

Nov. 10, 1959

H. O. JONES ET AL
SEALED ROTARY CONTROL

2,911,816

Filed June 28, 1957

2 Sheets-Sheet 1

FIG.3.

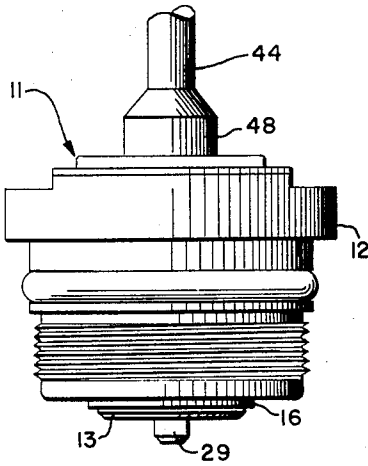


FIG.1.

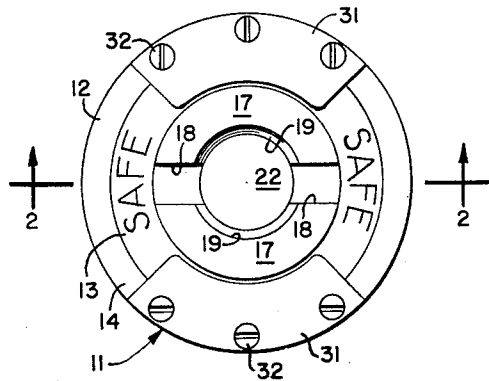


FIG.2.

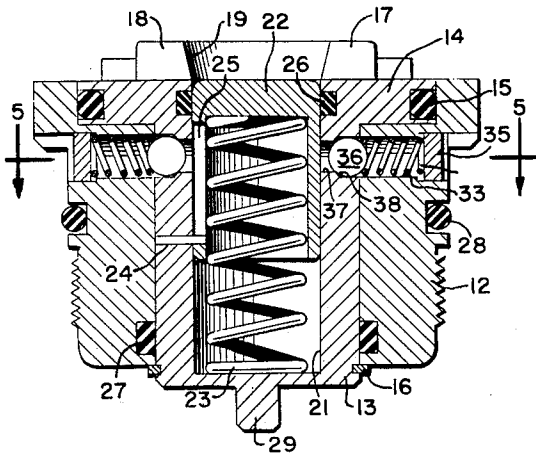
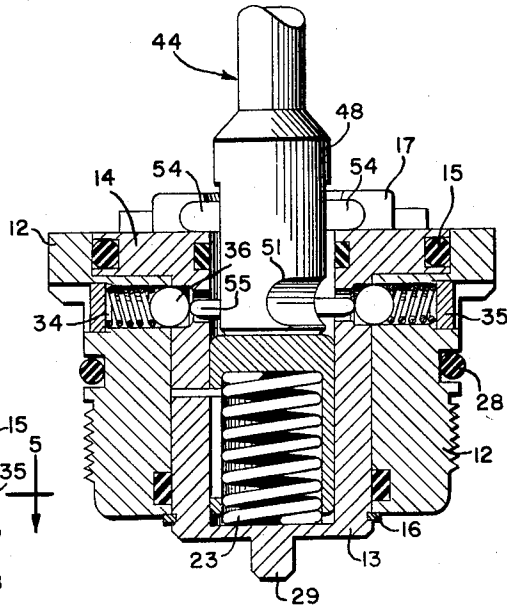


FIG.4.



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FIG. 5.

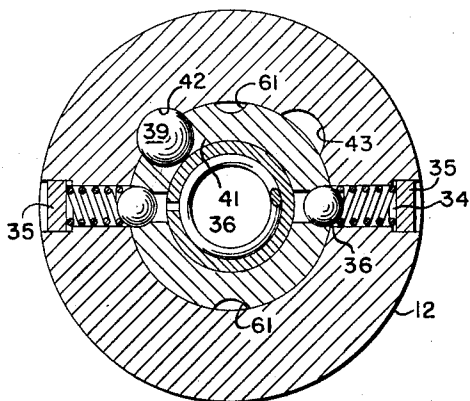


FIG. 6.

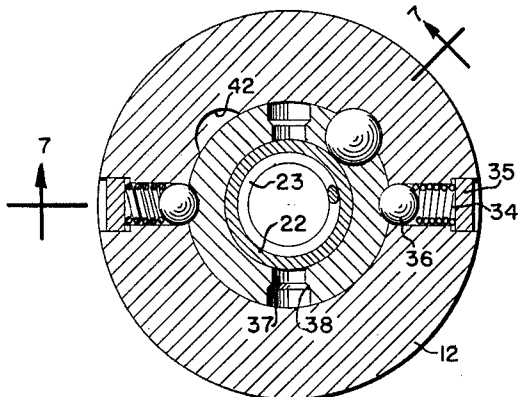


FIG. 7.

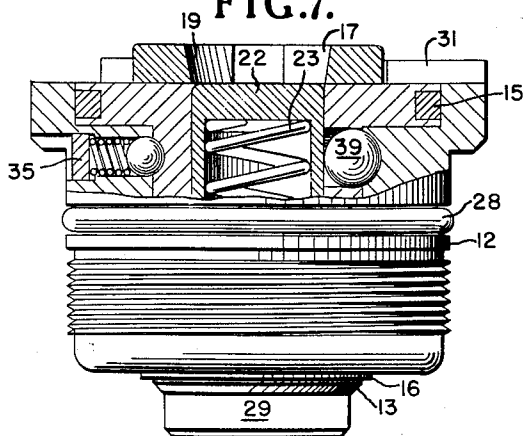


FIG. 8.

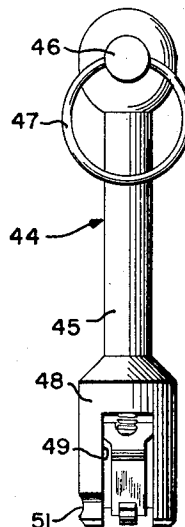
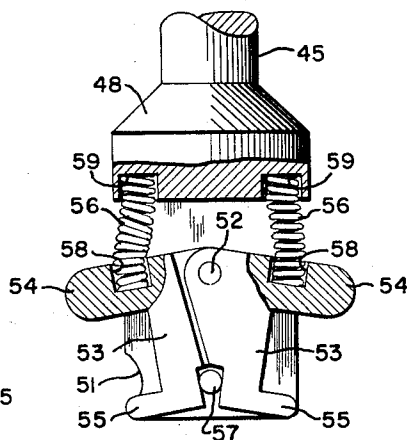


FIG. 9.



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SEALED ROTARY CONTROL

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4 Claims. (Cl. 70—386)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates generally to a rotary lock and more particularly to a watertight rotary control and tamper-proof lock for a switching mechanism enclosed in a pressurized container and adapted to be operated by rotating the lock with means external to the container.

Various types of rotary lock means have been proposed for locking in place the arming mechanism of ordnance items used underwater but such means have the disadvantage that they could be tampered with or "picked," were not sufficiently waterproof, or were of a complicated design whereby difficulties were encountered in the manufacture thereof.

Essentially, the rotary lock or control of the present invention comprises a rotary housing rotatable in a fixed casing, the rotary housing being locked to the casing by a plurality of balls, each ball being disposed partially in the casing and housing respectively. A spring loaded cylindrical piston normally engages and maintains one of said balls in the locked condition, the other balls having springs associated therewith to maintain them in locked condition, the balls being released from the locked condition thereof by means of a key or wrench which is adapted to move the piston against the bias of its spring. The key has means thereon for releasing the balls from said locked condition, whereby the rotary housing is freed to rotate and turning of the key is adapted to rotate the same and position the switching mechanism connected thereto in accordance with the turning. Suitable seals are provided between the relatively movable parts of the lock or control, and the rotary housing and associated parts actuated by employing the specially designed key or wrench, whereby the lock of this invention is both waterproof and tamper-proof and yet is simple in structure and operation as will hereinafter appear.

It is therefore an object of the present invention to provide a rotary lock adapted to control the position of switching mechanism within an underwater ordnance item, which lock is both waterproof and tamper-proof.

Another object is the provision of a positionable rotary member, normally locked to fixed structure by movable locking means, which means are movable by employment of a special key or tool for unlocking the rotary member and rotating the same.

A further object is the provision of a lock having a rotary member locked to fixed structure by a plurality of locking balls so located and arranged as to be incapable of being reached and manipulated other than with a specially designed key or tool having a pair of spring-pressed pivoted levers having fingers thereon which are adapted to engage and move said balls from the locking position thereof.

A final object of this invention is to provide a lock having a rotary member locked to fixed structure by a pair of oppositely disposed spring-pressed locking balls,

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adapted by proper actuation or manipulation to be moved into a pair of aligned, oppositely disposed bores in the structure, and a locking sphere partially disposed in said rotary member and said fixed structure respectively, said sphere being maintained in locking position by a movable piston, and a key for said lock having a pair of pivoted levers with manipulating fingers thereon adapted in operation to move the oppositely disposed balls into the respective bores and also having a notch adapted to partially receive said sphere upon movement and disengagement of the piston therefrom, whereby said rotary member may be rotated by turning of the key for locking in another position thereof.

Other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the annexed drawings, which illustrate a preferred embodiment, and wherein:

Fig. 1 is a plan view of a lock or control of the present invention with the rotary member thereof disposed in one, that is, the Safe, position thereof;

Fig. 2 is a side elevation of the apparatus shown in Fig. 1, on a somewhat larger scale and in section, the section being taken along the line 2—2 of Fig. 1;

Fig. 3 is a side elevation of the apparatus of Fig. 1 but showing a portion of the key employed therewith;

Fig. 4 is a side elevational view of the apparatus shown in Fig. 3, on a somewhat larger scale and in section for the purpose of illustrating the action of the actuating or manipulating fingers in moving the locking balls;

Fig. 5 is a sectional view along the line 5—5 of Fig. 2 and illustrates the disposition of the locking balls and sphere for maintaining the rotary member locked in the Safe position of the lock;

Fig. 6 is a view somewhat similar to Fig. 5 but showing the disposition of the locking balls and sphere after the rotary member has been rotated to the Armed position of the lock;

Fig. 7 is a side elevation, with parts broken away, generally along line 7—7 of Fig. 6, to show the disposition of the locking balls in the Armed position thereof;

Fig. 8 is a side elevation of the special key or wrench employed to control the positions of the lock of this invention; and

Fig. 9 is an enlarged detail view of the lower portion of the key of Fig. 8 and illustrates the structure of the manipulating or actuating fingers thereof.

Referring now to the drawings, wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in Fig. 1 a preferred embodiment of the lock or control of this invention designated generally by reference numeral 11. The lock or control 11 comprises an outer housing or casing 12, adapted to be secured to the wall of the container (not shown), which houses the switching mechanism or other part (not shown) to be controlled by the lock, and an inner housing or rotary member 13 normally locked to the outer housing or casing, as will hereinafter become more clearly apparent.

Referring to Fig. 2, it will be noted that the inner housing or rotary member 13 is cup-shaped and has an annular flange portion 14, which is received in a suitably hollowed out portion of the outer housing 12 and sealed thereto by means of an O-ring seal 15, the housings being held together by means of a conventional split retaining ring 16. Annular flange 14, at the center portion thereof, has extending therefrom substantially semi-circular portions 17, which are spaced from each other, whereby are formed slots 18 and a central opening 19 communicating therewith.

Central opening 19 communicates with a central bore 21, in which is received a cylindrical piston 22, the piston being cup-shaped and containing one end portion of a coiled compression spring 23, the other end of the spring

reacting against the bottom of bore 21 and biasing the piston toward opening 19, movement of the piston in the bore being limited through the medium of a pin 24 secured in the wall of the housing 13 and extending into an elongated slot 25 formed in the side of the piston.

In the extended position of the piston 22, as shown in Fig. 2, the piston is sealed to the inner housing 13 by means of an O-ring seal 26, or the like. If desired, the housing may be further sealed by means of an O-ring seal 27, or the like, an O-ring seal 28 serving the same purpose between the outer housing 12 and the wall of the container (not shown) to which the latter is adapted to be secured. A tongue or tab formed on the inner housing or rotary member is designated by reference character 29 and is adapted to couple the rotary member or housing 13 to the mechanism or part (not shown) to be controlled thereby. The annular flange 14 of the rotary housing 13 is provided with suitable indicia or markings for indicating the position thereof, plates 31 secured to the outer housing 12 by screws 32, or the like, partially masking the markings in order that the position of the rotary housing, and hence the true condition of the mechanism (not shown) controlled thereby, shall be indicated by the unmasked markings; see Fig. 1 noting the Safe markings. It will be understood, of course, that the Armed markings are masked by plates 31 in Fig. 1.

The outer housing or casing 12 is provided with a pair of bores 33, which bores are diametrically disposed and aligned, each such bore having a coil compression spring 34 disposed therein, and each such spring being retained within its respective bore by a plug or plate 35 closing the outer end thereof. Each spring 34, at one end thereof, reacts against the associated plug 35 and at the other end thereof against a ball 36, the balls each having a diameter slightly less than the diameter of bore 33, whereby each ball may be received in its associated bore.

The inner housing or rotary member 13 is also provided with a pair of diametrically opposite and aligned bores 37 adapted, in one position of the rotary member, to be aligned and communicate with bores 33, each bore 37 having a portion thereof of a diameter substantially equal the diameter of bore 33 and a portion of a reduced diameter, whereby a shoulder 38 is provided therebetween. When bores 33 and 37 are in alignment, each spring 34 biases the associated ball 36 into engagement with the associated shoulder 38, the position of the shoulders being so located as to dispose the centers of the balls 36 within the inner housing or rotary member 13 and a minor portion of each ball within its respective bore 33, and thereby locking the rotary member to the outer housing 12; Figs. 2 and 5.

Also locking the rotary member 13 to the outer housing 12 is a ball or sphere 39 of a larger diameter than ball 36, the sphere 39 being received in a bore 41 (Fig. 5) formed in the rotary member; a minor portion of the sphere 39 being adapted to be received in either of a pair of cavities or recesses 42, 43 formed in a wall of bore 21, piston 22 in the extended position thereof serving to maintain sphere 39 partially disposed in slot 41 and in cavity 42 or 43, as the case may be. Sphere 39 may be released from such disposition by forcing piston 22 inwardly, against the bias of spring 23, whereby the sphere may move completely into bore 41. Hence, with piston 22 pressed inwardly sufficiently to clear bore 41, and with balls 36 pressed outwardly to dispose the centers thereof within housing or casing 12, rotary member 13 may be rotated, since balls 36 and sphere 39 will be cammed away from locking position; the latter being cammed away from housing 12 and the former away from housing 13.

Turning now to Figs. 4, 8 and 9, reference character 44 designates a special key or wrench employed to control the lock of the present invention and constitutes therewith a combination of lock and key therefor. The key 44 is generally T-shaped and is comprised of a stem 45

and a cross-bar or top 46, the latter being provided with a key ring 47, or the like, if desired, and the lower portion of the stem being enlarged, as at 48, which enlarged portion has formed therein a slot 49 and a pair of oppositely disposed tapered recesses or concavities 51. Pivotaly mounted within slot 49, upon a pivot pin 52, is a pair of actuating levers or members 53, each lever having a cam element 54 and an actuating or manipulating finger 55, the cam element and actuating finger of each lever having portions generally parallel to each other and oppositely directed to corresponding structure on the other levers (see Fig. 9).

Associated with each of said levers respectively, is one of a pair of springs 56, said springs serving to bias the levers and urge them into engagement with an abutment or stop pin 57 so as to dispose the actuating fingers 55 within the outer periphery of the enlarged portion 48, as shown in Fig. 9. Each lever 53 has formed therein a socket 58 in which is received one end of the associated spring 56, the other end of such spring being received in one of a pair of sockets 59 in portion 48.

The operation of the special key or wrench 44 to control and position lock 11 will now be described. The key is grasped by the cross-bar 46 thereof and the enlarged portion 48 is inserted in central opening 19, with cam elements 54 disposed in slots 18, pressure exerted longitudinally of stem 45 serving to press piston 22 inwardly. When the key has been forced inwardly to the point that the cam elements 54 engage the bottoms of slots 18, actuating fingers 55 will be disposed opposite bores 37, continued pressing of the key causing levers 53 to pivot and actuating fingers 55 to enter bores 37 and move balls 36, the centers of the balls being moved from the positions within the housing 13 as shown in Figs. 2 and 5, to the positions within bores 33 of housing 12, as shown in Fig. 4. Simultaneously, piston 22 will be moved out of engagement with sphere 39 and uncover bore 41 and one of the concavities 51 will be disposed in facing relation to the inner end of said bore, permitting movement of the sphere from concavity 42. With the key pressed inwardly, as hereinbefore described, turning thereof, in the clockwise direction as viewed in Fig. 5, will rotate housing 13, sphere 39 meanwhile being cammed out of concavity 42 and moving into bore 41 and concavity 51, and balls 36 being cammed out of bores 37 and into bores 33. When housing 13 has been rotated about 1/4 turn, each of balls 36 will engage in one of a pair of recesses or concavities 61, formed in housing 13 (Fig. 5), and sphere 39 will be disposed in facing relation to concavity 43. Upon relaxation of pressure on the key, the bias of spring 23 will move piston 22 and the key outwardly, such movement of the key causing the walls of concavity 51 adjacent sphere 39 to cam the sphere to engage in concavity 43, movement of the piston closing off the inner end of bore 41 and maintaining the sphere engaged in concavity 43. The key may now be completely withdrawn, leaving housings 12, 13, balls 36 and sphere 39 disposed as shown in Fig. 6. Also, the aforesaid rotation of housing 13 will cause the Safe markings to be masked by plates 31 and the Armed markings to be exposed to view.

For returning the lock to the Safe position, it is only necessary to insert the key and press inwardly until the piston has uncovered bore 41, after which the key is turned 1/4 turn, counterclockwise as viewed in Fig. 6, withdrawal of the key leaving the parts as shown in Figs. 2 and 5.

From the foregoing, it should be apparent that there has been provided a rotary lock employing a number of seals and a plurality of locking balls controlled by means of a special key, whereby the lock is both waterproof and tamper-proof.

Various modifications are contemplated and may obviously be resorted to by those skilled in the art without

departing from the spirit and scope of the invention, as only a preferred embodiment thereof has been disclosed.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A rotary lock comprising a casing, a rotatable cup-like housing within said casing, a movable piston in said housing, means in said housing biasing said piston to a position closing the open end of the housing, said casing having a pair of elongated openings therein which are oppositely disposed and transversely aligned, said housing having a pair of through bores therein aligned and in communication with said openings respectively, a pair of balls with a ball disposed in each of said bores respectively, means in said openings biasing said balls inwardly toward said housing, each ball in a first position of said housing having a portion extending into the respective opening communicating with the bore in which the ball is disposed, said housing having a pair of oppositely disposed recesses formed in the outer periphery thereof and mutually spaced with respect to said bores, said balls in a second position of the housing being adapted to seat in said recesses respectively, said housing having a through opening therein, a sphere disposed in said last-named opening, and said casing having a pair of mutually spaced cavities therein, said sphere being adapted to engage in one of said cavities in said first position of said housing and to engage in the other of said cavities in said second position of said housing, said piston when in the position closing the open end of the housing serving to maintain said sphere engaged in a cavity.

2. A rotary lock as defined in claim 1, and a key for said lock, said key including a portion insertable in said housing, a pair of levers pivotally mounted on said portion and each having thereon an actuating finger, said fingers being adapted to engage and move said balls outwardly in response to insertion of said portion in said housing, and said portion having formed in the exterior thereof a concavity adapted to be disposed in facing relation to the inner end of said last-named opening for receiving said sphere after the piston has uncovered said last-named opening in response to insertion of said portion in said housing.

3. A rotary control comprising, in combination, an outer housing, an inner housing rotatably mounted within said outer housing centrally thereof, said inner housing

having a cup-like bore, a spring-pressed piston mounted in said bore and normally closing the open end thereof, a pair of substantially semi-circular portions facing each other and extending from said outer housing, said portions defining a spaced pair of aligned slots and a central opening communicating therewith and with said bore, said inner housing having a pair of oppositely disposed through openings formed therein and vertically aligned with said slots, a locking ball disposed in each of said through openings for locking said housings to each other, and a key insertable into said central opening and said bore, said key having a pair of levers thereon, each lever having a cam element and an actuating finger generally parallel to each other and directed outwardly, said finger being adapted to extend into said through openings for engaging and moving said balls upon pivoting of said levers, said slots being adapted to receive said cam elements for proper positioning thereof and for actuating said fingers, engagement of said cam elements with the bottoms of said slots serving to cam the elements and actuate the fingers in response to said insertion of the key.

4. A rotary control as defined in claim 3, said inner housing being formed with a through bore communicating with said cup-like bore, said outer housing having a cavity in facing relation to said through bore, and a sphere disposed in said through bore and adapted to engage in said cavity, said piston normally covering the inner end of said through bore for maintaining said sphere engaged in said cavity, and said key having a concavity formed therein which is adapted to be disposed in facing relation to the inner end of said through bore after said key has been fully inserted and said piston pressed inwardly to uncover the through bore.

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