

SPECIFICATION

Cylinder Lock Mechanism

This invention relates to a cylinder lock mechanism of the kind comprising a hollow cylinder housing which houses a plurality of tumbler discs turnable by means of the key of the lock mechanism and provided with a peripheral recess, a locking bar extending axially relative to the locking discs and being radially guided by them, and a turnable force transmission member non-turnably connected to the locking bar.

The disc cylinder lock mechanism with turnable locking discs is the most secure of all known types of cylinder lock mechanisms. Yet, one of its drawbacks is that the lock mechanism cannot be given very small diametrical dimensions, because the elements of the lock mechanism require a certain space in the radial direction. In a conventional disc cylinder lock mechanism, there is a turnable cylinder within the cylinder housing and locking discs fitted in the interior of the cylinder. It has been discovered, that the hollow part of the cylinder, which encloses the locking discs, is not absolutely necessary. Lock mechanisms without this part are known, for instance from U.S. Patent Specification No. 2,217,047. However, this known lock mechanism differ considerably from known disc cylinder lock mechanisms, among other things, in that each of its locking discs is guided by a separate groove made in the cylinder housing of the lock mechanism. The use of such guiding grooves requires, firstly, that the cylinder housing of the lock is divided into two parts along an axial plane, due to which the cylinder housing will be weak and at the same time complicated and expensive. Secondly, the function of the known lock mechanism is extremely unreliable, because there is no member pushing the locking bar outwards to its locking position. For these reasons the lock mechanism is not able to fulfil the requirements of a security lock mechanism, but new and more practical solutions must be found to make it possible to dispense with a part of the cylinder.

The present invention aims to create a disc cylinder lock mechanism of the kind referred to which functions reliably and is as uncomplicated as possible, which lock mechanism is cylinderless in the sense that that part of a conventional cylinder has been left out, inside which the locking discs are usually fitted.

According to the invention, a cylinder lock mechanism of the kind referred to, is characterized in that between the locking discs, there are spacer discs provided with a peripheral recess at the position of the locking bar, which peripheral recess is so formed that it guides, in the tangential direction of the spacer discs, the radial movement of the locking bar, in that the locking discs as well as the spacer discs are turnably guided and radially supported directly by the internal surface of the cylinder housing, and in that the locking discs, the spacer discs and the

locking bar have guiding surfaces acting in a tangential direction and so arranged that by means of them a tangential locking of the spacer discs relative to the locking bar is obtained in all functional positions of the lock mechanism as well as a limited movability of the locking discs relative to the locking bar and the necessary force transmission at the limits of said movability range.

The function of a lock mechanism in accordance with the invention is as secure and reliable as the function of a conventional disc cylinder lock mechanism, but it can be made with smaller external dimensions than a normal lock mechanism. The construction makes it possible to insert the disc set of locking and spacer discs in an axial direction into the cylinder housing, because it is not necessary to provide the internal surface of the cylinder housing with guiding grooves for the locking discs nor with guiding elements for the spacer discs. Hence, the cylinder housing does not have to be divided axially, which simplifies and strengthens the lock mechanism construction.

In a lock mechanism in accordance with the invention said guiding surfaces acting in a tangential direction can with advantage be arranged by providing several locking discs with a peripheral recess having a narrow, deep part and a broad, shallow part, and being so arranged, that the locking bar moves partly into the narrow, deep part when the lock mechanism is released. The shallow and considerably broader part determines the freedom of turning of the locking disc in question relative to the locking bar and prevents the locking bar from entering into said deep part until the deep parts of all locking discs have been brought to the position of the locking bar by means of the key of the lock mechanism. By this means, the necessary guiding of the locking bar is obtained in a simple way and the function of the lock mechanism will be secure and reliable.

Said tangentially acting guiding surfaces can also be arranged so that the radial dimension of the locking bar, at least at the position of some of the locking discs, is made smaller than at the position of the spacer discs. In this case, only a narrow peripheral recess is needed at the position of those locking discs where the radial dimension of the locking bar is small. Nevertheless, it is recommendable that there is a locking disc provided with two combined peripheral recesses at least at the outer end of the lock mechanism, preferably at both its ends, the radial dimension of the locking bar at these positions then being greater than at the position of the locking discs having only one peripheral recess. The locking discs at both ends of the disc set of the lock mechanism can with advantage work as so-called lifting locking discs for lifting the locking bar up from the channel formed by the peripheral recesses of the locking discs when the disc set is turned by the key in the locking direction. If said arrangement is used only at the outer end of the locking bar, that is, at that end at which the key is inserted in the lock mechanism, its opposite end

can be urged radially outwards by means of a spring.

In a lock mechanism in accordance with the invention, the turning angle of the locking discs relative to the locking bar can be limited by means of the side edges of said broad peripheral recess. It is not necessary to limit the turning angle of all the locking discs. There is also another solution providing means for limiting easily the turning angle of all the locking discs in both directions and means for guiding the spacer discs as well. According to this solution, the spacer discs are non-turnably locked relative to the locking bar by means of a separate element connected to said force transmission member, which element may be an axially disposed bar or tongue connected to said force transmission member, which bar or tongue at the same time may function as a member locking the turning movement of the spacer discs and limiting the turning movement of the locking discs. The suggested solution presupposes that the locking discs are provided with a second peripheral recess or with other suitable guiding surfaces for said bar or tongue.

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

Figure 1 is a longitudinal sectional view of a first embodiment of a lock mechanism according to the invention.

Figure 2 is a sectional view taken on the line II—II of Figure 1.

Figure 3 is a sectional view taken on the line III—III of Figure 1.

Figure 4 is an end view of a locking disc of a second embodiment of a lock mechanism according to the invention.

Figure 5 is an end view of a so-called lifting locking disc of the same second embodiment of the lock mechanism.

Figure 6 is a side view of the locking bar of the second embodiment of the lock mechanism.

Figure 7 is a cross-sectional view of a third embodiment of a lock mechanism according to the invention.

Figure 8 is an end view of a locking disc of the lock mechanism according to Figure 7.

Figure 9 is an end view of a so-called lifting locking disc of the lock mechanism according to Figure 7.

Figure 10 is an end view of a spacer disc of the lock mechanism according to Figure 7, and

Figure 11 is a side view of the locking bar of the lock mechanism according to Figure 7.

The lock mechanism shown in Figure 1 comprises a cylinder housing 1, a locking bar 2, locking discs 3, spacer discs 4 between adjacent locking discs, a force transmission member 5 at the inner end of the lock mechanism and a key 6 for actuating the lock mechanism. As can be seen from Figure 2, the locking bar 2, in its locking position, is partly located in an axial groove 7 made in the cylinder housing 1. When the lock mechanism is in its locking position, the locking discs 3 prevent the locking bar 2 from leaving the

groove 7, and a radial portion 8 of the locking bar locks the force transmission member 5 against turning. At the same time, the locking bar 2 functions as a locking member for the spacer discs 4 and prevents their turning movement.

From Figure 3 it will be seen that the locking discs 3 have a deep peripheral recess 9 and a shallow, but considerably broader peripheral recess 10. When the key 6 is turned in the opening direction of the lock mechanism, combination surfaces 11 of the key (see Figure 1) bring each locking disc 3 to such a position, that the deep peripheral recess 9 assumes a position opposite the locking bar 2. As a result, a continuous channel is formed below the locking bar, into which the locking bar 2 may move and so become released from its locking groove 7. When the locking bar 2 has been released in this way, the entire set of discs 3 and 4 and the force transmission member 5 of the lock mechanism can be turned in the opening direction of the lock mechanism. The side edges of the broad peripheral recess 10 of the locking discs determined the freedom of movement of the locking discs 3 relative to the locking bar 2.

In order to obtain a lifting of the locking bar 2, a locking bar lift spring 13, shown in Figure 1, is used, and, in addition, a so-called lifting locking disc is needed, at least at the opposite end of the locking bar, that is, at its outer end. If there is no mechanism to effect lifting of the locking bar 2, the turning of the lock mechanism back to its locking position will not stop when the locking bar comes opposite the position of the locking groove 7, and the key cannot be withdrawn from the lock mechanism.

Figure 4 shows a locking disc of another embodiment, slightly different from the above described embodiment, which locking disc does function as a lifting locking disc. This locking disc has a narrow peripheral recess 9a but no broad peripheral recess. However, the use of this kind of locking disc is only possible when the radial dimension of the locking bar 2 has been reduced, as shown at the positions 14 in Figure 6, by removing from the locking bar, at the position of the non-lifting locking discs, that part of the locking bar which would be left outside of the locking groove 7. At the positions 15 of the locking bar, there are spacer discs and at the positions 16 lifting locking discs. A lifting locking disc is shown in Figure 5. It has both a narrow peripheral recess 9 and a broad peripheral recess 10.

The lock mechanism shown in Figures 7—11 differs from those described above in that a separate bar or tongue 17, which is used as a member limiting the turning movement of the locking discs and locking the spacer discs, is axially disposed in the lock mechanism extending from the force transmission member 5. Also in this lock mechanism, the non-lifting locking disc shown in Figure 8 has only a narrow peripheral recess 9a for the locking bar, but in addition it has a separate broad peripheral recess 18, the object

of which is to determine the freedom of turning of the locking disc by means of the tongue 17. The lifting locking disc shown in Figure 9 corresponds to the lifting locking disc shown in Figure 5. The only difference is that this locking disc, of course, has to have the same kind of additional broad peripheral recess 18 as in the locking disc shown in Figure 8.

The spacer disc 4 shown in Figure 10 corresponds to the spacer discs of the other lock mechanisms described above, but in addition it has a peripheral recess 19, which corresponds to the width of member 17 and prevents turning of the spacer disc relative to the locking bar. In Figure 11 a locking bar 2b is shown, from the middle part 20 of which the portion exceeding the depth of the locking groove 7 has been removed. At least at one end of the locking bar, at the position 21, but preferably also at its other end, at the position 22, there is a lifting locking disc according to Figure 9. In other respects the function of the locking bar 2b and the way it is fitted in the lock mechanism corresponds completely to the function and way of fitting of the locking bars described above.

Claims

1. A cylinder lock mechanism comprising a hollow cylinder housing which houses a plurality of tumbler discs turnable by means of the key of the lock mechanism and provided with a peripheral recess, a locking bar extending axially relative to the locking discs and being radially guided by them, and a turnable force transmission member non-turnably connected to the locking bar, characterized in that between the locking discs, there are spacer discs provided with a peripheral recess at the position of the locking bar, which peripheral recess is so formed that it guides, in the tangential direction of the spacer discs, the radial movement of the locking bar, in that the locking discs as well as the spacer discs are turnably guided and radially supported directly by the internal surface of the cylinder housing, and in that the locking discs, the spacer discs and the locking bar have guiding surfaces acting in a

tangential direction and so arranged, that by means of them a tangential locking of the spacer discs relative to the locking bar is obtained in all functional positions of the lock mechanism as well as a limited movability of the locking discs relative to the locking bar and the necessary force transmission at the limits of said movability range.

2. A lock mechanism according to claim 1, in which said guiding surfaces acting in a tangential direction have been arranged by providing several locking discs with a peripheral recess having a narrow, deep part and a broad, shallow part and being so arranged that the locking bar moves partly into the narrow, deep part when the lock mechanism is released.

3. A lock mechanism according to claim 1, in which said guiding surfaces acting in a tangential direction have been arranged by making the radial dimension of the locking bar, at least at the position of some locking discs, smaller than at the position of the spacer discs.

4. A lock mechanism according to claim 3, in which, in those locking discs, at the position of which the radial dimension of the locking bar is smaller than at the position of the spacer discs, there is only a narrow peripheral recess.

5. A lock mechanism according to claim 3, in which the spacer discs are non-turnably locked relative to the locking bar by means of a separate element connected to said force transmission member.

6. A lock mechanism according to claim 5, in which said separate element is another bar or tongue axially disposed in the lock mechanism and connected to said force transmission member, which bar or tongue functions as a member locking the turning movement of the spacer discs and as a member limiting the turning movement of the locking discs.

7. A cylinder lock mechanism constructed and arranged substantially as herein described with reference to, and as illustrated in, Figures 1 to 3, Figures 4 to 6, or Figures 7 to 11 of the accompanying drawings.

8. A lock comprising the lock mechanism claimed in any of the preceding claims.



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Claims

1. A cylinder lock mechanism comprising a hollow cylinder housing which houses a plurality of tumbler discs turnable by means of the key of the lock mechanism and provided with a peripheral recess, a locking bar extending axially relative to the locking discs and being radially guided by them, and a turnable force transmission member non-turnably connected to the locking bar, characterized in that between the locking discs, there are spacer discs provided with a peripheral recess at the position of the locking bar, which peripheral recess is so formed that it guides, in the tangential direction of the spacer discs, the radial movement of the locking bar, in that the locking discs as well as the spacer discs are turnably guided and radially supported directly by the internal surface of the cylinder housing, and in that the locking discs, the spacer discs and the locking bar have guiding surfaces acting in a

tangential direction and so arranged, that by means of them a tangential locking of the spacer discs relative to the locking bar is obtained in all functional positions of the lock mechanism as well as a limited movability of the locking discs relative to the locking bar and the necessary force transmission at the limits of said movability range.

2. A lock mechanism according to claim 1, in which said guiding surfaces acting in a tangential direction have been arranged by providing several locking discs with a peripheral recess having a narrow, deep part and a broad, shallow part and being so arranged that the locking bar moves partly into the narrow, deep part when the lock mechanism is released.

3. A lock mechanism according to claim 1, in which said guiding surfaces acting in a tangential direction have been arranged by making the radial dimension of the locking bar, at least at the position of some locking discs, smaller than at the position of the spacer discs.

4. A lock mechanism according to claim 3, in which, in those locking discs, at the position of which the radial dimension of the locking bar is smaller than at the position of the spacer discs, there is only a narrow peripheral recess.

5. A lock mechanism according to claim 3, in which the spacer discs are non-turnably locked relative to the locking bar by means of a separate element connected to said force transmission member.

6. A lock mechanism according to claim 5, in which said separate element is another bar or tongue axially disposed in the lock mechanism and connected to said force transmission member, which bar or tongue functions as a member locking the turning movement of the spacer discs and as a member limiting the turning movement of the locking discs.

7. A cylinder lock mechanism constructed and arranged substantially as herein described with reference to, and as illustrated in, Figures 1 to 3, Figures 4 to 6, or Figures 7 to 11 of the accompanying drawings.

8. A lock comprising the lock mechanism claimed in any of the preceding claims.