

"Locking and unlocking device using a key for a cover or lid on a frame".

5 The present invention relates to a locking and unlocking device using a key for a cover or lid on a frame.

This is applicable primarily, although not exhaustively, for manhole covers.

10 This device aims to perfect the closing device with selective locking that is the object of French patent application FR-A 2 780 996 in the applicant's name.

15 This known closing device comprises a lock-bolt integral with the lid or cover and a key with a maneuver arm, one end of which has a socket which may be introduced into an opening in the lid to access the lock which comprises a rotor
20 rotatingly mounted in the lid and having at one of its ends a lock-bolt cooperating with a lock-bolt keeper of the frame and the other end of which may be combined with the socket of the key to allow the lock-bolt to pivot around the longitudinal axis of the rotor between a locked position in which the lock-bolt is locked by the lock-bolt keeper and the key may freely
25 leave the opening of the lid and an unlocked position in which the lock-bolt is released and the key is locked in the opening of the lid.

25 Thus, when the lid is unlocked from the frame by the key and removed from it, the key normally remains integral with the lid. However, it may occur that the operator having removed the lid from the frame wishes to use the key integral with this lid to unlock another identical cover located nearby. To this end, he rotates the key to its position
30 allowing it to be removed from the opening of the lid, which translates to the pivoting of the lock-bolt relative to the lid to its locked position. However, when the operator once again places the lid on the frame to close to opening delimited by said frame, the fact that the lock-bolt is in its
35 locked position prevents the cover from being replaced in the

frame. The operator may then manually grab the lock-bolt to pivot it to its unlocked position, allowing the introduction and application of the lid in its support frame, but the operator may then forget to use the key to lock the lock-bolt
5 in the frame's lock-bolt keeper such that the lid may remain placed in its frame without being locked to it. Moreover, because the lock is in its unlocked position in which the lock-bolt is released from the frame's lock-bolt keeper, the key socket can no longer be connected to the corresponding end
10 of the lock rotor, which may cause an operator having to access the manhole cover later to believe that the lock no longer works properly.

The purpose of the present invention is to eliminate the aforementioned drawbacks of the known device.

15 To this end, the invention proposes a locking and unlocking device using a key for a cover or lid on a frame, comprising a lock integral with the cover which presents an access opening to the lock for the key comprising an arm, one end of which make it possible to maneuver the lock, when the
20 key is introduced in the opening of the cover, from a locked position in which a lock-bolt is locked by a lock-bolt keeper of the frame to an unlocked position in which the lock-bolt is released from the lock-bolt keeper, the lock comprising a rotor rotatably mounted in the cover, accessible at one of
25 its ends through the opening and holding the lock-bolt at its opposite end in such a way as to allow the lock-bolt to pivot around the longitudinal axis of the rotor under the action of the key between its locked and released positions of the lock-bolt keeper, and which is characterized in that the lock
30 comprises a helical torsion spring concentrically mounted on the lock rotor having one of its ends resting on the cover and its opposite end integral with the rotor in such a way as to exercise, on the rotor, torque returning the key to its locked position and in that the key, when its end is engaged with the
35 corresponding end of the rotor, allows rotation of the key to

its unlocked position against the return torque of the torsion spring.

5 The end of the torsion spring opposite the end resting under the cover rests on a lever-handle transversally integral with the rotor to elastically prompt the free end of the lever-handle resting beneath the cover in such a way as to maintain the lock in its locked position.

10 The opening provides access to a cavity in the cover in which the end of the key may be introduced to engage the end of the rotor located in this cavity, which is delimited by a first internal wall of the cover perpendicular to the upper wall of said cover and the rotor comprises two parts, a first part comprising the end able to engage the end of the key and rotatingly mounted in a recess of the first wall of the cover
15 and a second part bearing the lock-bolt at its end and rotatingly mounted in a recess formed in a second internal wall of the cover parallel to the first wall, the rotor extending parallel to the upper wall of the cover under this upper wall.

20 The torsion spring and the lever handle are disposed between the first and second parallel support walls of the rotor.

25 Preferably, the rotor comprises a generally cylindrical axis constituting the part rotatingly mounted through the first wall and a cylindrical rod end housing with a lock-bolt constituting the other part of the rotor rotatingly mounted through the second wall, the cylindrical axis being coaxially engaged in a recess of the header body and made rotatingly integral with this body by two cooperating flat sections of
30 the axis and the recess in the header body, respectively.

The cylindrical axis and the header body of the rotor are each made integral in translation by a screw crossing the axis and the header body and also making it possible to fix the lever handle to the header body.

The torsion spring is disposed between the header body and a washer resting on the exterior surface of the first wall and the rotor axis comprises a head constituting the end with which the end of the key may engage, said head being engaged
5 on the interior surface of the first wall through a washer.

The opening has an L-shape, one branch of which, parallel to the first wall, allows the arm of the key to be rotatingly maneuvered to go from either of its locked and unlocked positions to the other position of the lock respectively under
10 the return torque and against the return torque exerted by the torsion spring once the end of the arm is engaged with the corresponding end of the rotor, and prohibits translation of the arm perpendicularly to this wall when it is located in this branch with the end of the arm of the key engaged with
15 the corresponding end of the rotor.

The cavity in the cover presents a tilted wall providing guiding of the end of the arm of the key in the cavity at the bottom of it so that this arm can then be moved in translation to a position engaged with the corresponding end of the rotor.

20 The end of the arm of the key is a cylindrical socket, the axis of which is perpendicular to the axis of the arm and said cylindrical socket is guided at the bottom of the cavity by a rectilinear channel realized in the tilted wall.

Advantageously, the lock-bolt is cylinder sector shaped.

25 The free end of the lever handle is bent at a right angle resting under the cover under the action of the return torque exerted by the torsion spring.

The ends of the torsion spring are bent at a right angle in parallel and opposite directions.

30 A chain is attached at the end of the lever handle to allow the lock-bolt to pivot to its unlocked position under the cover.

The invention will be better understood and other objectives, characteristics, details and advantages of it will
35 appear more clearly in the explanatory description that

follows, done in reference to the annexed drawings given only as examples illustrating one embodiment of the invention and in which:

5 - figure 1 is a broken down perspective view of one part of a closing lid of a manhole cover provided with the locking and unlocking device according to the invention;

10 - figure 2 is a perspective view from below following the arrow II of figure 1 and illustrating the device of the invention in a position allowing the cover to be locked to a support frame;

 - figure 3 is a perspective view similar to figure 2 and illustrating the device of the invention in the cover's unlocked position;

15 - figure 4 is a cross sectional view according to line IV-IV of figure 2 and illustrating the different elements of the device of the invention in the locked position of the cover with the key introduced in the bottom of a cavity related to an opening of the cover;

20 - figure 5 is a cross sectional view following line V-V of figure 4;

 - figure 6 is a cross sectional view following line VI-VI of figure 3 and showing the key socket engaged with the rotor pulling the lock-bolt of the lock in its unlocked position; and

25 - figure 7 is a cross sectional view following line VII-VII of figure 6.

 The locking and unlocking device of the invention which will be described below is intended in particular to equip a cover or lid 1 making it possible to close a frame or structure 2 delimiting the opening, in particular of a manhole cover.

 The locking and unlocking device may be actuated by a key 3, as will be seen later.

35 The cover 1 has its substantially flat upper wall 1a comprising an opening 4 leading on one end toward the exterior

of the cover 1 and on the other end into an interior cavity 5 of the cover 1 in the vicinity of the bottom of which a part of a lock 6 of the cover 1 is accessible.

The key 3 comprises a maneuver arm 7, one end of which is provided with a socket 8, the longitudinal axis of which is perpendicular to the longitudinal axis of the flat arm 7 with a rectangular transversal section. The socket 8 comprises an internal cavity 8a of a transversal square-shaped section, but it is understood that this cavity may have a transversal section of a different shape, for example hexagonal.

The opening 4 for accessing the key 3 is partially closed by a plate 9 of the cover 1 which can be integral with this cover and giving the opening 4 an L-shape. Thus, the plate 9, square or rectangular in shape, covers one of the corners of the rectangular opening 4 of the cover 1 such that the remaining part of this opening and which leads into the upper wall 1a of the cover 1 is substantially L-shaped, allowing the introduction and maneuvering of the key 3.

The cavity 5 of the cover 1 located below the plate 9 is delimited by an internal wall 10 integral with the upper wall 1a of the cover 1 perpendicularly to said upper wall opposite the leading part of the cavity 5 with the opening 4 and which is perpendicular to a tilted wall 11 of the cavity 5 providing guiding of the end part of the key 3 in the cavity 5 until the bottom of this cavity. A rectilinear groove or channel 12 is realized in the tilted wall 11 in balance with one 4a of the branches of the opening 4 extending parallel to the wall 10, the groove 12 being located under the branch 4a. Thus, by introducing the end part of the key 3 into the opening, the socket 8 is engaged in the channel 12 and the flat end part of the arm 3 of the key is resting on the tilted wall 11 to ensure the guided sliding of the end part of the arm 3 of the socket 8 down to the bottom of the cavity 5.

The lock 6 of the cover 1 comprises a rotor 13 comprising a lock-bolt 14 at one end and said rotor rotatably mounted

around its longitudinal axis under the cover 1 parallel to the upper wall 1a of this cover.

The rotor 13 comprises two parts integral with one another comprising a generally cylindrical axis 15 rotatably mounted in a recess 16 of the wall 10 and a generally cylindrical header body 17 rotatably mounted in a recess 18 made through a second wall 19 integral with the upper wall 1a of the cover 1 and, consequently, parallel to the wall 10, the header body 17 bearing the lock-bolt 14 protruding from the wall 19 opposite the wall 10. The lock-bolt 14 is generally hollow cylinder sector shaped.

The header body 17 is provided with a cylindrical part of the smallest diameter 20 located between the two walls 10 and 19 and the cylindrical axis 15 of the rotor 13 is housed in a recess 21 of the cylindrical part 20 while being rotatably linked to the latter by two flat cooperating sections 22, 23 of the axis 15 and the recess 21 of the part 20, respectively. Moreover, the axis 15 is translationally linked to the part 20 of the header body 17 by a screw 24 crossing the recesses 20a and 15a of the part 20 and of the axis 15 perpendicular to their respective coaxial longitudinal axes.

The part 20 of the header body 17 comprises an external transversal notch with a flat bottom 25 extending on a plane parallel to the longitudinal axis of the cylindrical part 20 and on which is fixed, resting, one end of the bar 26 forming a lever handle extending perpendicular to the longitudinal axis of the part 20. Preferably, the lever handle 26 is attached to the flat bottom of the notch 25 by the screw 24, the threaded end of which is anchored in a threaded hole 26a made in the end of the lever handle 26. Thus, the lever handle 26 is rotatably integral with the part 20 and, consequently, the rotor 13. The end 26b of this lever handle opposite the cylindrical part 20 is bent at a right angle such that this free end can rest on the interior surface of the upper wall 1a of the cover 1, as we will see later.

One end of a chain 27 is attached to the bent end 26b of the lever handle 26. The cylindrical axis 15 of the rotor 13 has its free end 28 opposite the lock-bolt 14 protruding into the cavity 5 in the vicinity of the bottom of said cavity and is presented in the shape of a square head which can be engaged with the combined internal cavity 8a of the socket 8. The head 28 of the axis 15 rests on the interior surface of the wall 10 through a washer 29.

A helical torsion spring 30 is concentrically mounted on the part of the axis 15 of the rotor 13 located between the cylindrical part 20 of the header body 17 and a washer 31 resting on the exterior surface of the wall 10. The unit constituted by the head 28, the washers 29, 31 and the spring 30 makes it possible to axially maintain the rotor 13 relative to the walls 10, 19 with practically no play. One end of the torsion spring 30 is bent at a right angle 30a resting on the rear surface of the lever handle 26 and its opposite end, also bent at a right angle 30b, is resting on the interior surface of the upper wall 1a of the cover 1, the ends 30a, 30b being parallel and in opposite directions from one another. In this way, the torsion spring is pre-stressed so as to exert torque to elastically and constantly return the lever handle 26 resting, with its free end 26b, on the interior surface of the upper wall 1a of the cover 1.

Thus, the unit constituted by the cylindrical part 20 of the header body 17, the lever handle 26, the torsion spring 30 and the washer 31 is located between the two walls 10 and 19 of the cover 1. The lock-bolt 14 is able to cooperate with a longitudinal beam part 32 protruding to the interior of the frame 2 to be held under this part in the locked position of the cover 1 in the frame 2. The longitudinal beam part 32 has one end 32a defining a space relative to a rib 1b of the cover 1 resting on a seat stop 2a of the frame 2, through which space the curved part of the lock-bolt 14 can pivot during unlocking of the cover 1 from the frame 2. The seat stop 2a is

located below the longitudinal beam forming a lock-bolt keeper 32.

The device of the invention operates as follows.

One considers that first the cover is locked in the frame
5 2 by the lock 6, the rotor of which 13 is maintained in the
locked position by the spring 30 with the lever handle 26
resting under the cover 1 and the lock-bolt 14 locked under
the lock-bolt keeper 32 as shown in figures 2, 4 and 5.

The end part of the key 3 is introduced in the cavity 5
10 through the opening 4 and this introduction can only be done
for just one direction of the key visible in figure 1, meaning
that the socket 8 slides in the guide channel 12 and the flat
end part of the arm 3 slides on the tilted wall 11 until the
socket 8 arrives practically at the bottom of the cavity 5. In
15 this position, the key 3 is blocked by its arm 7 between the
edge of the L-shaped branch 4b of the opening 4 perpendicular
to the wall 10 and the edge 9a facing the plate 9.

In these conditions, the key 3 can only be actuated by
translation by sliding of the socket 8 at the bottom of the
20 cavity 5 toward the head 28 of the rotor 13 in such a way as
to be directly engaged with it. This translational movement is
illustrated in figures 4 through 6.

Once the socket 8 is engaged with the head 28 of the
rotor 13, the arm 7 of the key 3 finds itself aligned with the
25 branch 4a of the opening 4 parallel to the wall 10 such that
the key 3 can be rotatingly maneuvered to cause the unit made
up of the axis 15, the cylindrical part 20, the lever handle
26, the header body 17 and, consequently, the lock-bolt 14, to
rotate against the return force exerted by the torsion spring
30 in such a way as to allow the lock-bolt 14 to be released
from the lock-bolt keeper 32 through the space between the
lock-bolt keeper and the rib 1b. Figures 3, 6 and 7 illustrate
the position of the lock-bolt 14 released from the lock-bolt
keeper 32.

The cover 1 can then be raised by the operator using the key 3 and completely released from the frame 2.

When the operator places the cover 1 on the ground close to the frame 2, the torsion spring 30 automatically returns the rotor 13 of the lock 6 to its locked position and the key 3 is also automatically returned by the torsion spring 30 to its position in which the arm 7 finds itself resting on the edge of the opening 4 located in the angle of the two branches of the L-shape of this opening. When the key 3 is in this position, it can then be removed from the cover 1 by moving it in translation perpendicularly to the wall 10 in the opposite direction from this to the position shown in figure 1.

The cover 1 can be returned to the closed position on the frame 2 with the key 3 introduced in the cavity 5 and rotatingly maneuvered to cause the rotor 13 to rotate to its unlocked position, and therefore the lock-bolt 14 which will occupy its position, allowing it to introduce it into the space between the lock-bolt keeper 32 and the rib 1b. The operator then releases the handle 3 such that the torsion spring 30 automatically returns the lock-bolt 14 to its locked position under the lock-bolt keeper 32.

The key 3 can then be removed from the cover 1 by translation perpendicular to the wall 10 to the position shown in figure 1, then sliding of the key 3 outside the opening 4 of this cover.

The key 3 must therefore perform, in the cavity 5, a translational, then rotational movement, or the opposite, to respectively unlock or lock the cover on its frame and by passing from one of the branches of the L to the other formed by the opening 4 with its related plate 9.

In the situation where the operator has removed the key 3 from the cover 1 after removing the cover from its frame in order to use this key to open one or several other covers from their respective frames, the first cover no longer having this key will not be able to be placed back in its frame. Indeed,

because the torsion spring 30 automatically and constantly returns the lock 6 to its locked position, the lock-bolt 14 will not be able to be introduced into the space between the lock-bolt keeper 32 and the rib 1b and will come to rest on the corresponding part of the longitudinal beam forming the lock-bolt keeper 32. Moreover, even if the operator had to manually maneuver the lock-bolt 14 to make it pivot against the return torque of the torsion spring 30 to a position corresponding to that of the introduction into this space of the lock-bolt keeper 32, this spring will return the lock 30 to its locked position even before the lock-bolt 14 can be introduced into the space. In other words, the torsion spring 30 makes it impossible to introduce the lock-bolt 14 into the space between the longitudinal beam forming the lock-bolt keeper 32 and the rib 1b of the cover 1. To allow this introduction, the operator must necessarily use the key 3 which is introduced in the cavity 5 and engaged with the head 28 of the rotor 13 to rotate the latter against the return force of the torsion spring 30 and to allow the introduction of the lock-bolt 14 in the space in position and, once the cover is resting on the frame 2, the operator releases the key 3 such that the torsion spring automatically returns the lock-bolt 14 to its locked position under the lock-bolt keeper 32.

The presence of the chain 27 allows a person inside the manhole chamber to exert traction on the lever handle 26 so that it rotates the rotor 13 and the lock-bolt 14 to their unlocked positions of the cover 1 of the frame 2.

The lever handle 26, by its bent free end 26b resting on the cover 1 by the torsion spring 30, indexes the lock-bolt 14 in a way to its captive position under the lock-bolt keeper 32.

CLAIMS

1. Locking equipment comprising a frame (2), a cover or lid (1) and a locking and unlocking device using a key (3) for
5 the cover (1) on the frame (2), comprising a lock (6) integral with the cover (1) which presents an opening (4) to access the lock (6) for the key (3) comprising an arm (7), one end of which (8) makes it possible, when the key (3) is introduced in the opening (4) of the cover (1), to maneuver the lock (6)
10 from a locked position in which a lock-bolt (14) of the lock (6) is locked by a lock-bolt keeper (32) of the frame (2) to an unlocked position in which the lock-bolt (14) is released from the lock-bolt keeper (32), the lock (6) comprising a rotor (13) rotatably mounted in the cover (1), accessible at
15 one of its ends by the opening (4) and having the lock-bolt (14) at its opposite end in such a way as to allow the lock-bolt (14) to pivot around the longitudinal axis of the rotor (13) under the action of the key (3) between its locked and unlocked positions from the lock-bolt keeper (32),
20 characterized in that the lock (6) comprises a helical torsion spring (30) concentrically mounted on the rotor (13) of the lock (6) while having one of its ends resting under the cover (1) and its opposite end integral with the rotor (13) such that it exerts on the rotor (13) a return torque of the lock
25 (6) to its locked position to prevent the introduction of the lock-bolt (14) in the lock-bolt keeper (32) and the replacement of the cover (1) on the frame (2) when the cover (1) has previously been removed from the frame (2) and in that the key (3), when engaged by its end (8) with the
30 corresponding end (28) of the rotor (13), allows rotation of the lock (6) to its unlocked position against the return torque of the torsion spring (30) and the introduction of the lock-bolt (14) in the lock-bolt keeper (32).

2. Equipment according to claim 1, characterized in that the end of the torsion spring (30) opposite the end resting under the cover (1) is resting on a lever handle (26) transversally integral with the rotor (13) to elastically prompt the free end (26a) of the lever handle (26) resting under the cover (1) in such a way as to maintain the lock (6) in its locked position.

3. Equipment according to claim 1 or 2, characterized in that the opening (4) provides access to a cavity (5) of the cover (1) in which the end (8) of the key (3) can be introduced to engage the end (28) of the rotor (13) located in this cavity, said cavity being delimited by a first interior wall (10) of the cover (1) perpendicular to the upper wall (1a) of said cover, in that the rotor (13) comprises two parts, a first part (15) comprising the end (28) which can be engaged with the end (8) of the key (3) and rotatably mounted in a recess (16) of the first wall (10) of the cover (1) and a second part (17, 20) having the lock-bolt at its end and rotatably mounted in a recess (18) formed in a second interior wall (19) of the cover (1) parallel to the first wall (10), the rotor (13) extending parallel to the upper wall (1a) of the cover (1) under this upper wall.

4. Equipment according to claim 3, characterized in that the torsion spring (30) and the lever handle (26) are disposed between the first and second parallel support walls (10, 19) of the rotor (13).

5. Equipment according to claim 3 or 4, characterized in that the rotor (13) comprises a generally cylindrical axis (15) constituting the part rotatably mounted through the first wall (10) and a cylindrical header body (17) with a lock-bolt (14) constituting the other part of the rotor (13) rotatably mounted through the second wall (19), the

cylindrical axis (15) being coaxially engaged in a recess (21) of the header body (17) and rotatably integral with this body by two cooperating flat parts (22, 23) of the axis (15) and the recess (21) of the header body (17), respectively.

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6. Equipment according to claim 5, characterized in that the cylindrical axis (15) and the header body (17) of the rotor (13) are integral in translation with one another by a screw (24) crossing the axis (15) and the header body (17) and
10 also making it possible to attach the lever handle (26) to the header body (17).

7. Equipment according to claim 5 or 6, characterized in that the torsion spring (30) is disposed between the header
15 body (17) and a washer (31) resting on the exterior surface of the first wall (10) and the axis (15) of the rotor (13) comprises a head (28) constituting the end with which the end (8) of the key (3) can engage, said head (28) resting on the interior surface of the first wall (10) through a washer (29).

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8. Equipment according to one of claims 3 to 7, characterized in that the opening (4) has an L-shape of which one branch, parallel to the first wall (10), allows the arm (7) of the key (3) to be rotatably maneuvered to pass from
25 any one of its locked or unlocked positions to the other position of the lock (6) respectively under the return torque and against the return torque exerted by the torsion spring (30) once the end (8) of the arm (7) is engaged with the corresponding end (28) of the rotor (13), and prohibits
30 translation of the arm (7) perpendicularly to this wall when it is located in this branch with the end (8) of the arm (7) of the key (3) engaged with the corresponding end (28) of the rotor (13).

9. Equipment according to one of claims 3 to 8, characterized in that the cavity (5) has a tilted wall (11) providing guiding of the end (8) of the arm (7) of the key (3) at the bottom of the cavity (5) so that this arm can then be
5 translationally moved to a position engaged with the corresponding end (28) of the rotor (13).

10. Equipment according to claim 9, characterized in that the end (8) of the arm (7) of the key (3) is a
10 cylindrical socket, the axis of which is perpendicular to the axis of the arm (7) and which is guided in the cavity (5) at the bottom of said cavity by a rectilinear channel (12) made in the tilted wall (11).

15 11. Equipment according to one of the preceding claims, characterized in that the lock-bolt (14) is cylinder sector shaped.

12. Equipment according to one of claims 2 to 11,
20 characterized in that the free end (26b) of the lever handle (26) is bent at a right angle resting on the cover (1) under the action of the return torque exerted by the torsion spring (30).

25 13. Equipment according to one of claims 2 to 12, characterized in that the ends (30a, 30b) of the torsion spring (30) are bent at right angles in parallel and opposite directions.

30 14. Equipment according to one of claims 2 to 13, characterized in that a chain (27) is attached at the end (26b) of the lever handle (26) to allow the lock (6) to pivot to its unlocked position below the cover (1).