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(54) **Lock for doors and the like**

(57) A lock (1) for doors and the like, having the advantage of being unusually smooth in use, comprises an elongate box-shaped body (2), a cylinder (10) that is rotatably supported in the box-shaped body (2) and designed to be made to rotate by a key, a carriage (11) that can move longitudinally inside the box-shaped body (2) under the action of the cylinder (10), and a bolt (4) that can move transversely inside the box-shaped body (2) under the action of the carriage (11) and by means of a right-angled turn mechanism (12), the said right-angled turn mechanism (12) comprising a spindle (13) that is rotatably supported in the box-shaped body (2), a pinion (14) and a toothed sector (16) that are fixed to the spindle (13), a rack (15) formed in the carriage (11) and meshing with the pinion (14) and a rack (17) formed in the bolt (4) and meshing with the toothed sector (16).

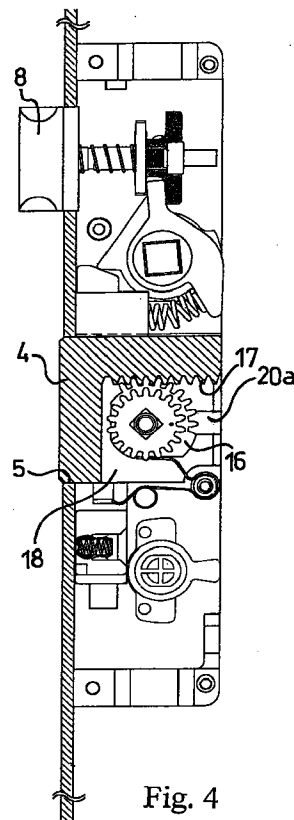


Fig. 4

EP 0 816 608 A2

## Description

The present invention relates to a lock for doors and the like, of the type comprising an elongate box-shaped body, a cylinder that is rotatably supported in the box-shaped body and designed to be made to rotate by a key, a carriage that can move longitudinally inside the box-shaped body under the action of the cylinder, and a bolt, of essentially rectangular cross-section, that can move transversely inside the box-shaped body under the action of the carriage and by means of a right-angled turn mechanism.

As is known, in locks of the type specified, the bolt needs to be opened and closed by rotating a cylinder into which an appropriate key has been inserted.

In accordance with a known solution, the cylinder controls a carriage which in turn controls the bolt by means of mechanisms comprising what are essentially matching cam profile elements so as to effect a right-angled change of direction.

Although in many ways these locks do fulfil the purpose and are used extensively, they nevertheless have the drawback that as the user inserts and turns the key in the lock he or she may encounter a certain resistance which may, in extreme cases, cause the key to stick or even become jammed in the lock.

The basic problem tackled by the present invention is one of providing a lock of the type specified, whose structural and functional characteristics are such that it overcomes the drawbacks referred to above in connection with the prior art.

The problem is solved by a lock of the type specified which is characterized in that the right-angled turn mechanism comprises a spindle that is rotatably supported in the box-shaped body, a pinion and a toothed sector that are fixed to the spindle, a rack formed along the carriage and meshing with the pinion and a rack formed along the bolt and meshing with the toothed sector.

Further features and advantages of the lock according to the present invention will become clear in the following description of a preferred embodiment thereof, given by way of non-limiting example and with reference to the appended figures, in which:

- Figure 1 shows a front view of a lock according to the invention,
- Figure 2 shows a side view of the lock in Figure 1,
- Figure 3 shows the same view as in Figure 2, with transparent parts,
- Figure 4 shows a sectional view of the lock in Figure 1,
- Figure 5 and Figure 6 show diagrammatic views of details of the lock in Figure 1,
- Figure 7 is a view of a detail of the lock in Fig. 1, taken in the direction of the arrow VII,
- Figure 8 shows a partial sectional view of a detail of the lock in Figure 1,

- Figures 9 and 10 are views of a further detail of the lock in Figure 1, and
- Figures 11, 12, 13 and 14 show the lock in Figures 1, 2, 3 and 4 in another phase of its operation.

With reference to the figures, the numeral 1 denotes, as a whole, a lock for doors, windows, door or window frames and the like.

The lock 1 comprises a box-shaped body 2 that is essentially parallelepipedal in shape and extends in a vertical longitudinal direction x-x and has a narrow front wall, indicated by 3.

The lock 1 comprises a bolt 4 of narrow rectangular cross-section and centre of gravity G, which can move inside the box-shaped body in a horizontal transverse direction y-y perpendicular to the wall 3, an opening 5 through which the bolt 4 moves in a guided manner being provided in the wall 3.

The lock 1 also comprises an upper motion transfer rod 6 and a lower motion transfer rod 7 which, together with the bolt 4, create three locking points in the lock 1.

The upper 6 and lower 7 motion transfer rods can move longitudinally inside the box-shaped body 2, emerging at opposite ends thereof.

The lock 1 also comprises a spring latch 8 which can move inside the box-shaped body 2 in the transverse direction y-y and is constantly urged by a spring 9 into a closed position, in which it projects out of the box-shaped body 2.

The reference numeral 10 indicates a cylinder having an axis z-z that extends perpendicularly to the axes x-x and y-y, the said cylinder being rotatably supported in the box-shaped body 2 and designed to receive a suitable key, not shown in the figure, so that it can be rotated.

The lock 1 comprises a carriage 11 that can move longitudinally inside the box-shaped body 2 under the action of the cylinder 10, and is mechanically connected to the bolt 4 by means of a right-angled turn mechanism 12.

In the lock 1 according to the invention, the right-angled turn mechanism 12 comprises a spindle 13 that is rotatably supported in the box-shaped body 2 and whose axis is in alignment with the axis z-z. Fixed to the spindle 13 is a first pinion 14 that meshes with a first rack 15 formed along the carriage 11. A toothed sector 16 is also fixed to the spindle 13 and meshes with a rack 17 formed along the bolt 4 and extending along a straight line g-g parallel to y-y and close to the centre of gravity G.

The toothed sector 16 is housed inside the bolt 4 in a cavity 18 which is formed in the bolt itself and defines therein two opposite side walls 19a and 19b. The bolt 4 comprises two slots 20a and 20b formed in the walls 19a and 19b respectively. The slots 20a and 20b extend in the direction y-y and are coupled, with a limited degree of play, to two corresponding cylindrical portions 21a and 21b formed on the spindle 13, behind the

toothed sector 16. In this way, the bolt 4 moves in a guided manner inside the box-shaped body 2 not just through the opening 5, but also on the cylindrical portions 21a and 21b.

The lock 1 also comprises a second pinion 22 which is fixed to the spindle 13 on the opposite side of the toothed sector 16 with respect to the first pinion 14.

The second pinion 22 meshes with two racks 23 and 24, formed along the motion transfer rods 6 and 7 respectively.

It should be noted that, advantageously, the first pinion 14, the toothed sector 16 and the second pinion 22 are fixed to the spindle 13 by means of corresponding seats of square cross-section, indicated by 14a, 16a and 22a respectively, that are in turn fixed to corresponding portions of the spindle 13 having a matching square cross-section, indicated by 14b, 16b and 22b respectively.

In order to move the spring latch 8 into a retracted open position, in addition to a lever 25 which is rotatably supported in the box-shaped body 2 and has a square element 26 designed to receive a suitable handle (not shown in the figure), there is also a lever 27 which is rotatably supported in the box-shaped body 2, co-axially with the lever 25.

The lever 27 is urged by an auxiliary carriage 28 which can move longitudinally in a guided manner inside the box-shaped body 2, parallel to the carriage 11, under the action of the cylinder 10, and engages with the spring latch 8 so as to move the latter against the force exerted by the spring 9 and into an open position in which it is retracted inside the box-shaped body 2.

It should be noted that the pinions, the toothed sector and the racks have modular toothings with a module of preferably low value, for example a module of one millimetre.

During operation, the movement imparted by the key to the cylinder, and therefore by the cylinder to the carriage, is transferred to the bolt 4 by means of two gear wheel/rack type couplings, and more specifically by means of the coupling comprising the rack 15 and the pinion 14 and by means of the coupling comprising the toothed sector 16 and the rack 17.

The bolt 4 thus moves between an open position in which it is retracted inside the box-shaped body 2 (Figs 1 to 4) and a closed position in which it projects out of the box-shaped body 2 (Figs 11 to 14).

As for the motion transfer rods 6 and 7, they too are controlled by means of gear wheel/rack type couplings, being moved by the coupling comprising the pinion 22 and the rack 23 and by the coupling comprising the pinion 22 and the rack 24 respectively, between an open position and a closed position.

An additional movement imparted by the key to the cylinder, and therefore by the cylinder to the auxiliary carriage, is transferred to the spring latch 8 by means of the lever 27, causing the spring latch to move into the

open position. As the key is released, the spring latch returns, under the action of the spring, into the closed position.

The main advantage of the lock according to the present invention lies in the unusually and consistently smooth way the movement is transferred from the key to the bolt and to the motion transfer rods. The consistent smoothness of the lock according to the invention may be explained by the fact that the bolt and the rods are subjected to forces that are essentially directed in the direction of movement and consequently produce low transverse forces and therefore low frictional forces.

In the case of the bolt, the force needed to move it is applied close to the centre of gravity of the cross-section, which further reduces friction.

An additional advantage of the lock according to the present invention is that, subsequent to the bolt and the motion transfer rods being opened, the spring latch is also opened.

Needless to say, a person skilled in the art may, for the purpose of fulfilling contingent and specific requirements, carry out numerous modifications and variations to the lock described above, all such modifications and variations being nevertheless encompassed within the scope of protection of the invention as defined in the following claims.

## Claims

1. Lock (1) for doors and the like, of the type comprising an elongate box-shaped body (2), a cylinder (10) that is rotatably supported in the box-shaped body (2) and designed to be made to rotate by a key, a carriage (11) that can move longitudinally inside the box-shaped body (2) under the action of the cylinder (10), and a bolt (4), of essentially rectangular cross-section, that can move transversely inside the box-shaped body (2) under the action of the carriage (11) and by means of a right-angled turn mechanism (12), characterized in that the right-angled turn mechanism (12) comprises a spindle (13) that is rotatably supported in the box-shaped body (2), a pinion (14) and a toothed sector (16) that are fixed to the spindle (13), a rack (15) formed along the carriage (11) and meshing with the pinion (14) and a rack (17) formed along the bolt (4) and meshing with the toothed sector (16).
2. Lock (1) according to Claim 1, characterized in that the rack (17) formed in the bolt (4) is close to the centre of gravity of the cross-section of the bolt.
3. Lock (1) according to Claim 1, characterized in that it comprises two motion transfer rods, an upper rod (6) and a lower rod (7), which can move longitudinally inside the box-shaped body (2) and which, together with the bolt (4), create three locking points in the lock, a second pinion (22) that is fixed

to the spindle (13) and two racks (23, 24), each of which is formed along a corresponding motion transfer rod (6, 7) and meshes with the second pinion (22).

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4. Lock (1) according to Claim 1, characterized in that the bolt (4) comprises two slots (20a, 20b) to the sides of the rack (17) formed in the bolt (4), these two slots being coupled, with a limited degree of play, to corresponding cylindrical portions (21a, 21b) formed in the spindle (13) behind the toothed sector (16), the said cylindrical portions (21a, 21b) acting as guides for the bolt (4). 10
5. Lock (1) according to Claim 1, characterized in that it comprises a spring latch (8) that can move transversely inside the box-shaped body (2) and is constantly urged by a spring (9) into a closed position in which it projects out of the box-shaped body (2), an auxiliary carriage (28) that can move longitudinally with respect to the carriage (11), the said auxiliary carriage (28) being controlled by the cylinder (10) and acting on a lever (25) that is rotatably supported in the box-shaped body (2) and engages with the spring latch (8) so as to move the latter against the force exerted by the spring (9) and into an open position in which it is retracted inside the box-shaped body (2). 15 20 25
6. Lock (1) according to Claim 3, characterized in that the pinions (14, 22), the toothed sector (16) and the racks (15, 23, 24) have modular toothings with a module of preset low value. 30

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