

**Device for locking and unlocking a manhole cover on a frame by means of a key,
with the option of automatic keyless locking of said manhole cover on the frame**

[0001] The present invention concerns a device for locking and unlocking a plug or
5 cover on a frame, in particular of a utility hole, using a key.

[0002] Such a device is known from document FR 2 979 368 which
comprises a lock joined to the plug which has an emergent opening for access to the lock
for the key which comprises an arm of which one end enables the lock to be actuated
when the key is inserted into the opening of the plug from a locking position in which the
10 lock bolt is held captive by a strike of the frame to an unlocking position for which the bolt
is clear of the strike.

[0003] This lock comprises a rotor rotatably mounted in the plug, accessible
at one of its ends by the emergent opening and bearing at its opposite end the bolt
consisting of a substantially rectangular flat transverse arm such that the rotation of the
15 rotor under the action of the key causes pivoting of the bolt in its own plane between its
positions that are captive in the frame strike and clear of the frame strike.

[0004] Furthermore, the emergent opening of the plug, coaxial with the end
of the rotor able to be engaged with the end of the key arm, is obturated by a stopper
returned to bear under the plug to its position of closing the emergent opening by a return
20 spring, and the key, when inserted into the emergent opening, causes the pushing-in of the
closing stopper against the return force of the spring along the rotor of which the end is
engaged with the end of the key arm.

[0005] The closing stopper of the emergent opening prevents detritus from
passing through the emergent opening of the plug which may reach some of the internal
25 components of the lock and lead to difficulty in the pivoting by the key of the bolt from its
locking position of the plug to the frame to its unlocking position of that plug from the
frame.

[0006] Furthermore, the closing stopper of the emergent opening of the plug
prevents detritus from accumulating in the emergent opening and from blocking it,
30 otherwise the insertion of the key into the emergent opening of the plug to actuate the bolt
of the lock would be made impossible.

[0007] However, the structure of the lock of the plug with a closing stopper of the emergent opening of that plug is relatively complex and painstaking to assemble under the plug.

[0008] Furthermore, when the plug is disengaged from the opening of the frame to its raised position with the key withdrawn from the plug, the flat bolt of the lock occupies its position corresponding to that of locking the plug to the frame. In these conditions, there is a risk that the operator, in particular when the plug is hinged to one of the sides of the frame, will accidentally cause the swinging of the plug to its position of closing the frame, thus damaging the lock bolt and, therefore, the lock, by violently striking the corresponding lateral wall of the frame.

[0009] The present invention aims to remedy the above disadvantages.

[0010] To that end, according to the invention, the device for locking and unlocking a plug on a frame using a key, comprising a lock fastened to the plug which has an emergent opening for access to the lock for the key comprising an arm of which one end enables the lock to be actuated when the key is inserted into the opening of the plug from a locking position in which a bolt of the lock is held captive by a strike of the frame to lock the plug in the frame to an unlocking position for which the bolt is clear of the strike to enable the movement of the plug to its position clear of the opening of the frame, the lock comprising a drive mechanism linked to the bolt so as to enable the movement of the bolt under the action of the key between its positions that are captive and clear of the strike, characterized in that the lock bolt comprises a shaft returned to its position that is captive of the strike by an elastic return member and the drive mechanism cooperates with the bolt under the action of the key to translate the bolt shaft against the return force of the return member to its position clear of the strike, in that the lock bolt, when the key is withdrawn from the plug in its position clear of the frame, enables the automatic locking by the elastic return member of the plug to the frame on insertion of the plug into the frame and in that the emergent opening of the plug, is obturated by an unlosable stopper returned to bear under the plug in its position of closing the emergent opening by a return spring.

[0011] The drive mechanism comprises a rotor rotatably mounted in the plug perpendicularly under the latter, accessible at one of its ends by the opening and a cam-forming part fastened to the opposite end of the rotor and engaged in a recess of the bolt shaft and cooperating with the cam-forming part of the rotor when the latter is actuated by the key engaged with the corresponding end of the rotor to translate the bolt shaft against the return force of the return member to its position clear of the strike.

[0012] The bolt shaft and the return member are coaxial and housed perpendicularly to the rotor in a casing removably fastened under the plug and the end part of the rotor comprising the cam passes through a wall of the casing situated on the inside face of the plug such that the cam engaged in the recess of the bolt shaft is housed in the casing.

[0013] The rotor cam extends perpendicularly to the longitudinal direction of the bolt shaft when the latter occupies its position that is captive of the strike.

[0014] The bolt shaft bears, by an inside face of its recess situated on the side near the return member, on a lateral face of the rotor adjacent the cam when the bolt shaft occupies its captive position in the strike.

[0015] The bolt shaft is flat and the casing comprises two parts removably fastened to each other, respectively a first part of substantially Ω -shaped cross-section with a flat base in which are housed for guided sliding the bolt shaft and the return member and a second part in the form of a planar plate constituting the aforementioned wall of the casing passed through by the cam and to which are removably fastened the two elongate lateral branches of the first part.

[0016] The second part of the casing comprises a small plate attached to an edge of that second part so as to obturate the opposite end opening of the first part to that enabling the passage of the beveled end of the bolt shaft and on which small plate bears an end of the return member consisting of a helical compression spring.

[0017] The second part of the casing is removably fastened under the plug.

[0018] The emergent opening of the plug is coaxial with the end of the rotor able to be engaged with the end of the arm of that key and in that the key, when inserted into the emergent opening, causes the pushing-in of the closing stopper against the return force of the spring along the rotor of which the end is engaged with the end of the key arm.

[0019] A cylindrical barrel fastened under the plug and comprising a transverse end wall through which is formed the emergent opening of the plug which comprises a circular central aperture and two diametrically opposite grooves opening into the circular central aperture and the closing stopper is in the form of a cylindrical piece mounted for guided sliding in the cylindrical barrel and on the lock rotor and comprising two cylindrical end parts separated from each other by a collar able to slide in the cylindrical barrel, one of the end parts of the closing stopper comprising two diametrically

opposite tenons respectively engaged in the two grooves of the emergent opening with the collar bearing under the transverse wall of the barrel when the closing stopper occupies its obturating position of the emergent opening, the tenons of the closing stopper being disengaged from the emergent opening when the key arm is engaged with the end of the lock rotor to rotate the rotor to its position at which the lock bolt is disengaged from the frame strike.

[0020] The closing stopper is rotationally coupled to the end of the lock rotor.

[0021] The return spring of the closing stopper is housed in the cylindrical barrel while being mounted pre-stressed between the collar of the cylindrical stopper and an inside shoulder of the cylindrical barrel.

[0022] The transverse end wall of the cylindrical barrel forms part of a cylindrical sleeve fastened to the corresponding end part of the cylindrical barrel.

[0023] The cylindrical barrel is fastened to the second part in the form of a planar plate of the casing and perpendicularly to that part.

[0024] The key comprises at the tubular end of its arm two diametrically opposite lugs of complementary shape to the grooves of the emergent opening to enable the engagement of the tubular end of the key arm through the emergent opening by pushing the closing stopper into the cylindrical barrel against the return force of the spring to reach a position in which the two lugs of the key are brought to bear under the transverse wall of the cylindrical barrel by rotation of the key engaged with the lock rotor and held under that wall by the closing stopper and the return force applied by the spring on the collar of the closing stopper.

[0025] The invention will be better understood, and other aims, features, details and advantages thereof will appear more clearly in the following explanatory description made with reference to the accompanying drawings given solely by way of example illustrating an embodiment of the invention, in which drawings:

- Figure 1 is a view from above of a plug mounted in locked position on a frame for a utility hole;

- Figure 2 is a view from below of the assembly of plug and frame of Figure 1;

- Figure 3 is a cross-section view on line III-III of Figure 2;
- Figure 4 is an enlarged view of the part circled within IV of Figure 3;
- Figure 5 is a perspective view from below of the assembly of plug and frame of Figure 1;

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- Figure 6 is an enlarged view of the part circled within VI of Figure 5;
 - Figure 7 is an exploded perspective view of the lock of the invention;
 - Figure 8 is a perspective view of the lock of Figure 7 in assembled position;
 - Figure 9 is a similar view to that of Figure 8 representing the unlocking key engaged in the lock;
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- Figure 10 is a perspective view flow of the unlocking key of the plug; and
 - Figure 11 is a view of the unlocking key in the direction of the arrow XI of Figure 10.

[0026] The locking and unlocking device of the invention which will be described below is configured to equip a plug or cover 1 making it possible to obturate a frame or body structure 2 delimiting the access opening in particular of a buried utility hole or visiting hole.

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[0027] The locking and unlocking device may be actuated by a key 3 as will be seen later to unlock the plug 1 from the frame 2 and disengage it from that frame to access the utility hole and, according to requirement, lock it to that frame again. The plug 1 is of square shape and is accommodated in its closing position in a square opening of the frame 2, but the plug 1 may be circular to provide the closing of the circular opening of the corresponding frame 2. Another shape of utility hole plug may be envisioned as rectangular or triangular.

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[0028] Furthermore, the plug 1 is pivotally mounted by one of its straight sides to an adjacent one of the lateral walls 2a of the frame 2 around a hinge axis A as is known *per se* to enable the swinging of the plug 1 relative to the frame 2 between its positions of opening and closing that frame and to hold the plug to the frame 2 when the plug occupies its upright raised position of clearing that opening. However, the hinging of the plug 1 to the frame 2 may be of the type enabling the removal of the plug 1 from that

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frame in the upright raised position of the plug 1. It may be envisioned to place this lock on a non-hinged device of which the plug would be manipulated by a "pulled-slid" movement to place it within the frame opening.

[0029] The substantially planar web-forming upper wall 1a of a plug 1 comprises anti-skid projecting elements 1b on its outer surface. The plug 1 further comprises an emergent opening 4 at the location of the planar upper face 1c of the wall 1a making it possible to obtain access by the key 3 to a lock 5 fastened under the wall 1a of the plug 1. The lock 5 is situated facing the opposite lateral wall 2a of the frame 2 to that of hinging the plug 1 to that frame. For a triangular plug in particular, the lock will be situated facing a wall adjacent to that of the hinge.

[0030] The key 3 comprises a longitudinal arm or shank 6 of which one end is provided with a socket 7 coaxial with the arm 6 and the opposite end is provided with an actuating handle 8 extending perpendicularly on opposite sides of the arm 6. The socket 7 comprises a internal cavity formation 9 making it possible be engaged with a rotor 10 rotatably mounted in the plug 1 to actuate the lock 5 from a locking position in which a bolt 11 of the lock 5 is held captive by a strike 12 of the frame 2 to lock the plug 1 to the frame 2 in an unlocking position for which the bolt 11 is clear of the strike 12 to enable the withdrawal of the plug 1 from the frame 2. The strike 12 is formed by a recess produced within an internal thickness of the opposite lateral wall 2a to the frame hinge axis 12.

[0031] The rotor 10 of the lock 5 extends perpendicularly to the upper wall 1a of the plug 1 under that wall and is linked, at its opposite end to that configured to engage with the socket 7 of the key 3, to the bolt 11 so as to enable the movement of the bolt 11 under the action of the key 3, when the socket 7 is engaged with the end 10b of the rotor 10, between its positions that are captive and clear of the strike 12 of the frame 2.

[0032] Reference V designates a jack for assisting the opening of the plug and which is hingedly mounted between the plug 1 and the lateral wall 2a of the frame 1 provided with the hinge A. Reference B designates a prop for holding the plug 1 in its upright position clear of the frame 2 and having one of its ends hingedly linked to the lateral wall 2a of the frame 2 provided with the hinge A and its opposite end shaped and able to cooperate with a rib 1n of the plug 1 under the latter to retain the plug 1 in its upright position.

[0033] An elastic support J is fastened under the plug 1 and comes to bear on an inside peripheral rib 2n of the frame 2 when the plug 1 obturates the frame 2. This elastic support J may have a sealing function.

[0034] According to the invention, the bolt 11 of the lock 5 comprises a shaft 11a, preferably constituted by a flat elongate bar, housed for guided sliding in a casing 13 removably fastened under the plug 1, the shaft 11a extending in a direction substantially parallel to the upper wall 1a of the plug 1 and transverse to the lateral wall 2a of the frame 2 provided with the hinge A when the latter is hinged.

[0035] The shaft 11a of the bolt 11 is returned to its position of engagement in the strike 12 of the frame 2 by an elastic member 14 preferably constituted by a helical compression spring housed in the casing 13 coaxially to the shaft 11a of the bolt 11 and perpendicularly to the rotor 10.

[0036] The casing 13 comprises two parts 15, 16 removably fastened to each other by fastening screws 17 and respectively comprising a first elongate part 15 of substantially of substantially Ω -shaped cross-section with a flat base 18 in which are housed for guided sliding the shaft 11a of the bolt 11 and the return member 14 and a second part in the form of a planar plate 16 under which are removably fastened the two elongate lateral planar branches 19 of the first part 15 by screws 17 anchored in tapped holes 20 of the second part 16. The second part 16 preferably has a rectangular general shape (according to the ribbing of the bottom-face cast material of the plug, that shape could be different).

[0037] The second part 16 of the casing 13 comprises a small plate 21 fastened to an edge of that second part perpendicularly thereto so as to obturate the opposite end opening of the first part 15 to that enabling the passage of the beveled end 11b of the shaft 11a of the bolt 11 and on which small plate 21 bears an end of the return member 14, of which the opposite end part is accommodated in a U-shaped end cut-out of the shaft 11a of the bolt 11.

[0038] The second part 16 of the casing 13 is removably fastened to four feet 22 able to be cast which project under the upper wall 1a of the plug 1. More specifically, the substantially planar square plate of the second part 16 of the casing 13 comprises four through-bores 23 made in the four corners of that plate and enabling the passage of four screws 16a, able to be respectively anchored in four tapped holes formed in the end parts of the four feet 22 of the plug 1.

[0039] The shaft 11a of the bolt 11 comprises a through-recess 24 formed in the neighborhood of the central part of that shaft and of which the role will be explained below.

[0040] The rotor 10 comprises, joined to its opposite end 10a to the end 10b able to be engaged with the key 3, a cam-forming part 25 engaged in the recess 24 of the shaft 11a of bolt 11, which recess 24 is shaped to cooperate with the cam-forming part 25 of the rotor 10 when the latter is actuated by the key 3 to translate the shaft 11a of the bolt 11 within the casing 13 to its position clear of the strike 12 against the return force of the elastic return member 14.

[0041] The cam-forming part 25 of the rotor 10 has its cam proper 25a extending perpendicularly to the longitudinal direction of the shaft 11a of the bolt 11 when the latter occupies its position engaged in the strike 12. Furthermore, the shaft 11a of the bolt 11 bears by an inside face 24a of its recess 24 situated on the side near the return member 14 on a lateral face 25b of the cam-forming part 25 and adjacent to the cam 25a when the shaft 11a of the bolt 11 occupies its position engaged in the strike 12 to constitute in this way a stop for retaining the shaft 11a of the bolt 11 in that position under the action of the return member 14.

[0042] The end part of the rotor 10 comprising the end 10a having cam-forming part 25 passes through the planar wall of the second part 16 of the casing 13 as will be seen later such that the cam-forming part 25 can be engaged in the recess 24 of the shaft of bolt 11 and, therefore, be housed in the casing 13.

[0043] The lock 5 comprises a cylindrical barrel 26 fastened to the upper face of the planar plate of the second part 16 of the casing 13 while extending perpendicularly to that face such that the cylindrical barrel 26 extends to a position fixed perpendicularly to the wall 1a of the plug 1 below that wall.

[0044] The rotor 10 extends coaxially in the cylindrical barrel 26 with its lower cylindrical end part of smallest diameter passing through a lower central bore 27 of the cylindrical barrel 26 and the planar wall of the second part 16 of the casing 13 in order for the cam-forming part 25 to be accommodated in the recess 24 of the shaft of bolt 11. Thus, the rotor 10 can turn under the action of the key 3 in the bore 27 of the cylindrical barrel 26 to angularly drive the cam-forming part 25 between its two positions of withdrawal of the shaft 11a of the bolt 11 of the strike 12 and of engagement of the shaft 11a of the bolt 11 in that strike.

[0045] The opposite end part of the cylindrical barrel 26 to the second part 16 of the casing 13 is capped with a cylindrical sleeve 28 fastened to that end part and comprising a transverse end wall 29 through which is defined the emergent opening 4 which comprises a circular central aperture 4a of a diameter slightly greater than the outside diameter of the socket 7 of the key 3 and two diametrically opposite grooves 4b opening into the circular central aperture 4a.

[0046] The cylindrical sleeve 28 comprises on the opposite side from its end wall 29 an annular base 30 comprising two diametrically opposite bores 31 in which are engaged two cylindrical pins 32, for example such as fluted dowels, force-fitted respectively into two corresponding bores 33 of the cylindrical barrel 26 to fasten the cylindrical sleeve 28 to the cylindrical barrel 26 with the end transverse wall 29 bearing on the annular end of the cylindrical barrel 26.

[0047] The lock 5 also comprises a stopper 34 making it possible to obturate the emergent aperture 4. The closing stopper 34 is in the form of a cylindrical piece comprising two cylindrical end parts 35, 36 separated from each other by a collar 37 able to slide in the cylindrical barrel 26, the upper one 35 of the cylindrical end parts of the closing stopper 34 comprising two diametrically opposite tenons 38 able to engage with the cylindrical end part 35 in the circular central aperture 4a and the grooves 4b of the cylindrical sleeve 28 to obturate the emergent aperture 4 with the collar 37 bearing under the end transverse wall 29 of the cylindrical sleeve 28.

[0048] A helical compression spring 39 is mounted pre-stressed between the collar 37 of the closing stopper 34 and an inside shoulder 40 of the cylindrical barrel 26 so as to apply a force for return of the stopper 34 to its obturating position of the emergent opening 4. Thus, the stopper 34 is rendered unlosable, that is to say that it cannot be removed from the plug 1.

[0049] The closing stopper 34 may be axially moved in guided manner along the end part of greatest diameter 10b of the rotor 10 against the return force of the spring 39 when the socket 7 of the key 3 is inserted through the emergent opening 4.

[0050] To that end, the closing stopper 34 has a central through-aperture 41 of shape complementary to the outside shape of the end part 10b of the rotor 10.

[0051] More particularly, the cylindrical end part 10b of the rotor 10 comprises a flat 10d extending along the end part 10b able to cooperate with a flat 41a of

the through-aperture 41 of the closing stopper 34. Other forms of key cavity formation may exist.

[0052] Furthermore, the end part 10b of the rotor comprises a second flat 10e of smaller width than that of the flat 10d, connected to the latter and constituting a fool-proof device cooperating with a second flat 41b of the aperture 41 of the closing stopper 34.

[0053] Thus, the closing stopper 34 can slide axially along the rotor 10 against the return force of the spring 39 by being rotationally coupled to that end part.

[0054] In closing position of the stopper 34, the end wall 29 of the cylindrical sleeve 28, the upper end of the closing stopper 34 and the upper end of the rotor 10 are flush in a same plane situated in the plane of the outside face 1c of the wall 1a of the plug 1. It is to be noted that the cylindrical sleeve 28 is in large part accommodated in a bore 1d of the wall 1a of the plug 1.

[0055] The rotor 10 is axially held in the cylindrical barrel 26 by the cam-forming part 25 accommodated in the recess 24 of the bolt 11 between the bottom wall 18 of the first part 15 of the casing 13 and the lower end of the cylindrical barrel 26, while being able to turn through a limited angle in that barrel under the action of the key 3.

[0056] The cavity formation 9 of the socket 7 of the key 3 is of complementary shape to that of the end 10b of the rotor 10, that is to say in the example illustrated that the cavity formation 9 comprises a flat 9a able to cooperate with the flat 10d of the end part 10b of the rotor 10 and a second flat of smaller width 9b able to cooperate with the flat 10e of the end part 10b of the rotor 10 to constitute together a fool-proof means.

[0057] The socket 7 of the key 3 further comprises two diametrically opposite lugs 7a projecting on opposite sides of that socket and of complementary shape to the two diametrically opposite grooves 4b of the emergent opening 4.

[0058] The mounting of the various components of the lock 5 is already in large part apparent from the foregoing description and will now be explained.

[0059] First of all, the rotor 10 is engaged in the cylindrical barrel 26 without its cam-forming part 25 such that its lower cylindrical end part 10a is engaged in the bore 27 of the cylindrical barrel 26 then the cam-forming part 25 is fastened to the end of the

rotor 10 by a central fastening screw, not shown. Next, the bolt 11 and the elastic return member 14 are mounted in the first part 15 of the casing 13 and the rotor 10 is engaged in the recess 24 of the bolt 11. The first part 15 is then fastened by fastening screws 17 under the plate of the second part 16 of the casing 13 and the spring 39 is engaged in the cylindrical barrel 26. Next, the closing stopper 34 is disposed above the spring 39 such that the collar 37 of that stopper bears on the upper end turn of that spring. Next, the cylindrical sleeve 28 is engaged on the upper end part of the cylindrical barrel 26 by positioning the emergent aperture 4 such that the tenons 38 of the stopper 34 are engaged respectively in the two grooves 4b of the cylindrical sleeve 28 which is then fastened to the cylindrical barrel 26 by the cylindrical pins 32 passing through the bores 31 of the circular base 30 of the cylindrical sleeve 28 and the bores 33 of the cylindrical barrel 26. Next the mounted assembly of the casing 13, cylindrical barrel 26, closing stopper 34 and cylindrical sleeve 38 is engaged under the wall 1a of the plug 1 such that the cylindrical sleeve 28 is engaged in the bore 1d of the wall 1a and the casing 13 is fastened via the second part 16 to the four feet 22 of the plug 1.

[0060] The operation of the lock of the invention to unlock the plug 1 of the frame 2 will now be explained.

[0061] In the locking position of the plug 1 to the frame 2, the bolt 11 occupies its position in which it is captive, by its beveled end 11a, of the strike 12 of the frame 2 as will better appear from Figure 4.

[0062] An operator positions the key 3 above the emergent opening 4 such that the socket 7 and the lugs 7a are directly opposite the opening 4 and the grooves 4b and the insertion of the socket 7 into the cylindrical barrel 26 causes the pushing of the closing stopper 34 into that barrel against the return force of the spring 39 with disengagement of the tenons 38 of the stopper 34 from the grooves 4b of the cylindrical sleeve 28. When this pushing-in takes place, the end part 10b of the rotor 10 is coupled to the socket 7 of the key 3 which is then turned through approximately a quarter of a turn to also turn through a quarter of a turn the stopper 34 in the barrel 26 such that the two lugs 7a of the socket 7 can come to bear under the end wall 29 of the cylindrical sleeve 28 and be held under the latter by the return force applied by the spring 39 on the collar 27 of the stopper 34, the lugs 7a thus being made captive between the wall 29 and the collar 37, retaining the key 3 to the plug 1.

[0063] When the rotor 10 is rotated through a quarter turn, the cam-forming part 25 causes by its cam 25a the guided translation of the shaft 11a of the bolt 11 within

the casing 13 against the return force of the elastic member 14 so as to disengage the beveled end 11a of that shaft from the strike 12 of the frame 2.

[0064] The pressure applied by the spring 39 on the stopper 34 to retain the key 3 made captive to the plug 1 is sufficient for the cam-forming part 25 of the rotor 10 to remain in its position of holding the shaft 11a of the bolt 11 in its withdrawn position in the casing 13 out of the strike 12.

[0065] The operator can then, using the key 3, raise the plug 1 to disengage it from the frame 2 by pivoting around the hinge axis A.

[0066] In the upright raised position of the plug 1, the operator can withdraw the key 3 from that plug by turning it a quarter turn so as to disengage the two lugs 7a of the key 3 from the grooves 4b of the cylindrical sleeve 28, thus bringing back the cam-forming part 25 of the rotor 10 to its position in which the shaft 11a of the bolt 11 is brought back by the elastic return member 14 to its position projecting from the casing 13.

[0067] It is to be noted that in the case in which the plug 1 is not hinged to the frame 2, this plug is fully withdrawn from the frame 2 to clear the opening thereof and the key 3 may also be withdrawn from the plug 1 as explained in the preceding paragraph in order for the shaft 11a of the bolt 11 to be brought automatically by the elastic return member 14 to its position projecting from the casing 13.

[0068] To bring the plug 1 to its position of closing the frame 2, the operator manually swings the plug 1 starting from its upright position. On swinging the plug 1 towards its closing position, the beveled part 11a of the shaft of bolt 11 strikes a face of a projecting part of the frame 2 situated above the strike 12 to cause the translation of the shaft 11a of the bolt 11 partly into the casing 13 against the return force of the elastic member 14 then that member returns the shaft 11a of the bolt 11 to its position of engagement of the beveled end 11b in the strike 12 of the frame 2 to again lock the plug 1 to that frame. Of course, the engagement of that beveled end 11b in the strike 12 of the frame 2 to again lock the plug 1 to the frame 2 is also carried out in case of the plug 1 not being hinged to the frame 2 by manually placing that plug directly in the opening of the frame 2.

[0069] Thus, the plug 1 is automatically locked to the frame 2 without use of the key 3.

[0070] Of course, if need be, in the upright position of the plug 1, the key 3 may be held captive by that plug and the operator can swing that plug to its position of closing the frame 1. Once the frame 1 has been obturated by the plug, the operator turns the key 3 through a quarter turn to cause the angular pivoting of the cam-forming part 25 to its position in which the elastic member 14 can return the shaft of bolt 11 to its position engaged in the strike 12 of the frame 2 in order to lock the plug 1 to that frame.

[0071] The rotor 10 and the cam-forming part 25 may be replaced by any other drive mechanism housed in the plug 1 and which, under the action of the key 3, enables the translation of the bolt 11 between its positions engaged in the strike 12 and clear from it.

[0072] The above-described device of the invention uses a lock which enables the automatic locking of the plug 1 to the frame 2 on swinging that plug to its position of closing the frame 2 without the use of the actuating key of that lock while ensuring the anti-fouling of the opening for access to that lock in the position of closing the frame 2 by the plug 1. The advantages of the invention are the possibility of closing and rapidly locking the plug within the frame and of preventing the forgetting on the worksite of foreign bodies, such as a removable stopper mounted in the emergent opening of the plug and removed from that opening to access the rotor in order to unlock the plug from the frame.

CLAIMS

1. A device for locking and unlocking a plug (1) on a frame (2), using a key (3), comprising a lock (5) fastened to the plug (1) which has an emergent opening (4) for access to the lock (5) for the key (3) comprising an arm (6) of which one end (7) enables
 5 the lock (5) to be actuated when the key (3) is inserted into the opening (4) of the plug (1) from a locking position in which a bolt (11) of the lock (5) is held captive by a frame (2) strike (12) to lock the plug (1) in the frame to an unlocking position for which the bolt (11) is clear of the strike (12) to enable the movement of the plug (1) to its position clear of the opening of the frame (2), the lock (5) comprising a drive mechanism (10, 25) linked to the
 10 bolt (11) so as to enable the movement of the bolt (11) under the action of the key (3) between its positions that are captive and clear of the strike (12), characterized in that the lock (5) bolt (11) comprises a shaft (11a) returned to its position that is captive of the strike (12) by an elastic return member (14) and the drive mechanism (10, 25) cooperates with the bolt (11) under the action of the key (3) to translate the bolt (11) shaft (11a) against the
 15 return force of the return member (14) to its position clear of the strike (12), in that the lock (5) bolt (11), when the key (3) is withdrawn from the plug (1) in its position clear of the opening of the frame (2), enables the automatic locking by the elastic return member (14) of the plug (1) to the frame (2) on insertion of the plug (1) into the frame (2) and in that the emergent opening (4) of the plug (1), is obturated by an unlosable stopper (34) returned to
 20 bear under the plug (1) in its position of closing the emergent opening (4) by a return spring (39).

2. A device according to claim 1, characterized in that the drive mechanism (10, 25) comprises a rotor (10) rotatably mounted in the plug (1) perpendicularly under the latter, accessible at one (10b) of its ends by the opening (4) and a cam-forming part (25)
 25 fastened to the opposite end (10a) of the rotor (10) and engaged in a recess (24) of the bolt (11) shaft (11a) and cooperating with the cam-forming part (25) of the rotor (10) when the latter is actuated by the key (3) engaged with the corresponding end (10b) of the rotor (10) to translate the bolt (11) shaft (11a) against the return force of the return member (14) to its position clear of the strike (12).

30 3. A device according to claim 2, characterized in that the bolt (11) shaft (11a) and the return member (14) are coaxial and housed perpendicularly to the rotor (10) in a casing (13) removably fastened under the plug (1) and the end part (10a) of the rotor (10) comprising the cam (25) passes through a wall (16) of the casing (13) situated on the

inside face of the plug (1) such that the cam (25) engaged in the recess (24) of the bolt (11) shaft (11a) is housed in the casing (13).

4. A device according to claim 2 or 3, characterized in that the rotor (11) cam (25) extends perpendicularly to the longitudinal direction of the bolt (11) shaft (11a) when the latter occupies its position that is captive of the strike (12).

5. A device according to one of claims 2 to 4, characterized in that the bolt (11) shaft (11a) shaft bears, by an inside face (24a) of its recess (24) situated on the side near the return member (14), on a lateral face (10c) of the rotor (10) adjacent the cam (25) when the bolt (11) shaft (11a) occupies its captive position in the strike (12).

6. A device according to one of claims 3 or 4, characterized in that The bolt (11) shaft (11a) is flat and the casing (13) comprises two parts (15,16) removably fastened to each other, respectively a first part (15) of substantially Ω -shaped cross-section with a flat base (18) in which are housed for guided sliding the bolt (11) shaft (11a) and the return member (14) and a second part (16) in the form of a planar plate constituting the aforementioned wall of the casing (13) passed through by the cam (25) and to which are removably fastened the two elongate lateral branches (19) of the first part (15).

7. A device according to claim 6, characterized in that the second part (16) of the casing (13) comprises a small plate (21) attached to an edge of that second part so as to obturate the opposite end opening of the first part (15) to that enabling the passage of the beveled end (11b) of the bolt (11) shaft (11a) and on which small plate (21) bears an end of the return member (14) consisting of a helical compression spring.

8. A device according to claim 6 or 7, characterized in that the second part (16) of the casing (13) is removably fastened under the plug (1).

9. A device according to one of claims 2 to 8, characterized in that the emergent opening (4) of the plug (1) is coaxial with the end (10b) of the rotor (10) able to be engaged with the end (7) of the arm (6) of that key (3) and in that the key (3), when inserted into the emergent opening (4), causes the pushing-in of the closing stopper (34) against the return force of the spring (39) along the rotor (10) of which the end (10b) is engaged with the end (7) of the key (3) arm (6).

10. A device according to claim 9, characterized in that it comprises a cylindrical barrel (26) fastened under the plug (1) and comprising a transverse end wall (29) through which is formed the emergent opening (4) of the plug (1) which comprises a

circular central aperture (4a) and two diametrically opposite grooves (4b) opening into the circular central aperture (4a) and the closing stopper (34) is in the form of a cylindrical piece mounted for guided sliding in the cylindrical barrel (26) and on the lock (5) rotor (10) and comprising two cylindrical end parts (35, 36) separated from each other by a collar (37) able to slide in the cylindrical barrel (26), one (35) of the end parts of the closing stopper (34) comprising two diametrically opposite tenons (38) respectively engaged in the two grooves (4b) of the emergent opening (4) with the collar (37) bearing under the transverse wall (19) of the barrel (26) when the closing stopper (34) occupies its obturating position of the emergent opening (4), the tenons (38) of the closing stopper (34) being disengaged from the emergent opening (4) when the key (3) arm (6) is engaged with the end (10b) of the lock (5) rotor (10) to rotate the rotor (10) to its position at which the lock (5) bolt (11) is disengaged from the frame (2) strike (12).

11. A device according to claim 10, characterized in that the closing stopper (34) is rotationally coupled to the end (10b) of the lock (5) rotor (10).

12. A device according to claim 10 or 11, characterized in that the return spring (39) of the closing stopper (34) is housed in the cylindrical barrel (26) while being mounted pre-stressed between the collar (37) of the cylindrical stopper (34) and an inside shoulder (40) of the cylindrical barrel (26).

13. A device according to one of claims 10 to 12, characterized in that the transverse end wall (29) of the cylindrical barrel (26) forms part of a cylindrical sleeve (28) fastened to the corresponding end part of the cylindrical barrel (26).

14. A device according to one of claims 10 to 13 when considered in combination with claim 6, characterized in that the cylindrical barrel (26) is fastened to the second part in the form of a planar plate (16) of the casing (13) and perpendicular to that part.

15. An assembly comprising a key and a device according to one of claims 10 to 14, characterized in that the key (3) comprises at the tubular end (7) of its arm (6) two diametrically opposite lugs (7a) of complementary shape to the grooves (4b) of the emergent opening (4) to enable the engagement of the tubular end (7) of the key (3) arm (6) through the emergent opening (4) by pushing the closing stopper (34) into the cylindrical barrel (26) against the return force of the spring (39) to reach a position in which the two lugs (7a) of the key (3) are brought to bear under the transverse wall (29) of the cylindrical barrel (26) by rotation of the key (3) engaged with the lock (5) rotor (10) and

held under that wall by the closing stopper (34) and the return force applied by the spring (39) on the collar (37) of the closing stopper (34).