TWIST-TYPE SECURITY SEAL

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ABSTRACT

A security seal of the twist-type comprises a housing (11) that contains a revolving stem-like insert (13) having two axially opposed holes (17) positioned in line with guiding holes (19) which extend across the housing wall to receive a locking wire which is wound by turning the revolving stem (13) with a handle (15) solidly fixed to it in a pre-determined direction. The revolving stem has a disc-shaped section with an anti-rotational device that comprises six helical teeth (35) engaging with matching shoulders (37) formed on the respectively matching surfaces of the inner wall of the housing to prevent rotation of the stem in the unwinding direction. Included is a lid (27) to cover the stem-like insert once it is in place in the housing, the lid being attached to the housing by means of a breakable strip (59) and an identification code engraved inside the lid, said identification being at least partially identical to an univocal code identification engraved on the housing. Protuberances (57A, 57B) on each side of the housing are provided through which through holes pass so that they are long enough so as to avoid an element introduced in them applying leveraged up-force on the stem-like insert in an attempt to push it upwards. An anti-removal device comprises a retainer ring (21) formed on the stem engages with a groove (23) formed in the housing (11) when the stem is introduced into the body, the side wall of the housing having a weakened section (29) intended to break if someone tries to remove the lid (67). The housing is see-through and looking through its bottom wall (51) it is possible to see the three last digits of the univocal serial number of the security seal, stamped on a tab (45) fixed to the housing.
TWIST-TYPE SECURITY SEAL

FIELD OF THE INVENTION

The present invention is directed to security seals or locks of the twist type, which are used to keep the integrity of goods and valuables during their transportation, as well as of metering or control equipment mounted in third parties’ premises. They are frequently used in high security applications for sealing all kinds of metering and control instruments, and in different applications in the oil industry. They are also useful to prevent pilfering, adulteration or contamination by sealing “eared” bags and containers, drums, vehicles, containers, etc., once the goods or valuables set forth in the packing list have been loaded for transportation, thus preventing unauthorized access before their delivery and control at destination.

The particular feature of these seals is that, once they have been closed, they cannot be opened without destroying them, and that they cannot be reconstructed to their original state. To achieve this, they are provided with unidirectional seal mechanisms or structures and they are codified in an indelible manner.

Although the prior art security seals include features intended to prevent fraudulent tampering, they are frequently broken and in many cases tampering remains unnoticed. Therefore, even if the seals are destroyed or altered, they should be designed in a way that they cannot be reconstructed to their original state, which would efface any evidence of tampering.

BACKGROUND OF THE INVENTION

The kind of seal generally used for these and other applications is a two-piece twist-type lock, particularly one comprising a housing that contains a revolving stem or drum which is solidly fixed to a lever or handle. The wire used for sealing is first inserted through the holes of a pair of ears built on the container to be sealed, and then wound around the revolving stem by turning the handle until the wire is tight. Normally, the handle is removed when the seal is tight in order to prevent the revolving stem to be manipulated inside the housing.

Twist type seals are equipped with anti-removal and anti-rotation means that operate when the stem is inserted into the housing. The anti-removal means prevent removal of the stem, while the anti-rotation means prevent rotation of the stem inside the housing in the opposite direction to that in which the wire is wound. The different types of security seals normally bear a univocal serial number both on the housing and on the stem.

When the seal is closed, the wire or strap cannot be removed by turning the stem in the opposite direction, since this would destroy the seal and reveal the tampering activity. The integrity and wrinkle-free aspect of the security seal indicate that the secured content has not been pilfered or contaminated.

Typical examples of conventional security seals are those commercialized by Brooks. They usually include:

- a disc with two or four helical teeth on the stem, which engage matching circumferential grooves on the inner wall of the housing
- anti-removal circumferential flanges having a slightly smaller diameter in the housing and a slightly greater diameter in the stem
- a univocal serial number on a tab solidly fixed to the housing and an identical identification on the handle or on any other exposed portion of the stem, intended to prevent resealing with a part of another security seal after tampering.

In spite of the security features provided by the Brooks seals, it is possible to break the sealed stem, remove it from the housing and replace the broken revolving stem by one with the same last three digits, and thus avoid tampering to become evident.

Application EP 1 403 841 reveals an improved twist-type security seal that solves most of these problems. Still, the security seal revealed in EP 1 403 841 is a two-piece seal and access to stem-like insert can be achieved through the top of the housing. Also access could be gained through the holes located on the side of the housing through which the wire is inserted. Through this access leverage could be placed on the stem-like insert in an attempt to push it upwards.

SUMMARY OF THE INVENTION

An object of the present invention is to improve the inviolability of security seals used to protect the integrity of containers of any type.

In order to achieve these and other potential advantages, the present invention comprises the following features:

- (a) The anti-rotation disc-shaped section includes a greater number of teeth than those of the prior art, conveniently six teeth.
- (b) The stem-like insert has different cross-sectional holes to respectively engage one end of the wire and to receive the free end of the wire, where the matching holes on the housing wall are larger to facilitate insertion of the wire towards the axially spaced holes on the stem.
- (c) A lid is provided to cover the stem-like insert once it is in place in the housing and the handle has been removed, the lid being attached to the housing by means of a breakable strip. Thus, once the lid is in place the new security seal of the present invention effectively becomes a “one piece seal”.
- (d) The sidewall of the housing has a sufficiently weakened section to break upon exertion of axial stress on the lid by an extracting element.
- (e) An identification code is indelibly engraved on the base portion of the stem-like insert, and the same identification code is engraved inside the lid, said identification being at least partially identical to the univocal code identification engraved on the housing.
- (f) The stem-like insert has different cross-sectional holes to respectively engage one end of the wire and to receive the free end of the wire. Preferably, the matching through holes on the housing wall are larger to facilitate insertion of the wire towards the axially spaced holes on the stem.
Protuberances on each side of the housing are placed effectively making the through holes sufficiently long to avoid an element introduced in them to apply leverage on the stem-like insert in an attempt to push it upwards. The preferred embodiments of the invention further comprise anti-removal means comprising a retainer circular ring on the stem engaged with a circumferential groove in the housing. When the stem is introduced into the housing, the retainer ring fits into the circumferential groove on the inner wall of the housing located far away from the rim of the housing adjacent to a weakened section of the housing wall, so that the wall will break upon any attempt to remove the stem and the retainer by pulling in the axial direction.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partially cut-away perspective view illustrating the inside of a security seal with the improvements of the present invention.

FIG. 2 is a sectional view along the longitudinal axis of the security seal of FIG. 1.

FIG. 3 is a perspective view of the stem-like insert of the security seal of FIGS. 1 and 2.

FIG. 4 is a sectional view along the longitudinal axis of the stem-like insert of the security seal of FIG. 3.

FIG. 5 is a perspective bottom view of the housing of the security seal of FIGS. 1 and 2, showing the identification tab.

FIG. 6 is a perspective side view of the housing of the security seal of FIGS. 1 and 2.

FIG. 7 is another perspective side view of the housing of the security seal of FIGS. 1 and 2.

FIG. 8 is a sectional view along the longitudinal axis of the housing of the security seal of FIGS. 1 and 2.

FIG. 9 is an orthogonal axis sectional view of the housing of the security seal.

FIG. 10 is a cross-sectional view of the of the security seal housing.

FIG. 11 is a cross-sectional view showing the anti-rotation means of the same security seal.

DESCRIPTION OF A PREFERRED EMBODIMENT

FIGS. 1 and 2 illustrate a security seal whose main components are a see-through plastic housing 11 that receives a revolving stem-like insert 13 which includes a handle 15 solidly fixed thereto and which extends beyond the housing 11 to allow manual turning of the stem 13 during the sealing operation. The security seal uses a sealing wire 25 that is preferably a 0.5 to 1.0 mm wire, which can be single strand, multistranded or coiled, with or without a coloured plastic sheath.

To receive the wire, the stem 13—as shown in more detail in FIG. 3—has a lower hole 17A through which one of the ends of the wire is anchored, and a second hole 17B, axially spaced from the first hole, intended for through-insertion of the free end of the wire. The housing 11 also comprises a cylindrical or slightly frustro-conical body as illustrated in FIG. 7 whose sidewall also has two holes 19A and 19B axially aligned with the stem holes 17A and 17B (see FIGS. 8 and 9). A third hole 19C is placed on the housing diametrically opposed to the upper hole 19B. At a specific angular position of the stem 13 in relation to the housing 11, as shown in FIGS. 1 and 2, the anchoring hole 17A on the stem 13 is aligned with the guiding hole 19A in the housing 11, thus forming a blind-ended hole 17A-19A where the wire end is inserted and anchored, while the upper hole 17B in the stem is aligned with the pair of holes 19B-19C in the housing 11, to conform a through hole where the free end of the wire is inserted and tightened, with the excess length of wire coming out through hole 19C.

As holes 19A, 19B and 19C are used as threading guides for the insertion of the wire into 17A and 17B, they have a diameter that is slightly larger than the diameter of the wire uses, preferably this diameter is 2 mm, which is larger than the preferred 1.5 mm diameter of holes 17A and 17B on the stem. Protuberances 57A-57B on each side of the housing through which through holes 19A-19C pass, are long enough so as to avoid an element introduced in them applying a leveraged up-force on the stem-like insert in an attempt to push it upwards.

A lid 27 is provided to cover the stem 13 once it is inserted in the housing 11 and the handle 15 has been removed, the lid being attached to the housing by means of a breakable strip 59. The lid, once in place, protects the seal against any attempt to open it. The lid is placed on the housing and is forced in. Because the lid and the housing both have threads 61 and 63 respectively which are flat as shown in FIG. 8 the lid cannot be extracted by pulling upwards without breaking the sidewall of housing 11. Four tabs 65 and four slots 67 are provided. The tabs and slots may be all or some on the lid and the housing so that when the lid is fitted on the housing each tabs fits into a slot so that once the lid is snapped in place the lid cannot be rotated. Therefore, three separate security devices are provided: strip 59, threads 61 and 63, tabs 65 and slots 67 ensure that the seals integrity is protected from access from the top of the device. Furthermore, sidewall of housing 11 has a sufficiently weakened section of sidewall 29 to break upon exertion of axial stress on the lid by an extracting element. Any attempt to pry open the lid introducing an element between the lid and the housing will break the weakened section sidewall 29 indicating that the seal has been violated.

An anti-removal lock for the stem-like insert is provided as a retaining circular ring 21 formed on the stem 13, said ring being engaged with a circumferential groove 23 formed in the housing 11. When the stem 13 is inserted into the housing 11, the retainer 21 snaps into the circumferential groove 23 formed on the inner wall of the housing 11, preventing the removal of stem 13. Groove 23, with which the anti-removal retainer ring 21 is engaged, defines a weakened, i.e. much thinner, side-wall section 29, intended to break upon exertion of localized stress during any unauthorized attempt to remove the stem 13 from the housing 11. As groove 23 is located far away from rim 69 on the housing, even if it were possible to remove the lid without detection it would not be possible to insert a tool to force the retaining ring 21 from groove 23 as the weakened wall section 29 would break further indicating the seal has been violated.
An anti-rotational protection, designed to prevent unwinding and release of the wire from the lock without removing the stem 13 from the housing 11, comprises a disc-shaped section 31 with rotationally asymmetric protrusions which engage with matching shoulders on the inner wall of the housing, as shown in more detail in FIG. 10. The anti-rotational lock comprises a lower disc-shaped section 31 with six uniformly distributed peripheral locking members 35. Each of the members 35 has a curved filament shape, relatively flexible properties and a substantially helical arrangement, with a convex side and a concave side according to the allowed sense or rotation of the stem 13 within the housing 11, and ending with a flat base surface which is substantially radially oriented in relation to the stem 13 for engagement with complementary radially oriented shoulders 37 which are formed on the matching section of the inner wall of the housing 11, thus forming an anti-rotational lock for a preferential sense of rotation. The design of the anti-rotational protection not only provides a means for avoiding the forced rotation of the stem 13 but, by winding in the anti-rotation sense, provides a means for breaking the handle 15 after insertion of the stem 13 into the housing 11 allowing the lid 27 to be placed on the housing 11.

A tab 45 in the housing shows an indelible univocal serial number applied, for example, by hot stamping or laser engraving. The last three digits of the serial number are stamped on the flat base surface 49 of the stem 13 that contacts the bottom 51 of the housing 11. As the housing body is transparent, this feature provides the advantage that the security serial number can be readily visually verified through the bottom 51 of the housing 11, and said bottom wall 51 also protects said number against unauthorized replacement by unscrupulous personnel.

All the elements of the security seal are all made of a rigid frangible material such as polycarbonate, acrylic or the like which, because of their nature, will easily break if a force is applied on them providing an additional indication of a violation. Also, because only one type of material is used, if violation is attempted by heating or cooling the seal, dilatation and contraction will occur in equal way to each part. If different type of material were used having different thermal properties the seal could be forced open unnoticed taking advantage of these properties. Therefore the careful selection of the material used throughout the manufacture of the various parts of the security seal improves the security of the same.

The embodiments described and illustrated above, are included merely as examples of the invention and it can be readily appreciated that numerous modifications can be introduced in their construction, materials and arrangement without departing from the spirit and scope of the invention.

1. A security seal of the twist-type, comprising a housing 11 including a revolving stem-like insert 13 on which a locking security wire 25 is wound by turning a handle 15 attached to the top of the stem 13, in a predetermined sense, after passing through the object to be protected and being inserted through at least one hole 17B in said stem 13 when said hole is aligned with a matching hole 19B on the housing wall, protuberances 57A-B on each side of the housing through which holes guiding holes 19A-C pass, said stem having a disc-shaped section 31 with a plurality of peripherally distributed locking members 35 capable of engaging with matching shoulders 37 formed on the corresponding section of the inner wall of the housing 11 to prevent rotation of the stem 13 within the housing in an opposite sense to the above winding sense, the housing and the stem having a univocal code in visible sites when the seal is closed, wherein at least the bottom wall 51 of the housing 11 being transparent so as to allow reading of a code printed on a flat surface of the bottom innermost end of the stem, said code matching at least partially an univocal identification code printed on a tab 45, an anti-removal lock for the stem-like insert 13 comprising a retaining circular ring 21, said ring being engaged with a circumferential groove 23 formed in the housing 11, characterized in further comprising:

- a lid 27 to cover the stem-like insert 13 once it is in place in the housing 11 and the handle 15 has been removed, the lid 27 being attached to the housing by means of a breakable strip 59 and thus effectively becoming a one piece seal;
- an identification code engraved inside the lid 27, said identification being at least partially identical to an univocal code identification engraved on the housing; said lid and said housing both have flat threads 61 and 63 respectively; and
- said lid and said housing further comprise four tabs 65 and four slots 67.

2. The security seal of claim 1, characterized in that all parts of the security seal are made of a rigid frangible material such as polycarbonate, acrylic or the like.