

A DEVICE FOR LOCKING AND UNLOCKING BY MEANS OF A WRENCH, A
PLUG OR LID ON A FRAME, NOTABLY OF A MANHOLE.

The present invention relates to a device for locking and unlocking by means of a wrench, a plug or lid on a frame, notably of a manhole.

Such a device comprising a lock integral with the plug
5 is known, which has an aperture opening out providing access to the lock for the wrench including an arm with an end with which the lock may be maneuvered when the wrench is introduced into the aperture of the plug from a locking position in which a bolt of the lock is retained captive by
10 a keeper of the frame to an unlocking position for which the bolt is released from the keeper.

However, this known device is of a relatively complex structure taking into account the numerous components involved and is relatively costly.

15 The object of the present invention is to propose a device for locking and unlocking by means of a wrench, a plug or lid on a frame, which in particular is suitable for ensuring children's safety and which has a simple and economical structure.

20 For this purpose, according to the invention, the device for locking and unlocking by means of a wrench, a plug or lid on a frame, comprising a lock integral with the plug which has an aperture opening out providing access to the lock for the wrench including an arm with an end with
25 which the lock may be maneuvered when the wrench is introduced into the aperture of the plug from a locking position in which a bolt of the lock is retained captive by a keeper of the frame to an unlocking position for which the bolt is released from the keeper, is characterized in
30 that the bolt is removably mounted and guided in translation in a casing of the plug, is held in its locking position by a coil compression spring interposed between the bolt and a bottom wall of the casing, and has its end adjacent to the spring including a branch transverse to the

longitudinal direction of the bolt extending through two guiding grooves respectively formed in two side walls of the casing parallel to the longitudinal direction of the bolt, at least one of the guiding grooves passing through
5 the corresponding side wall of the casing and into which the end of the arm of the wrench may be introduced, which may act on the corresponding end of the bolt's transverse branch in order to translationally displace the latter towards its position of release from the keeper against the
10 return force of the spring.

The side wall of the casing including the through-groove further comprises a slot perpendicular to this wall, opening out into the through-groove and allowing the maneuvering end of the arm of the wrench to be
15 introduced into the groove.

The wrench comprises a handle parallel to the arm with a maneuvering end and a bar connecting the handle to the arm, the handle, the bar and the arm with a maneuvering end of the wrench being located in a same plane and the
20 aperture of the plug providing access to the lock being a slot extending in a plane perpendicular to the longitudinal direction of the bolt and allowing the arm and its maneuvering end to be introduced by displacement in its own plane of the wrench perpendicularly to the plane of the
25 plug, the maneuvering end of the arm of the wrench may be introduced into the groove passing through the wall of the lock casing by translating the arm parallel to the slot of the plug towards the casing and may act on the transverse branch of the bolt in order to displace it to its position
30 of release from the keeper by rotating the handle of the wrench in the corresponding direction around the bar of this wrench.

The plug comprises, extending perpendicularly under the latter, at least one wall parallel to the slot in
35 extension of the latter and allowing the end of the arm of the wrench to be guided towards the through-groove of the wall of the lock casing.

The plug may include two walls for guiding the arm of the wrench and one of them includes at its end facing the lock casing, a plate diverging from the other guiding wall and allowing limited rotation of the arm of the wrench in the direction for releasing the bolt from the keeper, once
5 the maneuvering end of the arm is introduced into the through-groove of the wall of the casing.

Preferably, the free maneuvering end of the arm of the wrench is bent so as to extend parallel to the arm towards
10 the handle and in the direction opposite to the bar connecting the arm to the handle.

Advantageously, a shim is integral with the plug and with at least one wall for guiding the wrench on the side of the lock casing and conformed so as to fit into the
15 substantially U-shaped portion defined by the arm of the wrench between the bar and the bent end of this arm, when the maneuvering end of the arm is introduced into the through-groove of the wall of the casing.

The bolt comprises two flexible tabs located in the same plane as the transverse branch of the bolt opposite
20 the latter diverging from each other in the direction opposite to the transverse branch and allowing the bolt to be held in the lock casing after latching, when mounting the bolt in this casing, of the tabs respectively in two
25 windows formed in both side walls of the casing opposite to its bottom wall and two grooves for guiding the transverse branch of the bolt, the free ends of the flexible tabs being supported, in the locking position of the plug and under the action of the return force of the spring, on both
30 edges of the windows opposite to the guiding grooves.

The transverse branch of the bolt is part of a T-shaped end of the bolt.

Preferably, the bolt is made in a plastic material, such as polyacetal, and the return spring is in the same
35 material as the bolt.

The bolt and its return spring are mounted in the casing by inserting them through a conjugate imprint of the

front wall of the casing and by longitudinally pushing the bolt into the casing against the return force of the spring until the flexible tabs elastically latch in their respective windows.

5 Alternatively, the bolt and its return spring are mounted in the casing by inserting them longitudinally through the end aperture of the casing opposite to the bottom wall of the casing.

10 The lock casing and the walls for guiding the arm of the wrench are cast together with the plug.

 The invention will be better understood and other objects, features, details and advantages thereof will become more clearly apparent in the explanatory description which follows, made with reference to the appended drawings only given as an example illustrating an embodiment of the invention and wherein:

20 - Fig. 1 is a perspective view of a plug mounted jointed on a frame in the half-open position and provided with a locking and unlocking device according to the invention;

 - Fig. 2 is a partial perspective top view of the assembly of Fig. 1 and showing the keeper of the frame for locking the plug to this frame;

 - Fig. 3 is a top view of the plug of Fig. 1;

25 - Fig. 4 is a bottom view of the plug of Fig. 1 and showing the lock according to the invention;

 - Fig. 5 is an enlarged view of the lock of the invention without its bolt;

30 - Fig. 6 is a perspective view of the bolt of the invention;

 - Fig. 7 is a top view of the bolt of Fig. 6;

 - Figs. 8-11 are perspective views showing the mounting of the bolt in its lock casing;

35 - Fig. 12 is a perspective view of the wrench of the invention used in combination with the lock of the invention;

 - Fig. 13 is a partial perspective top view of the

plug showing the introduction of the wrench of Fig. 12 through an aperture of the plug;

- Fig. 14 illustrates the guiding of the maneuvering arm of the wrench towards the lock casing;

5 - Fig. 15 illustrates a phase for maneuvering the wrench in order to introduce the end of its arm into the lock casing;

10 - Fig. 16 illustrates the maneuvering arm of the wrench, the end of which is introduced into the lock casing;

- Fig. 17 illustrates the position of the wrench corresponding to that of Fig. 16;

- Fig. 18 illustrates the wrench in its position for unlocking the bolt;

15 - Fig. 19 illustrates the position of the external portion of the wrench corresponding to its unlocking position of Fig. 18; and

20 - Fig. 20 is a perspective view illustrating a shim so that only the wrench of Fig. 12 may be used for unlocking the plug from its frame.

25 The locking and unlocking device of the invention is most particularly intended for fitting out a plug, lid or the like 1, allowing a frame, chassis or the like 2 delimiting an aperture of a man-hole for example, to be blocked.

This locking device may be actuated by a wrench 3 which will be described subsequently.

30 The locking device comprises a lock 4 integral with the internal face of the upper wall 1a of the plug 1, the wall 1a having an aperture 5 opening out for providing the wrench 3 with access to the lock 4.

35 The wrench 3 comprises an arm 6, an end 7 of which allows the lock 4 to be maneuvered when the wrench 3 is introduced into the aperture 5 of the plug 1 from a locking position in which a bolt of the lock 4 is retained captive by a keeper 9 of the frame 1 to an unlocking position for which the bolt 8 is released from the keeper 9.

The plug 1 is illustrated as being of the rectangular type which may be housed in a frame with a conjugate shape 2, but of course it may have a circular shape.

According to the invention, the bolt 8 is removably
5 mounted and guided in translation in a lock 4 casing 10 cast together with the plug 1 and extending perpendicularly to the side of the plug 1 opposite to the one including the hinge 11 of the plug 1 for jointing to the frame 2 so that the active portion 12 of the bolt 8 is supported, in the
10 closing position of the plug 1 on the frame 2, under the keeper 9 formed by a rib integral with the internal face of the side of the frame 2 adjacent to the casing 10.

The lock casing 10 has the general shape of a rectangular parallelepiped and the bolt 8 is held in its
15 position for locking the plug 1 to the frame 2, by a coil compression spring 13 mounted pre-stressed between the bolt 8 and a bottom wall 14 of the casing 10 opposite to the active portion 12 of the bolt 8.

The bolt 8 comprises a T-shaped end portion 15, the
20 extreme branch 16 of which extends transversely to the longitudinal direction of the bolt 8.

The latter further comprises two flexible tabs 17 located in the same plane as the T-shaped portion 15 and which diverge from each other in the direction opposite to
25 the transverse branch 16 and consequently, towards the active portion 12 of the bolt 8.

Preferably, the bolt 8 and the return spring 13 are made in a single piece from plastic material, for example based on polyacetal. The active portion 12, the flexible
30 tabs 17, the T-shaped portion 15 and the return spring 13 are symmetrical relatively to the longitudinal median plane of the bolt 8.

The tabs 17 may move elastically closer to each other at a position substantially parallel to the longitudinal
35 axis of the bolt 8.

The use of polyacetal as a material forming the bolt 8 is advantageous in that it has a good viscosity index and

so a good lifetime in spite of friction which may occur between the bolt 8 and the pig iron of the casing 10. This material also has the advantage that it allows the compression spring 13 to be easily integrated into the rear
 5 of the bolt 8.

The casing 10 comprises two grooves 18, only one of which is clearly visible, respectively formed in both side walls 19 of the casing 10, perpendicular to the upper wall 1a of the plug 1, both grooves 18 extending parallel to the
 10 longitudinal direction of the casing 10 towards the bottom wall 14 of the latter. At least, one of the grooves 18, the one which is closest to the aperture 5 of the plug 1, passes through the corresponding side wall 19 of the casing 10 and this wall includes a slot 20 perpendicular to the
 15 plane of the plug 1 and opening out in the front wall 21 of the casing 10 on the one hand and in the through-groove 18 on the other hand so as to allow the end 7 of the arm 6 of the wrench 3 to be introduced into the groove 18 as this will be seen subsequently.

Both grooves 18 respectively allow both ends of the transverse branch 16 of the bolt 8 to be guided in the casing 10 along the longitudinal direction of the latter against the return force of the spring 13 when the bolt 8 is displaced longitudinally in translation to its position
 20 for unlocking the plug 1 from the frame 2.

The casing 10 further comprises two rectangular windows 22 respectively made in both side walls 19 of this casing opposite to the wall 14 and grooves 18 and extending parallel to the longitudinal direction of the casing 10
 30 substantially in the same plane as the guiding grooves 18. Both windows 22 are intended to receive by latching both flexible tabs 17 upon mounting the bolt 8 in the casing 10.

The front wall 21 of the casing 10 is cut out so as to form an imprint with a conjugate shape to the T-shaped
 35 portion 15 and to the compression spring 13 of the bolt 8 so as to allow the latter to be mounted in this casing.

As this is better visible, notably in Fig. 8, the bolt

8 comprises a lug 23 protruding perpendicularly from the planar leg of the T-shaped portion 15 of the bolt 8 and allowing the bolt 8 to be introduced manually by translation into the casing 10 upon mounting this bolt.
 5 This lug also allows the bolt to be unlocked from its keeper from the inside of the manhole.

The wrench 3 comprises a handle 24 parallel to the arm 6 and a bar 25 perpendicular or tilted to the handle 24 and connecting the latter to the arm 6. The arm 6 and its end
 10 7, the handle 24 and the connecting bar 25 are located in a same plane and formed by deforming a bar with a rectangular cross-section.

The end 7 of the arm 6 is connected to the latter by a portion bent at right angles so that this end extends
 15 parallel to the arm 6 towards the handle 24 and in the direction opposite to the bar 25. The wrench 3 thus has a general shape of approximately a G with the handle 24 of a length larger than that of the arm 6 and of its end 7.

The aperture 5 of the plug 1 is formed by a long thin
 20 slot parallel to the side of the plug 1 opposite to its joint 11 to the frame 2 and which is located in a plane perpendicular to the longitudinal direction of the casing 10.

The slot 5 has a length which is slightly larger than
 25 that of the arm 6 and of its end 7 so that the arm 6 and its end 7 may be introduced through the slot 5 by displacing in its own plane the wrench 3 perpendicularly to the upper wall 1a of the plug 1.

The plug 1 comprises, extending perpendicularly from
 30 its internal face, two walls 26 positioned parallel to the slot 5 in extension of the latter and allowing the end 7 of the arm 6 to be guided towards the through-groove 18 of the wall 19 of the lock casing 10.

Both guiding walls 26 are connected to each other by a
 35 transverse wall 27 opposite to the casing 10 and defining an aperture located facing the groove 18 and the slot 20. The guiding wall 26, located opposite to the edge of the

plug 1 intended to face the edge of the frame 2 including the keeper 9, includes a wall 28 which diverges from the other guiding wall 26 and allows the end 7 of the wrench 3 to be limitedly pivoted in the direction providing translational displacement of the bolt 8 in the casing 10 towards its position for unlocking the plug 1, against the return force of the spring 13.

A shim 29 is integral with the internal face of the upper wall 1a of the plug 1 between the divergent wall 28 and the guiding wall 26 and is facing the through-groove 18 and the slot 20. The shim 29 is conformed so as to fit into the substantially U-shaped portion defined by the arm 6 between the bar 25 and the bent end 7 of the wrench 3, when the end 7 is introduced into the slot 20 at the groove 18. The shim 29 forms an obstacle for introducing a simple hook-shaped wrench in order to attempt to fraudulently unlock the bolt 8 from its keeper 9. In other words, only the wrench 3 of the invention may be used, by the presence of the shim 29, to act with its end 7 on the bolt 8 during the unlocking of the plug 1 from its frame 2.

According to an alternative embodiment, a single guiding wall 26 may be provided, the one not including the divergent wall 28. In this case, the shim 29 is integral with the plug and with this single wall 26, and the end 7 of the wrench 3 will be supported at the bottom of the through-groove 18 at the position of the wrench corresponding to the one for unlocking the bolt 8.

Figs. 8-11 illustrate the mounting of the bolt 8 in the casing 10. As shown in Fig. 8, the bolt 8 is shown facing the front wall 21 of the casing 10 so that its active portion 12 is outside the casing 10 and its T-shaped portion 15 as well as its compression spring 10 are facing the conjugate imprint made in the front wall 21 of the casing 10. The bolt 8 is then introduced into the casing 10 through the wall 21 to the position illustrated in Fig. 9 and the bolt 8 is then displaced in translation, by means of the gripping lug 23, in the casing 10 as indicated by

the arrows F1 in Fig. 9 so that both flexible tabs 17 are elastically moved closer to each other by the two end portions of the side wall 19 opposite to the bottom wall 14 as illustrated in Fig. 10 until they reach both windows 22 in which they are elastically spaced apart from each other as illustrated in Fig. 11. In this position, the free ends of both tabs 17 are in abutment, under the action of the return force exerted by the spring 13 supported on the bottom wall 14, onto the end edges of the windows 22 so as to hold the bolt 8 in its position for locking the plug 1 to the frame 2. Further, the bolt 8 is retained in the casing 10 not only by both tabs 17 housed in their respective windows 22 but also by the transverse branch 16 of the bolt 8, the ends of which are housed in their respective guiding grooves 18.

Alternatively, the bolt 8 and its return spring 13 may be mounted in the casing 10 by inserting them longitudinally through the aperture opening out from the casing 10 opposite to its bottom wall 14.

The unlocking of the plug 1 from its frame 2 is carried out as follows.

As illustrated in Fig. 13, the arm 6 and its end 7 of the wrench 3 are introduced into the slot 5 of the plug 1 so that the arm 6 and its end 7 arrive in the position illustrated in Fig. 14 in which a portion of the bar 25 of the wrench 3 is located between both guiding walls 26 and in proximity to the transverse wall 27, the end 7 being found at a substantially higher level relatively to the shim 29. In this way, the wrench 3 may be displaced in a way guided by the walls 26 along a direction perpendicular to the longitudinal direction of the casing 10 as indicated by the arrow F2 in Fig. 14 so that the arm 6 and its end 7 arrive in the position illustrated in Fig. 15 in which the bar portion 25 is supported on the end of the shim 29 opposite to the casing 10 and the U-shaped portion defined by the arm 6 between the bar 25 and the bent end 7 i.e. at the vertical of the shim 29 so as to then allow, by

traction exerted on the handle 24 of the wrench 3 in the direction opposite to the upper wall 1a of the plug 1, the end 7 to be introduced into the slot 20 of the casing 10 as symbolized by the arrow F3 in Fig. 15.

5 Figs. 16 and 17 show that by pivoting the wrench 3 around the bar 25 in the direction indicated by the arrow F4 (Fig. 17), the arm and its end pivot in the same direction as symbolized by the arrow F5 in Fig. 16 so that the end 7 acts on the corresponding end of the transverse
10 branch 16 of the bolt 8 in order to displace the latter in a rectilinear and guided translation in the grooves 18 of the casing 10 against the return force of the spring 13 and up to a position in which the active portion 12 of the bolt 8 is released from the keeper 9 of the frame 2. Pivoting of
15 the arm 6 and of its end 7 for releasing the bolt 8 from the keeper 9 is limited by the divergent wall 28.

Once the bolt 8 has been disengaged from its keeper 9, the plug 1 may be lifted by means of the handle 27 of the wrench 3 around its axis 11 for jointing to the frame 2 up
20 to its open position, completely released from this frame. In the unlocking position of the plug 1, the bolt 8 is brought back to its locking position by the compressing spring 13. The wrench 3 may be used for bringing the plug 1 back to its position for closing the frame 2 by swinging
25 around the joint 11 until the active portion 12 of the bolt 8 automatically engages under the keeper 9 against the return force of the spring 13, but the wrench 3 may quite simply be removed from the plug 1 before swinging the plug 1 under its own weight to its closed position locked to the
30 frame 2 by the bolt 8.

Like for the casing 10, the guiding walls 26, 28 may be cast together with the plug 1.

The bolt 8 may be removed from its casing 10 by bringing both tabs 17 closer to each other and by taking
35 out the bolt 8 through the conjugate imprint of the front wall 21 of the casing after having longitudinally displaced the bolt 8 facing this imprint. If necessary, the bolt 8

may be removed from the casing 10 by longitudinally pulling the latter out of the casing after having brought both tabs 17 closer to each other.

5 The locking and unlocking device of the invention is of an extremely simple and economical structure and is particularly suitable for locking a plug or lid ensuring the safety of a child. Indeed, because a child has limited strength, making the bolt in plastic material provides this bolt with sufficient strength in order to ensure this
10 safety. Further, the extremely simple configuration of the wrench 3 associated with the shim 29 at the exit of the slot for introducing the active portion 7 of this wrench, prevents the use of any other wrench in the form of a simple hook for fraudulently unlocking the plug 1 from its
15 frame 2.

CLAIMS

1. A device for locking and unlocking by means of a wrench (3) a plug or lid (1) on a frame (2), comprising a lock (4) integral with the plug (1) which has an aperture (5) opening out providing access to the lock (4) for the wrench (3) including an arm (6) with an end (7) of which the lock (4) may be maneuvered when the wrench (3) is introduced into the aperture (5) of the plug (1) from a locking position in which a bolt (8) of the lock (4) is retained captive by a keeper (9) of the frame (2) to an unlocking position for which the bolt (8) is released from the keeper (9), characterized in that the bolt (8) is removably mounted and guided in translation in a casing (10) of the plug (1), is held in its locking position by a coil compression spring (13) interposed between the bolt (8) and a bottom wall (14) of the casing (10), and has its end adjacent to the spring (13) including a branch (16) transverse to the longitudinal direction of the bolt (8) extending through two guiding grooves (18) respectively formed in two side walls (19) of the casing (10) parallel to the longitudinal direction of the bolt (8), at least one of the guiding grooves (18) passing through the corresponding side wall (19) of the casing (10) and into which the end (7) of the arm (6) of the wrench (3) may be introduced, which may act on the corresponding end of the transverse branch (16) of the bolt (8) in order to translationally displace the latter to its position of release from the keeper (9) against the return force of the spring (13).

2. The device according to claim 1, characterized in that the side wall (19) of the casing (10) including the through-groove (18) further comprises a slot (20) perpendicular to this wall, opening out into the through-groove (18) and allowing the maneuvering end (7) of the arm (6) of the wrench (3) to be introduced into the groove

(18).

3. The device according to claim 1 or 2, characterized in that the wrench (3) comprises a handle
5 (24) parallel to the arm (6) with a maneuvering end (7) and a bar (25) connecting the handle (24) to the arm (6), in that the handle (24), the bar (25) and the arm (6) with a maneuvering end (7) of the wrench (3) are located in a same plane and in that the aperture (5) of the plug (1)
10 providing access to the lock (4) is a slot extending in a plane perpendicular to the longitudinal direction of the bolt (8) and allowing the arm (6) and its maneuvering end (7) to be introduced by displacing in its own plane the wrench (3) perpendicularly to the plane of the plug (1),
15 the maneuvering end (7) of the arm (6) of the wrench (3) may be introduced into the through-groove (18) of the wall (19) of the lock casing (10) by translating the arm (6) parallel to the slot (5) of the plug (1) towards the casing (10) and may act on the transverse branch (16) of the bolt
20 (8) in order to displace it to its position of release from the keeper (9) by rotating the handle (24) of the wrench (3) in the corresponding direction around the bar (25) of this wrench.

25 4. The device according to claim 3, characterized in that the plug (1) comprises, extending perpendicularly under the latter, at least one wall (26) parallel to the slot (5) in extension of the latter and allowing the end (7) of the arm (6) of the wrench (3) to be guided towards
30 the through-groove (18) of the wall (19) of the lock casing (4).

5. The device according to claim 4, characterized in that the plug (1) comprises two walls (26) for guiding the
35 arm (6) of the wrench (3) and one of which includes, facing the lock casing (4), a plate (28) diverging from the other guiding wall (26) and providing limited rotation of the arm

(6) of the wrench (3) in the direction for releasing the bolt (8) from the keeper (9) once the maneuvering end (7) of the arm (6) has been introduced into the through-groove (18) of the wall (19) of the casing (4).

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6. The device according to any of the preceding claims, characterized in that the free maneuvering end (7) of the arm (6) of the wrench (3) is bent so as to extend parallel to the arm (6) towards the handle (24) and in the direction opposite to the bar (25) connecting the arm (6) to the handle (24).

7. The device according to claim 6, characterized in that a shim (29) is integral with the plug (1) and with at least one wall (26) for guiding the wrench (3) on the side of the lock casing (4) and is conformed so as to fit into the substantially U-shaped portion defined by the arm (6) of the wrench (3) between the bar (25) and the end (7) of this arm, when the maneuvering end (7) of the arm (6) is introduced into the through-groove (18) of the wall (19) of the casing (10).

8. The device according to any of the preceding claims, characterized in that the bolt (8) comprises two flexible tabs (17) located in the same plane as the transverse branch (16) of the bolt (8) opposite to the latter by diverging from each other in the direction opposite to the transverse branch (16) and allowing the bolt (8) to be held in the lock casing (4) after latching, when mounting the bolt (8) in this casing, tabs (17) respectively in two windows (22) formed in both side walls (19) of the casing (10) opposite to its bottom wall (14) and to both guiding grooves (18) of the transverse branch (16) of the bolt (8), the free ends of the flexible tabs (17) being supported, in the locking position of the plug (1) and under the action of the return force of the spring (13), on both edges of the windows (22) opposite to the

guiding grooves (18).

9. The device according to any of the preceding claims, characterized in that the transverse branch (16) of
5 the bolt (8) is part of a T-shaped end of this bolt.

10. The device according to any of the preceding claims, characterized in that the bolt (8) is made in plastic material, such as polyacetal, and the return spring
10 (13) is of the same material as the bolt (8).

11. The device according to claim 10, characterized in that the bolt (8) and its return spring (13) are mounted in the casing (10) by inserting them through a conjugate
15 imprint of the front wall (21) of the casing (10) and by longitudinally pushing the bolt (8) into the casing (10) against the return force of the spring (13) until the flexible tabs (17) elastically latch into their respective windows (22).

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12. The device according to claim 10, characterized in that the bolt (8) and its return spring (13) are mounted in the casing (10) by longitudinally inserting them through the end aperture of the casing (10) opposite to the bottom
25 wall (14) of the casing (10).

13. The device according to any of the preceding claims, characterized in that the lock casing (4) and the walls (26) for guiding the arm (6) of the wrench (3) are
30 cast together with the plug (1).