CLAMPING ARRANGEMENT FOR A COMPACT DISC OR THE LIKE

The present invention relates to a clamping arrangement for a compact disc (CD) or the like and in particular but not exclusively to a clamping arrangement for a CD-ROM.

CD-ROMS are well-known as information storage devices. To access the information stored on a CD-ROM, CD-ROM reading apparatus are generally employed. Such CD-ROM reading apparatus typically comprise a turntable on which the CD-ROM is mounted to thereby rotate the CD-ROM. An optical reading head is mounted on for example a swing arm to read data from the CD-ROM. The optical reading head may move along a radius of the CD-ROM. The CD-ROM is rotated at a constant linear velocity such that the speed of rotation of the CD-ROM varies depending on the location of data being read so that the data is read by the reading head at a constant rate. The signal provided by the optical reading head is decoded and processed to provide an indication of the data which has been read.

When reading data from the CD-ROM, it is important to ensure that the data is being read from the correct locations on the disc and accordingly CD-ROM reading apparatus are usually provided with a clamping arrangement to keep the CD-ROM in a single plane. Without a clamping arrangement, the CD-ROM may wobble during rotation in upward and downward directions with respect to the plane of rotation of the CD-ROM. This could lead to data at an incorrect location being read or data being missed out. Additionally, this wobble might lead to inaccurate data being read from a given location on the CD-ROM.

Typically, the clamping arrangement comprises a clamper holder which supports a clamper. These clamper holders are able to move upwardly and downwardly with respect to the CD-ROM. The clamper holders may be hingedly mounted such that they can move upwardly and downwardly but are prevented from moving in a sideways direction. These clamper holders are generally also able to slide in the forwards or backwards direction relative to a plastic frame.

A tray is generally provided to support the CD-ROM as it is being read. The tray generally has a tray-in position in which the CD-ROM can be read and a tray-out position which allows the CD-ROM to be placed on or removed from the tray. In the tray-in position, the clamper holder and its associated clamper are locked into a clamping position in which the clamper in association with the clamper holder clamp the CD-ROM in position. The clamper and clamper holder are retained in the clamping position by means of a strong magnetic catch. In order to release the CD-ROM, the clamper holder and its associated clamper have to be forceably disengaged from their clamping position by using a minimum force of about 400gm to release the magnetic catch. The force required to disengage the clamper and its associated holder causes the clamper and its holder suddenly to jerk open which may result in the clamper and its holder crashing into the top casing of the drive for the CD-ROM. This is disadvantageous in that the apparatus may be damaged, particularly if the clamper and its holder repeatedly crash into the top casing. There is also the further problem that the clamper and its holder may themselves be damaged. This may result in inadequate clamping of a CD-ROM during a reading operation.

According to the first aspect of the present invention, there is provided a clamping arrangement for clamping a compact disc or the like in position on a rotary support, said clamping arrangement comprising a clamp member and guide means, said clamp member cooperating with the guide means and being movable relative to said guide means, said clamp member having a first position in which said clamp member causes the compact disc or the like to be clamped in position on the rotary support, and a second non-clamping position in which the compact disc or the like is unclamped and may be removed from the rotary support, wherein movement of the clamp member relative to the guide means causes the movement of the clamp member between the first and second positions, and the guide means retains the clamp member in a clamped position when in said first position.

By using the movement of the clamp member relative to guide means to move the clamp member between the first and second positions and by using the guide means to retain the clamp member in the clamped position, the need for a magnetic catch or the like can be avoided. This is advantageous in that it is possible to disengage the clamping member without collision or interference between the clamping arrangement and the drive for the compact disc. Embodiments of the present invention are thus able to permit the clamp member to move smoothly between the clamping and non-clamping positions without any risk of damage to the apparatus of which the clamping arrangement forms a part.

Preferably, said guide means defines a path of movement for said clamp member and includes retaining means at part of said path arranged to engage with holding means on said clamp member when located at said part of the path and thereby hold the clamp member in the clamped position. As can be seen, the guide means of embodiments of the present invention are able to not only guide the movement of the clamper member but also to retain the clamp member in the clamped position.

Preferably, said guide means guides the clamp member to move in a direction towards a plane containing said compact disc or the like when the clamp member is moving to said first position and guides the clamp member to move in a direction away from the plane containing the compact disc or the like when the clamp member moves to said second position. Additionally, or alternatively, the guide means may be arranged to guide the clamp member in direction generally parallel to a plane containing said compact disc or the like when moving between the first and second positions. In a particularly preferred embodiment, the guide means is arranged to allow the clamp member to move towards and away from the plane of the compact disc or the like as well as in a direction generally parallel to the plane containing the compact disc. This may allow a smooth movement of the clamp member between the two positions to be achieved by movement of the clamp member relative to the guide means.

The clamp member is preferably arranged to be slidable relative to the guide means. The guide means may comprise a surface means over which a portion of the clamp member moves. The guide means may comprise a surface which is arranged to contact the surface of the clamp member more remote from the compact disc or the like to thereby guide the movement of the clamp member, between said first and second positions. Alternatively, or additionally, the guide means may comprise a surface which is arranged to contact a surface of the clamp member closer to the compact disc or the like to thereby guide the movement of the clamp member between the first and second positions.

It is preferred that the or at least one surface comprise two levels, the first level of which causes the clamp member to adopt the clamping position and the second level of which causes the clamp member to adopt the second non-clamping position. This facilitates a movement of the clamp member between the two positions. A ramp may connect the first and second levels. This allows the clamp member to be moved smoothly between the two positions.

In one preferred embodiment, the guide means comprises a first downwardly facing surface and a second upwardly facing wall surface, the first and second surfaces each comprising two levels, the first levels being arranged to define the clamping position for the clamp member and the second levels being arranged to define the second non-clamping position for the clamp member, wherein said clamp member is arranged to contact, on a upper surface, the first surface, and to contact on a lower surface, the second surface, whereby movement of the clamp member relative to first and second wall surfaces causes the clamp member to move between said first and second positions. By having the upper and lower surfaces of the clamp member arranged to contact respective first and second surfaces, it can be ensured that the clamp member maintains the desired position relative to the compact disc or the like when the clamp member is on the first and/or second position. It will be appreciated that in some embodiments, the clamp member will not always be in contact with both of said surfaces, at the same time.

Preferably, the clamp member comprises at least one protrusion which is arranged to engage said guide means to guide said clamping member between said first and second positions. It is particularly preferred that the clamper holder comprise at least two protrusions. Preferably, one of the protrusions contacts the first surface of the guide means and the other of which contacts the second surface. The two protrusions can thus be used to guide the clamp member relative to the guide means and retain the clamp member in the clamping position when the clamp member is in the first position.

It is also particularly preferred that guide means be provided on either side of the clamp member. In those circumstances, it is preferred that at least one and preferably two protrusions be provided on each side of the clamp member to interact with the guide means to guide the clamping member between said two positions.

Preferably the first and second surfaces are substantially adjacent to one another and substantially collinear. This allows more precise positioning of the clamp member to be achieved as two different regions of the clamp member may contact the first and second surfaces.

The clamp member preferably comprises a clamper holder, said clamper holder being arranged to support a clamper, wherein when said clamper holder is in said first position, the clamper clamps the compact disc or the like in position and when the clamper holder is in the second position, said compact disc or the like is unclamped by the clamper. In those embodiments in which the compact disc or the like is arranged to rotate whilst being clamped, the clamper is arranged to be rotatable relative to the clamper holder to rotate with the compact disc or the like. In this way, movement of the compact disc or the like in directions perpendicular to the plane of rotation of the compact disc can be avoided without interfering with the rotation of the compact disc.

The clamping arrangement preferably further comprises a tray member for supporting said compact disc or the like, said tray having a tray-in position in which the compact disc or the like is clamped and a tray-out position in which the compact

disc or the like can be inserted in or removed from said tray, wherein movement of the tray between its tray-in and tray-out positions causes the clamp member to be guided by said guide means between said first and second positions. This may be for example achieved by cooperating engagement means of the tray member and the clamp member.

Means are preferably provided for limiting the extent of movement of the clamper holder in the direction of movement of said tray between the tray-in and tray-out positions. The means for limiting movement may take any suitable form and may for example be in the form of a wall against which the clamping member engages to prevent further movement of the clamping member. The extent of movement of the clamp member is preferably less than that of the tray.

According to a second aspect of the present invention there is provided a method of moving a clamp member between a first position in which a compact disc or the like is clamped in position on a rotary support and a second position in which said compact disc or the like is released, said method comprising : moving said clamp member relative to guide means which are provided to guide the movement of said clamp member, whereby said movement causes the clamp member to move from one of said first and second positions to the other of said first and second positions and retaining the clamp member in a clamped position when the first position, said guide means being arranged to retain the clamp member in said clamped position.

For a better understanding of the present invention and as to how the same may be carried into effect, reference will now be made by way of example to the accompanying drawings in which :

Figure 1 shows a view from above of a clamper holder;

Figure 2 shows a view from above of a clamper holder of Figure 1 with a chassis, the clamper holder being in a clamping position;

Figure 3 shows a cross-sectional view along line III-III of Figure 2;

Figure 4 shows a view from above of the clamper holder of Figure 1 with the chassis, the clamper holder being in a non-clamping position;

Figure 5 shows a cross-sectional view along line V-V of Figure 4;

Figure 6 shows a cross-sectional view of the clamper holder shown in the previous Figures with a clamper supported by the clamper holder, clamping a CD-ROM in position; and

Figure 7 is a schematic view illustrating how a tray causes movement of the clamper holder.

Reference will now be made to the Figures which show a clamper holder 2 for a CD-ROM reading apparatus. The clamper holder 2 is arranged to support a clamper 4 which in turns clamps a CD-ROM 5 in position whilst the CD-ROM is being read. The clamper 4 and CD-ROM 5 are shown in Figure 6 and will be described in more detail hereinafter. The clamper holder 2 cooperates with a chassis 32 and tray 30. The clamper holder 2 is preferably made of a suitable metal whilst the chassis 32 and tray 30 are preferably made of a suitable plastics material. However, the clamper holder 2, chasses 32 and tray 30 can be made of any other suitable materials.

The clamper holder 2, which can be seen particularly clearly from Figure 1, comprises a generally planar body portion 8 and two wing portions 10 which lie in the same plane as the body portion 8. The body portion 8 has a circular cut-out portion 12 which is surrounded by a ring shaped surface 14. The ring shaped surface 14 and the circular cut-out portion 12 lie in a plane parallel to and below the general plane of the clamper holder 2. A wall 11 extends between the ring shaped surface 14 which is on the lower plane and the general plane of the clamper holder 2. As will be described in more detail hereinafter, the ring shaped surface 14 and cut-out portion 12 are arranged to support the clamper 4 and, when the clamper holder 2 is in a clamping position, to cause the clamper 4 to clamp the CD-ROM 5 in place. This will be described in more detail in relation to Figure 6.

The body portion 8 of the clamper holder 2 has a second cut-out portion 15 which can accommodate other parts of the CD-ROM reading apparatus. In particular,

the second cut-out portion 15 allows an added feature to the drive such as, for example, a lens cleaning device. Additionally, the second cut-out portion 15 allows the weight of the clamper holder to be reduced.

The two-wing portions 10 each have two protrusions 16 and 18. The first protrusions 16 each have first and second parts 20 and 22 respectively which extend above the general plane of the clamper holder 2 whilst the second protrusions 18 each have a single part 23 which projects below the general plane of the clamper holder 2. Thus, the lower surfaces 17a of protrusions 16 are generally planar with parts 20 and 22 extending from the upper surface 17b thereof. In contrast, the upper surfaces 19b of protrusion 18 are generally planar whilst the first part 23 extends from the lower surface 19a thereof. This can clearly be seen from Figures 3 and 5. The upwardly and downwardly extending parts 20, 22 and 23 are arranged to curve away from contact surfaces of the plastics chassis 32 with which the protrusions 16 and 18 come into contact. This will be discussed in more detail hereinafter. This means that the upwardly and downwardly extending parts 20, 22 and 23 extend upwardly or downwardly away from the plastics contact surfaces. This reduces the risk of the metal protrusions 16 and 18 digging into or damaging the plastics surfaces at the point of contact.

The clamper holder 2 is arranged to be hingedly connected via pins 24 to a frame 26 that can be seen in Figures 2 and 4. Thus, the clamper holder 2 is free to move relative to the frame 26 in a upward direction, that is in a direction perpendicular to the plane of the sheets of paper containing Figures 2 and 4. Sideways movement of the clamper holder 2 in the direction of arrow B is prevented by virtue of the hinged connection between the frame 26 and clamper holder 2. As will be described in more detail, the frame 26 and the clamper holder 2 are arranged so as to be movable backwards and forwards with respect to the chassis 32 in the direction of arrow C. The frame 26 is arranged so that it is not able to move in the sideways directions but is only free to move in the backwards, forwards, upwards and downwards directions. This movement of the frame 26 an be achieved by providing guide rails (not shown) in the chassis 32 for the frame 26.

The clamper holder 2 is movable between a clamping position (shown in Figures 2 and 3) in which the CD-ROM is clamped in position and a non-clamping position (shown in Figures 4 and 5) in which the CD-ROM is released. The movement of the clamper holder 2 between these two positions will be described in more detail hereinafter.

The chassis 32 and tray 30 will now be described with particular reference to Figures 2 to 5. The tray 30 has a generally circular recess 31 (see Figure 2), the outer circumference of which conforms generally to the size of a standard 12cm CD-ROM. A further generally circular recess 33 is arranged within the first circular recess 31 which conforms to the size of a standard 8cm CD-ROM. The first circular recess 31 and the further generally circular recess 33 together define a ring like surface 35. The plane of the further recess 33 is lower than that of surface 35. In use, a 12cm CD-ROM is accommodated within the boundary of the first circular recess 31 with the CD-ROM 5 being supported by the ring like surface 35. Similarly, a 8cm CD-ROM is accommodated within the boundary of the second circular recess 33 with the CD-ROM 5 being supported by surface 35A of said second circular recess 33.

The tray 30 also has a cut-away portion 37 (see Figure 2) which is provided to allow the CD-ROM 5 to be read, by, for example a reading unit 28 (see Figure 6). The reading unit 28 is provided below the CD-ROM and is arranged to move back and forth in the direction of arrow A along a radius of the CD-ROM 5 to scan the CD-ROM to thereby read information thereon. The cut-away portion 37 thus allows the reading unit 28 to be accommodated below the tray 30 without the tray 30 coming between the reading unit 28 and the CD-ROM. The extent of the cut-away portion 37 is sufficient to allow the reading unit 28 to scan along a radius of the CD-ROM 5.

Additionally, the cut-away portion 37 allows a turntable 29 (see Figure 6) to contact the CD-ROM 5 to rotate it during a reading operation. As with the reading unit 28, the turntable 29 is accommodated below the tray. On each side of the cut-away portion 37 of the tray 30 is a side portion 39 which has a first wider part 39a and a second narrower part 39b. These first and second parts 39a and 39b cooperate with the

chassis 32 to guide the tray 30 between its tray-in and tray-out positions. The side portion 39 has the narrower parts 39b to avoid interference between the tray 30 and the clamper holder 2 in the region where the clamper holder 2 is hingedly connected to the frame 26, particularly when the tray 30 is in the tray-in position discussed below. In use, the tray 30 moves between a tray-out position (shown in Figure 4) in which a CD-ROM 5 can be inserted or removed from the circular recess 31 and a tray-in position which can be seen from Figure 2. When the tray 30 is in the tray-in position, the CD-ROM 5 is clamped by the action of the clamper holder 2 and the CD-ROM 5 can be read. When the tray 30 is in the tray-out position, the clamper holder 2 is in the non-clamping position shown in Figures 4 and 5.

The tray 30 is arranged to be guided between the tray-in and tray-out positions by the chassis 32, which remains fixed in position, and slides over the chassis 32 between the two positions. The movement of the tray 30 is guided by cooperation of the sides of the tray 30 with the side walls 34 of the chassis 32. The frame 26 to which the clamper holder 2 is hingedly connected is slidably mounted with respect to the chassis 32 and is thus movable with respect to the chassis 32. As will be described in more detail hereinafter, the path of movement of the frame 26 and the clamper holder 2 in the direction of sliding of the tray 30 (in the direction of arrow A) is determined by the interaction of the clamper holder 2 with the side walls 34 of the chassis 32. Movement of the tray 30 causes the movement of the clamper holder 2 and the frame 26. However, as discussed later, the maximum extent of movement in the direction of arrow C of the clamper holder 2 and frame 26 is less than that of the tray 30 in that same direction.

The side walls 34 will now be described in more detail. As can be seen from Figures 2 and 5, the side walls each comprise a first wall portion 36 and a second wall portion 38 which interact with the clamper holder 2 and constitute guide means therefor. These two wall portions 36 and 38 are adjacent to one another and extend longitudinally generally in the direction of sliding of the tray 30.

The second wall portion 38 extends upwardly from the chassis 32 and has an upper surface 42 profile which can be seen particularly clearly from Figures 3 and 5. The profile of the upper surface 42 of the second wall part 38 will be described starting from the end of the second wall part 38 closer to the hinged end of the clamper holder 2. The first part 44 of the upper surface of the second wall 38 is flat. The second part 46 slopes upwardly with a relatively steep gradient whilst the third part 48 of the second wall part 38 is again flat. The fourth part 49 slopes upwardly less steeply than the second part 46 of the second wall portion 38. Finally, the last part 50 of the upper surface 42 of the second wall portion 38 is once more flat.

The first wall portion 36 will now be described. The first wall portion 36 has a protruding part 52 which extends inwardly therefrom. The upper surface 54 of the protruding part 52 is substantially planar and lies flush with the top of the first wall portion 36. The lower surface 55 of the protruding part 52 has a first flat part 61 which extends along most of the length of the protruding part 52. This flat part 61 is next to a downwardly sloping part 60 and on the other side of the sloping part 60, there is a further flat part 62. The plane containing the first flat part 61 is above that containing the further flat part 62. The further flat part 62 and the downwardly sloping part 60 define a downwardly extending wedge 58 which can be seen particularly clearly from Figures 3 and 5. The longitudinal extent of at least part of the protruding part 52 is generally collinear with that of the second wall portion 38. As can be seen from Figures 3 and 5, the wedge 58 is at the end of the protruding part 52 further from second wall portion 38.

A further wall 53 which acts as a stop, as will be described in more detail hereinafter, is arranged adjacent to the second wall portion 38. This stop wall 53 is higher than the highest part of the second wall portion 38, that is the part of the second wall portion 38 with the final upper surface part 50. Thus, a side 59 of the stop wall 53 extends at right angles to the final upper surface part 50.

The wall 34 on the other side of the chassis 32 is a mirror image of that shown in Figures 3 and 5, at least in the region of interaction of the clamper holder 2 with the chassis 32.

As will now be described, the first and second wall portions 36 and 38 act to guide the movement of the clamper holder 2 between the clamping position as shown in Figures 2 and 3 in which the CD-ROM 5 is clamped by the clamper 4 in association with the clamper holder 2 and a non-clamping position as shown in Figures 4 and 5 in which the CD-ROM is unclamped. The clamping position of the clamper holder 2 will now be discussed with reference to Figures 2 and 3. The tray 30 is in the tray-in position when the clamper holder 2 is in its clamping position. The clamper holder 2 and the frame 26 to which it is mounted are also in their innermost position with respect to the chassis 32. The upper surfaces 19b of the second protrusions 18 on each side of the clamper holder 2 contact further wedge 58 of the protruding part 52 of the first wall portion 36. The lower surfaces 17a of the protrusions 16 on each side of the clamper holder 2 contact the third, flat part 48 of the second wall portion 38. The clamper holder 2 is thus in its lowermost position with respect to the CD-ROM 5 and as will be described hereinafter causes the clamper 4 to clamp the CD-ROM 5. The plane of the clamper holder 2 is generally parallel to the plane of the CD-ROM 5.

The non-clamping position of the clamper holder 2 will now be described with reference to Figures 4 and 5. When the tray 30 is moved to a tray-out position, the movement of the tray 30 also causes the frame 26 to be moved outwardly along with clamper holder 2. The movement of the frame 26 is caused by engagement between that frame 26 and the tray 30 as will be discussed hereinafter. As the frame 26 and the clamper holder 2 move outwardly in the direction towards the tray-out position of the tray 30, the protrusion 18 of the clamper holder 2 is moved out of engagement with flat surface 62 of the wedge 58, moves along sloping surface 60. However, the protrusion 18 does not contact the first flat part 61 of the first movable part 36. The first flat part 61 acts to limit any movement of the clamper holder in the upwards direction. At the same time, the first protrusion moves along the fourth sloping part 49 of the second wall portion 38 and comes to rest on the final part 50 of the second wall portion 38.

As can be seen from a comparison of Figure 5 with Figure 3, the clamper holder 2 is in a higher position as compared to when the clamper holder 2 is in the clamping position shown in Figures 2 and 3. Thus, when the clamper holder 2 is in the position shown in Figures 3 and 4, clearance is provided between the clamper 4 and a CD-ROM. The stop wall 53 prevents the clamper holder 2 from being moved by the tray beyond the position shown in Figure 5. This, therefore, limits the extent of movement of the clamper holder 2 in one of its directions of sliding movement.

When the tray 30 is moved back to the tray-in position, the clamper holder 2 and the frame 26 are engaged by the tray 30 and are moved inwardly as will be discussed later. The inward movement of the clamper holder 2 and frame 26 is limited by engagement between the frame 26 and the chassis 32 as shown in Figure 2. This, therefore, limits the extent of movement of the clamper holder 2 in its other direction of sliding movement. The protrusions 16 and 18 of the clamper holder 2 are guided back to the positions shown in Figures 2 and 3. The path taken by the protrusions 16 and 18 is opposite to that taken as the clamper holder 2 moves from the clamping position to the non-clamping position. As will be appreciated, the clamper holder 2 starts to release the CD-ROM as soon as the clamper holder 2 moves out of the clamping position shown in Figures 2 and 3.

The protrusions 16 and 18 cooperate with the wall portions 36 and 38 to guide the clamper holder 2 between the clamping and non-clamping positions. Additionally, when the clamper holder 2 is in the clamping position, the engagement of the clamper holder 2 with the downwardly facing flat surface 62 of wedge 58 and with the upwardly facing surface 48 of the second wall portion 38 prevents the clamper holder 2 from moving in an upward and downward direction relative to the frame 26. Similarly, when the clamper holder 2 is in the non-clamping position shown in Figures 4 and 5, the downwardly facing surface 61 of the first wall portion 36 and the upwardly facing surface of the final part 50 of the second wall portion 38 limits the upward and downward movement of the clamper holder 2 relative to the frame 26. The clamper holder 2 of course moves upwardly and downwardly relative to the frame 26 as it moves between the clamping and non-clamping positions.

Reference will now be made to Figure 7 which schematically illustrates how the movement of the clamper holder 2 is achieved. The frame 26, on which the clamper holder 2 is mounted, has an engaging protrusion 100 which when the clamper holder is in the clamped position engages in recess 102 of a slot 104 of the tray 30. As the tray 30 moves outwardly towards the tray-out position, the protrusion 100 is guided by side 102a of the recess 102 out of that recess. The tray 30 continues to move outwardly to the tray-out position. However, as the protrusion 100 is no longer in recess 102, the frame 26 does not move relative to the tray 30 and remains stationary. Additionally, the stop wall 53 also prevents further movement of the frame 26 and the clamper holder 2 which is attached thereto in a direction towards the tray-out position. When the tray 30 is moved towards the tray-in position, the frame 26 remains stationary until protrusion 100 is engaged in recess 102. Once the protrusion 100 has engaged in recess 102, the frame 26 and the clamper holder 2 are moved inwardly together with the tray 30.

Reference will now be made to Figure 6 which shows a clamper holder 2 together with the clamper 4 clamping the CD-ROM 5 in position. The CD-ROM 5 is rotated by turntable 29 which supports the CD-ROM from below. The turntable 29 causes the CD-ROM 5 to be rotated during the reading operation. The clamper 4 is arranged so as to be rotatable relative to the clamper holder 2. The clamper 4 is made of any suitable material such as, for example, a plastics material. The clamper 4 has a clamping surface 72 which is arranged to contact a CD-ROM 5 in use. The clamping surface 72 is in the form of a ring. The clamping surface 72 may be covered with a material such as felt to prevent scratching of the CD-ROM 5 by the clamping surface 72 and to facilitate engagement between the CD-ROM 5 and clamping surface 72.

The clamper 4 has a first substantially extending protrusion 76 and a second sidewardly extending protrusion 77 which extends around a respective part of the clamper 4. The first protrusion 76 lies above the clamper holder 2 whilst the second sidewardly extending protrusion 77 lies below the clamper holder 2. These protrusions 76 and 77 are thus arranged in parallel and spaced apart planes. In this way, it can be ensured that the clamper 4 moves upwardly and downwardly in conjunction with the

clamper holder 2. The distance between the protrusions 76 and 77 is designed so as to permit the clamper 4 to rotate with respect to the clamper holder 2. The clamper 4 also has a dome 78 which extends upwardly from the inner circumference 79 of the clamping surface 72. The dome 78 which also houses a strong magnet allows a pin member 80 of the turntable to protrude through the CD-ROM without contacting the clamper holder which could adversely affect the speed of the CD-ROM.

Thus, when the clamper holder 2 is in the engaged position shown in Figures 2 and 3, the magnet 81 attracts the metal chuck 82 causing clamper 4 to move downwards by the interaction of the magnetic circuit closing between the magnet 81 and the chuck 82. The clamping surface 72 of the clamper 4 is pressed downwardly so that the CD-ROM is clamped in position by the action of the clamper 4 against the turntable 29. The CD-ROM 5 is read by the reading unit 28 as the CD-ROM 5 is rotated by the turntable 29. The action of the turntable 29 in combination with the clamper 4 maintains the CD-ROM 5 in a given plane during rotation thereof. As the clamper 4 is free to rotate relative to the clamper holder 2, it does not interfere with the rotation of the CD-ROM 5. When the clamper holder 2 is in the disengaged position shown in Figures 3 and 4, the clamper 4 in association with the turntable 29 no longer clamps the CD-ROM 5 which allows the CD-ROM 5 accommodated in the tray 30 to be removed from the apparatus.

It should be appreciated that whilst the present invention has been described in relation to a CD-ROM, embodiments of the invention can have applications to other similar systems and the compact disc need not be a ROM. Embodiments of the invention may also have applications to arrangements which use any type of compact disc or similar media. Additionally, the CD in question may additionally be written to instead of or additionally to being read.

* C L M S *

CLAIMS :

1. A clamping arrangement for clamping a compact disc or the like in position on a rotary support, said clamping arrangement comprising a clamp member and guide means, said clamp member cooperating with the guide means and being movable relative to said guide means, said clamp member having a first position in which said clamp member causes the compact disc or the like to be clamped in position on the rotary support, and a second non-clamping position in which the compact disc or the like is unclamped and may be removed from the rotary support, wherein movement of the clamp member relative to the guide means causes the movement of the clamp member between the first and second positions, and the guide means retains the clamp member in a clamped position when in said first position.

2. A clamping arrangement as claimed in claim 1 in which said guide means defines a path of movement for said clamp member and includes retaining means at part of said path arranged to engage with holding means on said clamp member when located at said part of the path and thereby hold the clamp member in the clamped position.

3. A clamping arrangement as claimed in claim 1 or 2, wherein said guide means includes guide members arranged to guide the clamp member to move in a direction towards a plane containing said compact disc or the like when the clamp member is moving to said first position and to guide the clamp member to move in a direction away from the plane containing the compact disc or the like when the clamper member moves to said second position.

4. A clamping arrangement as claimed in claim 1, 2 or 3, wherein said guide means has guide members arranged to guide the clamp member in a direction generally parallel to a plane containing said compact disc or the like when moving between the first and second positions.

5. A clamping arrangement as claimed in the preceding claims, wherein said clamp member is arranged to be slidable relative to said guide means.

6. A clamping arrangement as claimed in any preceding claim wherein said guide means comprises a surface which is arranged to contact a surface of the clamp member more remote from the compact disc or the like to thereby guide the movement of the clamp member between said first and second positions.

7. A clamping arrangement as claimed in any preceding claim wherein said guide means comprises a surface which is arranged to contact a surface of the clamp member closer to the compact disc or the like to thereby guide the movement of the clamp member between said first and second positions.

8. A clamping arrangement as claimed in claim 6 or 7, wherein the or at least one surface comprises two levels, the first level of which causes the clamp member to adopt the clamping position and the second level of which causes the clamp member to adopt the second non-clamping position.

9. A clamping arrangement as claimed in claim 8 wherein a ramp connects said first and second levels.

10. A clamping arrangement as claimed in any preceding claim wherein said guide means comprises a first downwardly facing surface and a second upwardly facing surface, the first and second surfaces each comprising two levels, the first levels being arranged to define the clamping position for the clamper member and the second levels being arranged to define said second non-clamping position for the clamp member, wherein said clamp member is arranged to contact, on an upper surface, the first surface and to contact on a lower surface the second surface, whereby movement of said clamp member relative to said first and second surfaces causes said clamp member to move between said first and second positions.

11. A clamping arrangement as claimed in claim 10, wherein said first and second surfaces are substantially adjacent to one another and substantially collinear.

12. A clamping arrangement as claimed in any preceding claim, wherein said clamp member comprises at least one protrusion which is arranged to engage said guide means to guide said clamping member between said first and second positions.

13. A clamping arrangement as claimed in claim 12 when appended to claim 10 or 11, wherein two protrusions are provided, one of which contacts said first surface and the other of which engages the second surface.

14. A clamping arrangement as claimed in any preceding claim, wherein said clamp member comprises a clamper holder, said clamper holder being arranged to support a clamper, wherein when said clamper holder is in said first position the clamper clamps the compact disc or the like in position on the rotary support and when the clamper holder is in the said second position, said compact disc or the like in unclamped by the clamper.

15. A clamping arrangement as claimed in claim 14, wherein said compact disc or the like is arranged to rotate, whilst being clamped by said rotary support, said clamper being arranged to the rotatable relative to said clamper holder to rotate with said compact disc or the like.

16. A clamping arrangement as claimed in any preceding claim, further comprises a tray member for supporting said compact disc or the like, said tray having a tray-in position in which the compact disc or the like is clamped and a tray-out position in which the compact disc or the like can be inserted in or removed from said tray, wherein movement of said tray between its tray-in and tray-out positions causes said clamp member to be guided by said guide means between said first clamping and second non-clamping positions.

17. A clamping arrangement as claimed in claim 16, wherein means are provided for limiting the extent of movement of the clamp member in the direction of movement of said tray between the tray-in and tray-out positions.

18. A clamping arrangement as claimed in any preceding claim, wherein guide means, are provided on two opposite sides of said clamp member.

19. A method of moving a clamp member between a first position in which a compact disc or the like is clamped in position on a rotary support and a second position in which said compact disc or the like is released, said method comprising :

moving said clamp member relative to guide means which are provided to guide the movement of said clamp member, whereby said movement causes the clamp member to move from one of said first and second positions to the other of said first and second positions; and

retaining the clamp member in a clamped position, when in the first position, said guide means being arranged to retain the clamp member in said clamped position.