June 27, 1944. D. J. FOOTE ET AL 2,352,190

PADLOCK

Filed May 23, 1942

Fig. 1.

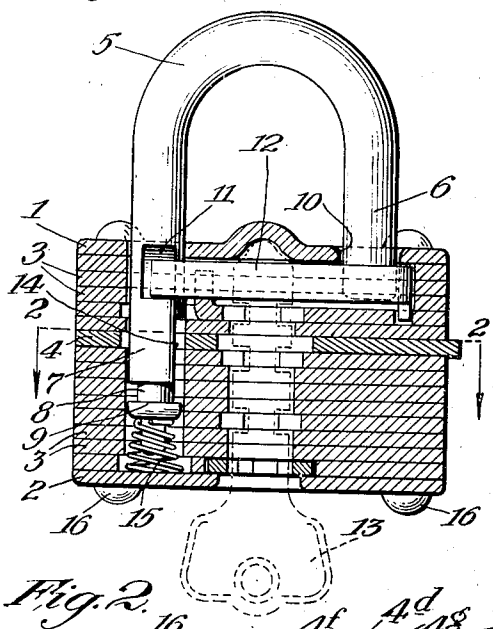


Fig. 3.

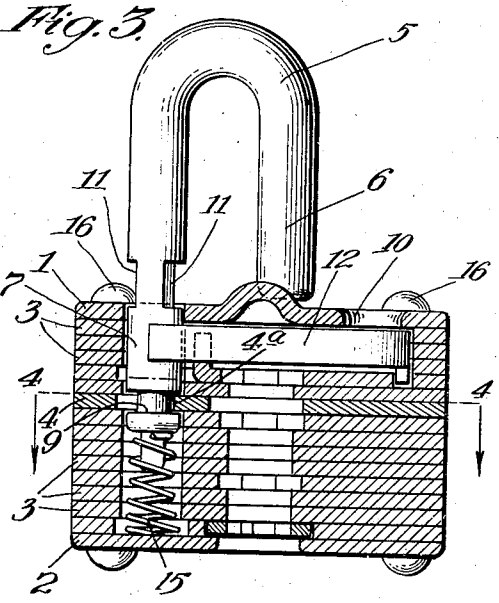


Fig. 2.

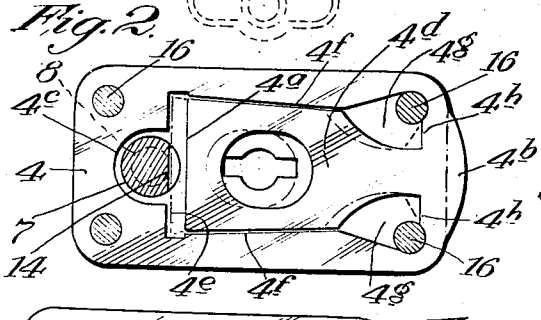


Fig. 4.

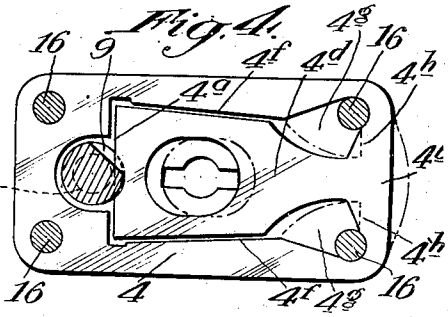


Fig. 5.

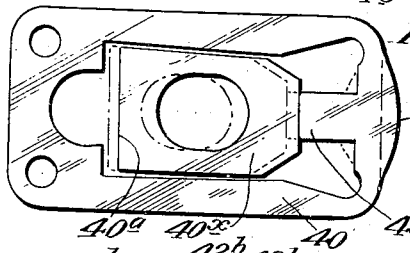


Fig. 6.

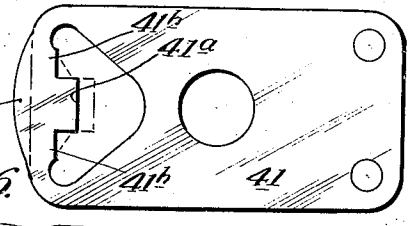


Fig. 7.

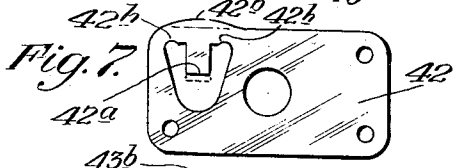


Fig. 9.

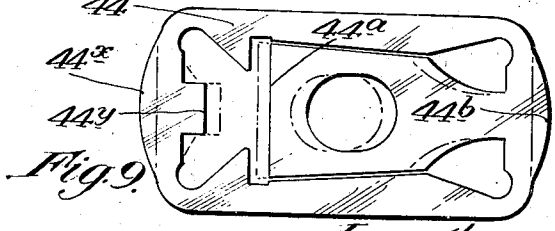
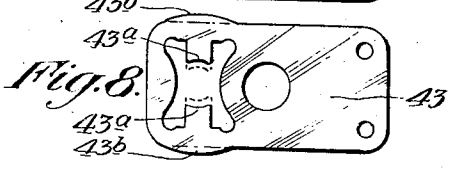


Fig. 8.



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PADLOCK

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Application May 23, 1942, Serial No. 444,158

8 Claims. (Cl. 29—84)

This invention relates to locks and particularly to locks of the type in which the casing is of laminated construction, being formed of a plurality of superimposed, metallic plates. The invention is herein illustrated as applied to a padlock having a casing of this type, but the features of the invention are not necessarily limited to padlock casings.

One object of the invention is to provide a new and useful structure which admits of a novel method of constructing a lock.

Another object of the invention is to provide a novel and simple means for anchoring a movable member in a lock casing of laminated construction.

A further object of the invention is to provide a lock casing of laminated plates in which a socket or guideway is formed by aligned openings in certain of the plates for a shouldered member disposed in said socket, and in which one of the plates is initially formed with a portion of its margin protruding beyond the adjacent plates, but adapted to be forced into flush relation thereto, thereby shifting a portion of the said plate so that it projects into the socket or guideway to act as a stop for retaining said member.

It is also an object of the invention to provide a lock casing composed of laminated plates which may be assembled and secured togther in superimposed relation with a portion of the margin of one plate protruding beyond the adjacent plates, but adapted to be forced into flush relation thereto to effect an alteration in the internal outline of the plate as a step in producing the final structure of the lock.

Other objects and advantages of the invention will appear from the following description, taken in connection with the drawing, in which:

Fig. 1 is a sectional view of a padlock having a casing of laminated construction made in accordance with this invention, the section being taken substantially in the plane of the axis of the shackle member, and showing the casing at a certain stage in the process of its manufacture.

Fig. 2 is a transverse section taken substantially as indicated at line 2—2 on Fig. 1.

Fig. 3 is a sectional view similar to Fig. 1 but showing the casing in finished form and showing the shackle in open position.

Fig. 4 is a transverse section taken substantially as indicated at line 4—4 on Fig. 3.

Fig. 5 is a plan view of a modified form of plate to be substituted for that shown in Figs. 2 and 4.

Figs. 6, 7, 8 and 9 are plan views, each showing an additional modification in the form of plate constituting one of the laminations of the lock casing and adapted to be substituted for that shown in Figs. 2 and 4.

It may be understood that the invention is susceptible of still further modifications and alternative constructions, the embodiments shown in the drawing and described hereinafter being by way of preferred illustration only, and it is not intended that the invention be limited thereto or thereby, but rather it is the intention to cover all forms and constructions falling within the scope of the invention as defined by the claims.

In the type of lock construction to which this invention relates, a relatively sturdy and substantial casing is provided by superimposing a plurality of sheet metal plates which are formed with aligned openings serving to compose the required recesses and chambers in the casing, and which are permanently assembled in laminated relation. The drawing shows a padlock in which such a casing includes a top plate 1, a bottom plate 2 with intervening plates 3, and with a special intervening plate 4 with which this invention is particularly concerned. In the case of a padlock, the U-shaped shackle 5 customarily includes a shorter leg 6 and a longer leg or post member 7, the latter being accommodated in a socket in the casing which is composed of aligned openings in the plates 1, 3 and 4. Adjacent its lower end the post portion is reduced at 8, thus providing a stop shoulder 9 so that stop means engaging this shoulder will serve to prevent complete withdrawal of the shackle from the casing. In accordance with the present invention, the plate 4 provides such stop means.

In its locked position, the shackle 5 is thrust into the casing with the end portion of its shorter leg 6 extending through an opening 10 in the top plate 1, as seen in Fig. 1, and in the particular lock illustrated the longer leg 7 of the shackle is formed with flats or notches at 11 which are engaged by the spring arms of a keeper 12. When a key of the general type indicated in dotted outline at 13 in Fig. 1 is inserted in the lock and turned, it operates to spread the spring arms 12 out of engagement with the notches 11 so as to release the shackle 5 and permit it to be pulled outwardly to the extent indicated in Fig. 3. In this position, the shoulder 9 encounters a portion of the plate 4 which projects into the socket in which the post leg 7 of the shackle is accommodated, and thus arrests the outward movement of the shackle. At this position, however, the

shorter leg 6 is released from the opening 10 in the top plate of the casing, so that the shackle can be swung about the axis of its post portion 7 for disengagement from the hasp or other element with which it is linked for locking purposes.

The portion 4^a of the plate 4 which projects into the socket in which the shackle post 7 is accommodated, as seen in Fig. 3, not only engages the shoulder 9 to arrest the outward movement of the shackle member 5, but at this limit of movement said projecting portion 4^a engages in the groove in the shackle formed by the reduced part 8 and thus acts to hold the shackle open when it has been swung away from its normal locking position. When the shackle is rotated back to locking position for re-insertion of its short leg 6 in the opening 10, a flattened portion 14 of the leg 7 will register with the projection 4^a so as to permit the shackle to slide downwardly to the position shown in Fig. 1, at which its notches 11 will again be engaged by the spring arms of the keeper 12 for locking it. Preferably in a lock of this type a coiled spring 15 is seated in the recess or socket which accommodates the shackle post 7 so as to automatically lift the shackle to open position upon release of the arms of the keeper 12.

Heretofore, in the assembly of a lock of this type, it has been necessary to provide a separate member to act as a stop for engaging the shoulder 9 of the shackle. Such separate member could only be placed in position before the final assembly and securement of the plates 3, or at least before the upper plates of the series were secured in position. By the present invention, all the plates constituting the lock casing are assembled and permanently connected by means of rivets 16 before the shackle 5 is inserted; then, upon insertion of the shackle, the projection 4^a of the plate 4 is shifted into its final locking position in which it will encounter the shoulder 9 and prevent removal of the shackle from the casing. This is accomplished by making the plate 4 initially in the form indicated in Fig. 2, with a portion 4^b at one end shaped to protrude slightly beyond the outlines of the adjacent plates 3 when the plate 4 is assembled with them. In this initial form of the plate, the edge of the part 4^a is spaced away from the opposite and arcuate edge 4^c of the opening, which is to accommodate the shackle post 7, by a distance greater than the full diameter of the post. Therefore, when a plate of this form is first incorporated in the lock casing by assembly with the plates 1, 2 and 3, as shown in Fig. 1, the part 4^a will not interfere with the insertion of the full diameter of the shackle adjacent its shoulder 9 and the shackle is therefore lowered into the position shown in Fig. 1. The lock casing is then placed in a kick press or equivalent machine for exerting pressure against the protruding edge of the part 4^b, so as to force it into flush relation with the adjacent plates 3. This inward movement of the metal at 4^b is transmitted through the intervening part 4^d to the portion 4^a which is thus shifted to the position indicated in broken lines at 4^e, in which it projects into the socket which accommodates the post 7 and extends far enough therein to engage with the shoulder 9 when the shackle is moved outwardly in the socket. This inward shifting of the projection 4^a is permitted by the cut-away or flattened portion 14 of the shackle post 7 which is presented opposite the projection 4^a when the shackle is in its locked position, as shown in Fig. 1, and which permits the outward movement of the shackle in this plane when the keeper 12 is released, as already described.

In the plate 4 the connecting portion 4^d, which transmits movement from the protruding part 4^b to the part 4^a which is to be shifted, is severed from the remainder of the plate along the lines 4^f, and immediately adjacent the part 4^b it is narrowed down by cutting out portions of the plate 4 at 4^g. This reduces the cross section of the part 4^b adjacent the rivets 16, so that the reduced portions 4^h are readily bent or deformed, but without rupturing, when the part 4^b is driven inwardly, thus allowing the part 4^a to be shifted bodily to the position shown in Fig. 4, while the parts 4^h assume the form indicated in that figure. The broken outlines in Fig. 4 denote the previous position of the parts corresponding to the full outlines of Fig. 2. Although the rivets 16 are inserted and headed over for final securement of the laminated structure prior to the step of shifting the projection 4^a into its final position, it is found that the friction between the plates is not so great as to interfere with this shifting of the material of the plate 4, as just described.

Fig. 5 illustrates a slight modification in which a plate 40 is provided as a substitute for the plate 4 and in which the part which is to serve as the stop projection at 40^a is a separate member or a completely severed part 40^x of the plate 40. It is initially engaged at one end by a tongue 40^d extending inwardly from the protruding marginal portion of the plate at 40^b so that, when this protrusion 40^b is driven inward into flush relation with the adjacent plates of the casing, it will shift the member 40^x bodily to bring the part 40^a thereof into position to act as a stop for the shoulder 9 of the shackle post 7.

Fig. 6 shows another modification in which a plate 41 is provided with a protrusion 41^b located at the end of the plate adjacent the position of the shackle post 7. An inwardly projecting tongue 41^a is the part which is to serve as the stop for the shackle leg and will be forced inwardly into final position by pressure applied to the protrusion 41^b. The reduced cross section of the parts 41^h at either side of the tongue 41^a will facilitate the shifting of the material in this manner.

In Fig. 7 a modified form of plate is shown at 42, in which the locking tongue 42^a extends inwardly from a protrusion 42^b at one side of the plate and adjacent the position of the shackle post 7. At either side of the tongue 42^a the section of the plate is reduced at 42^h to allow the protrusion 42^b to be forced inwardly and thus carry the tongue 42^a to its final stop position.

Fig. 8 illustrates a duplication of the stop structures of Fig. 7 as embodied in a plate 43 having a pair of tongues 43^a projecting inwardly from opposite sides and in alignment with protrusions 43^b which are to be forced inwardly to bring the tongues 43^a into stop relation to the shoulder 9 of the shackle 7, in accordance with the principles already discussed.

Fig. 9 shows a modified plate 44 which also provides two stop shoulders for the shackle post. A protrusion 44^b at the end of the plate remote from the shackle operates to shift a portion 44^a into stop position, while a protrusion 44^x at the end of the plate adjacent the shackle post is similarly employed to shift a locking tongue 44^y into its final position. As will be recognized, this construction is simply a combination of the fea-

tures of the plate shown in Fig. 2 and the features of the plate shown in Fig. 6.

It will be readily seen that the method of assembly herein disclosed for providing a stop member to limit the withdrawal of the shackle of a padlock may have other applications in this general field. For example, locks of this laminated type are frequently fitted with cylinders and permutation tumblers; the final securement of the cylinder in the casing may be effected by providing a deformable plate with a portion which is to interlock with a groove or shoulder of the cylinder when the plate is forced into its final position. Or, in the case of a door lock or cabinet lock having a sliding bolt, a plate of the laminated casing may be made deformable to provide a stop to limit the movement of the bolt by engagement with a shoulder thereon in a manner which will be obvious in view of the foregoing disclosure. In any of these applications of the invention, it serves to greatly simplify the process of assembly of the parts, since all the plates of the laminated casing can be permanently secured in final position before the slidable or rotatable element is inserted, and the latter can then be locked in place by the simple expedient of driving in the protruding portion of the special locking plate of the assembly. Furthermore, it will be evident that, if preferred, the marginal portion of the special plate need not be formed to initially protrude beyond the plates adjacent to it; this portion may be initially flush with them, and then, after insertion of the shouldered element such as the shackle, the marginal part of the one plate may be deformed inwardly to shift an interior part of this plate, or a separate element disposed in the plane of the plate, inwardly into a position to project into the cavity as a stop to retain the shouldered element therein.

We claim as our invention:

1. The method of assembling a laminated lock structure which includes superimposing a plurality of plates having aligned openings which form a cavity and one of which plates has a portion of its area removed, leaving a marginal portion of relatively small cross-section with an adjacent internal portion extending close to the cavity, permanently clamping said plates together, inserting a shouldered member into the cavity, and then applying pressure against the external edge of said plate adjacent its portion of small cross-section and forcibly bending said portion and shifting the said internal portion of the plate into the cavity as a stop retaining the shouldered member therein.

2. The method of assembling a laminated lock structure which includes superimposing a plurality of plates having aligned openings which form a cavity and one of which plates has a marginal portion which protrudes beyond the outlines of adjacent plates, a portion of the area of said plate being removed in the vicinity of said protrusion, leaving the protruding portion attached to the plate by material of relatively small cross-section with an adjacent internal portion extending close to the cavity, permanently clamping said plates together, inserting a shouldered member into the cavity, and then applying pressure against the edge of said protruding portion and forcing it into flush relation to the outlines of adjacent plates and forcibly shifting the said internal portion into the cavity as a stop retaining the shouldered member therein.

3. The method of assembling a laminated lock structure which includes superimposing a plurality of plates having aligned openings which form a cavity, permanently clamping said plates together by means of rivets extending through marginal portions thereof with a marginal portion of one plate intermediate two of said rivets protruding beyond the outlines of adjacent plates and with openings in the internal area of said plate adjacent said rivets, leaving its adjacent marginal portions of relatively small cross-section, inserting a shouldered member into the cavity, and then applying sufficient pressure against the edge of said protruding portion to move it into flush relation to the adjacent plates, thus forcibly bending the material of the plate around the rivets as fulcrums and thereby shifting inwardly an intermediate portion of the plate into a position in which it projects into said cavity as a stop retaining the shouldered member therein.

4. The method of assembling a laminated lock structure which includes superimposing a plurality of plates having aligned openings which form a cavity, and additional aligned openings in their marginal portions to receive rivets, one of said plates having a marginal portion intermediate two rivet openings which protrudes beyond the outlines of adjacent plates and having open portions in the internal area of said plate adjoining said rivet openings, leaving its adjacent marginal portions of relatively small cross-section, said plate also having an opening in its internal area with a part enclosed therein adjacent the said cavity, inserting a shouldered member into said cavity and then applying sufficient pressure against the edge of said protruding portion to move it into flush relation to the adjacent plates, thus forcibly bending the material of the plate around the rivets as fulcrums and thereby shifting inwardly an intermediate portion of said plate into a position in which it shifts the said enclosed part into the cavity as a projecting stop retaining the shouldered member therein.

5. The method of assembling a laminated lock structure which includes superimposing a plurality of plates having aligned openings which form a cavity, permanently clamping said plates together with a portion of one plate protruding initially beyond the external outlines of adjacent plates and with means within the area of said plate initially disposed adjacent the cavity, inserting a shouldered member into the cavity, and then applying pressure to the edge of the protruding portion of the said plate and forcing it between adjacent plates into flush relation to the external outlines of said plates and thereby shifting the said means in a direction parallel to the faces of adjacent plates into a position to project into the cavity as a stop to engage and retain the shouldered member therein.

6. The method of assembling a laminated lock structure which includes superimposing a plurality of plates having aligned openings which form a cavity, clamping said plates together with an interior portion of one plate initially disposed adjacent the cavity, inserting a shouldered member into the cavity, and then applying pressure to an external edge of said one plate and forcing a marginal portion of said one plate inwardly between the faces of adjacent plates, thereby shifting its said interior portion in a direction parallel to the faces of adjacent plates

and into a position to project into the cavity as a stop to engage and retain the shouldered member therein.

7. As an article of manufacture, a plate for a lock casing of laminated construction, said plate having an opening to be aligned with openings in other plates of the laminated casing to form a cavity, said plate having also an integral tongue extending adjacent said opening from a marginal portion of the plate, with openings at both sides of said tongue adjacent said marginal portion, leaving two narrow portions of relatively small cross-section and an intermediate portion which provides the sole connection between the tongue and the remainder of the plate, said narrow portions being bendable inwardly to carry the tongue into the first mentioned opening.

8. As an article of manufacture, a plate for a lock casing of laminated construction, said plate having an opening to be aligned with openings in other plates of the laminated casing to form a cavity, said plate having a marginal portion opposite said opening with additional portions of the plate cut away adjacent said marginal portion, leaving two spaced marginal portions of relatively small cross-section which are bendable inwardly to carry the intermediate marginal portion toward the said opening for the purpose indicated.

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