

TITLE OF THE INVENTION**DEVICE FOR LOCKING AND UNLOCKING, WITH A KEY, A STOPPER
ON A FRAME**

The present invention concerns a device that makes it possible to lock and unlock, by means of a key, a stopper or cover on a frame.

It can be used in traffic route equipment, such as, for example, a manhole cover.

5 A locking and unlocking device such as this is known as comprising a lock that forms a unit with the stopper that has an access opening to the lock for the key. This key comprises an arm, having at its end a part forming a bushing that makes it possible to manipulate the lock when the key is introduced into the opening of the stopper from a locking position, in which a
10 slide bolt of the lock is held captive by a catch of the frame to an unlocking position, for which the slide bolt is released from the catch and the key is held captive in the stopper opening. The lock also comprises a rotor mounted with rotation in the stopper and accessible through the opening of the stopper, the rotor being coupled to the slide bolt, perpendicular to the latter. When the key
15 is introduced into the stopper in locked position of same on the frame and is operated to unlock the stopper from the frame, the assembly made up by the rotor and the slide bolt pivots from its position captive in the catch to its position where it is released from same.

20 This known device has the disadvantage that the rotor, which is directly accessible from the outside across the opening of the stopper, can be operated by people with bad intentions using a tool other than the one necessary for operating this lock, in an attempt to fraudulently access the equipment installed in the manhole.

25 The object of the present invention is to eliminate the disadvantage above by proposing a locking and unlocking device with key for a stopper or cover on a frame, comprising a lock that forms a unit with the stopper, which has an access opening to the lock for the key, comprising an arm having at its

end a part forming a bushing that makes it possible to operate the lock when the key is introduced into the opening of the stopper, from a locking position in which the slide bolt of the lock is held captive by a catch on the frame to an unlocking position for which the slide bolt is disengaged from the catch and the key is held captive in the opening of the stopper, the lock also comprising a rotor mounted with rotation in the stopper, accessible through the opening and coupled with the slide bolt, perpendicular to the latter in such a way as to allow pivoting of the slide bolt around the longitudinal axis of the rotor due to the action of the key between its positions when it is captive with and disengaged from the catch and which is characterized in that the rotor of the lock comprises a generally cylindrical barrel mounted with rotation in the stopper and being attached in rotation to the slide bolt and a cylindrical axle mounted loosely in the barrel, of which the head engages axially in the bushing of the key when it is introduced into the cavity of the stopper.

Advantageously, the slide bolt is made up of a flat rigid plate comprising, near one of its ends, a hole in which two diametrically opposed radial arc-shaped notches and a third radial arc-shaped notch pointed toward the active opposite free end of the slide bolt plate; the barrel crosses the bottom wall of the cavity of the stopper and comprises a circular head with radial pin lodged in the hole of the slide bolt with the pin engaged in the third notch of the slide bolt, the cylindrical head of the cylindrical axle mounted loosely being in contact on the circular head of the barrel, the bushing of the key comprises two parallel, diametrically opposed external pegs that are able

to engage in the two opposite notches, respectively, of the slide bolt in locked position of the stopper on the frame across from two diametrically opposed grooves of the lateral wall of the cavity overhanging the two opposite notches of the slide bolt and making it possible to move in rotation around one-quarter
5 of a turn, the cylindrical axle assembly, barrel and slide bolt plate by turning the key in the corresponding direction for moving the slide bolt to its unlocking position in which the key is captive in the stopper by its two pegs retained axially in two longitudinal recesses, respectively, in the lateral wall of the cavity.

10 According to one embodiment, the length of each passage groove for a peg of the key bushing is less than the length of the notch that it overhangs of the slide bolt plate in locked position of the stopper on the frame in such a way that the notch would be inaccessible to a tool, such as a screwdriver, introduced into the opening of the stopper and the groove to prevent any
15 fraudulent operation of the slide bolt using this tool.

Each peg of the key bushing is in the shape of a reversed L, of which the small branch is connected radially to the bushing and the other branch that is parallel to the arm of the key projects beyond the opening part of the bushing.

20 The slide bolt plate and the circular head of the barrel are in contact with the inside face of the bottom wall of the stopper cavity and the means elastically holding the head of the barrel in contact with the bottom wall and the cylindrical head of the cylindrical axle on the head of the barrel comprise an elastic element, such as a spring, mounted coaxially on the part of the
25 barrel located on the outside of the bottom wall by being prestressed between the outside face of this wall and a contact washer retained axially with respect to the barrel by a pin crossing the free end of the cylindrical axle projecting from the barrel.

The elastic element is in contact on the outside face of the bottom wall by way of a wavy washer that is connected with rotation to the barrel and cooperating with four recesses made in this outside face and spaced regularly around the passage hole of the barrel across the bottom wall at the time of rotation of the barrel to position the slide bolt at one or the other of its locking and unlocking positions of the stopper on the frame.

The barrel comprises a flat surface cooperating with a flat surface of the wavy washer to move the latter along in rotation when the slide bolt pivots.

The slide bolt projects to the outside of the lateral wall of the cavity of the stopper across a slot making possible the pivoting of the slide bolt around one-quarter of a revolution.

The invention will be better understood, and other goals, characteristics, details and advantages of same will be seen more clearly in the explanatory description to follow with reference to the attached schematic drawings given only by way of example, illustrating an embodiment of the invention, and in which:

- Figure 1 is a perspective exploded view of a locking and unlocking device of a stopper on a frame according to the invention;

- Figure 2 is an enlarged cross section view along line II-II of Figure 1 of the different assembled elements of the device according to the invention in the locked position of the stopper or frame;

- Figure 3 is a cross section view similar to that in Figure 2 and representing the device according to the invention in its unlocked position of the stopper of the frame;

- Figure 4 is a partial top view according to arrow IV of Figure 2;

- Figure 5 is a partial top view according to arrow V in Figure 2;
- Figure 6 is a partial top view according to arrow VI in Figure 3;
- Figure 7 is a partial top view according to arrow VII in Figure 3;
- Figure 8 is a perspective view of an assembly with rotor and slide
5 plate of the lock or device in Figure 1; and
- Figure 9 is a perspective top view according to arrow IX in Figure 2.

The locking device according to the invention that will be described is most specifically intended to equip a stopper, cover or the like 1, making it possible to close a frame, chassis or the like 2 and delimiting the opening
10 through a manhole, for example.

The locking device can be actuated using a key 3.

The upper wall 1a of stopper 1 comprises an access opening 4 for the key 3 which opens on one side toward the outside of the stopper 1 and on the other side into a cavity 5 in which the unlocking mechanism that will be
15 described below is mounted.

Key 3 comprises a cylindrical arm 6 of which one end comprises a part forming a bushing 7 and the opposite end comprises an operating handle 8 that is interdependent with this end transversally to the arm 6.

In the present case the bushing 7, which extends co-axially to the arm
20 6, and in the present case is implemented by a hole with a flat base at the end of the arm 6, but it could be made up by a bushing attached to the end of this arm.

The end of the arm 6 comprising the bushing 7 is equipped with two external pegs 9 connected to the arm 6, being diametrically opposed and
25 parallel to the longitudinal axis of the arm 6. Preferably, each peg 9 is in the shape of a

reversed L, of which the small branch 9a is interdependent radially with the end of the bushing 7 and the large branch 9b extends parallel to the arm 6 of the key 3, projecting beyond the opening part of the bushing 7.

5 The locking and unlocking mechanism comprises a lock attached to the stopper 1 and comprises a slide bolt 10 that can interact with a catch 11 of the frame 2 and made up, in the present case, by one of ribs of frame 2 making it possible to support the stopper 1. The slide bolt 10 is made up of a flat rigid plate, of which the active end 12 positions itself above the rib 11 making up the catch in locking position of stopper 1 on frame 2.

10 The slide bolt 10 comprises a hole 13 made near its arc-shaped end opposite the active part 12. In the hole 13, two diametrically opposed and identical radial arc-shaped notches 14 and a third radial arc-shaped notch 15 pointed toward the free active end 12 of the slide bolt plate 10 are arranged. The two notches extend along a direction perpendicular to the direction of the notch 15.

15 The plate of the slide bolt 10 is arranged in the stopper 1, having the part of its end comprising notches 14 and 15 in contact with the internal face of the bottom wall 1b of cavity 5 and its active end part 12 projecting outside the stopper across a slot that is essentially at a right angle 1c made in a part of the lateral wall delimiting the cavity 5 in such a way that the slide bolt 10 can pivot around one-quarter revolution from its locking position of stopper 1 with frame 2 to its position of unlocking with this stopper.

20 The lock additionally comprises a rotor 16 mounted with rotation in the stopper 1 and coupled with the slide bolt 10, perpendicular to the latter. The key 13 can access to the rotor 16 across the opening 4 and the cavity 5 so that it can start the rotor in rotation around its longitudinal axis and, as a

result, ensure the pivoting of the slide bolt 10 along this axis between its position when it is captive with the catch 11 and its position when it is released from same.

The rotor 16 comprises a generally cylindrical barrel 17 mounted with rotation in the stopper 1 and attached in rotation to slide bolt 10 and a cylindrical axle 18 mounted loosely, i.e. able to rotate freely, in the barrel 17. The latter crosses a hole 1d of the bottom wall 1b of the cavity 5 of stopper 1 and comprises a circular head 19 with radial pin 20 being engaged in the notch 15 to connect the barrel 17 in rotation to the slide bolt 10. As can be seen better from Figures 2 and 3, the thickness of the circular head 19 of the barrel 17 is less than the thickness of the plate of slide bolt 10.

The cylindrical axle 18 mounted loosely in the barrel 17 comprises a cylindrical end head 21 that is fastened co-axially with axle 18 by means, successively of a shoulder with larger diameter 22 and a cylindrical bearing surface 23 lodged in the hole 13 on the circular head 19 of the barrel 17, the shoulder 22 being in contact with the plate of slide bolt 10. The diameter of the cylindrical head 21 of axle 18 is slightly less than the internal diameter of the bushing 7 of the key 3.

The cylindrical axle 18 completely crosses the barrel 17 and at its free end opposite the head 21 projects outside beyond the barrel 17.

An elastic element 24, such as a helical spring, is mounted, prestressed between the external face of the bottom wall 1b of cavity 5 and a washer 25 arranged co-axially around the end of barrel 17, which projects to the outside of the wall 1b, the washer 25 being held axially with respect to the barrel 17

by a pin 26, of which one branch crosses a hole made at the free end of the axle 18.

The elastic element 24 is in contact with the outside face of the wall 1b by means of a washer 27 that is slightly wavy in some locations and cooperates with the recesses 28, in the present case four in number, made in the wall 1b in such a way as to hold the slide bolt 10 at one or the other of its locking and unlocking positions with the stopper on frame 2. More specifically, the washer 27 comprises at least two waves or bosses 27a that are diametrically opposed and one or the other able to engage with the two positions locking and unlocking, respectively, in two recesses 28 that are diametrically opposed on each side of passage hole 1d of barrel 17. In the present case, the four recesses 28 are made up of small holes extending crosswise around the hole 1d.

Over almost all of its length, the barrel 17 comprises a flattened surface 17a cooperating with an internal flattened surface 27b of the washer 27 to join the latter with rotation to barrel 17.

The assembly made up by stacking washers 25, 27 and spring 24 constitutes a means that makes it possible to hold the barrel 17, elastically and axially, with its head 19 in contact with the internal face of the wall 1b and the axle 18 in contact by the shoulder 22 and the bearing surface 23 on the head 19 and the plate of slide bolt 10.

The lateral wall defining the cavity 5 comprises two internal grooves 29 that are parallel and diametrically opposed, in which the two pegs 9 of the bushing 7 of the key 3 can engage, respectively.

The two grooves 29 overhang the two notches 14, respectively, of the slide bolt 10 when the latter occupies its locking position of the stopper 1 with the frame 2. In addition, the length of each passage groove 29 of a peg 9 is less than the length of the notch 14 that overhangs the plate of slide bolt 10 in

such a way that in the locked position of stopper 1 on frame 2, the notch 14 would be inaccessible to a tool, such as a screwdriver, introduced into opening 4 of stopper 1 and groove 29 in order to thus carry out any fraudulent manipulation for pivoting the slide bolt 10 with the use of this tool. In fact, the two radial lateral walls defining each notch 14, in the locking position of stopper 1, are located as shown in the bottom view of Figure 5 on each side of the lateral walls of the corresponding groove 29 below the end opening into this groove in such a way that the tool cannot reach, in particular, the lateral wall of the recess 14 to make the slide bolt 10 turn in its direction for unlocking the stopper 1. If necessary, the depth of each notch 14 can be either equal or greater than the depth of the groove 29 which overhangs it in order to prevent the tool from reaching the arc-shaped wall of notch 14 and, as a result, prevent turning of the slide plate 10 in the unlocking direction of the stopper.

The lateral wall of the cavity 5 also comprises two longitudinal notches or recesses 30 that are diametrically opposed and located on each side of the grooves 29. These two notches make it possible to axially hold the pegs 9 of the bushing 7 when the key 3 has been turned to its unlocking position of the slide bolt 10 in such a way as to hold the key 3 captive on the stopper 1 when the latter is removed from its frame in order to make it impossible to lose the key 3.

The head 21 of the loosely mounted axle 18 projects into cavity 5 of stopper 1.

Starting from the closed position of the stopper 1 shown in Figure 2, the key 3 is introduced into the opening 4 and the cavity 5 in such a way that the pegs 9 engage in the grooves 29 until the ends of the branches 9a of the

plugs engage in the two notches 14 as shown in dotted lines on this figure, the head 21 of axle 8 then being engaged in the cylindrical hole of bushing 7 to limit the depth of introduction of pegs 9 into cavity 5.

By then turning key 3 to unlock stopper 1 from frame 2, the branches 5 9a of pegs start in rotation, by the notches 14, the slide bolt 10 that turns with the assembly made up of the axle 18, the barrel 17, the washers 25, 27, the elastic element 24 and the pin 26 in the direction indicated by arrow F1 in Figure 5 around one-quarter revolution to move the slide bolt 10 to its unlocked position shown in Figures 3, 6 and 7 and at which position the 10 stopper 1 can be removed from the frame 2. At the time when the slide bolt 10 pivots from its locking position to its unlocking position, the two bosses 27a of the washer 27 leave their engagement position, respectively in two of the recesses 28 that are diametrically opposed, to engage in the two other recesses 28 that are diametrically opposed due to the return force of the elastic element 15 24. In unlocking position, the pegs 9 are held axially by their radial branches 9b in the two recesses 30 in such a way as to hold key 3 in the stopper 1 so that it will not be locked again to frame 2. Each notch 30 comprises a lateral wall 30a serving as a stop for the corresponding branch 9a of the bushing 7 in such a way as to limit the rotation of the key to the angular value of one- 20 quarter revolution.

To close frame 2, all that is necessary is to place stopper 1 on the ribs 11 and, by turning the key in the direction opposite to arrow F1, the slide bolt 10 is moved into its locking position below the corresponding rib 11 and the key can be freely removed from stopper 1.

25 In the locked position of stopper 1 on frame 2, any unauthorized person who is not in possession of the key 3 cannot unlock the lock. In fact,

the use e.g. of pliers acting on the cylindrical head 21 will do nothing but freely turn the cylindrical axle 18 in the barrel 17, which is inaccessible from the outside, and as a result, this eliminates the risk of causing the slide bolt 10 to turn. In addition, as already explained above, the introduction of a
5 screwdriver into one or the other of the grooves 29 will not work for making the slide bolt 10 turn, since the notches 14 of the slide bolt 10 are inaccessible across these grooves.

CLAIMS

1. Locking and unlocking device with key (3) for a stopper or cover (1) on a frame (2), comprising a lock that is interdependent with the stopper (1) and has an access opening (4) to the lock for the key (3), comprising an arm (6) having on its end a bushing (7) that makes it possible to manipulate the lock when the key (3) is introduced into the opening (4) of stopper (1) from a locking position, in which a slide bolt (10) of the lock is held captive by a catch (11) of the frame (2), to an unlocking position for which the slide bolt (10) is released from the catch (11) and the key (3) is held captive in the opening (4) of the stopper (1), the lock also comprising a rotor mounted with rotation in the stopper (1), accessible through the opening (4) and coupled with the slide bolt (10) and perpendicular with it in such a way as to allow the pivoting of the slide bolt (10) around the longitudinal axis of the rotor (16) due to the action of the key, between its positions when it is captive in and released from the catch (11), characterized in that the rotor (16) of the lock comprises a generally cylindrical barrel (17) mounted with rotation in the stopper (1) and being interdependent in rotation with the slide bolt (10) and a cylindrical axle (18) mounted loosely in the barrel (17), the cylindrical axle (18) comprising a cylindrical head (21) in contact on the barrel (17) and lodged in a cavity (5) of the stopper (1) that is accessible from the outside through the opening (4) of the stopper and in that means are provided for elastically and axially holding, in the stopper (1), the barrel (17) and the cylindrical axle (18) of which the head (21) engages axially in the bushing (7) of the key (3) at the time of its introduction into the cavity (5) of the stopper (1).

2. Device according to Claim 1, characterized in that the slide bolt (10) is made up of a flat rigid plate comprising, in the area of one of its ends, a hole

(13) in which two diametrically opposed radial arc-shaped notches (14) are arranged and a third radial arc-shaped notch (15) is pointed toward the opposite active free end (12) of the plate of slide bolt (10), in that the barrel (17) crosses the bottom wall (1b) of the cavity (5) of stopper (1) and comprises a circular head (19) with radial pin (20) engaged in the third notch (15) of the slide bolt, the cylindrical head (21) of the loose axle (18) being in contact with the circular head (19) of the barrel (17), in that the bushing (7) of the key (3) comprises two diametrically opposed parallel external pegs (9) that are able to engage, respectively, in the two opposing notches (14) of the slide bolt (10) in the locked position of the stopper (1) in the frame (2) across from two diametrically opposed grooves (29) of the lateral wall of cavity (5) overhanging the two opposing notches (14) of slide bolt (10) and making it possible to bring into rotation of about one-quarter revolution the assembly with loose axle (18), barrel (17) and plate of the slide bolt (10) by turning the key (3) in the direction corresponding to the one for bringing the slide bolt (10) to its unlocking position, at which point the key (3) is captive in the stopper (1) by its two pegs (9) held axially, respectively, in two longitudinal recesses (30) of the lateral wall of the cavity (5).

3. Device according to Claim 2, characterized in that the length of each passage groove (29) for a peg (9) of the bushing (7) of key (3) is smaller than the length of the notch (14) that overhangs the plate of the slide bolt (10) in the locked position of stopper (1) in frame (2) in such a way that the notch (14) would be inaccessible to a tool, such as a screwdriver, introduced into the opening (4) of the stopper (1) and the groove (29) to prevent any fraudulent manipulation of the slide bolt (10) using this tool.

4. Device according to Claim 2 or 3, characterized in that each peg (9) of the bushing (7) of the key (3) has the shape of a reversed L, of which the

small branch (9b) is interdependent radially with the bushing (7) and the other branch (9a) parallel to the arm (6) of the key (3) projects beyond the opening part of the bushing (7).

5 5. Device according to one of Claims 2 to 4, characterized in that the plate of the slide bolt (10) and the circular head (19) of the barrel (17) are in contact on the internal face of the bottom wall (1b) of cavity (6) of the stopper (1) and that the means that elastically hold the head (19) of the barrel (17) in contact with the bottom wall (1b) and the cylindrical head (21) of the loose axle (18) on the head (19) of the barrel (17) comprise an elastic element (224)
10 [sic], such as a spring, mounted coaxially to the part of the barrel (17) located on the outside of the bottom wall (1b), being prestressed between the external face of this wall and a contact washer (25) held axially with respect to the barrel (17) by a pin (26) crossing the free end of the loose axle (18) projecting from the barrel (17).

15 6. Device according to Claim 5, characterized in that the elastic element (24) is in contact on the external face of the bottom wall (1b) by way of a wavy washer (27) that is interdependent in rotation with the barrel (17) and cooperates with four recesses (28) made in this external face and spaced regularly around the passage hole (1d) of the barrel (17) across from the
20 bottom wall (1b), at the time of rotation of the barrel (17), to position the slide bolt (10) at one or the other of its locking and unlocking positions of the stopper (1) on the frame (2).

25 7. Device according to Claim 6, characterized in that the barrel (17) comprises a flattened surface (17a) that works together with a flattened surface (27b) of the wavy washer (27) to start the latter in rotation when the slide bolt (10) pivots.

8. Device according to any one of the preceding claims, characterized in that the slide bolt (10) projects to the outside of the lateral wall of the cavity (5) of stopper (1) through a slot (1c) making it possible for the slide bolt (10) to pivot around one-quarter revolution.