

Device for clamping an information disc onto a turntable.

The invention relates to a device for clamping an information disc onto a turntable, comprising a frame, a turntable for supporting the information disc, which turntable is supported by the frame and is rotatable about an axis of rotation, a carrier which is movable between a first and a second position, which carrier has a disc pressure member for pressing the information disc onto the turntable in the first position of the carrier, the carrier cooperating with the disc pressure member to move said member away from the turntable during a movement of the carrier from the first position to the second position, and the carrier carrying the disc pressure member in the second position.

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Such a device is known from DE-A 33 03 705 (herewith incorporated by reference). The known device comprises a turntable mounted on a drive spindle and having a supporting surface for an information disc, for example an optical disc, which can be scanned without mechanical contact by means of laser beam. The known device further comprises a carrier provided with magnetic means and a disc-pressure member and constructed in the form of a cover, the cover being hingeably connected to a housing and being movable between a closed position, in which the disc pressure member is capable of pressing an information disc against the supporting surface of the turntable by means of a first magnetic force, and an open position, in which the disc pressure member is retained by a second magnetic force. To this end the magnetic means comprise a ring-shaped permanent magnet secured to the disc pressure member and a ferromagnetic ring secured to the cover. In the closed position of the cover the permanent magnet cooperates with the turntable, which is made of a ferromagnetic material, to press an information disc onto the turntable. In order to counteract the influence of the ferromagnetic ring the disc pressure member has been provided with a protective cap. In the open position the permanent magnet cooperates with the ferromagnetic ring to hold the disc pressure member in a floating condition counteracted by the weight of this member.

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A drawback of the known device is that during a movement of the cover between its open position and its closed position the disc pressure member performs a comparatively large but particularly jerky displacement and consequently produces noise. Another drawback is the comparatively large overall height and the comparatively large number of parts required for the known construction.

It is an object of the invention to provide a simple low-noise device for clamping an information carrier onto a turntable.

10 The device in accordance with the invention is characterised in that the carrier comprises resilient means which are in a contactless position relative to the disc pressure member in the first position of the carrier and which retain the disc pressure member in the second position of the carrier. Thus, the resilient means are constructed and positioned in such a way that in the first position of the carrier, in which position it is possible to record and/or read information, the disc pressure member together with the turntable can rotate entirely clear of the carrier or parts thereof. A simple magnet system, for example formed by a permanent magnet in the turntable and a soft-magnetic part in the carrier, can provide the required pressure on an information disc present on the turntable. As the carrier moves from the first to the second position the disc pressure member is smoothly moved away from the turntable, a small displacement of the carrier relative to the disc pressure member being adequate to bring the resilient means into contact with the disc pressure member, the pressure being applied to bring the disc pressure member into its retaining position, counteracted by the resilient means. As the carrier moves from the second to the first position the disc pressure member gradually approaches the turntable, so that the contact between the disc pressure member and the information disc disposed on the turntable is established in a well-defined manner. Thus, the device in accordance with the invention comprises comparatively simple means to allow free rotation of the disc pressure member in the first position and to ensure that it remains rattle-free in the second position. These means require only a minimal overall height. The carrier of the device in accordance with the invention may be formed by a cover which is hingeably connected to a housing.

An embodiment of the device in accordance with the invention is characterised in that the resilient means comprise a resilient tongue having a contact face for cooperation with a circumferential edge of the disc pressure member, which contact face



faces the disc pressure member. In the second position of the support the contact face of the resilient tongue ensures that the disc pressure member is locked.

An embodiment of the device in accordance with the invention is characterised in that the resilient tongue is disposed adjacent the disc pressure member and, in the first position of the carrier, extends substantially parallel to the axis of rotation of the turntable, the contact face being provided on a projecting portion of the resilient tongue, which projecting portion faces the disc pressure member and is disposed at least partly between the circumferential edge of the disc pressure member and the turntable in the first position of the carrier and engages tightly against the circumferential edge in the second position of the carrier. Preferably, the projecting portion is a substantially V-shaped free end portion of the resilient tongue, the portions of the resilient tongue which form the V-shaped end portion diverging viewed from the disc pressure member. For a correct operation it is not necessary for said portions of the tongue to have the same length.

An embodiment of the device in accordance with the invention is characterised in that in the second position of the carrier the resilient tongue presses the disc pressure member against an abutment forming part of the carrier. Preferably, this abutment is integral with the carrier and in the first position of the carrier it is preferably situated between the circumferential edge of the disc pressure member and the turntable. The spacing between the circumferential edge and the stop is preferably small.

A practical embodiment of the device in accordance with the invention is characterised in that the resilient means comprise a total of three resilient tongues which are equispaced along the circumferential edge of the disc pressure member. In this embodiment the disc pressure member is retained efficiently in the second position of the carrier by three equispaced tongues.

An embodiment of the device in accordance with the invention is characterised in that the resilient means together with the carrier are constructed as a single injection-moulded product. The resilient means, particularly the tongue or tongues, are realised simply yet effectively in this embodiment. The synthetic material may be, for example, acrylonitrile butadiene styrene (ABS).

It is to be noted that a disc-pressure mechanism using a pressure spring is known from JP-A 3-46153 (herewith incorporated by reference). The pressure spring has one end attached directly to a holder and the other end to a disc pressure member via an intermediate element. The holder is movable between a first position situated nearer a turntable and a second position situated remoter from the turntable. In the first position of



the holder the pressure spring exerts pressure on a disc lying on the turntable *via* the disc pressure member. In the second position of the holder the disc pressure member is suspended from the pressure spring. A drawback of the known mechanism is that the pressure spring is constantly connected to the disc pressure member, so that during clamping this member cannot rotate freely, *i.e.* without contact, relative to the holder with the pressure spring.

The invention further relates to a scanning device for optically scanning an information disc. Such a device is known from the afore-mentioned DE-A 33 03 705. The known device is a disc player suitable for reading, for example, optical discs and comprises a housing with an optical scanning system.

10 A first version of the scanning device in accordance with the invention for optically scanning an information disc comprises the device in accordance with the invention for clamping an information disc onto a turntable and further comprises a unit including an objective which is movable towards and away from the axis of rotation of the turntable.

15 A second version of the scanning device in accordance with the invention for optically scanning an information disc comprises a housing and a unit including a turntable and an objective which is movable towards and away from the turntable preferably comprises a device in accordance with the invention for clamping an information disc onto a turntable and further comprises a cover, which is hingeably connected to a housing, and a damper, preferably arranged in the housing, the cover having an arm with a curved toothed surface for cooperation with a toothed wheel of the damper, means being provided for generating an increasing normal force between the toothed wheel and the toothed surface during opening of the cover. An advantage of this device is that well-defined movements of the cover and a reliable locking of the cover in its open position are guaranteed with a minimal number of parts.

25 An embodiment of the last-mentioned device in accordance with the invention for optically scanning an information disc is characterised in that the means comprise a resilient finger which is inclined towards the toothed wheel and on which at least a part of the toothed surface extends, which finger has a receding end portion which adjoins the toothed surface, for cooperation with the toothed wheel in order to lock the cover in an open position. During opening of the cover the toothed wheel loads the resilient finger and in the open position of the cover the finger can relax and thereby cause the cover to be locked.

The invention also relates to an optical player provided with a scanning device in accordance with the invention.

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The invention will now be described in more detail, by way of example, with reference to the drawings, in which

Figure 1 is a partly exploded perspective view showing an embodiment
5 of the scanning device in accordance with the invention, provided with a cover,

Figure 2 is a perspective underneath view showing the cover of the embodiment of Fig. 1 as well as a disc pressure member,

Figure 3 shows the cover, provided with the diagrammatically shown disc pressure member, in an open position in a sectional view taken on the line III-III in
10 Figure 2, and

Figure 4 shows the cover, provided with the diagrammatically shown disc pressure member, in a closed position in a sectional view taken on the line III-III in Figure 2.

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The scanning device in accordance with the invention shown in Figure 1 forms part of an optical player 1, particularly a CD or CDI player. The scanning device comprises a housing 1a with a frame 1, in which an electro-optical scanning unit 3 is mounted by resilient and damping fixing means, and a cover which is hingeably connected to
20 the frame 1 by means of two pivots 5.

In the present example the scanning device 3, which comprises an objective 9, is of a type as disclosed in EP-A 541 162 (PHN 13.884, herewith incorporated by reference). The scanning unit 3, which is thus known *per se*, for optically recording and/or reading information comprises an electrically drivable turntable 11, which is rotatable
25 about an axis of rotation 11a, for supporting and centring an inscribable and or readable optical information disc, such as a CD or CDI. Mechanical guide means 13 serve for supporting and guiding a slide 15, which can be translated in a radial direction relative to the axis of rotation 11a and on which an actuator carrying the objective 9 is mounted. The slide 15 serves for moving the objective 9 over a comparatively large distance in a radial direction
30 relative to the turntable 11 and the actuator serves for realising comparatively small focusing and tracking movements of the objective 9. For a comprehensive description of the scanning unit 3 and the actuator reference is made to the afore-mentioned EP-A 541 162.

The scanning device in accordance with the invention comprises a device for clamping an information disc onto the turntable 11. In addition to said frame 1 and said

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turntable 11 the clamping device comprises a carrier with a disc pressure member 17, which carrier is movable between a first position and a second position and is formed by the cover 7. In the first position, which corresponds to the closed position of the cover 7, the disc pressure member 17 cooperates with the turntable 11 to retain an information disc lying on the turntable. In this position the disc pressure member 17 is entirely clear of the cover 7 and the required clamping force is provided by a magnet system having a first part 16, for example a permanent magnet, situated in the disc pressure member 17 and a second part 18, for example a soft-magnetic disc, situated in the turntable 11. Figure 4 shows the cover 7 in the first position. Figure 3 shows the cover 7 in the second or open position, in which position the disc pressure member 17 is supported by the cover.

The cover 7, also see Figure 2, has resilient means which in the present example comprise three resilient tongues 19, which are spaced from the disc pressure member 17 in the first position of the cover and which retain the disc pressure member 17 in the second position of the cover 7. The resilient tongues 19 are disposed in an imaginary cylindrical surface surrounding the disc pressure member 17 and are oriented in such a manner that they extend substantially parallel to the axis of rotation 11a of the turntable 11 in the closed position of the cover. Preferably, the resilient tongues 19 and the cover 7 form an integral injection-moulded product of, for example, ABS.

The resilient tongues 19 each have a projecting, particularly V-shaped, end portion 19a with a contact face 21 which faces the disc pressure member 17. In the first position of the cover 7, in which the disc pressure member 17 bears on the turntable 11, the end portions 19a are spaced from and disposed at least partly between a circumferential edge 17a of the disc pressure member 17 and the turntable 11. In the second position of the cover 7 the circumferential edge 17a of the disc pressure member 17 is a tight fit between the contact faces 21 of the resilient tongues 19 and one or more abutments of the cover 7. In the present example the cover 7 has three abutments 23, each constructed as a fixed projection on a cylindrical wall portion 25 of the cover 7.

A damper 31 situated in the housing 1a is secured to the frame 1 and has a toothed wheel 33 for cooperation with a toothed surface 35 provided on an arm 37 of the cover 7. The at least partly bent or curved toothed surface 35 extends at least partly over a resilient finger 39 of the arm 37. During the movement of the cover 7 from its closed position to its open position and *vice versa* the toothed wheel 33 is in mesh with the toothed surface 35. The toothed surface 35 is shaped and positioned in such a manner that during opening an increasing force is exerted on the finger 39, which force is directed towards the



pivot 5. In the present example this is achieved in that the toothed surface 35 is given a more gradual curvature or has no curvature at all at the location of the finger 39. In the open position the toothed wheel 33 reaches a receding end portion 41 of the finger 39, as a result of which the finger 39 springs back slightly and blocks the toothed wheel 33 and hence the cover 7. A small force enables the toothed wheel to be moved back into mesh with the toothed surface 35 for the purpose of closing.

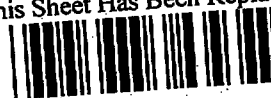
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CLAIMS:

1. A device for clamping an information disc onto a turntable, comprising
 - a frame,
 - a turntable for supporting the information disc, which turntable is supported by the frame and is rotatable about an axis of rotation,
 - 5 - a carrier which is movable between a first and a second position, which carrier has a disc pressure member for pressing the information disc onto the turntable in the first position of the carrier, the carrier cooperating with the disc pressure member to move said member away from the turntable during a movement of the carrier from the first position to the second position, and the carrier carrying the disc pressure member in
 - 10 the second position,characterised in that the carrier comprises resilient means which are in a contactless position relative to the disc pressure member in the first position of the carrier and which retain the disc pressure member in the second position of the carrier.
2. A device as claimed in Claim 1, characterised in that the resilient means
- 15 comprise a resilient tongue having a contact face for cooperation with a circumferential edge of the disc pressure member, which contact face faces the disc pressure member.
3. A device as claimed in Claim 2, characterised in that the resilient tongue is disposed adjacent the disc pressure member and, in the first position of the carrier, extends substantially parallel to the axis of rotation of the turntable, the contact face being provided
- 20 on a projecting portion of the resilient tongue, which projecting portion faces the disc pressure member and is disposed at least partly between the circumferential edge of the disc pressure member and the turntable in the first position of the carrier and engages tightly against the circumferential edge in the second position of the carrier.
4. A device as claimed in Claim 3, characterised in that in the second
- 25 position of the carrier the resilient tongue presses the disc pressure member against an abutment forming part of the carrier.
5. A device as claimed in Claim 3 or 4, characterised in that the projecting portion is a substantially V-shaped free end portion of the resilient tongue.

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6. A device as claimed in Claim 2, 3, 4 or 5, characterised in that the resilient means comprise a total of three resilient tongues which are equispaced along the circumferential edge of the disc pressure member.

7. A device as claimed in any one of the preceding Claims, characterised in that the resilient means together with the carrier are constructed as a single injection-moulded product.

8. A scanning device for optically scanning an information disc, particularly an optical disc, comprising the device as claimed in any one of the preceding Claims, and further comprising a unit including an objective which is movable towards and away from the axis of rotation of the turntable.

9. A scanning device for optically scanning an information disc, particularly an optical disc, comprising a housing and a unit including a turntable and an objective which is movable towards and away from the turntable, preferably comprising a device as claimed in any one of the Claims 1 to 7 and further comprising a cover, which is hingeably connected to a housing, and a damper, the cover having an arm with a curved toothed surface for cooperation with a toothed wheel of the damper, means being provided for generating an increasing normal force between the toothed wheel and the toothed surface during opening of the cover.

10. A scanning device as claimed in Claim 9, characterised in that the means comprise a resilient finger which is inclined towards the toothed wheel and on which at least a part of the toothed surface extends, which finger has a receding end portion which adjoins the toothed surface, for cooperation with the toothed wheel in order to lock the cover in an open position.

11. Optical player provided with a scanning device as claimed in Claim 8, 9 or 10.



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