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(54) Twist-type security seal

(57) A security seal of the twist- type comprises a housing (11) that contains a revolving stem (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 with a handle (15) solidly fixed to it in a pre-determined direction. The revolving stem has two disc-shaped sections with separate anti-rotational devices: a first disc-shaped section (31) comprises six helical teeth (35) and a second disc-shaped section (33) comprises saw-teeth (39), all of them engaging with matching shoulders formed on the respectively matching surfaces of the inner wall of the housing to prevent rotation of the stem in the unwinding direction. An anti-removal device comprises a metal retainer ring (21) formed on the stem and extending beyond an inner rim (27) of the housing 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 stem. The housing is see-through and looking through its bottom wall (51) it is possible to see the three last digits (53) of the univocal serial number (47) of the security seal, stamped on the tab (45) fixed to the housing.

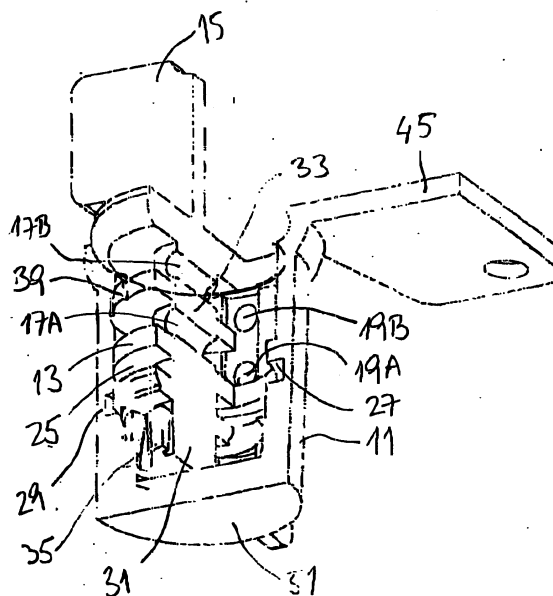


FIG. 1

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Description

FIELD OF THE INVENTION

[0001] 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.

[0002] 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 a unidirectional seal mechanism or structure and they are codified in an indelible manner.

[0003] 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

[0004] 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.

[0005] Twist type seals are equipped with anti-removal and anti-rotation means which 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.

[0006] 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.

[0007] A typical example 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.

[0008] 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.

SUMMARY OF THE INVENTION

[0009] An object of the present invention is to improve the inviolability of security seals used to protect the integrity of containers of any type.

[0010] In order to achieve these and other potential advantages, the present invention comprises the following novel 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 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) the side wall of the housing has a sufficiently weakened section to break upon exertion of axial stress on the stem by an extracting element;
- (d) A code is indelibly engraved on the base portion of the stem, said identification being at least partially identical to the univocal identification engraved on the housing.
- (e) the stem 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 holes on the housing wall are larger to facilitate insertion of the wire towards the axially spaced holes on the stem.
- (f) The preferred embodiments of the invention further comprise anti-removal means comprising a metal retainer ring engaged with a circumferential

groove on the stem. When the stem is introduced into the housing, the retainer ring fits into the circumferential groove on the inner wall of the housing adjacent to the 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

[0011]

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

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

Figure 3 is a perspective view of the stem of the security seal of Figures 1 and 2.

Figure 4 is a sectional view along the longitudinal axis of the stem of the security seal of Figure 3.

Figure 5 is a perspective view of the housing of the security seal of Figures 1 and 2.

Figure 6 is a sectional view along the longitudinal axis of the housing of the security seal of Figure 5, showing the identification tab.

Figure 7 is a orthogonal axial sectional view of the of the security seal housing.

Figure 8 is a cross-sectional view along the lower portion of the security seal of Figures 1 and 2.

[0012] Finally, Figure 9 is a cross-sectional view showing the anti-rotation means of the same security seal.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0013] Figures 1 and 2 illustrate a security seal whose main components are a see-through plastic housing 11 that receives a 23.6 mm long revolving stem-like insert 13 which includes a 7.5 x 16mm 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 0.5 to 1.0 mm sealing wire (not shown), which can be single wired, multi-wired or coiled, with or without a coloured plastic sheath.

[0014] To receive the wire, the stem 13 - as shown in more detail in Figures 3 and 4 - has a lower hole 17A in 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 Figure 5 whose sidewall also has two holes 19A and 19B axially aligned with the stem holes 17 (see figures 6 and 7). A third hole 19C is placed on the housing diametrically opposed to the upper hole 19B.

[0015] At a specific angular position of the stem 13 in

relation to the housing 11, as shown in Figures 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.

[0016] As holes 19A, 19B and 19C are used as threading guides for the insertion of the wire into 17A and 17B, they have a 2 mm diameter, which is larger than the 1.5 mm diameter of holes 17A and 17 B on the stem.

[0017] The anti-removal lock is a metal retainer 21 comprising a discontinuous ring for radial elasticity, said ring being engaged with a 1.2 mm wide and 9.5 mm bore circular groove 23 formed on the stem 13. When the stem 13 is inserted into the housing 11, the retainer 21 snaps into the circumferential groove 25 formed on the inner wall of the housing 13, and rim 27 prevents the removal of stem 13. Groove 25, with which the anti-removal retainer 23 is engaged, defines a weakened, i.e. much thinner, wall section 29, intended to break upon exertion of localized stress during any unauthorized attempt to remove the stem 13 from the housing 11.

[0018] 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 two indented disc-shaped sections 31 and 33 with rotationally asymmetric protrusions which engage with matching shoulders on the inner wall of the housing, as shown in more detail in figures 8 and 9. The primary anti-rotational lock comprises a lower disc-shaped section 31 with a 7.28 mm diameter with six equiangularly distributed peripheral locking members 35. Each of the members 35 has a curved filiform 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 casing 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.

[0019] To provide further the anti-rotational protection, Figure 9 shows that the stem further comprises a second indented 9.0 mm diameter disc-shaped section 33 near the housing 11 opening, having six peripheral saw-teeth 39 capable of engaging with twelve shoulders 41 formed in the corresponding section 43 of the inner wall of the housing 11, while the lower helical members 35 engage with the corresponding shoulders 37. The latter members 41 are more flexible than the saw-teeth 39 and this, added to their helical orientation, makes them bulge against the inner wall of the housing 11, which is a further obstacle to any attempt of turning the stem in

the sense that would unwind the wire.

[0020] The second ant-rotational lock 33 not only provides a supplementary security mechanism but also, in the practice, has a synergic behaviour with the first means 31, thus providing enhanced security to the seal.

[0021] A tab 45 in the housing shows an indelible univocal serial number 47, applied, for example, by hot stamping or laser engraving. In Figure 8 it can also be seen that 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 54 can be readily visually verified through the bottom 51 of the housing 11, and said bottom wall 11 also protects said number against unauthorized replacement by unscrupulous personnel.

[0022] 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.

[0023] Having thus described and illustrated the nature of the present invention and the manner in which it can be put into practice, the applicants claim exclusive ownership and rights on:

Claims

1. A security seal of the twist- type, comprising a housing that contains a revolving stem on which a locking wire is wound in a predetermined sense after passing through the object to be protected and being inserted for bent engagement through at least one hole on said stem when said hole is aligned with a matching hole on the housing wall, said stem having a disc-shaped section with a plurality of peripherically distributed locking members capable of engaging with matching shoulders formed on the corresponding section of the inner wall of the housing to prevent rotation of the stem within the housing in an opposite sense to the above winding sense, further comprising an anti-removal element to prevent axial displacement of the stem once it has been inserted into the housing, the housing and the stem having a univocal code in visible sites when the seal is closed, **characterized in that** the seal comprises at least one of the following improvements:
 - (a) said disc-shaped section has at least six anti-rotational teeth
 - (b) the side wall of said housing has a weakened section operatively connected with said anti-removal element, said weakened section being capable of breaking upon exertion of axial stress to remove the stem; and
 - (c) at least the bottom wall of the housing is
- transparent and the bottom of the stem in its innermost end conforms a flat surface on which a code is printed, said code matching at least partially the univocal identification code printed on the tab.
2. The security seal of claim 1, **characterized in that** said disc-shaped section is positioned at the innermost end of the stem, in the bottom of the housing.
3. The security seal of claim 1 or 2, **characterized in that** said stem has a second disc-shaped section having multiple peripherically distributed anti-rotational saw-teeth capable of engaging with shoulders formed on a corresponding second section of the inner wall of the housing, to prevent turning of the stem inside the housing in the opposite sense to said winding sense.
4. The security seal of claim 3, **characterized in that** said locking members of the primary disc-shaped section match six filiform fingers disposed in a generally helical arrangement in sympathy with said predetermined turning sense of the stem inside the housing, wherein said secondary disc-shaped section teeth are generally shaped as saw-teeth.
5. The security seal of any of the preceding claims, **characterized in that** said stem has two axially spaced holes positioned in line with three respective through-holes on the housing wall, being one of the stem holes an anchor for one end of said wire, and the other stem hole forming a through-hole which is continued on both ends by lining up with the housing holes, being two of said housing holes axially spaced guiding holes on the housing wall and being the third hole an opening for discharging the excess part of the wire, which is diametrically aligned with one of the guiding holes of the housing, so that, in a specific angular position of the stem, said anchoring hole of the stem is lined up with one of said guiding holes of the housing, while the remaining stem hole is diametrically aligned with the two remaining holes in the housing.
6. The security seal of claim 5, **characterized in that** said guiding holes in the housing are larger than said holes in the stem.

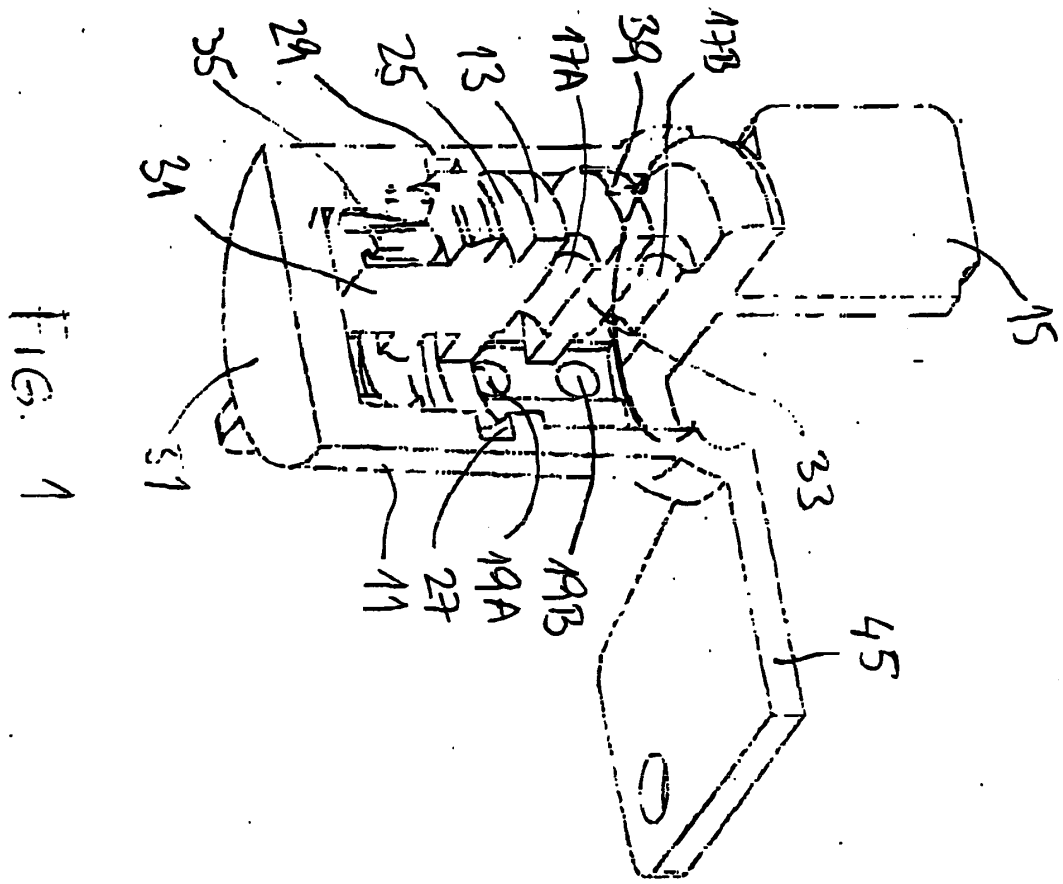


FIG. 1

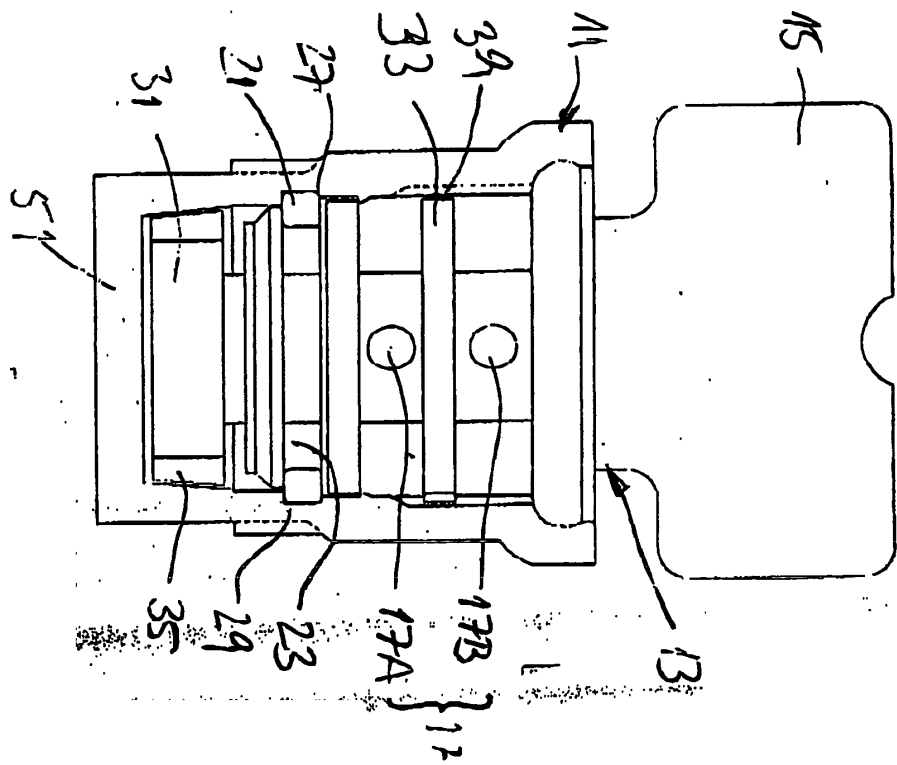


FIG. 2

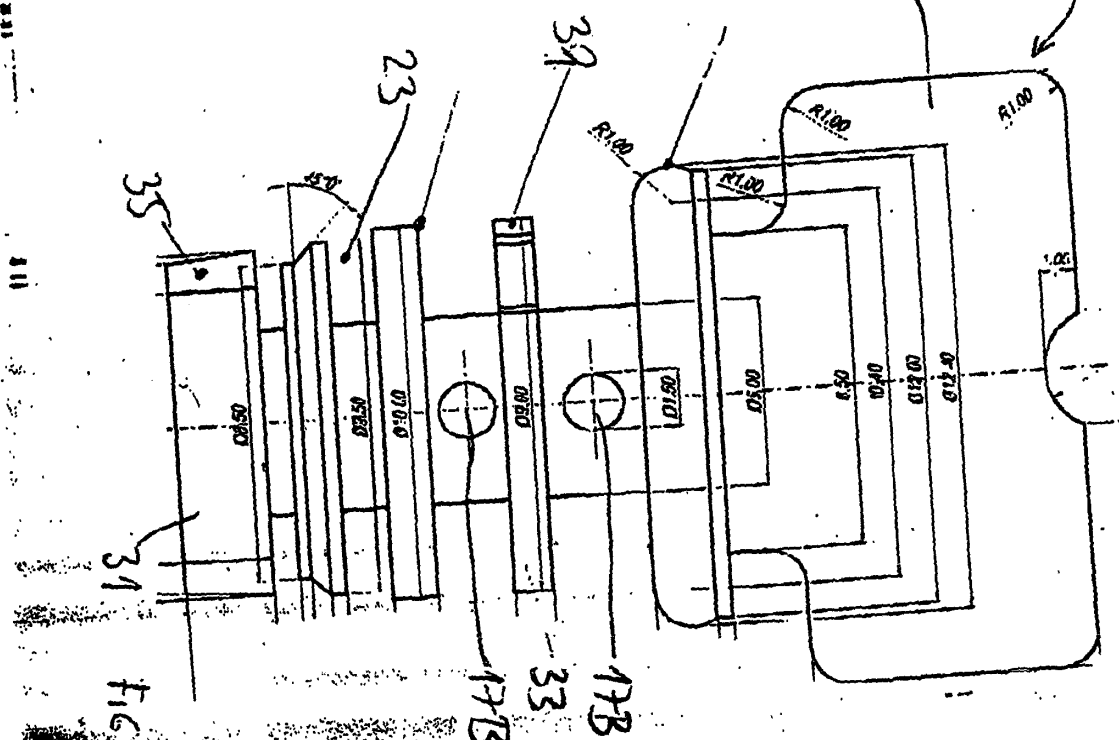
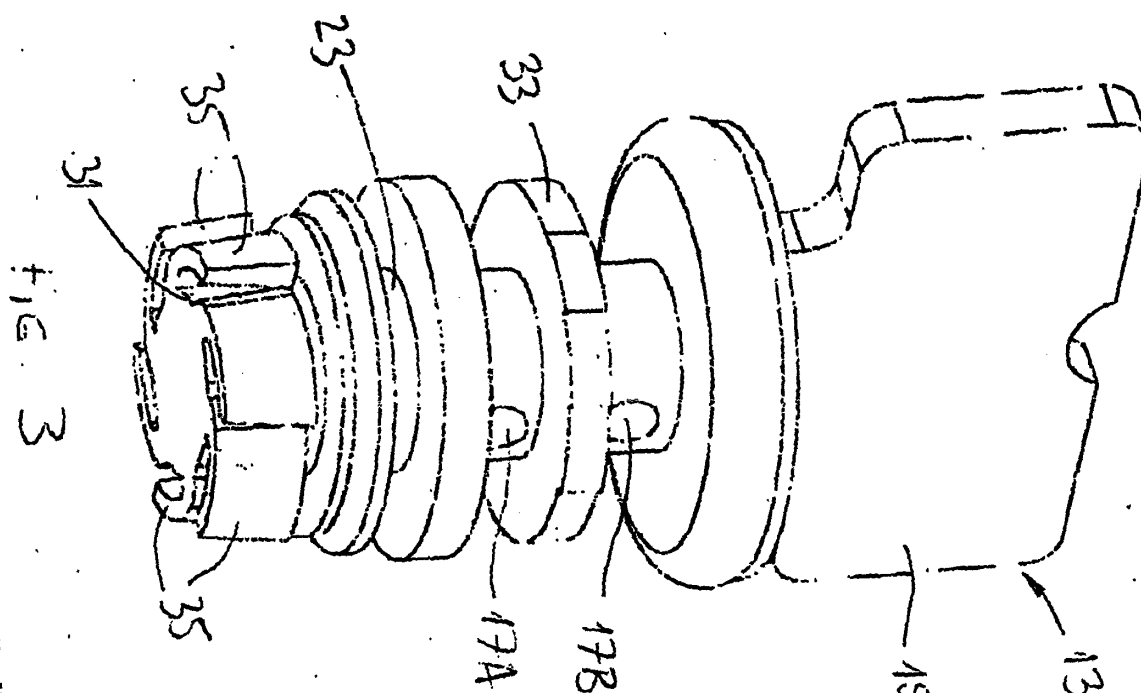


FIG 5

