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(54) Padlock

(57) This invention relates to a padlock having a shackle and a body portion containing a lock, the shackle being of the kind which is of generally U-shaped configuration having one leg shorter than the other. In accordance with the invention each of the shackle legs is formed with a recess (15) of curved configuration and there is provided a pair of spaced bolt elements (16) together with a cam

member (17) disposed between the bolt elements in engagement therewith. The cam member (17) is rotatable in one direction of rotation by actuation of the lock and is rotatable in the opposite direction by means of a cam spring (22) the bolt elements (16) have shackle engaging surfaces which are also of rounded form and which are arranged in the locked position of the padlock to enter into the recesses (15).

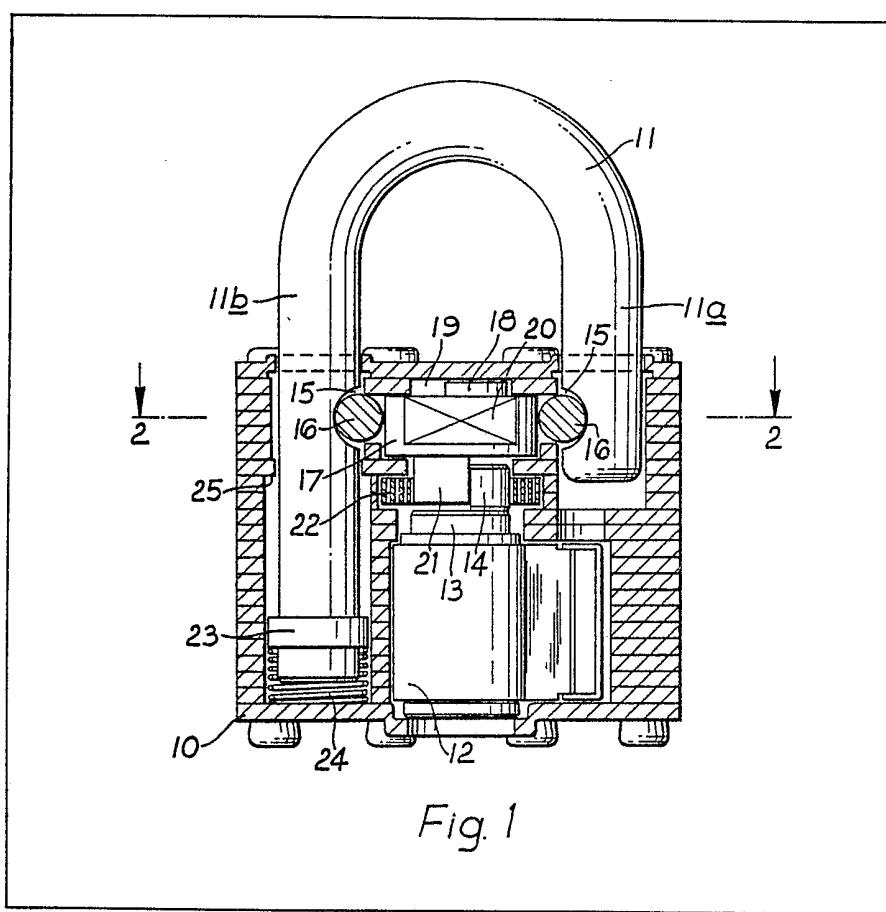


Fig. 1

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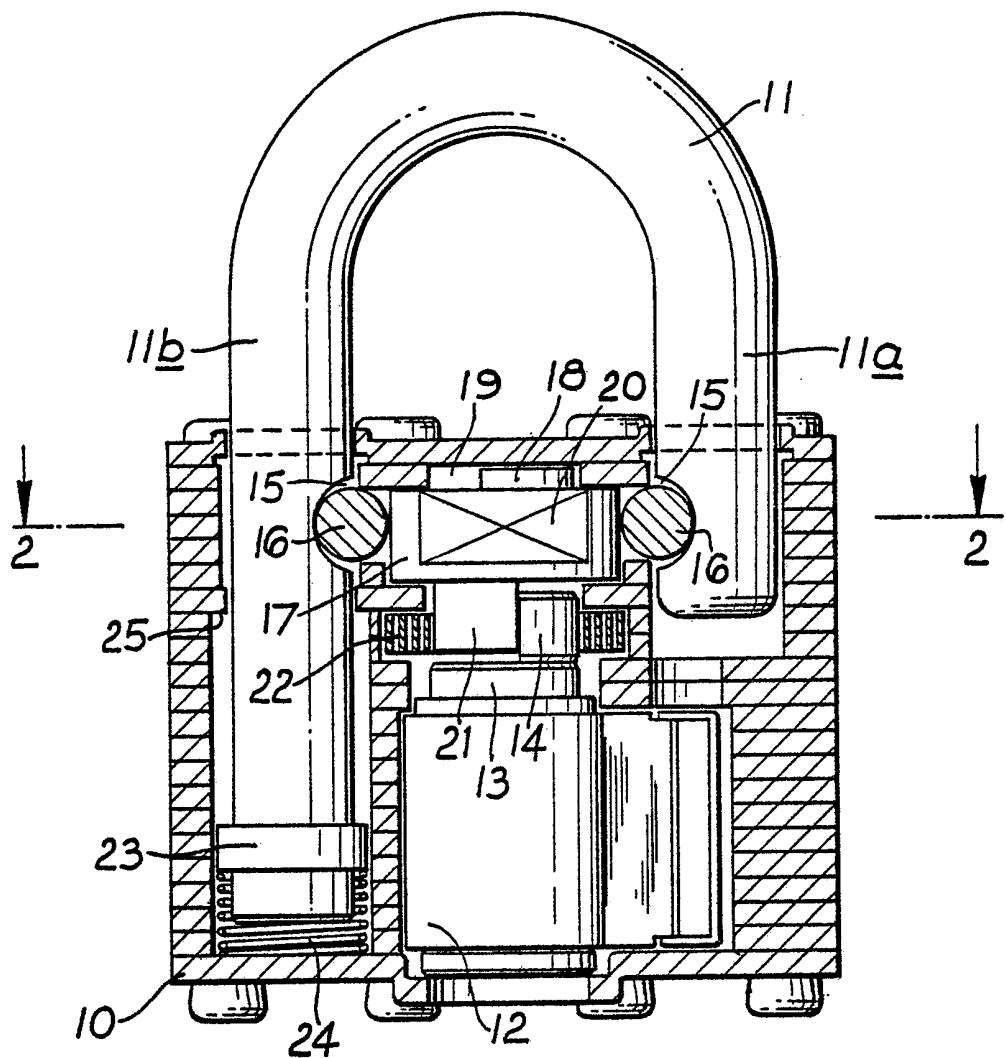


Fig. 1

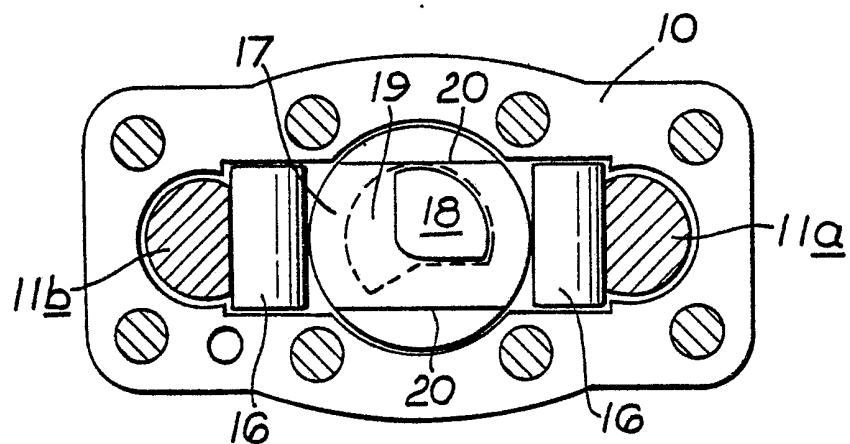


Fig. 2

SPECIFICATION
Padlock

This invention relates to a padlock which, as is well-known in the art, commonly comprises a shackle and a body portion which contains a lock including bolt means, the shackle being of generally U-shaped configuration but with one leg shorter than the other and being slidably mounted in the body portion so as to be movable relative thereto between an operative, locked, position in which the free ends of both legs of the shackle are disposed within the body portion and an inoperative, unlocked position in which the free end of the shorter leg of the shackle lies outside said body portion, said bolt means being arranged in said operative, locked, position of the shackle to engage it so as to prevent it from moving or being moved to its inoperative, unlocked, position.

One known form of padlock utilises bolt means in the form of a spring-loaded slideable bolt which is urged by the associated spring to a position in which, in the locked position of the padlock, one of the ends of the bolt enters a notch formed in the shorter leg of the shackle adjacent to the free end thereof, the lock being arranged to act on the bolt, when it is desired to unlock the padlock, to push back the bolt, against the force exerted by the bolt spring, so as to withdraw said bolt end from the shackle notch and thus permit said shackle to move outwardly relative to the body portion to its unlocked position, such outward movement usually being effected by means of a further spring acting on the shackle and located within the body portion.

The above-described construction does however suffer from some disadvantages. Thus, it is sometimes possible, by striking the outside of the padlock with a heavy, sharp blow, to cause the bolt to slide momentarily relative to the body portion against the force exerted by the bolt spring so that the locking end of the bolt moves out of engagement with the shackle notch, thus enabling the shackle to spring open. It may also be possible, by forcing a shim or like their flexible piece into the body portion between the shorter leg of the shackle and the complementary body portion aperture, to engage the bolt and push it back against the bolt spring until it is again withdrawn from the shackle notch, thus releasing the shackle.

Furthermore the notch formed in the shackle is usually formed with plane faces giving rise to sharp corners where these faces intersect and such corners tend to generate concentrations of stress which weaken the shackle.

In another known construction, said bolt means comprises two opposed slideable bolts having spring means which tend to urge the bolts apart so as to cause their opposite ends, in the locked position of the padlock, to enter respectively a pair of notches formed in the two lugs of the shackle. Although this construction avoids the danger of the padlock being illicitly opened by striking the body portion as above described, the other disadvantages mentioned above still apply.

It is the object of the present invention to provide a padlock which, *inter alia*, avoids all the above-mentioned disadvantages.

In accordance with the invention, there is provided a padlock having a shackle 11 and a body portion 10 which contains a lock 12, said shackle being of generally U-shaped configuration but with one leg shorter than the other, wherein each of said shackle legs is formed with a recess 15 of curved configuration and wherein there is provided within said body portion bolt means comprising a pair of spaced bolt elements 16 and a cam member 17 which is disposed between said bolt elements in engagement therewith and mounted within the body portion so as to be rotatable in one direction of rotation by actuation of said lock and rotatable in the opposite direction of rotation by means of a cam spring 22 to which it is connected, said bolt elements having shackle engaging surfaces which are of rounded form and which are adapted, in the locked position of the padlock, to enter into said recesses 15 formed in the shackle legs.

The bolt elements may be integrally formed with or connected to said cam member so as to be rotatable therewith or alternatively they may be separately formed in which case they may be slidably mounted in the body portion. Preferably, however, they comprise a pair of rollers or balls. The cam spring is conveniently in the form of a torsion spring.

The invention will now be more particularly described with reference to the accompanying drawings wherein:

Figure 1 is a part-sectional side view of one example of a padlock constructed in accordance with the invention, and

Figure 2 is a sectional view taken on the line 2—2 of Figure 1.

Referring now to the drawing there is shown therein a padlock which comprises a body portion 10 conveniently formed from a plurality of laminations in the form of steel plates which are riveted together and a shackle 11 which is of generally U-shaped configuration although one leg 11a of said shackle namely leg 11a is shorter than the other leg 11b. Mounted within said body portion 10 is a lock 12 comprising a pin tumbler mechanism having a rotatable barrel 13 integrally formed at one end with an eccentrically disposed projection 14.

Each of the aforementioned shackle legs 11a and 11b is formed in one side with a recess 15 which is of curved configuration. For example each recess 15 may be of part spherical or part cylindrical configuration or may represent a developable surface. For co-acting with said recesses 15 there is provided a pair of spaced bolt elements 16 which may comprise a pair of balls or a pair of slideable elements but which in the example illustrated comprise a pair of rollers. Whichever form of bolt element is used however at least the surface thereof which is intended to engage with a co-acting recess 15 is formed to a rounded configuration.

There is also provided a cam member 17 which is disposed within said body portion 10 so as to be rotatable therein. The upper end of said cam member 17 is formed with a quadrant shaped portion 18 which is located within a recess 19 formed in one of the plates making up the laminations of the body portion, said projection 18 and co-acting recess 19 forming a location for the cam member which also limits its rotational

5 movement to an angle of approximately 130°. The opposite sides of said cam member 17 are each formed with a flat or ellipse 20 and the lower end of said cam member is integrally connected to an eccentric downwardly extending projection 21
 10 which is engaged by the projection 14 of the lock barrel 13. There is also provided a torsion spring 22 which is connected to said projection 21 and which has the effect of tending to rotate said cam member 17 in a direction in which the widest part
 15 20 of the cam member engages the inner sides of the bolt elements 16 as is shown in Figures 1 and 2.

The longer leg 11b of the shackle 11 is fitted, adjacent to its lower end as seen in Figure 1 with a collar 23 which serves as an abutment for one end
 25 25 of a shackle spring 24, the other end of said spring being located against the bottom plate of the body portion 10.

The locked position of the padlock is illustrated in the drawing and in this position the torsion
 30 35 spring 22 has, as above-mentioned, turned the cam member 17 into a position in which its widest part forces the bolt elements 16 outwardly to engage the aforementioned curved recesses 15 in the shackle legs. The shackle spring 24 is compressed but engagement of the bolt elements 16 with the co-acting recesses 15 prevent the shackle 11 from springing outwardly. In this position it is not possible to open the padlock by striking the body portion with a heavy blow
 40 45 because the bolt elements are positively engaged by the cam member and are therefore dead-locked. For the same reason any attempt at forcing the lock by inserting shims into the body portion through the clearance between the shackle legs and the complementary apertures in the body portion will be equally ineffective. Also the rounded configuration of the aforementioned recesses 15 in the shackle legs ensures that no unacceptably large concentrations of stress will be
 50 55 formed in said shackle legs. Further, as the cam member 17 and bolt elements 16 are located freely, equal stress will be applied to both legs of the shackle.

When it is desired to open the padlock a key inserted into the pin tumbler mechanism at the base of the padlock as shown in Figure 1 can be used to turn the barrel 13 and with it the projection 14 and the latter, through its engagement with the projection 21, can turn the
 60 65 cam member 17 through an angle of at least 90° so that the flats 20 will now be disposed between the bolt elements 16 thereby reducing the width of said cam member between the bolt elements so as to provide sufficient room for the bolt elements
 65 to be able to move inwardly which they will do

under the force exerted by the shackle spring 24 (the lower parts of the surfaces of the recesses 15 engaging the elements 16 to push them inwardly) causing said shackle 11 to spring outwardly until the free end of the shorter leg 11a is clear of the body portion 10. Outward movement of the shackle 11 will be limited by engagement

70 between the upper side of said collar 23 and a shoulder 25 provided by one of said plates
 75 forming the laminations of the body portion. In the open position of the padlock, the key can be removed, and the torsion spring 22 will then again act on the cam member 17 so as to urge it towards the position in which its widest part
 80 85 engages the bolt elements 16 although of course said widest part of the cam member cannot yet engage the bolt elements and the latter cannot move to their outermost positions since, in the open position of the padlock, they will not be aligned with the recesses 15. However, when it is desired to re-lock the padlock, the shackle 11 is pushed inwardly against the force exerted by the spring 24 until said recesses 15 are again aligned with the bolt elements whereupon the cam
 90 95 member 17 will be able to complete its turning movement under the influence of torsion spring 22 to bring the widest part of said member 17 into engagement with the bolt elements 16 and force them into the recesses 15 where they will be dead-locked as previously explained. Thus it is not necessary to use the key when re-locking the padlock.

As above-described, turning of the key (and, with it, the projection 14 and cam member 17) through an angle of 90° from the locked position will bring the cam member into the unlocked position in which the flats 20 are disposed between the bolt elements 16 and in this position said bolt elements will ordinarily move inwardly
 100 105 out of the recesses 16 under the influence of the force exerted by the spring 24. However if, for any reason, one or both of the bolt elements are temporarily retained in their locked positions (for example because they have become slightly tilted from their true positions) then a continued further rotation of the key up to a maximum turn of 130° permitted by the allowable movement of the quadrant shaped portion 18 in said recess 19 will result in the corners at the ends of the flats or
 110 115 ellipses 20 engaging said bolt elements to release them from their jammed positions whereupon the key can be turned back to its 90° position to permit the bolt elements to move inwardly out of the recesses 15 and into their unlocked positions so as to release the shackle 11.

Although, as above described the bolt elements comprise a pair of rollers it is to be understood that they may comprise a pair of balls or alternatively they may each be slidably mounted
 125 130 but in this case the outer end of each such slidably bolt element will be of rounded configuration as of course is the case where the bolt elements comprise rollers or balls. In a still further alternative construction the bolt elements may be formed as an integral part of the cam member but

again their outer surfaces will be of rounded configuration for engagement with the curved recesses formed in the shackle legs.

CLAIMS

5 1. A padlock having a shackle and a body portion which contains a lock, said shackle being of generally U-shaped configuration but with one leg shorter than the other, wherein each of said shackle legs is formed with a recess 15 of curved configuration and wherein there is provided within said body portion bolt means comprising a pair of spaced bolt elements 16 and a cam member 17 which is disposed between said bolt elements in engagement therewith and mounted within the body portion so as to be rotatable in one direction of rotation by actuation of said lock and rotatable in the opposite direction of rotation by means of a cam spring 22 to which it is connected, said bolt elements having shackle engaging surfaces which

10 are of rounded form and which are adapted, in the locked position of the padlock, to enter into said recesses 15 formed in the shackle legs.

15 2. A padlock as claimed in Claim 1 wherein said

25 bolt elements are formed separately from said cam member.

3. A padlock as claimed in Claim 2 wherein said bolt elements comprise a pair of rollers or balls.

4. A padlock as claimed in any one of the preceding claims wherein said cam spring is in the form of a torsion spring.

30 5. A padlock as claimed in any one of the preceding claims wherein the cam member and the body portion are formed with a projection and a co-acting recess into which said projection

35 extends, the projection and recess being shaped to limit the angle of rotation of the cam member.

6. A padlock as claimed in Claim 5 wherein the projection is formed on the cam member and the co-acting recess is formed in the body portion.

40 7. A padlock as claimed in Claim 5 or Claim 6 wherein the projection and the recess are shaped to permit rotation of the cam member through an angle of more than 90°.

8. A padlock as claimed in Claim 1 and

45 9. A padlock substantially as hereinbefore described with reference to and as shown in the accompanying drawing.