This invention relates to padlocks in general, and more particularly to the latch mechanism thereof, which functions to lock and release the padlock shackle.

The padlocks presently made available by various manufacturers are fundamentally quite similar in construction, operation and general design due to the necessary inclusion in all modern padlock structures of certain elements, parts and units that have become more or less standardized or conventional in this art. For example, all padlocks, whether of the permutation type, the key operated type, or of the combination permutation and key operated type, necessarily include a latch mechanism which, at one time functions to hold the padlock shackle in its locked position, and another time functions to release the shackle for movement to its open position. To meet the challenge of present day competition in the padlock manufacturing field, it has become highly important to reduce the manufacturing costs of padlocks to a minimum by solving the problems that will enable the various padlock parts to be produced by modern high speed low cost methods, practices and procedures.

One object of our invention is to provide a novel and improved padlock which solves the indicated problems relative to the latch mechanism thereof.

Another object is to provide such a padlock which embodies a unique latch mechanism that is comparatively more economical to produce and more effective and efficient in its operation than the padlock latch mechanisms of the prior art.

A further object is to provide certain latch mechanism elements of special configuration that are forced of pliable material in extruded, stamped, molded, or cast form, so as to effect substantial economy in their production over the similar machine made elements of the prior art.

An additional object is to provide such a padlock which includes novel means for preventing the shackle bolt therefrom becoming laterally displaced during its sliding movement to and from locking engagement with the shackle lug notch.

Other objects reside in the provision of a padlock of the type indicated which comprises in cooperative combination such parts as a housing, or casing, having shackle leg receiving openings therein; a shackle arranged so that the legs thereof are slidable in said openings, one of which legs is provided with a notch; a shackle bolt adapted to cooperate with said shackle leg notch so as to effect the locking and unlocking of the shackle; a bolt mounting that is pivotally positioned within said housing and provided with a cavity adapted to movably accommodate the bolt therein; means arranged to limit, or restrain, the movement of the bolt within said cavity in a longitudinal sliding movement in parallelism with the axis of the cavity; spring means arranged within said cavity so as to urge movement of the shackle bolt in one direction; and a key operated cylinder, as well as other means, for effecting movement of the bolt from a position of engagement thereof with the shackle leg notch to a position of disengagement therefrom.

With these and other objects in view, which will become more apparent from the following detailed description of one practical and illustrative embodiment of our improvements shown in the accompanying drawings, the invention resides in the novel padlock, elements, features of construction and arrangement of parts in cooperative relationship, as more particularly indicated and defined by the hereto appended claim.

In the accompanying drawings:

FIGURE 1 is a front elevational view, substantially to full scale, of a padlock in accordance with our invention;

FIG. 2 is a rear elevational view of the padlock shown in FIG. 1;

FIG. 3 is a side elevational view of the padlock as seen from the left of FIG. 1;

FIG. 4 is an elevational sectional view, on an enlarged scale, taken substantially as indicated by the arrows 4—4 on FIG. 3, with certain parts thereof shown in full outline; and

FIG. 5 is an elevational sectional view, similar to FIG. 4, but showing certain of the parts thereof in another position;

FIG. 6 is a detail face view of a certain latch mechanism motion transmitting element of our invention;

FIG. 7 is an edge view of FIG. 6;

FIG. 8 is a fragmentary detail view of the padlock bolt mounting means of our invention;

FIGS. 9 and 10 are, respectively, side and front elevational views of the bolt mounting unit of our invention;

FIG. 11 is a perspective view, on an enlarged scale, of the bolt unit of our invention;

FIG. 12 is a fragmentary detail view showing certain parts of our padlock in one of their shackle locking positions;

FIG. 13 is a view similar to FIGS. 4 and 5, but showing certain of the latch mechanism parts in their shackle release position; and

FIG. 14 is an elevational sectional view, taken substantially as indicated by the arrows 14—14 on FIG. 5.

In order to simplify the disclosure of our invention, only those usual and well known parts of a combination permutation and key operated padlock are shown and indicated in the accompanying drawings that will make it clear to those skilled in this art how to practice our invention so as to attain a novel padlock structure that embodies our improvements and provides the benefits thereof. For further information concerning the construction and operation of such well known padlocks, reference may be had to the prior art patents relating thereto and to the literature made freely available by the various padlock manufacturers.

From the disclosure of our improvements, it will be apparent that our invention is applicable to padlocks in general. That is to say, to padlocks of the permutation type, the key operated type and to the combination permutation and key operated type.

By referring to the drawings, it will be seen that the padlock of our invention generally comprises a molded, or cast, hollow housing H, of circular configuration, that is open at its front end and includes an integrally unitary rear wall section 1 and a side wall or flange section 13. Two shackle leg receiving openings are formed, as usual, in the upper part of the flange section 1, as indicated at 2 and 3, which openings are adapted to slidingly accommodate therein the downwardly extending legs 4 and 5 of a shackle S. The shackle leg 4 is somewhat shorter than the shackle leg 5 and is provided with at its lower end with a notch 6, as more clearly shown in FIGS. 5 and 12.

Within the padlock housing H, in a somewhat downward centrally offset relation therewith, is a usual change disc post 7, that is integrally formed with and extends in right-angular relation from, the rear wall or housing section 1. Mounted for free rotation on the post 7, are the usual type and number of permutation change discs, or tumbler elements, of which only two are indicated at 8 and 9, which discs are each provided with usual functional
members, for example, the disc 8 is provided with a pinlike member 8a, a depression 8b, and a notch 8c, arranged so that disc 8 will perform its usual and normal permutation change function.

The change discs or tumbler elements are turned for lock operating purposes by a usual lock operating unit U, that comprises a circular mounting plate 10, that is fixedly secured to the front stepped or shouldered edge 13 of the flange section 1 of the housing H, so as to close the front opening of the latter. The plate 10 rotatably carries at the front thereof an external knob K that is integrally formed with a dial D. A shaft (not shown) extends through the plate 10 and connects for united rotation the combined knob K and dial D with an operating disc (not shown) adapted to rotate with the disc 8.

Other prior art pads that are mounted within the housing H, the construction and operation of which is well known, are a shackle guide 11 that is connected with the lower end of the shackle leg 5 and has a rearward extension (not shown) which slides along a raised guide track member 12 that is integrally formed in the rear wall section 1 of the padlock housing and the other one of which is formed in a positioning plate or disc 17, the housing 14 being maintained against turning from the position shown in the various figures by a retaining post 18; a usual upserter stop post 19, that is arranged in cooperative relation with an upsetter member 20 on the disc 9; and a bolt mounting base post 20 that is provided at its rear end with a spacing flange 29a. The posts 7, 10, 18, 19, and the spacing flange 29a are all integrally combined with the rear wall section 1 of the padlock housing by molding and extend internally therefrom in right-angular relation, as shown.

Prior art padlocks having the usual parts so far described and indicated, or parts similar thereto, are also normally provided with a latch mechanism, in one form or another, adapted to complete the padlock structure.

As previously mentioned, the latch mechanism and padlock structure of our invention solves certain minimum manufacturing cost problems as achieved by modern low cost methods, practices and procedures, and to this end comprise special elements and parts, some of which are of novel construction and/or functionality, some of which are producable in extruded, stamped, molded or cast form, and some of which are otherwise new in form, structure, or operation. These special elements and parts are cooperatively arranged and combined in the manner of our invention, with the usual padlock parts of the type hereinbefore described, and thereby attain the unique padlock structure and benefits of our invention.

In general, the said special elements comprise a bolt element 21, a bolt mounting 22, a spiral compression spring 23, a cam-like motion transmitting element or bolt retractor 24, a stud shaft 25 on which the element 24 is slidably and turnably mounted, a bolt retractor hold down element 26, and a metal bar, by an extrusion process, which bar, throughout its length, has a cross-sectional configuration in substantial correspondence with the longitudinal cross-sectional shape of the element 21, and then successively cutting from said bar similar proper size portions thereof each of which forms one of the completed individual elements 21.

The bolt mounting 22 is produced by a molding, or casting process and is shaped as illustrated more particularly by FIGS. 9 and 10. The mounting 22 is provided with an internal cavity 22a of substantially rectangular cross-sectional configuration of slightly increased dimensions relative to the maximum rectangular cross-sectional dimensions of the bolt element 21, and is adapted to slidingly accommodate therein the bolt element 21, so that the latter may occupy the various positions therein as indicated by FIGS. 4, 5, 12 and 13. The mounting 22 is also provided with a transversely extending bore or aperture 22b through which it is adapted to extend the portion 22c as indicated by FIG. 8, thereby effecting a pivotal connection of the mounting 22 with the post 20. The rear cavity forming wall of the mounting 22 is provided with a circular protrusion 22d adapted to form a seat for the spiral compression spring 23. At its rear end, the mounting 22 is provided with a curved depression 22e which is adapted to rest on the perimeter of the change disc 8, as indicated by FIG. 12, or to extend into the notch 8c of the disc 8, as indicated by FIG. 13, or to be positioned in slightly spaced relation with the disc 8, as indicated by FIGS. 4 and 5. At its lower front end, the mounting 22 is provided with a projection 22f that normally rests on the disc 8 and forms a movement stop for the mounting 22 in one direction.

Formed integrally with and internally along the side walls section 1a of the housing H, in crosswise relation therewith, is a wall projection 1a, having the stud shaft 25 projecting from its front end. The bolt retractor element 24 is turnably and slidably mounted on the stud shaft 25. Also mounted on the stud shaft 25, forwardly of the element 24 so as to retain the same against lateral displacement, is the bolt retractor hold down washer 26.

The cam projection 27 is integrally formed with the side wall section 1a of the housing H and is provided with a curved edge, as shown, that is arranged in contacting relation with a rear edge section of the bolt retractor element 24.

The bolt retractor element 24 has a shape or configuration as more particularly illustrated by FIGS. 6 and 7.

The key operated cylinder 28 is rotatably mounted in the cylinder housing 14. A transverse slot or groove 14a is provided in the cylinder housing 14 that is arranged in alignment with the groove 28a of the cylinder 28. The bottom edge of the bolt retractor element 24 contacting rests on the bottom surfaces of the grooves or slots 14a and 28a when the element 24 is in its inactive position, as illustrated by FIGS. 4 and 13.

It is to be particularly noted that the rectangular cross-sectional configuration of the body member of the bolt element 21, in conjunction with the similar cross-sectional configuration of the cavity 22a of the bolt mounting 22, enables easy, guided, nonstabilizing ending projection 22c of the bolt within the cavity. Furthermore, that this arrangement, at all times, positively restrains the bolt element 21 against lateral movement or displacement, and thereby prevents any misalignment of the bolt head 21a with the notch 6 of the shackle leg 4.

It is also to be noted that, due to the configuration of the various special elements and parts of our latch mechanism, substantially all of them can be readily and economically produced from metal in extruded, stamped, molded or cast form. If desired, for one reason or another, some, or substantially all these elements and parts, can also be similarly produced from a suitable plastic material.

Accordingly, our invention not only provides a novel padlock having certain structural and functional features of advantage over the similar padlocks of the prior art, but one which can be more economically produced than the latter.
When the various parts of our padlock structure are arranged as illustrated by FIGS. 1 to 4 inclusive, the shackle S is closed and held in its locked position by the bolt 21. When the parts are so arranged, the padlock may be operated to effect opening of the shackle S by either turning the knob K to the right and to the left, as usual, to bring the proper padlock opening numbers of the dial D, successively into registry with an indicator line I provided on the face of the mounting plate 19, or by inserting an appropriate key Y into the key slot X of the cylinder 28, and then turning the latter in usual padlock opening manner.

Assuming that our padlock is to be opened by the usual procedure of dialing, then the knob K is successively turned to the right and to the left until the particular combination of numbers have been brought into registry with the indicator I, which will effect the setting of the disc 8 of the latch mechanism, as illustrated by FIG. 13, so that the projection 22 of the bolt mounting 22 can freely move into the notch 8 of the disc 8. The exertion of an upward pull on the shackle S will then result in unopposed upward movement of the shackle S to its open position and in this connection the shackle leg 3 will effect movement of the bolt 21 to its shackle release position as depicted by FIG. 15. It is noted that FIG. 13 shows the shackle S in its lowered position, i.e., the position to which it is eventually returned after being first moved upwardly to its open position so as to effect the indicated action of moving the bolt 21 to its shackle release position. It will be seen that, in this relationship of the latch mechanism parts, the bolt head 21 is completely removed from the notch 6 of the shackle leg 4, as effected by the upward pull of the shackle S to its open position.

Assuming that our padlock is to be opened by the usual procedure of inserting a key Y into the key slot X of the cylinder 28, and then turning the key, this procedure will effect the setting of the padlock mechanism as illustrated by FIG. 5. It will be noted that this relationship of the latch mechanism parts is attained by turning movement of the cylinder 28 so that a meeting edge, or corner, of the flat surface 28a and the circular surface portion of the cylinder 28 acts directly on the lower flat surface of the bolt retractor element 24 and pushes the latter upwardly until said lower flat surface of the retractor element 24 comes to rest on the circular surface of the cylinder 28. In this connection, the upper end of the element 24 is also moved laterally to the right, as seen in FIG. 5, by the edge contacting relation of the element 24 with the fixed cam projection 27, until the upper end of the element 24 has moved the bolt element 21 to its retracted position from the notch 6 of the shackle leg 4, as clearly shown. The shackle S can then be pulled upwardly to its open position, as illustrated by FIG. 5.

In the event that, when our padlock is closed and the padlock mechanism is set as illustrated by FIG. 4, an attempt is made to open the padlock in unconventional manner by a shackle jarring action, i.e., by exerting a quick, forceful, upward pull on the shackle S, this will simply cause the bolt 21 and its mounting 22 to pivotally move slightly on the shaft 20 to a secondary locking position as illustrated by FIG. 12. In other words, our padlock cannot be opened by the indicated jarring action.

Modifications

Of course, it will be understood by those skilled in this art that our improvements, as herein specifically shown and described, can be changed and modified in various ways, without departing from the scope of our invention which is more particularly indicated and defined by the hereto appended claim.

We claim:

A padlock; comprising a housing having shackle leg receiving openings therein; a shackle arranged so that the legs thereof are slidable in said openings, one of which legs is provided with a notch; a shackle bolt having an end portion adapted to cooperate with said shackle leg notch so as to effect the locking and unlocking of the shackle, said bolt having a body portion; a bolt mounting that is pivotally positioned within said housing and provided with a cavity adapted to slidably accommodate therein the said bolt body portion; spring means arranged within said cavity so as to urge movement of the shackle bolt in one direction; a slidably mounted motion transmitting element for effecting movement of the bolt from a position of engagement of the bolt end with the shackle leg notch to a position of disengagement therefrom; and a key operated cylinder arranged in abutting relation with said motion transmitting element so that a certain cylinder movement will be transmitted to the bolt end portion.

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