Sept. 4, 1945. J. R. BURBRIDGE 2,384,276

MULTIPLE ENGAGEMENT LATCH

Filed Sept. 27, 1943 2 Sheets-Sheet 1

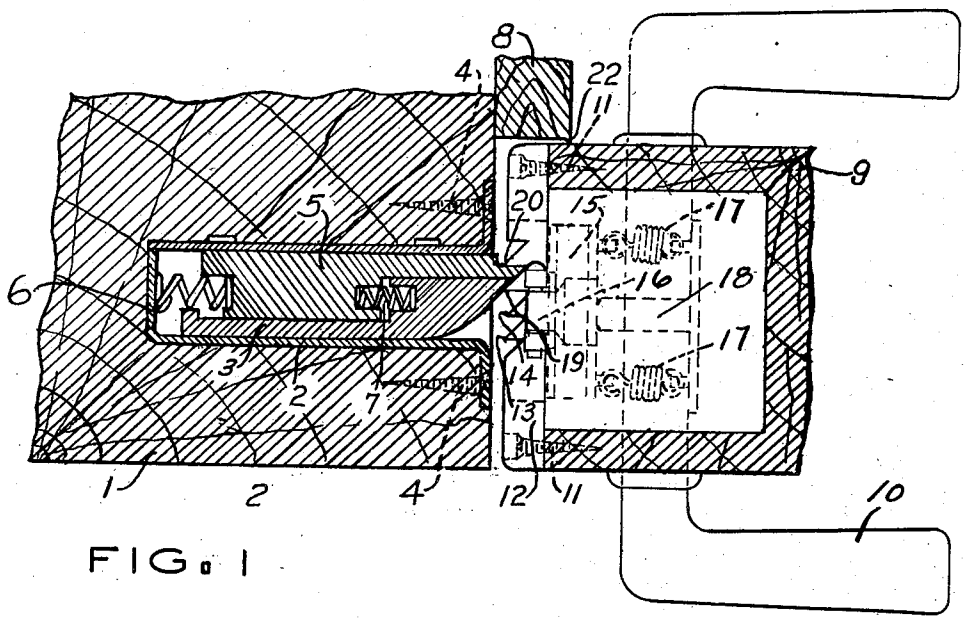


FIG. 1

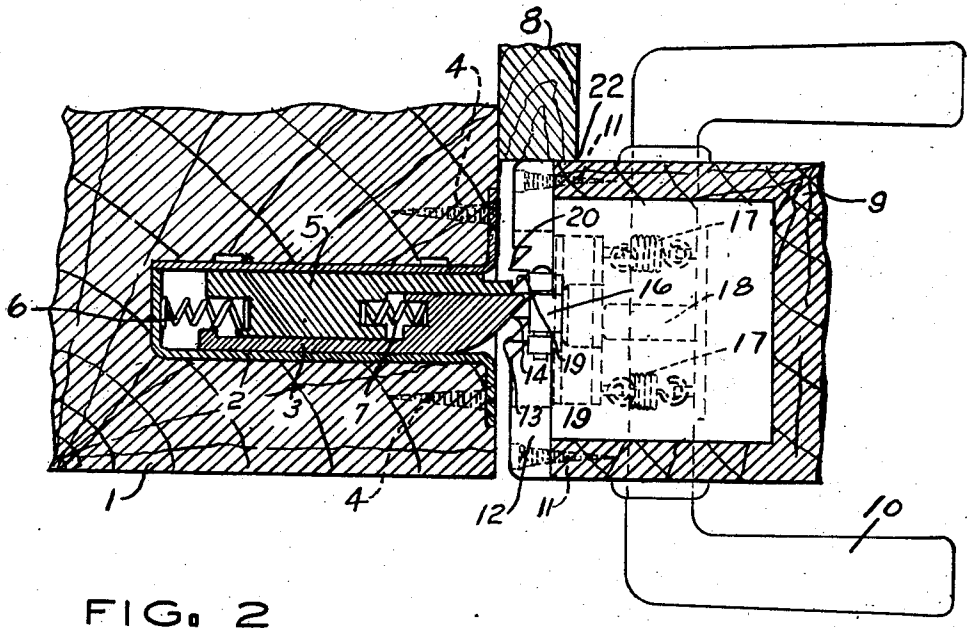


FIG. 2

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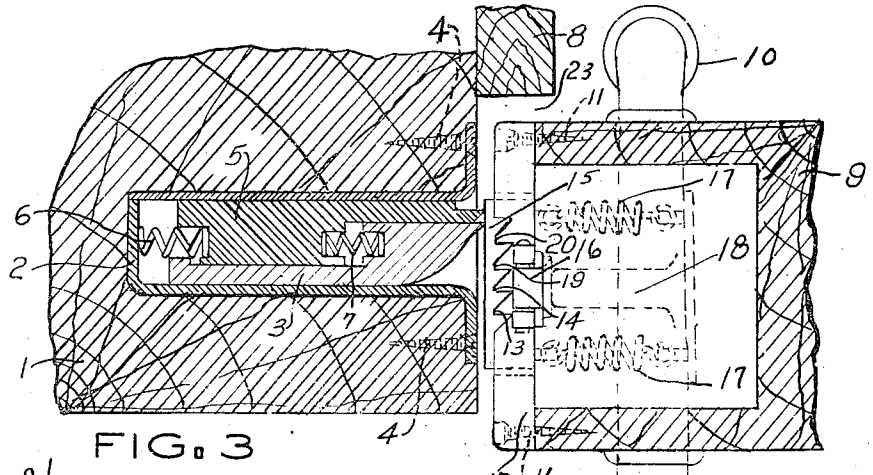


FIG. 3

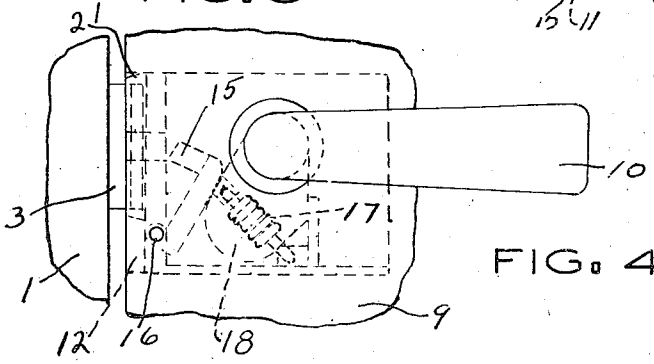


FIG. 4

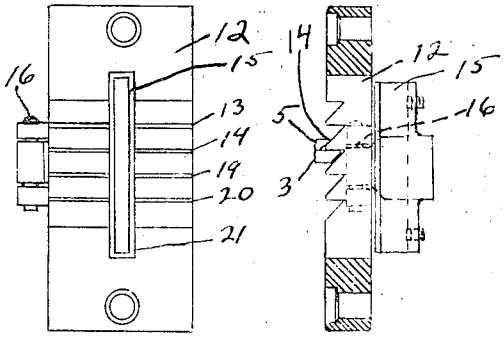


FIG. 5

FIG. 6

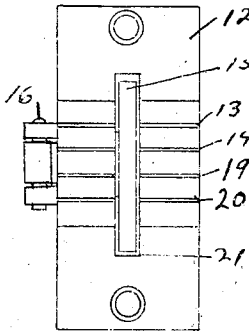


FIG. 7

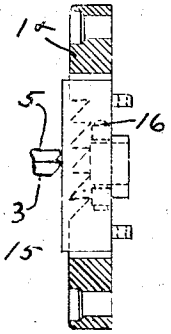


FIG. 8

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UNITED STATES PATENT OFFICE

2,384,276

MULTIPLE ENGAGEMENT LATCH

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Application September 27, 1943, Serial No. 504,010

11 Claims. (Cl. 292—254)

This invention relates to an improved latching device for use on doors and in particular for use on such doors as are used on moving conveyanes, as for example on railroad cars and automobiles and the like. It is commonly known that where doors are subject to vibration it is difficult to prevent such doors from rattling, due to play in the latching device. There are methods available for overcoming this difficulty, such as, for example, the commonly used hydraulic door checks which are often adjusted to exert sufficient pressure against the door to prevent such rattling, irrespective of play in the latching device.

While non-rattle latching devices have been known and used prior to this invention, such devices have, in general, been unsatisfactory or expensive to manufacture, or both. The present invention discloses a device for maintaining intimate contact between the latching pawl and the striking plate, without resorting to excessive spring pressure in the door check normally used to insure closure of a door. In addition to the improved method of maintaining intimate contact between the latching pawl and the striking plate, my improved latching device also includes a new and novel latch release which may be operated with a minimum of applied force.

It is well known that numerous latching devices now in common use, especially on conveyances such as railroad cars, make use of heavy spring pressure on both the door closure device and on the latching pawl. This is a serious disadvantage in that considerable force must be applied to the latch release handle in order to release the latching pawl and, in addition, considerable force must be applied to open the door against the door closure device spring pressure. This heavy spring pressure is used to insure firm closure of the door and to insure intimate contact between the latching pawl and the striking plate and, while such heavy spring pressure is effective for the intended purpose, it offers a serious disadvantage in that considerable strength is required to open the door, which results in considerable inconvenience, which is particularly so when the person desiring to open the door is handicapped with packages.

My invention is designed to provide firm closure of a door without resorting to excessive spring pressure and also to provide for easy opening of a door without exerting considerable force.

A principal object of my invention is to provide a latching device which will provide intimate contact between the latching pawl and the striking plate.

A further object of my invention is to provide a latching device which may be released with a minimum of effort.

A still further object of my invention is to provide a latching device which may be released by moving the release handle through a much smaller distance than normally required with latching devices using relatively heavy spring pressure against the latching pawl.

A still further object of my invention is to combine any or all of the foregoing objects in a single latching device. Additional objects will become apparent in view of the following detailed description.

Briefly, my invention comprises a multiple latching pawl where each latching pawl is projected by a separate spring, said multiple pawl engaging a multiple engagement striking plate in such a manner that positive engagement is afforded for any degree of closure of the door. The design of the engagement pawls and the multiple striking plate is such that for a condition where the door is closed sufficiently to afford initial engagement, any further movement of the door, from vibration, for example, will result in additional engagement and thus provide a tighter closure than was initially afforded.

This invention will be best understood in consideration of the following detailed description, in view of the accompanying drawings forming a part of the application. Nevertheless, it is understood that the invention is not confined to the disclosure, being susceptible to such changes and modifications as define no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

Figure 1 is a top cross section view showing the multiple pawl section of my latching device mounted in the door jamb or frame, and the multiple engagement striking plate, together with the pawl release mechanism, mounted on the door, this view being for a condition where the door is not completely closed.

Figure 2 is a top cross section view similar to that shown by Figure 1, this view representing a condition where the door is tightly closed.

Figure 3 represents a top cross section view similar to Figure 1 for a condition where the pawl release mechanism is in the operated position, showing the pawls released and the door partly open.

Figure 4 is a phantom side view showing detail of the pawl release mechanism.

Figure 5 is a front view of the multiple engage-

ment striking plate with the pawl release mechanism in the nonoperated position.

Figure 6 is a top cross section view of the multiple striking plate showing the multiple pawls in the engaged position with the pawl release mechanism in the non-operated position.

Figure 7 is a front view of the multiple striking plate showing the pawl release mechanism in the operated position.

Figure 8 is a top cross section view of the multiple striking plate showing the multiple pawl in the operated position, with the multiple pawls disengaged.

Referring now in particular to Figure 1, a section of the door jamb or frame is represented by 1 and the latch mounting case by 2. The engagement pawls are represented by 3 and 5, where 5 is the primary engagement pawl and 3 the secondary engagement pawl. The pawl springs are represented by 6 and 7 where 6 is the primary pawl spring and 7 the secondary pawl spring. The latch mounting screws are represented by 4 and the door stop by 8. A sectional view of the door is represented by 9 where 12 represents the multiple engagement striking plate, the engagement teeth being represented by 13, 14, 19 and 20, four such engagement teeth being shown in the drawing, it being understood that any desired number of such engagement teeth may be used. The pawl release dog is represented by 15, the pawl release operating cam by 18, the pawl release dog fulcrum by 16, and the pawl release return springs by 17. The striking plate mounting screws are represented by 11, and the pawl release operating handle by 10.

Figure 1 represents a condition where door 9 is not completely closed, the space 22 between door 9 and door stop 8 being representative of a condition where the door 9 is almost, but not completely, in contact with the door stop 8. It is well known that such a condition will allow the door to rattle, where the usual type of single engagement latch is used.

In the partly closed top cross section view of Figure 1, actual engagement is between primary pawl 5 and engagement tooth 20. Secondary engagement pawl 3 is shown partly depressed and, while secondary pawl 3 is not actually engaged, it acts to strengthen the engagement made by primary pawl 5.

Referring now in particular to Figure 2 which is identical to Figure 1, except that space 22 in Figure 1 has now been eliminated by complete closure of the door, complete closure being represented by engagement of secondary pawl 3 with latching tooth 19.

The entire latching mechanism as represented, by Figures 1 and 2, is so designed as to afford eight engagement positions. The number of engagement positions afforded will always be the product of the number of pawls used and the number of teeth in the multiple engagement striking plate. For purposes of example, the total number of engagements represented is eight, it being understood that any number of engagements may be used, this feature being a function of design and in part a function of the purpose for which the latching device is intended. For example, for a condition where three pawls were used in conjunction with a five tooth striking plate, a total of fifteen engagements would be offered, as compared to the usual type of latching device, many of which depend on a single engagement latch.

A practical result of this design is that a slight movement of the door, from any cause, will result in tighter closure of the door. For example, in Figures 1 and 2, where a total of eight engagements is shown, a movement of ⅛ of the total engagement distance will afford a further engagement. A further practical result obtained by the use of my latching device is that positive engagement is always afforded, irrespective of alinement of the door with the latching device. It is commonly known that with the usual type of latching device misalinement of the door results in a condition where the latching pawl does not engage the striking plate, and this is usually so irrespective of the form of misalinement. For example, in one common form of latching device where the pawl engagement is made through the striking plate, a slight sag in the door will result in a condition where the pawl strikes the solid part of the striking plate and no engagement is possible.

A further difficulty often encountered in this type of latching device is a condition where the alinement between the door and the door stop is such that the door cannot be closed sufficiently to allow the engagement pawl to project through the striking plate, and this also results in a condition where no engagement is possible. Difficulties of the type cited above cannot occur with my improved latching device. Due to the multiple engagement feature, exact alinement between the door and the door stop is of little importance. This is also true in respect to vertical alinement, as the boundaries of the striking plate are not absolutely defined, and engagement will be afforded for any condition where the pawl meets with the striking plate so that for any condition where a door will close at all positive engagement will be afforded.

Referring now in particular to Figure 3, the pawl release mechanism is shown in the operated position where handle 10 has been turned at right angles to the release position represented in Figures 1 and 2. Cam 18 is formed as an integral part of handle 10 and in the operated position cam 18 exerts pressure against movable dog 15, causing said movable dog 15 to project through an opening provided in striking plate 12, and so causing said movable dog to exert pressure against latching pawls 3 and 5, so that said pawls are no longer engaged with any of the latching teeth of the striking plate. The space 23 in Figure 3 represents the door in a partly opened position and with the pawl release mechanism in the position shown in Figure 3 the door may be completely opened and, upon release of handle 10, pawl release dog 15 will be returned to the non-operated position by springs 17.

The construction of this pawl release mechanism will be further clarified from a consideration of Figure 4, which is a side phantom view clearly showing the relationship between handle 10, cam 18, pawl release dog 15, release dog fulcrum 16, striking plate 12 and secondary pawl 3.

The operation of this pawl release mechanism will be further clarified in view of Figures 5 and 6, where Figure 5 represents a front view of striking plate 12 clearly showing opening 21 provided in striking plate 12, with pawl release dog 15 in the non-operated position, the design being such that in the non-operated position, pawl release dog 15 is flush with or below the surface of striking plate 12.

Figure 6 is a top cross section view representing the same condition as that represented by Figure 5 and clearly showing the engagement of secondary latching pawl 3 with latching tooth

14, with pawl release dog 15 in the full non-operated position.

Referring more particularly to Figs. 1, 2 and 6, it will be seen that the teeth 13, 14 and 19 will act as guides for separating the outer ends of the pawls 3 and 5 when the outer ends of the pawls straddle a tooth as shown in Figs. 2 and 6. In other words, when the outer end of the pawl 5 moves over one of the teeth, the free end of the tooth will be engaged between the free ends of the pawls 3 and 5 so that the pawl 3 will move into one notch while the pawl 5 will move into an adjacent notch separated by the guiding means or tooth. On the other hand, both pawls may enter a single notch between a pair of teeth.

Referring now to Figure 7, a view similar to that of Figure 5 is shown except that pawl release dog 15 is now in the operated position and projects through opening 21 in striking plate 12 to a distance slightly above the maximum extension of latching teeth 13, 14, 19 and 20. Figure 8 represents a top cross section view for the condition represented by Figure 7, where pawl release dog 15 is in the fully operated position, thus completely disengaging latching pawls 3 and 5 from the engagement teeth of striking plate 12.

In view of the foregoing description, it is apparent that my improved latching device overcomes numerous difficulties inherent with previous latching devices and, while my improved latching device is primarily intended for conditions where the door may be subject to vibration, such as on a moving conveyance, it is understood that such a latching device may also be used on any type of door where positive latching is an advantage. For example, such a latching device may be manufactured economically for use on doors of the type usually employed in dwellings and other buildings and, while such doors are not normally subject to vibration, my improved latching device offers advantages not found in previous devices of the class described.

In the drawings, the striking plate and pawl release mechanism is shown mounted in the door, with the co-operating latching pawls mounted in the door jamb or frame, it being understood that this arrangement may be reversed if desired. With reversed mounting, i. e., mounting opposite to that shown in the drawings, the pawl release handle would appear on the door frame or casing rather than on the door and, for certain purposes, this reverse mounting offers definite advantages, it being understood that for the purposes of this invention it is of no material importance which type of mounting is employed.

The above examples are for the purpose of illustrating some of the methods and means by which the broad purposes of the invention may be carried out and are not to be deemed as restrictive in any manner. Other modifications and alternatives will occur to those skilled in the art without departing from the scope of the invention as defined by the following claims.

I claim:

1. A latching arrangement for a closure movably mounted in a frame, comprising a pair of pawls slidably mounted in the frame, a catch on the closure having a series of motches, a spring urging both pawls towards the catch, a second spring urging one pawl toward the catch independently of the first spring, the outer ends of the pawls being beveled so that both beveled ends of said pawls will enter a single notch, or one beveled end of one pawl will enter said notch while the second spring will cause the beveled end of the other pawl to enter an adjacent notch and hold the closure against movement, and means on the closure adapted when operated to force the beveled ends of the pawls out of said notches when it is desired to open said closure.

2. A latching arrangement for a closure movably mounted in a frame, comprising a casing in the frame, a pair of latch pawls slidably mounted in the casing, a catch on the closure having a series of notches, a spring urging both pawls towards the catch, a second spring urging one pawl toward the catch independently of the first spring, the outer ends of the pawls being beveled so that both beveled ends of said pawls will enter a single notch or one beveled end of one pawl will enter said notch while the second spring will cause the beveled end of the other pawl to enter an adjacent notch to hold the closure against movement, and means on the closure, adapted when operated to force the beveled ends of the pawls out of said notches when it is desired to open said closure.

3. A latching arrangement for a closure movably mounted in a frame, comprising a pair of latch pawls slidably mounted in the frame, a catch on the closure having a series of notches, said pawls having cooperating shoulders, a spring acting on one of the pawls to project the outer ends of both pawls from the frame, a second spring between the shoulders for forcing the outer end of the other pawl outwardly of the frame, the outer ends of the pawls being beveled so that both beveled ends of said pawls will enter a single notch or one beveled end of one pawl will enter said notch while the second spring will cause the beveled end of the other pawl to enter an adjacent notch, and hold the closure against movement, and means on the closure adapted when operated to force the beveled ends of the pawls out of said notches when it is desired to open said closure.

4. A latching arrangement for a closure movably mounted in a frame, comprising a pair of latch pawls slidably mounted in the frame, a catch on the closure having a series of notches, a spring urging both pawls towards the catch, a second spring urging one pawl toward the catch independently of the first spring, the outer ends of the pawls being beveled so that both beveled ends of said pawls will enter a single notch or one beveled end of one pawl will enter said notch while the second spring will cause the beveled end of the other pawl to enter an adjacent notch and hold the same against movement, a releasing dog movably mounted in the closure and adapted to project outwardly of the catch, means operating the dog for causing said dog to engage and move the beveled ends of the pawls out of the notches so that the closure may be opened.

5. A latching arrangement for a door movably mounted in a frame, comprising a plurality of latch pawls in slidable contact in the frame, having outer beveled ends projecting beyond the frame and adapted to be engaged by the free edge of the door when said door is moved towards closing position, springs projecting the beveled ends of the pawls outwardly from the frame, a catch on the free edge of the door and provided with notches adapted to be engaged successively by the beveled ends of the pawls for holding the door against movement during progressive stages of closing, means on the door and adapted to be moved outwardly therefrom for

forcing the outer ends of the pawls from the notches to permit opening of the door, and means for operating the last-mentioned means.

6. A latching arrangement for a door movably mounted in a frame, comprising a plurality of latch pawls in slidable contact in the frame, having outer beveled ends projecting beyond the frame and adapted to be engaged by the free edge of the door when said door is moved towards closing position, springs projecting the beveled ends of the pawls outwardly from the frame, a catch on the free edge of the door and provided with notches adapted to be engaged successively by the beveled ends of the pawls for holding the door against movement during progressive stages of closing, means on the door and adapted to be moved outwardly therefrom for forcing the outer ends of the pawls from the notches to permit opening of the door, said latch having a passage through which said means is movable, and means for operating the last-mentioned means.

7. A latching arrangement for a door movably mounted in a frame, comprising a catch on the door, a pair of latch pawls slidable in the frame, having outer beveled ends projecting beyond the frame and adapted to be engaged by the catch when said door is moved towards closing position, interengaging shoulders between the pawls to provide for simultaneous movement of both pawls, a spring acting on one pawl for causing outward projection of both pawls, a spring between the shoulders for causing independent outward projection of the other pawl, said catch being provided with spaced teeth and corresponding notches, adapted to be engaged successively by the beveled ends of the pawls so that said pawls enter a single notch or be guided by a tooth so that each pawl will enter a separate notch for holding the door against movement during progressive stages of closure, means adapted to be projected from the door for moving the pawls to an inoperative position and means for operating the last-mentioned means.

8. A latching arrangement for a closure including a movable door and a frame forming the main elements of said closure, a catch on one of the elements, a pair of slidable latch pawls having beveled ends projecting from the other element and adapted to be engaged by the catch when the door is moved toward closing position, inter-engaging means between the pawls to cause simultaneous outward movement of both pawls, a spring urging both pawls outwardly of their supporting element, a spring tending to urge one of the pawls outwardly independently of the other pawl, said catch being provided with alternately disposed teeth and notches adapted to be successively engaged by the pawls so that said pawls will enter a single notch or be guided by a tooth so that each pawl will enter a separate notch for holding the door securely during progressive stages of closing, means adapted to be projected from the catch for moving the pawls to inoperative positions and means for operating the last-mentioned means.

9. A latching arrangement for a closure movably mounted in a frame, comprising a pair of latch pawls slidable in the frame, and having the outer ends projecting from the frame, a catch on the closure having a series of spaced notches and alternately disposed teeth, the projecting ends of the latch pawls being in close association and tapered so that both ends may be received by a notch, resilient means urging the pawls outwardly toward the notches, said catch having a passage therethrough, a releasing dog pivotally mounted in the door, springs retaining the dog in an inoperative position, an operating shaft provided with a cam adapted to engage the dog when said shaft is operated for forcing said dog through the passage for engagement with the ends of the latch pawls to move said ends out of the notches to permit opening of the door, said cooperating ends of the pawls adapted to be seated in the single notch or to span a tooth so that each end will be received in a separate notch at opposite sides of the tooth when the door is being moved through progressive stages of closing.

10. A latching arrangement for a closure including a movable door and a frame constituting the main elements of said closure comprising a pair of latching pawls slidably mounted in one element, a resilient means urging the pawls outwardly of said element, the other element being provided with teeth and alternately disposed spaced notches, said notches adapted to be engaged simultaneously by the projected ends of the pawls when the door is progressively closed, a second resilient means urging one pawl farther outwardly of the other pawl so that at times one pawl may be received by one notch and the other pawl may be received by an adjacent notch with the pawls straddling a tooth, one pawl at least always acting to prevent opening of the door, and means on the second-mentioned element for forcing the pawls on the other element to inoperative positions to permit opening of the door.

11. A latching arrangement for a closure, including a movable door and a frame forming the main elements of said closure, comprising a catch on one of the elements, a plurality of slidable means projecting from the other elements and engageable with the catch when the door is moved toward closing position, cooperative means on the plurality of slidable means for causing simultaneous outward movement of all of slidable means, means tending to urge one of the slidable means outwardly and independently of the other slidable means, said catch being provided with spaced notches and guiding means adapted to be engaged successively by the plurality of slidable means so that all of the projected slidable means will enter a single notch or each slidable means will be forced to enter a separate notch and straddle the guiding means for holding the door securely during progressive stages of closing, and means on the first-mentioned element for causing the projected slidable means on the other element to inoperative positions.

JOHN R. BURBRIDGE.