March 5, 1946. O. W. MARLOW 2,395,893

LOCKING DEVICE

Filed Nov. 18, 1942

Fig. 1.

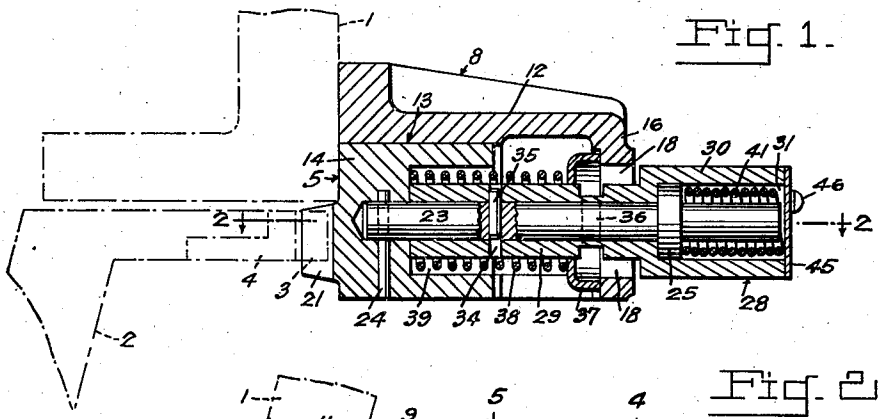


Fig. 2.

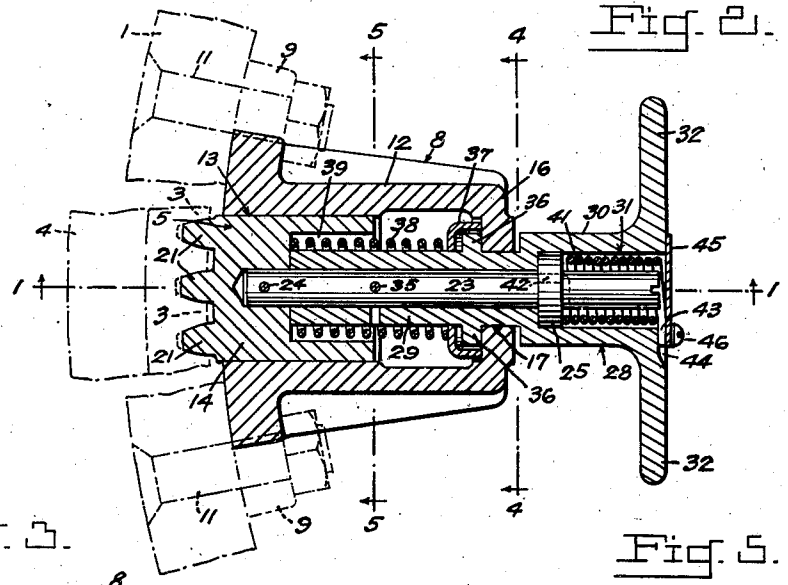


Fig. 3.

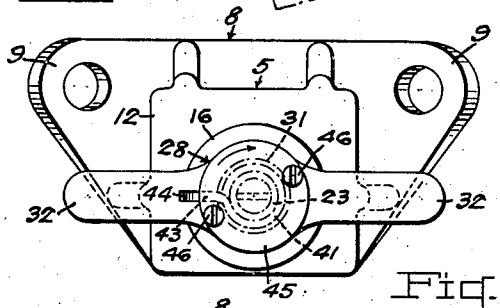


Fig. 5.

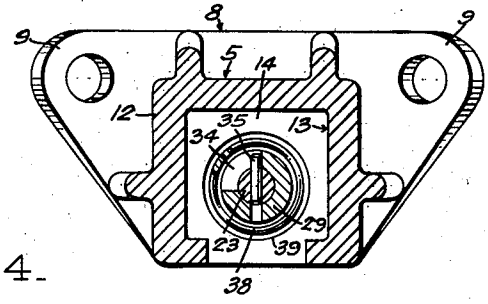
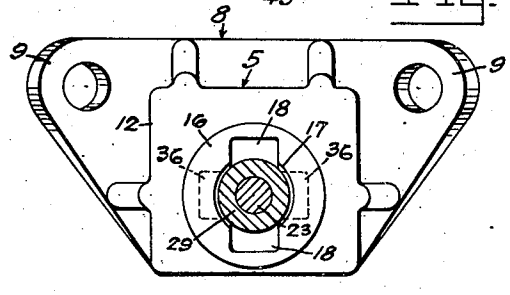


Fig. 4.



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UNITED STATES PATENT OFFICE

2,395,893

LOCKING DEVICE

Owen W. Marlow, Rock Island, Ill.

Application November 18, 1942, Serial No. 465,972

17 Claims. (Cl. 188—69)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without payment to me of any royalty thereon.

The present invention relates generally to locking devices and more particularly to mechanism for optionally securing a pair of relatively movable parts against movement.

The object and general nature of this invention is the provision of new and improved locking mechanism for holding a movable part optionally against movement with respect to a relatively stationary part, the locking mechanism being particularly constructed so as to provide an initial yielding engagement followed automatically by a positive lock whereby the two parts are held against relative displacement substantially without any likelihood of becoming disconnected until the locking mechanism is released.

A more specific feature of this invention is the provision of a new and improved turret lock for military tanks for optionally locking a rotatable turret to a relatively stationary part of the tank, and more particularly it is a feature of this invention to provide new and improved turret locking means associated with the turret traversing mechanism and utilizing a part thereof. It is, further, another feature of this invention to provide means whereby the control of the turret lock may conveniently and easily be effected. It is to be understood, however, that the principles of this invention are equally applicable to non-military uses, and may be used wherever it is desired to controllably hold two parts against relative movement.

Another feature of this invention is the provision of a spring-biased locking bolt which may optionally be engaged with the toothed part for insuring a full locking engagement, irrespective of whether or not the parts are in relative motion at the time. Still further, another feature of this invention is to provide new and improved lock operating means whereby the lock is automatically held in engaged or released position without danger of loosening or shifting during operation.

These and other objects and advantages of the present invention will be apparent to those skilled in the art after a consideration of the following detailed description of the preferred structural embodiment, taken in conjunction with the accompanying drawing, in which:

Figure 1 is a vertical section taken generally along the line 1—1 of Figure 2;

Figure 2 is a horizontal section taken generally along the line 2—2 of Figure 1;

Figure 3 is an end view, looking from right to left in Figure 1; and

Figures 4 and 5 are sections taken, respectively, along the lines 4—4 and 5—5 of Figure 2.

Referring now to the drawing, the reference numeral 1 indicates a movable part, such as a turret-supporting ring or ball race of a tank, supported on a relatively stationary part 2, such as the lower ball race. Generally, the turret, represented by the upper ring 1, is rotated by power traversing mechanism that is carried by the rotatable parts and includes a power unit having a drive pinion (not shown) meshing with teeth 3 on a ring gear 4 that is secured to or forms a part of the lower stationary part 2.

It is desirable at times to lock the turret against movement, and to that end I provide improved locking mechanism indicated at 5. The lock 5 includes a support in the form of a bracket or locking bolt carrier 8, preferably in the form of a casting having apertured attaching ears 9 that are adapted to receive bolts 11 by which the lock may be secured to the turret ring 1. The bracket 8 has a hollow body section 12 which at one end is formed with a bolt-receiving way 13, substantially square in section as best shown in Figure 5, in which a locking bolt or plunger 14 is slidably disposed. The other end 16 of the bracket 8 is provided with a key-hole opening 17 having a pair of opposite slots 18.

The locking bolt 14 that is shiftable in the way 13 carries a plurality of teeth 21 which are adapted to mesh with the teeth 3 on the ring gear 4. The teeth 3 and 21 are of conventional configuration, being generally tapered, and are the same as or similar to ordinary gear teeth. A rod 23 is secured at one end, as by a pin 24, to the locking bolt 14 and at the other end is formed with a head 25. An operating handle, indicated in its entirety by the reference numeral 28, is rockably mounted on the pin or rod 23 and includes a sleeve section 29 embracing the pin 23 and a section 30 having a recess 31 which receives the head 25. A pair of extensions 32 formed integral with the section 31 forms the handle proper. Intermediate its ends the sleeve section 29 has a slot 34 (Figure 5) which receives a pin 35 fixed in position in an opening in the pin 23. As best shown in Figure 5, the slot 34 is formed so that the handle member 28 is permitted to swing through approximately 90°. A pair of locking lugs or ears 36 are formed on or carried by the handle member 28, and as best shown in Figures 2 and 4 are

disposed in a horizontal position, generally transverse with respect to the opening in the other end and at the inside thereof. A cup-shaped member 37 surrounds the sleeve section 29 but clears the lugs or ears 36, as best shown in Figure 2. A spring 38 bears at one end against the member 37 and at the other end against the locking bolt 14, being received in a recess 39 formed in the bolt 14. The spring 38 exerts a continual bias tending to shift the bolt 14 into locking engagement with the ring gear 4. A torsion spring 41 is disposed in the recess 31 and has its inner end 42 seated in an opening in the head 25 and its outer end 43 lying in a groove 44 formed in the member 28. A plate 45 covers the end of the recess 41 and is removably held in place by a pair of screws 46. The plate 45 also secures the spring end 43 in place.

The operation of my locking mechanism is substantially as follows:

The parts of the device are shown in Figure 2 in the positions they occupy when the turret ring 1 is locked to the supporting part 2. The torsion spring 41, acting between the handle member 28 and, through the pin 23, the locking bolt 14, reacts against the latter to hold the operating handle in its locked position. To release the bolt 14, the handle 28 is turned in a clockwise direction (Figure 3) through approximately 90° against the tension of the torsion spring 41, as permitted by the slot 34 and pin 35 (Figure 5). This disposes the ears or lugs 36 in a vertical position in line with the slots 18 (Figure 4). The handle 28 is then pulled outwardly of the bracket 8, withdrawing the bolt 14 against the action of the spring 38 until the teeth 21 are disengaged from the teeth 3. During this action the ears or lugs 36 pass through the slots 18 and after they clear the edges of the slots, the handle may be rotated counterclockwise until the ears 36 engage the end 16 of the bracket 8 at points between the slots 18, whereby the bolt 14 is locked in its withdrawn or released position. The spring 38 is compressed but so long as the lugs 36 remain engaged with the end 16, and the effect of the torsion spring 41 is to hold the lugs 36 in that position, the bolt is locked against moving into engagement with the ring gear 4.

When it is desired to reengage the bolt 14 with the ring gear 4 so as to lock the turret against movement, all the operator has to do is to turn the handle so as to bring the ears 36 into a position to enter the slots 18. The handle may then be released, whereupon the spring 38 shifts the locking bolt 14 forwardly. As soon as the teeth on the locking bolt mesh with the teeth on the ring gear 4 the lugs 36 will be in a position inside the end wall 16, whereupon the torsion spring 41 will immediately swing the lugs 36 behind the end wall 16, thereby locking the bolt 14 in its outer or operative position. This is an important feature of my invention, inasmuch as the torsion spring 41 acts immediately to rock the handle 28 and swing the ears 36 behind the wall 16, after the teeth are in mesh, and serves to hold the handle in locked position, without requiring the operator to actually operate the handle. Further, if for any reason the teeth do not immediately mesh, the spring 38 will shift the parts into engagement as soon as meshing occurs, whereupon the torsion spring 41 will then swing the lugs 36 behind the wall 16, thereby automatically locking the bolt 14 in engagement with the gear 4. Since the teeth 3 and 21 are conventional gear teeth, as they should be if the ring 4 is to function as a part of the traversing mechanism, and of generally tapered configuration, if the bolt 14 were held merely by spring pressure there would be a tendency for excessive pressure to force the bolt 14 out of mesh. However, according to the present invention, after the spring 38 forces the locking bolt 14 into mesh with gear 4, the torsion spring 41 automatically turns the ears or lugs 36 into locking position behind the wall 16, as shown in Figure 4, positively locking the bolt 14 against being forced outwardly by pressure against the teeth. In addition, the continual bias exerted by the torsion spring 41 holds the handle 28 against accidental displacement due to vibrations, jars and the like, both when the turrent is locked and when it is unlocked.

While I have disclosed the preferred form of my invention, it is to be understood that my invention is not to be limited to the details shown and described but that, in fact, widely different means may be employed in the practice of the broader aspects of my invention.

What I claim, therefore, and desire to secure by Letters Patent is:

1. Mechanism for positively locking a pair of relatively movable members against movement, comprising a part carried on one of said members and shiftable thereon into and out of locking connection with the other member, a bracket rigidly mounted on said one member and shiftably receiving said shiftable part, and means mounted on said shiftable part and engageable with said bracket for positively holding said shiftable part in either locked or released position.

2. Mechanism for locking a pair of relatively movable members, one of said members comprising a ring gear having a plurality of teeth thereon, a carrier mounted on the other member adjacent the toothed portion of said ring gear, a locking bolt having tooth means adapted to mesh with the teeth of said ring gear, said locking bolt being slidable in said carrier toward and away from said ring gear, resilient means acting against said locking bolt for moving it into mesh with said ring gear, and means for positively maintaining said bolt tooth means in mesh with said ring gear teeth.

3. Detent mechanism comprising a support, a part slidable thereon, spring means biasing said slidable part for movement in one direction relative to said support, a handle carried by said slidable part for limited rotation with respect thereto but held against axial displacement, means on said handle adapted to engage a portion of said support for preventing movement of said slidable part in one direction, said means being adapted to engage another portion of said support for preventing movement of said slidable part in the other direction, and torsion spring means acting against said handle for rotating it into a position to cause said means to engage one or the other positions of support.

4. A locking device comprising a support having a bolt-receiving way at one end and a keyhole opening at the other end, a locking bolt slidable in said way, a rod fixed at one end to said locking bolt and having its other end extending through said opening, a handle member rockably mounted on said rod and extending through said opening, means on said rod and handle member for holding the latter against

axial displacement on said rod and limiting the rocking movement of said handle member on said rod, said key-hole opening having a central section and a pair of oppositely arranged slots, a pair of oppositely arranged lugs on said handle member and adapted, when the latter is turned into one position, to pass through said slots, a cup-shaped member surrounding said handle member on the inside of said support and about said opening, said cup-shaped member being adapted to receive said lugs in the inner position of said handle member, a spring bearing at one end against said cup-shaped member and at its other end against said locking bolt, said spring serving to urge said bolt and handle member in one direction, and a torsion spring connected at one end to the outer end of said rod and at its other end to said handle member for rocking the latter in a direction to carry said lugs away from said slots in either position of the handle member.

5. In a locking device, a locking bolt, an operating handle connected with said locking bolt and rockable relative thereto, means holding said handle member against axial movement relative to said locking bolt but accommodating said rocking movement, and a torsion spring connected with said locking bolt and said handle member for rocking the latter relative to said locking bolt.

6. In a locking device, a locking bolt, an operating handle including a recessed section and a sleeve section, a pin having a head seated in said recessed section, and extending through said sleeve section, means connecting the inner end of said pin to said locking bolt, means limiting the rotational movement of said handle on said pin, and a torsion spring disposed in said recessed section and connected at one end with said pin and at the other end with said handle.

7. Mechanism for locking a pair of relatively movable members against movement, comprising a part carried on one end of said members and shiftable thereon into and out of locking connection with the other member, means mounted on said shiftable part and cooperating with one of said members for positively holding said part in either locked or released position, first resilient means constantly biasing said shiftable part towards locking connection with said other member, and second independent resilient means constantly biasing said holding means towards positive locking position and operative to maintain said shiftable part against axial shifting in either the locked or released position of the latter.

8. Mechanism for locking a pair of relatively movable members against movement, comprising a part carried on one of said members and shiftable thereon into and out of locking connection with the other member, a combined retracting and locking handle for optionally locking said part in either of its positions and for shifting said shiftable part from one position to the other, and means connecting said shiftable part and said handle constructed and arranged whereby to prevent axial movement while permitting limited rotational movement therebetween.

9. Mechanism for locking a pair of relatively movable parts against movement, one of said parts having teeth of generally tapered form, said mechanism comprising a support fixed to the other of said relatively movable parts, a plunger movable relative to said support and having tooth means also of generally tapered form adapted to mesh with the teeth on said one part when the latter are in meshing position, resilient means exerting a constant bias tending to cause said plunger to engage said one part whether or not said teeth are in meshing position, and locking means cooperating with said support and said plunger for automatically positively locking said parts upon movement of said teeth from non-meshing to meshing position.

10. A locking device comprising a support having a bolt receiving way at one end and a keyhole opening at the other end, a locking bolt slidable in said way, a handle rockably disposed in said opening and having its inner end rockably connected and adapted to shift said bolt by axial movement of the handle through said opening, and a lug on said handle adapted to be disposed, when the handle and bolt are in one position relative to said support, on one side of said opening and to react against said other end of the support to hold said bolt in one position, turning said handle serving to dispose said lug in a position to pass through said keyhole opening so as to provide for moving said handle and bolt from one position into their other position, whereupon turning of the handle disposes said lug against the other side of said opening so as to hold said bolt and handle in said other position, spring means acting between said support and bolt for urging the latter forward into one position and between said support and said handle for rocking the latter to carry said lug into locked relation with the support in either position of the bolt and handle.

11. In mechanism for locking a pair of parts against relative movement, one of said parts having a toothed section including a plurality of teeth thereon and the other of said parts having a detent adapted to mesh with said toothed section, positive locking means for said detent to unyieldingly hold the latter in locking position, means biasing said locking means for movement into positive locking position, and operating handle means operatively associated with said detent for positively retracting the latter out of engagement with said toothed section.

12. Mechanism for positively locking a pair of relatively movable parts against movement, one of said parts having teeth of generally tapered form, said mechanism comprising a support rigidly mounted on the other of said relatively movable parts, a plunger movable relative to said support and having tooth means also of generally tapered form adapted to mesh with the teeth on said one part so as to lock said parts against relative movement, resilient means exerting a constant bias tending to cause said plunger to engage said one part, means for unyieldingly holding said plunger in locking engagement with said one part so as to positively prevent any movement of said plunger away from said one part resulting from the generally tapered form of said teeth and any tendency of one part to move relative to the other which otherwise might be sufficient to overcome said resilient means, and operating handle means operatively associated with said plunger for positively retracting the latter out of engagement with the teeth on said one part.

13. In mechanism for locking a pair of parts against relative movement, one of said parts having a toothed section including a plurality of teeth thereon and the other of said parts having a detent adapted to mesh with said toothed section, positive locking means for said detent to unyieldingly hold the latter in locking position, means biasing said locking means for movement into positive locking position, and operating handle means operatively associated with said detent

for positively retracting the latter out of engagement with said toothed section, said locking means being operative to positively maintain said detent in unlocked position upon retraction thereof.

14. Mechanism for positively locking a pair of relatively movable parts against movement, one of said parts having teeth of generally tapered form, said mechanism comprising a support rigidly mounted on the other of said relatively movable parts, a plunger movable relative to said support and having tooth means also of generally tapered form adapted to mesh with the teeth on said one part so as to lock said parts against relative movement, resilient means exerting a constant bias tending to cause said plunger to engage said one part, means for unyieldingly holding said plunger in locking engagement with said one part so as to positively prevent any movement of said plunger away from said one part resulting from the generally tapered form of said teeth and any tendency of one part to move relative to the other which otherwise might be sufficient to overcome said resilient means, and operating handle means operatively associated with said plunger for positively retracting the latter out of engagement with the teeth on said one part, said holding means being operable to positively maintain said plunger in unlocked position upon retraction thereof.

15. In a locking device, a locking bolt, an operating handle including a recessed section and a sleeve section, a pin having a head seated in said recessed section, and extending through said sleeve section, means connecting the inner end of said pin to said locking bolt, means limiting the rotational movement of said handle on said pin, a torsion spring disposed in said recessed section and connected at one end with said pin and at the other end with said handle, means forming a groove in the outer face of said handle adjacent said recess adapted to receive one end of said torsion spring, and a cover plate for said recess operative to secure said one torsion spring end within said groove.

16. A torque transmitting device comprising in combination, a generally cylindrical torque applying member having a longitudinal passageway and an enlarged coaxial recess therein open at one end, a torque receiving member including an elongated generally cylindrical portion adapted to lie partially within and to partially project from said passageway and an enlarged head portion adapted to be substantially entirely contained within said recess, means forming a groove in said torque applying member adjacent the open end of said recess, a torsion spring mounted in said recess and having one end secured to said head portion and its other end lying in said groove, a generally flat cylindrical cover plate, and means mounting said cover plate on said torque applying member whereby to close the open end of said recess and to secure said other spring end within said groove.

17. In a torque transmitting device the combination comprising, a first member adapted to have a force applied thereto, a second member adapted to receive the force transmitted thereto from said first member, at least one of said members having a substantially hollow recess therein open at one end, said recessed member including a groove formed therein adjacent its open end, spring means mounted in said recess and having one end lying in said groove of said recessed member and the other end secured to said other member, a cover plate mounted on said recessed member and constructed and arranged whereby to close the open end of said recess and to secure said one end of said spring within said groove.

OWEN W. MARLOW.