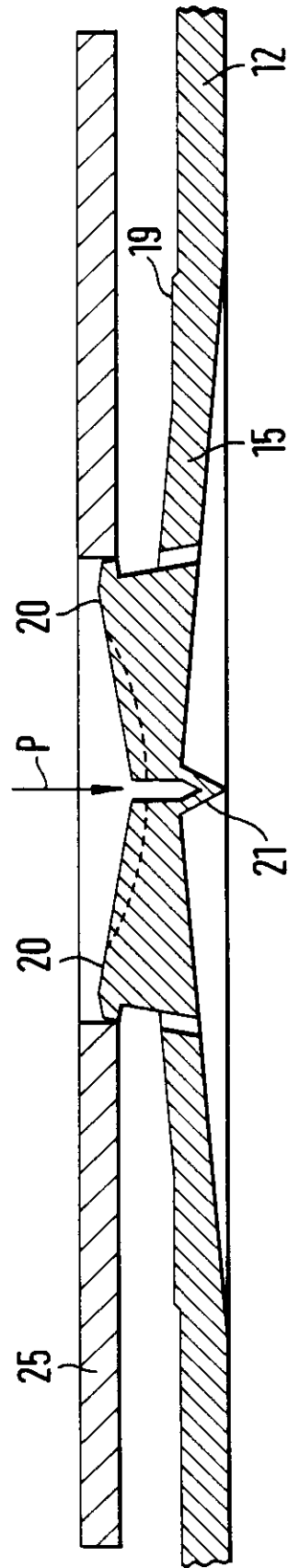


Fig. 4

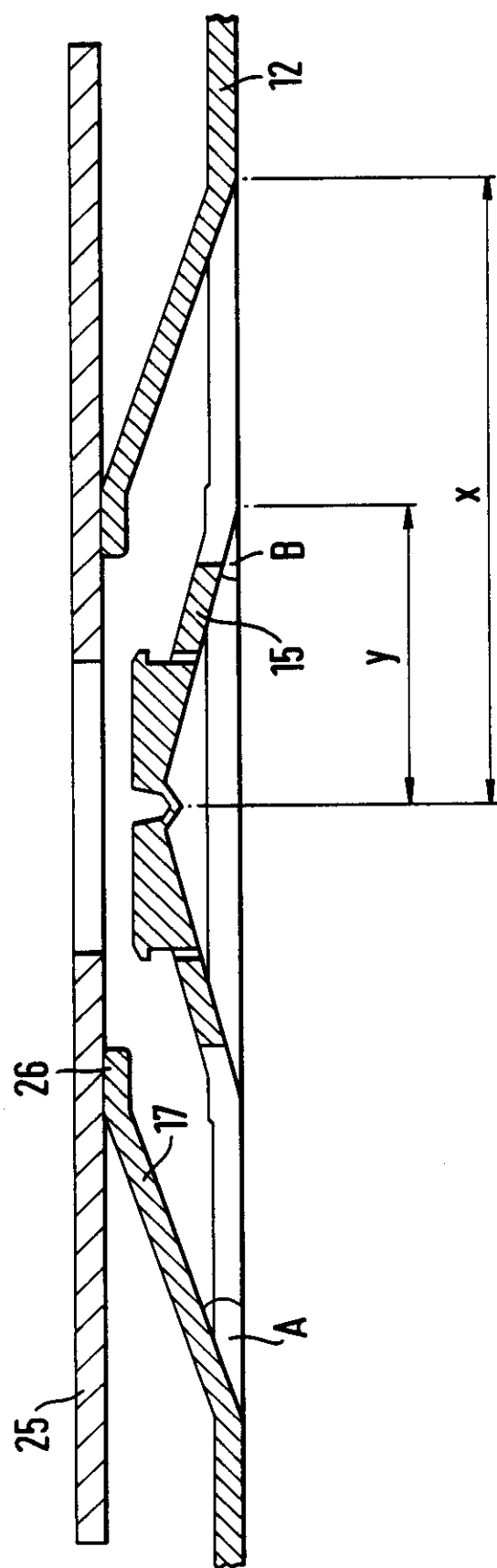


Fig. 5

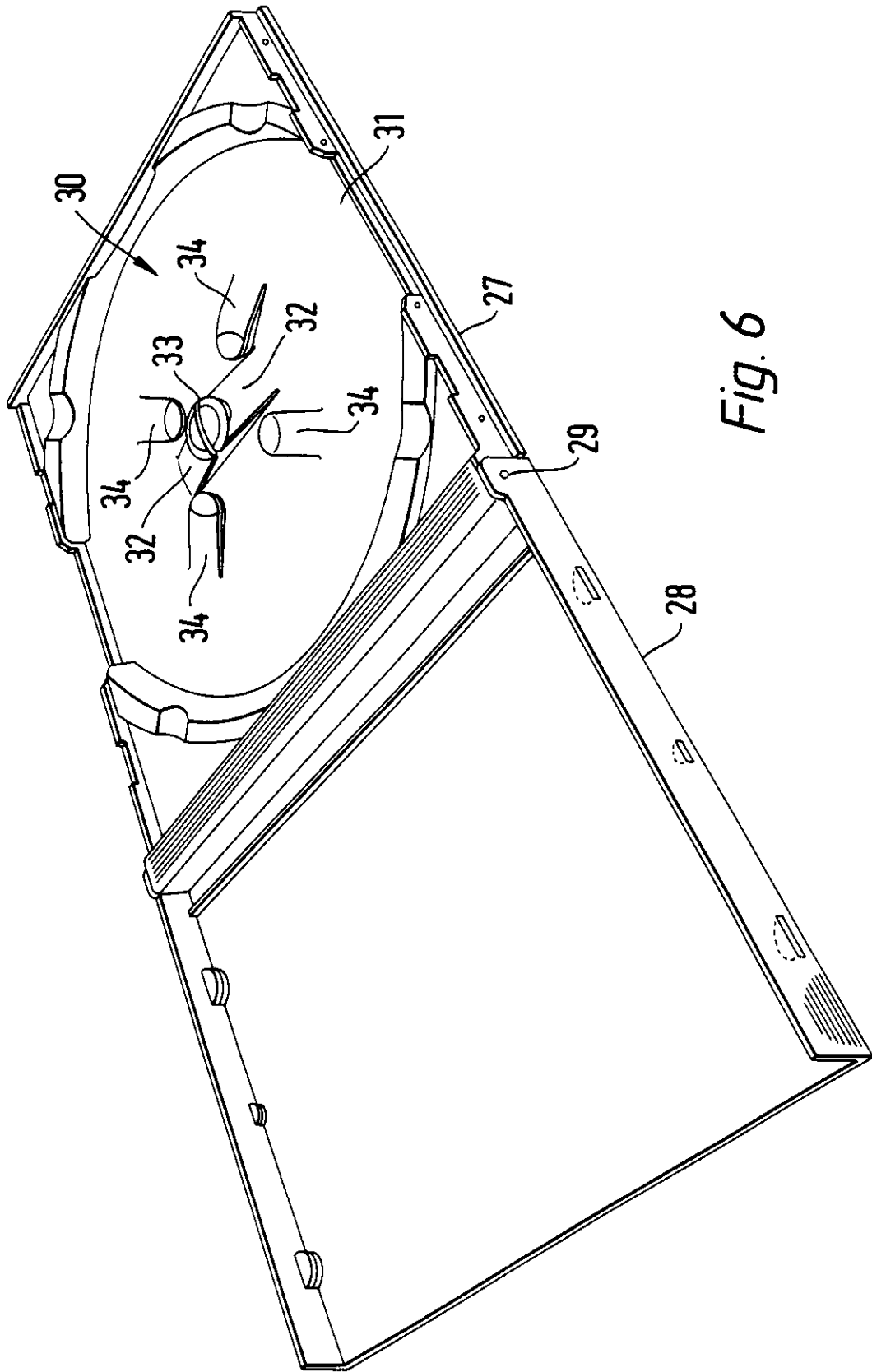


Fig. 6

APPARATUS FOR HOLDING A COMPACT DISK

This invention relates to apparatus for holding a compact disk, to disk storage containers and video style library boxes incorporating such apparatus, and to a method of manufacturing such apparatus, containers and boxes.

By "compact disk", in the context of this specification, is meant not only the relatively common standard 120mm diameter laser-readable disk such as are currently sold carrying, for example, pre-recorded music, computer software and data, and similar recordable disks, but also similar disks of various sizes such as are known or proposed for recording video, films, interactive games and other information or data.

Conventionally, when not in use, such compact disks are stored in clear polystyrene boxes, known as "jewel cases", wherein the disk is held on a separate tray fitted in the case and having seven or eight tines arranged to form a boss or "rosette" with which the aperture in the centre of a compact disc may be releasably engaged.

The legs or tines of the rosette are shaped such that they extend upwardly from the tray, curve outwardly, such that they can grip a compact disk, and then, towards their ends, curve inwardly to provide a boss over which the hole in the compact disk may be manually pushed.

It has long been recognised that such apparatus for holding a compact disk is not very satisfactory because it requires two hands to release a disk and lift it from the rosette; consequently many people do not attempt to push the centre of the rosette but instead use just one hand to grasp an outer edge of a compact disk and wrench it off the rosette thereby bending the disk, sometimes scoring the recorded surface of the disk on the tines, and eventually distorting or even breaking the tines.

Such bending and scoring of the disk can be especially critical when, as is now often the case, the disk carries compressed, or "stacked", computer software, or computer readable data.

There have been many attempts to overcome the above problems and provide a more reliable and readily releasable disk-holding apparatus.

For example, EPA-0356539 proposed apparatus in which the rosette was provided with a central pushing part having cranked flap pieces arranged such that pressing down the pushing part would cause the cranked flap pieces to push a disk up and off the disk-engagement tines. EPA-0429195 proposed the use of resilient means to urge the disk out of engagement with the central boss. PCT WO-A-93/01598 proposed a release button arranged to engage all the inner ends of the legs of the rosette and a spring designed to remain with no tension during disk storage but to "pop-up" the disk should the button be pressed. US-A-5,251,750 proposes linking the inner ends of all the tines by a "live" or "living" hinge produced by a reduced thickness in the moulded material whilst also suggesting linking the button to four cranked ejection arms arranged such that depressing the button causes the ejection arms to push a compact disk off the rosette.

One object of this invention is to provide apparatus for holding a compact disk, suitable for incorporating in a tray of a disk storage container and in a video style library box, which is reliable and easily operable to release a compact disk stored thereon. Other potential advantages of the invention will be apparent from the following description.

According to a first aspect of the invention there is provided apparatus for holding a compact disk having a central hole, the apparatus comprising: a base portion, disk-engaging means extending from the base portion for releasably engaging the central hole of the disk; and ejection means arranged so that the disk is urged out of engagement with the disk engaging means when the disk is released from the disk engaging means; the disk engaging means comprising at least two arms resiliently cantilevered from the base portion and

extending radially inwards at an angle away from the base portion so as to support a disk held thereby away from the base portion, the inner ends of the arms together forming, or being engaged by, a button-like member and having rims, or lips, arranged to securely retain a disk by engaging on the outwardly facing surface of a compact disk held by the disk-engaging means, the arrangement being such that pressure applied to the button-like member depresses the arms towards the base portion thereby moving the inner ends of the arms towards each other until the engagement of the rims or lips on the outwardly facing surface of the disk is released; the ejection means being arranged such that upon release of the engagement of the rims or lips on the disk, the disk is urged out of engagement with the disk engaging means.

Advantageously, the inner ends of adjacent arms forming the button-like member are interconnected by an integral living hinge, but alternatively the inner ends of the arms may be interconnected by a or a further button-like member engaging the inner ends of each of the arms.

Moreover, the button-like member advantageously presents a generally concave outer surface so as to reduce the possibility of any accidental contact acting on the inner end of any of the arms and thereby accidentally releasing the compact disk.

Furthermore, the ejection means is preferably arranged to resiliently support the disk away from the base when the disk is held by the disk engaging means, so that during handling and storage the disk is resiliently supported to cushion the disk from any shock.

Indeed, according to a second aspect of the invention there is provided apparatus for holding a compact disk having a central hole, the apparatus comprising: a base portion, disk-engaging means extending from the base portion for releasably engaging the central hole of the _____

disk, and resilient ejection means arranged to urge the compact disk out of engagement with the disk-engaging means when the disk-engaging means is released, the resilient ejection means being arranged to resiliently support the disk away from the base when the disk is held by the disk-engaging means.

Also, the resilient ejection means preferably comprises a plurality of further resilient inwardly extending arms cantilevered from the base; alternatively, the resilient ejection means may comprise one or more pieces of compressible material which is compressed when a disk is held by the disk engaging means and expands to move the disk out of engagement with the disk engaging means when the disk engaging means is released.

It should be understood that apparatus according to the invention can be incorporated into a tray for fitting into a conventional "jewel case" compact disk container, or can be incorporated in a video style library box, and in either case, with the obvious exception of any separate second button and/or separate resilient ejection means of compressible material, the tray or the box may be formed as an integral one-piece, one shot, injection moulding of a plastics material such as polypropylene or a copolymer of butadene and styrene.

Thus, according to another aspect of the invention, there is provided a video style library box formed as a one-piece moulding characterised by the provision therein of apparatus for holding a compact disk of the type referred to above. Preferably the apparatus for holding a compact disk is integrally formed with a wall of the box.

According to a further aspect of the invention, there is provided a method of manufacturing apparatus for holding a compact disk of the type referred to above in which the apparatus is formed as a one-piece moulding.

Other features of this invention will be apparent from the following description and the subsidiary claims of the specification.

The invention will now be further described, merely by way of example, with reference to the following drawings, in which:

Figure 1 is a perspective view of a video style library box incorporating apparatus for holding a compact disk according to one aspect of the invention;

Figure 2 is a fragmentary plan view of the box shown in Figure 1;

Figure 3 is a cross-sectional view taken on the line 3-3 in Figure 2 showing a compact disk held in the apparatus;

Figure 4 is a similar view to Figure 3 but showing the apparatus in the disk-release position;

Figure 5 is a schematic cross-sectional view of the apparatus according to the invention illustrated in the previous Figures taken partially on line 3-3 in Figure 2 and partially on line 5-5 in Figure 2 and showing a compact disk in position to be engaged with the apparatus; and

Figure 6 is a perspective view of a tray incorporating apparatus for holding a compact disk fitted in a jewel-case according to another aspect of the invention.

The video style library box shown in Figure 1 comprises a lid portion 11, a base portion 12 and a spine portion 13, which is connected to the lid portion 11 and to the base portion 12 by living hinges 14.

Within the lid portion 11 is moulded a spring clip-like device 11' for holding a printed booklet or leaflet to be included with the disk, and within the base portion 12 is moulded an annular rim 12' that protects the disk should any loose booklet or the like be left in the box and also constitutes an aesthetic frame around the disk held in the box.

Moulded integrally in the base portion 12 is the apparatus for holding a compact disk (a disk being shown only in Figures 3, 4 and 5), the apparatus comprising the base portion 12 of the box, two resilient inwardly extending radial arms 15 each cantilevered from the base portion 12 and interconnected at their inner ends, the inner ends being formed to provide a disk-engaging button-like member indicated generally as 16 and described in more detail hereinafter with reference to Figures 3 and 4; and four resilient inwardly extending disk ejection arms 17 also cantilevered from the base portion 12 as described in more detail hereinafter with reference to Figure 5.

The box is injection moulded, as indicated by moulding-orifice flash 18, in polypropylene or a copolymer of butadene and styrene, and the base portion 12 is apertured, with "cut aways", below the arms 15 and the ejection arms 17 to allow the complete box to be formed in a one-shot, one-piece, moulding; subsequently (as in conventional library style video boxes) a clear plastic sheet (not shown) may be welded across the outside of box, and a descriptive paper jacket or the like may be inserted between the box and the sheet to identify the contents of the box and also hide any cutaways in the base 12 of the box that might otherwise be deemed unsightly.

Referring now to Figures 3 and 4, where the two inwardly extending radial arms 15 are cantilevered from the base portion 12, the base portion 12 is reinforced by a thickening 19 of the moulding. The disk-engaging button-like member identified generally as 16 in Figure 1 is moulded as two substantially semi-circular segments 20, interconnected by an integral living hinge 21 to ensure that if either segment is depressed the other segment will also move.

Nevertheless, it should be readily understood that the segments 20 can be mechanically interconnected by, for example, a separate second button-like member (not shown).

Moreover, the outer surface of the button-like member 16 may be formed with a generally concave outer surface as indicated by the

dotted line 22 such that any accidental contact on the button-like member 16 is unlikely to act against the inner ends of either of the arms 15.

The semi-circular segments 20 are each moulded with a disk-retaining capping rim, or lip, 23, overlying an aperture or cut-away 24 in the respective arm 15 to allow the capping rims, or lips, 23 to be formed during the one-shot moulding operation.

As will be seen in Figure 3, the segments 20 are adapted to engage within the central aperture of a compact disk, such as shown at 25, with the capping rims, or lips, 23 securely retaining the disk 25. Nevertheless, as shown in Figure 4, pressure, such as indicated by the arrow "P" in Figure 4, depresses the segments 20 and hence the arms 15, thereby disengaging the capping rims, or lips, 23 from the upper surface of the disk 25 and so allowing the disk to be disengaged from the segments 20. Due to the mechanical interconnection provided between the segments 20, it will be appreciated that even if pressure is not applied centrally to the button-like member 16, the segments will still all move so as to disengage from the central hole of the disk 25.

Disengagement of the disk 25 from the segments 20 is effected by the four resilient inwardly extending disk ejection arms 17. As will be seen in Figure 5, the disk ejection arms 17, which are shown on the section line 5-5 in Figure 2, are cantilevered from the base portion 12 at a distance "x" at least 20mm radially outward from the centre and preferably at least 30mm therefrom, and at an angle "A" in the range 10 to 40 degrees and preferably in the range 20 to 30 degrees with respect to the base portion 12 when in the unstressed state, such that when the disk 25 is engaged by the segments 20, the arms 17 are flexed through an angle of only 5 to 20 degrees and preferably only 10 to 15 degrees and therefore are not unduly stressed and hence can reliably function over a long period. The arms 17 are each moulded with a pad-like end portion 26 adapted to engage on the annular inner area of the disk 25 that does not carry recorded information.

The ends of the arms 17 are preferably arranged to engage an area of the disk 25 approximately 5-10mm radially outward of the edge of the central hole thereof.

It will thus be appreciated that the disk 25 can be reliably and easily removed from the apparatus by simply pressing the button-like member 16 whereupon the disk 25 is released from engagement therewith and the resilient arms 17 act to lift the disk 25 a few millimetres so that disk 25 can be easily gripped by its outer edge and removed from the apparatus. The button-like member 16 is designed such that finger pressure on either part thereof will reliably release the disk 25 from engagement with the rim, or lip, 23 thereof.

In accordance with an important secondary aspect of this invention, when a compact disk 25 is held in the apparatus the arrangement is such that the disk 25 is resiliently supported between the capping rims or lips 23 away from the base portion 12, the resilient ejection means 17 thereby protecting the disk 25 from undue shock loads during handling or transit.

Whereas the apparatus illustrated in the drawings includes four resilient arms 17, the apparatus should include at least three such arms 17 in order to provide stable support and ejection of a disk 25, and the apparatus may include more than four arms 17 although spatial limitation may restrict the number of arms 17 that can be accommodated without unduly weakening the base 12 and/or compromising the reliability of the arms 17.

Moreover, the resilient arms 17 may be omitted, and the resilient disk ejection means may comprise one or more pieces of compressible material (not shown), e.g. foam, acting between the base 12 and the disk 25.

As will also be seen in Figure 5, the two resilient disk-engaging arms 15, which are shown as taken on the line 3-3 in Figure 2, are cantilevered from the base portion 12 at a distance "y" radially

outward from the centre, which is preferably at least 10mm and more preferably at least 15mm, and at an angle "B" in the range 5 to 30 degrees, and preferably around 10-20 degrees, with respect to the base portion 12 when in the unstressed state, so that the arrangement is such that with a disk 25 engaged thereon, as shown in Figure 3, the arms 15 are flexed through an angle of 10 degrees or less and preferably 5 degrees or less thereby ensuring that the apparatus can be repeatedly and reliably operated over a very long period.

Although the apparatus described has two arms 15, in a modified form of the apparatus (not shown) it may include three such arms each having its inner end moulded as a segment of a composite button-like disk-engaging member: and whereas even more than three such arms may be provided, it is considered that spatial limitations would prevent four or more such arms from being sufficiently sturdy to reliably withstand repeated use and would increase the difficulty of providing reliable mechanical interconnection between the ends of each of the arms.

The apparatus according to the invention may also, as shown in Figure 6, be incorporated in a disk-holding tray for fitting in an otherwise conventional jewel-case. In figure 6, the jewel-case includes a conventional box portion 27 and lid portion 28 hinged together at 29 in known manner. Within the box portion 27 is inserted the apparatus for holding a compact disk, in the form of a tray, shown generally at 30, which comprises a base portion 31, two resilient inwardly extending arms 32 cantilevered from the base portion 31 and interconnected at their inner ends, with the inner ends being formed to provide a disk-engaging button 33 in similar manner to the button-like member 16 of the apparatus described with reference to the previous Figures. Moreover, the jewel-case tray 30 shown in Figure 6 also includes four resilient inwardly extending disk ejection arms 34 similar to the arms 17 shown in Figures 1 and 5. Thus it should be understood that the apparatus of Figure 6 is operated and functions in similar manner to that of the previous Figures and therefore does not require further description.

It will be appreciated from the above description of the video-style library box that at least the base portion 12, ejection arms 17 (when provided) and the radial arms 15 may be formed as an integral plastics moulding and preferably the entire disk-holding tray or the video style library box is formed as a one-shot, integral moulding.

As described above, the apparatus for holding a disk may be provided in a video-style library box, preferably integrally moulded with a wall thereof as illustrated. Alternatively, the apparatus for holding a disk may be provided in some other form of box or enclosure. Moreover, the present invention also provides a video-style library box, as distinct from a conventional "jewel box", provided with a disk-engaging means for releasably engaging the central hole of a compact disk, the disk-engaging means preferably being integrally moulded with a wall of the box.

CLAIMS

1. Apparatus for holding a compact disk having a central hole, the apparatus comprising: a base portion, disk-engaging means extending from the base portion for releasably engaging the central hole of the disk; and ejection means arranged so that the disk is urged out of engagement with the disk engaging means when the disk is released from the disk engaging means; the disk engaging means comprising at least two arms resiliently cantilevered from the base portion and extending radially inwards at an angle away from the base portion so as to support a disk held thereby away from the base portion, the inner ends of the arms together forming, or being engaged by, a button-like member and having rims, or lips, arranged to securely retain a disk by engaging on the outwardly facing surface of a compact disk held by the disk-engaging means, the arrangement being such that pressure applied to the button-like member depresses the arms towards the base portion thereby moving the inner ends of the arms towards each other until the engagement of the rims or lips on the outwardly facing surface of the disk is released; the ejection means being arranged such that upon release of the engagement of the rims or lips on the disk, the disk is urged out of engagement with the disk engaging means.
2. Apparatus for holding a compact disk as claimed in Claim 1 in which the inner ends of adjacent arms forming the button-like member are interconnected by an integral living hinge.
3. Apparatus for holding a compact disk as claimed in Claim 1 in which the button-like member presents a generally concave outer surface.
4. Apparatus for holding a compact disk as claimed in Claim 1, 2 or 3 in which the inner ends of the arms are interconnected by a or a further button-like member engaging the inner ends of each of the arms.

5. Apparatus for holding a compact disk as claimed in any preceding claim in which the arms connect to the base portion at positions at least 10mm radially outward from the centre thereof and preferably at least 15mm from the centre thereof.
6. Apparatus for holding a compact disk as claimed in any preceding claim in which, in the unstressed state, the arms extend from the base portion at an angle in the range 5 to 30 degrees and preferably in the range 10 to 20 degrees therefrom.
7. Apparatus for holding a compact disk as claimed in any preceding claim in which the arms are arranged to flex through an angle of 10 degrees or less so as to release their engagement with the disk and preferably through an angle of 5 degrees or less.
8. Apparatus for holding a compact disk as claimed in any preceding claim having two or three resilient inwardly extending radial arms only.
9. Apparatus for holding a compact disk as claimed in any preceding claim in which the ejection means are arranged to resiliently support the disk away from the base when the disk is held by the disk engaging means.
10. Apparatus for holding a compact disk as claimed in Claim 9 in which the ejection means comprises a plurality of further inwardly extending arms resiliently cantilevered from the base portion.
11. Apparatus for holding a compact disk as claimed in Claim 10 in which the further arms connect to the base portion at positions at least 20mm radially outward from the centre thereof and preferably at least 30mm from the centre thereof.
12. Apparatus for holding a compact disk as claimed in Claim 10 or 11 in which, in the unstressed state, the further arms extend away from the base portion at an angle in the range 10 to 40 degrees and preferably in the range 20 to 30 degrees thereto.

13. Apparatus for holding a compact disk as claimed in Claim 10, 11 or 12 in which the further arms are arranged to flex through an angle in the range 5 to 20 degrees and preferably 10 to 15 degrees between their stressed position when the disk is held by the disk engaging means and their unstressed position when the disk is released.
14. Apparatus for holding a compact disk as claimed in any of Claims 10 to 13 comprising at least three further arms and preferably four further arms only.
15. Apparatus for holding a compact disk as claimed in any one of Claims 1 to 9 in which the ejection means comprises one or more pieces of compressible material which is compressed when the disk is held by the disk engaging means and expands to move the disk out of engagement with the disk engaging means when the disk engaging means is released.
16. Apparatus for holding a compact disk as claimed in any preceding claim in which the ejection means is positioned so as to engage an area of the disk radially outward of the central hole thereof, preferably 5 to 10mm radially outward from the edge thereof.
17. Apparatus for holding a compact disk as claimed in Claim 16 in which the ejection means is positioned so as to engage an area of the disk which does not carry recorded information.
18. Apparatus for holding a compact disk as claimed in any preceding claim in which the base portion forms part of a tray for fitting into a disk storage container.
19. Apparatus for holding a compact disk as claimed in any of Claims 1 to 17 in which the base portion forms part of a wall of a disk storage container.

20. Apparatus for holding a compact disk as claimed in any preceding claim, apart from Claims 4 and 15, in which the base portion, the ejection means and the inwardly extending radial arms are formed as an integral plastics moulding.
21. Apparatus for holding a compact disk as claimed in Claim 20 in which the plastics material is polypropylene or a copolymer of butadiene and styrene.
22. Apparatus for holding a compact disk having a central hole, the apparatus comprising: a base portion, disk-engaging means extending from the base portion for releasably engaging the central hole of the disk; and resilient ejection means arranged to urge the compact disk out of engagement with the disk-engaging means when the disk-engaging means is released, the resilient ejection means being arranged to resiliently support the disk away from the base when the disk is held by the disk engaging means.
23. Apparatus for holding a compact disk substantially as hereinbefore described with reference to the accompanying drawings.
24. Apparatus as claimed in any preceding claim holding a compact disk.
25. A video style library box formed as a one-piece moulding characterised by the provision therein of apparatus for holding a compact disk as claimed in any of Claims 1 to 23.
26. A video style library box as claimed in Claim 25 in which the apparatus for holding a compact disk is integrally formed with a wall of the box.
27. A video style library box substantially as hereinbefore described with reference to the accompanying drawings.

28. A method of manufacturing apparatus for holding a compact disk as claimed in Claim 1 or as claimed in Claim 22 in which the apparatus is formed as a one-piece plastics moulding.
29. A method of manufacturing apparatus for holding a compact disk substantially as hereinbefore described.

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Title APPARATUS FOR HOLDING A COMPACT DISK

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