

April 25, 1944.

A. DIEMER

2,347,467

DOOR LATCH

Filed Nov. 13, 1939

2 Sheets-Sheet 1

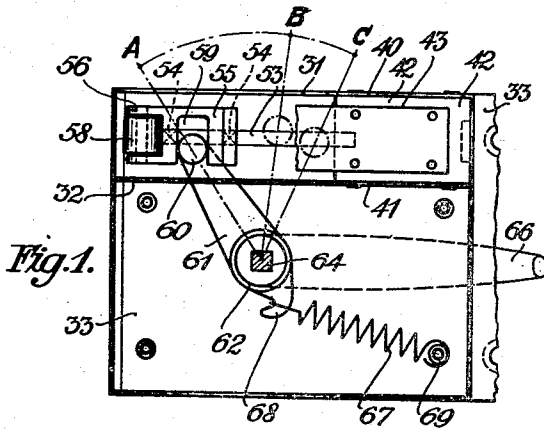


Fig. 1.

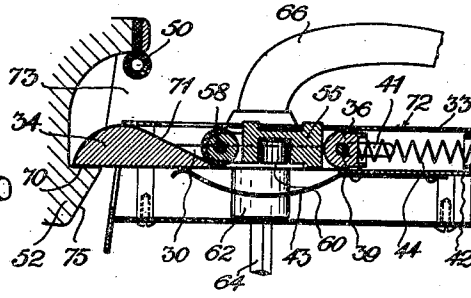


Fig. 4.

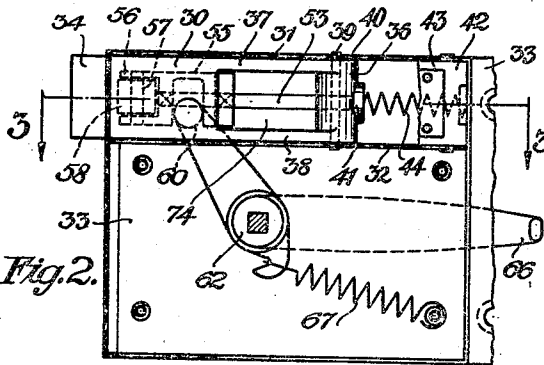


Fig. 2.

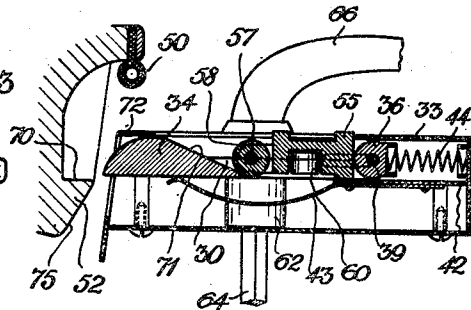


Fig. 5.

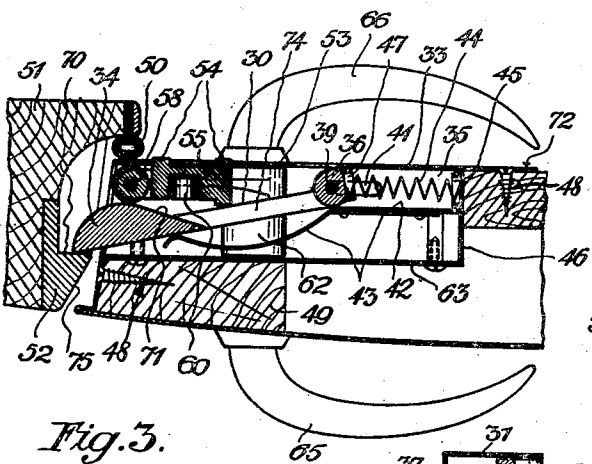


Fig. 3.

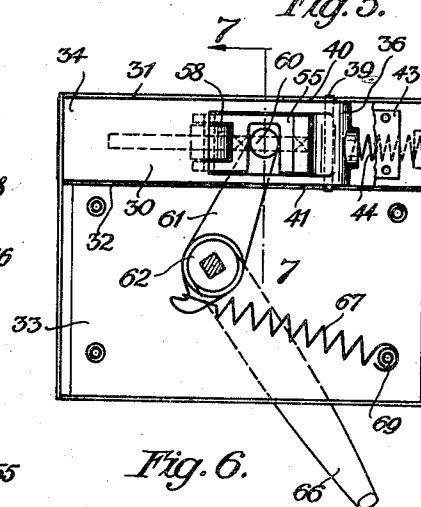


Fig. 6.

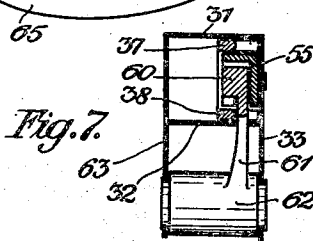


Fig. 7.

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Fig. 10

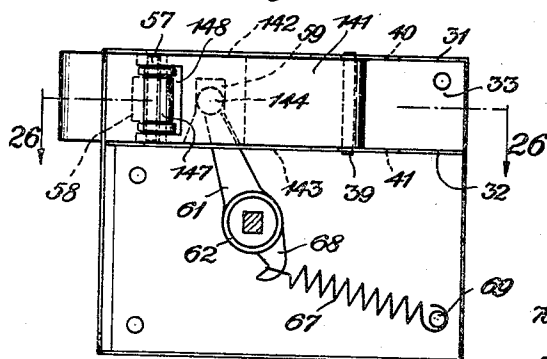


Fig. 12

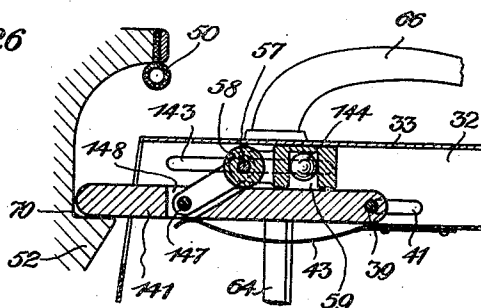
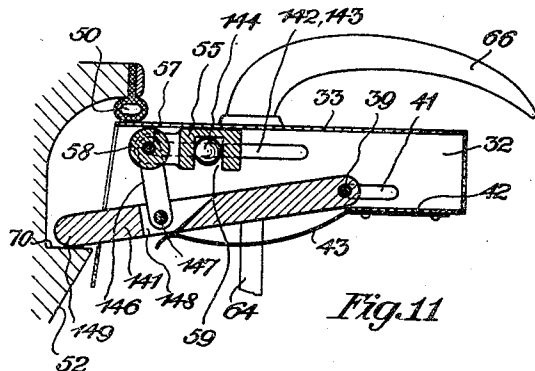


Fig. 11

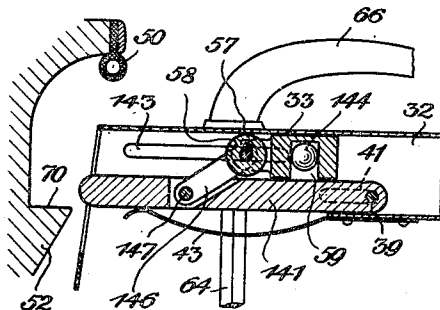


Fig. 13.

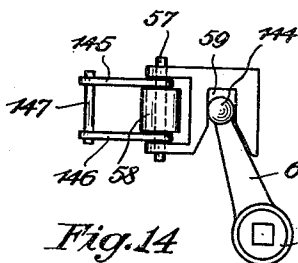


Fig. 14

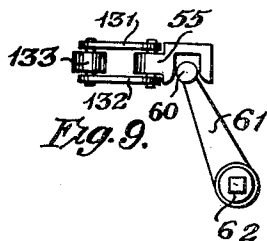


Fig. 9.

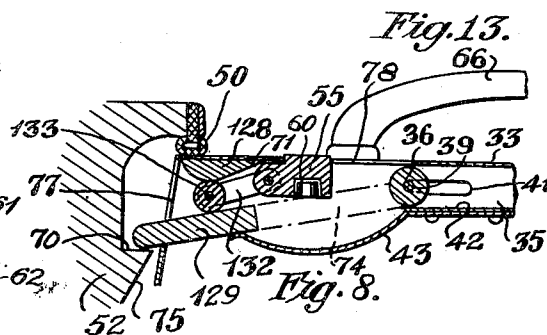


Fig. 8.

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## UNITED STATES PATENT OFFICE

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## DOOR LATCH

Anton Diemer, Stuttgart, Germany; vested in the  
Allen Property CustodianApplication November 13, 1939, Serial No. 303,977  
In Germany May 12, 1938

13 Claims. (Cl. 292—65)

This invention relates to locks or latches, especially for doors of motor vehicles and for other doors which when closed are under spring tension, the bolt of such latches carrying out, in addition to its forward motion, also a transverse one or a cross motion. An object of such double motion is to secure an easy entering of the head of the latch bolt into the striker plate or behind the keeper, despite the door being distorted or being under spring tension when in closed position. This should occur prior to the door being completely introduced into the body frame, so that such doors need not be slammed. However since with latches of known structure the bolt performs both these movements simultaneously, the results aimed at are not always or almost not always securely attained. This is due to the fact that especially with bolts having their forward motion depending upon spring action only it may occur that the head of the bolt will enter either with its tip only or not sufficiently deep into the striker plate opening or behind the keeper, being thereon jammed in the attained position on account of great friction or pressure. In such a condition at the slightest concussion or distortion the door may open.

The present invention has for its object to remove this drawback, this being achieved by a suitable connection between the door handle and the latch bolt providing for said movements being carried out consecutively only. In this way when a latch is to be unlocked, the bolt performs at first a cross motion only, while it is retracted into the latch casing after said cross motion is terminated. In locking operation, on the contrary, the bolt executes first its forward motion, whereafter when this latter is terminated, it carries out its cross motion providing for a complementary drawing of the door into the door frame.

With these objects in view, in a preferred embodiment of this invention, I provide a slider between the latch bolt and a lever connected to the door handle, said slider being adapted to bear both on the latch bolt and on the latch casing. When the door handle performs an unlocking movement said slider first slides along a wedge surface whereafter it causes the latch bolt to perform its inward movement. The just mentioned wedge surface may be arranged either on the bolt or on the door casing or on the slider proper.

When this door latch is used with motor vehicles it is desirable that the outer door handle be able to be moved independently of the inner one, so that the inner door handle remains stationary when the latch is opened by means of the

outer door handle and vice versa. In order that such a mutual independence of both door handles be obtained with the above described new door latch, I provide, according to a further improved feature of this my invention, between the latch bolt and the displaced door handles or respectively between a slider acting on the latch bolt and said door handles, a swinging lever transferring the motion of the door handle either to the latch bolt or to the slider. By this means when one of the door handles is rotated, the point of engagement between the other door handle and the swinging lever serves always as stationary fulcrum for said lever.

Other features and objects of the invention will more fully appear from the following description of a number of exemplary embodiments thereof with reference to the appended drawings.

In the drawings:

Figures 1 to 7 illustrate a door latch constructed in accordance with this invention and applicable to motor vehicles. In this latch both door handles, viz. the outer and the inner one, are mounted on a common axle, both being thus operatively connected to one another.

Figs. 8 and 9 illustrate a modification, and

Figs. 10 to 14 inclusive illustrate another modification.

In the first exemplary embodiment illustrated in Figs. 1 to 7 the latch bolt 30 is guided slidably between walls 31 and 32 of the latch casing. The bolt proper consists of a head 34 biased towards the base plate 33 of the latch casing, of a cylindrical part 36 shiftable in a chamber 35 of said casing and of two arms 37, 38 connecting the said cylindrical part with the bolt head. Guided in grooves 40, 41 of the walls 31 and 32 respectively is a pin 39 projecting upwardly and downwardly from the cylindrical part 36. In this way the latch bolt 30 is adapted to be moved not only in its longitudinal direction but also in a direction transverse to the plane of the latch when oscillated about the pin 39. A leaf spring 43 attached to a partition 42 of the latch casing tends steadily to urge the head 34 of the latch bolt towards the base plate 33 of the latch casing, while a coiled spring 44 which bears by one of its ends, at 45, against the cross wall 46 of the latch casing and by its other end, at 47, against the cylindrical part 36 of the latch bolt is adapted steadily to urge said latch bolt 30 outwardly in the direction of its length.

The latch casing is mounted in a door 49 of a motor vehicle in a known manner by means of screws 48. When the door is closed, its inner

edge is applied, also in a manner known per se, under a relatively great pressure onto a yieldable sealing strip 50 provided on the rigid motor vehicle body frame 51 surrounding the door opening. The head 34 of the latch bolt bears under a suitable pressure onto the rear face of a keeper 52 also arranged on the frame.

A slider 55 guided by its lateral lugs 54 in a slot 53 of the casing base plate 33 is adapted to develop the pressure necessary for the closing of the door. Said slider carries on its bifurcated outer end 56 a roller 58 rotatable on a pin 57. Said roller bears, in closed position of the door, both on the base plate 33 of the casing and on the cambered surface of the latch bolt head 34.

A cylindrically shaped end 60 of a roll back lever 61 is engaged in a cavity 59 of the slider 54. Said lever passes downwardly between the arm 38 of the latch bolt and the casing base plate 33, its other end being fixed on a roll back 62 journaled both in the said casing base plate 33 and in the cover plate 63 of the latch casing.

A longitudinal bore of square cross section is formed in the roll back wherein a square shaped shank 64 is inserted having attached to both its ends respectively the outer and the inner door handles 65 and 66. A contraction spring 67 having one of its ends attached to a hook-shaped extension 68 of lever 61 and connected by its other end to a pin 69 fixed in the latch casing is adapted to prevent any rattling of the upper cylinder-shaped end 60 of lever 61 in the cavity 59 of the slider 55.

In order to explain the operation of the door latch, said latter is represented on the drawings in various stages of its opening and locking movement. Figs. 1 to 3 represent the latch in its closed or locked position, there being omitted in Figs. 1 and 2 the cover plate 63 of the latch casing and in Fig. 1 also the latch bolt 30. These omissions have been made for the purpose of permitting a clear representation of the parts located behind the omitted ones. Fig. 3 represents a section of Fig. 2 taken on the line 3-3. Fig. 4 represents a section similar to that of Fig. 3. However, in these figures the parts of the latch are represented at the very moment when but the first stage of an opening or locking movement respectively is accomplished, whereas Figs. 5 and 6 represent in section and respectively in elevation the latch after its parts have already terminated their opening movement. Fig. 6 represents the latch also with its casing cover plate 63 removed. Fig. 7 represents a section of Fig. 6 taken on the line 7-7.

When the door is firmly closed (Figs. 1 to 3) lever 61 takes the position denoted by A in Fig. 1. The roller 58 of slider 55 engages the latch bolt head 34 pressing it toward the abutment 70 of keeper 52 and also the base plate 33 of the latch and thereby the entire door towards the yieldable sealing strip 50 of the door frame. In this way the door is closed tightly and secured against rattling, being simultaneously pressed onto the edges of the said door opening. The cambered conformation of the latch bolt head 34 is such that the roller 58, when in locking position, lies between two nearly parallel surfaces, so that the latch device has a self stopping effect. In other words, no forces acting in longitudinal direction of the latch bolt may be created by a pressure acting transversely to the plane of the door, i. e., no forces acting both on the latch bolt proper and on the slider carrying the roller 58 may be created thereby.

When the lever 61 is swung from its position B represented in Fig. 1 by depressing the outer or inner door handle 65 or 66, it acts by means of its cylindrical head 60 to shift the slider 55 in its longitudinal direction until said slider will occupy the position represented on Fig. 4. In the same extent in which the roller 58 of the slider descends the wedged surface 71 of the bolt head 34 the latch bolt 30 itself is released and it is turned by the leaf spring 43 around its pivot 39 towards the base plate 33 of the latch casing until the highest portion of its camber will bear on the said base plate 33 (Fig. 4). The door may be now opened so far that between the sealing strip 50 and the inner surface 72 of the door there will be formed a distinctly perceivable air gap 73, and the bolt head 34 will yet bear on the abutment 70 of the keeper 52.

During the shift movement of slider 55 towards the position represented on Fig. 4 with a simultaneous shifting movement of the latch bolt 30, said slider enters into a rectangular opening 74 of the latch bolt and is thus in contact with the cylindrical portion 36 of the said latch bolt. Therefore when the slider is further shifted on account of a continued movement of lever 61 from its position C, past the position represented in Fig. 4 and up to its position represented in Figs. 5 and 6, it carries also the latch bolt 30 in opposition to spring 44 in such a way that said bolt is fully retracted into the latch casing. The door may be now entirely opened.

When a closing movement of the door is carried out the above recited operative steps follow in opposite order. So when one of the door handles 65, 66 has been depressed, the door is primarily closed so far only that its inner surface 72 bears but slightly on the yielding sealing strip 50. By moving the door handle upwards, the bolt is shifted out of the latch casing until it takes the position represented in Fig. 4. Such outward motion of the bolt is assisted by springs 44 and 67. Should now the lever 61 be brought back into its initial position A by a further upward movement of the door handle, it will move the slider by means of its cylindrical head 60 in outward direction, whereas the latch bolt 30 is no longer moving outwardly for the reason that its guiding pin 39 has been already brought to contact with the outer end of the guiding slots 40, 41. Therefore the roller 58 of the slider now moves on the inclined surface 71 of the bolt head 34 and at the same time it turns the latch bolt 30 about the pin 39 up to the moment when the bolt reaches again its closing position represented in Fig. 3.

The locking operation may be also carried out without acting on the door handle by merely slamming the door. In the latter case the latch acts as any conventional door latch wherein the bolt 30 is retracted into the latch casing when its head 34 strikes on the inclined surface 75 of the keeper in opposition to spring 44. Thereby neither the slider 55 nor the door handles 65, 66 change their positions. As soon as the inner surface of the door gets in contact with the sealing strip 50 and said latter is sufficiently compressed by the momentum of the slammed door, the bolt head 34 snaps under the action of spring 44 behind the abutment 70 of the keeper whereon the door is securely latched.

Figs. 8 and 9 represent in section and in fragmentary view an embodiment of the latch wherein the inclined surface 71 causing the latch bolt to perform its cross movement is arranged on a

member 128 fixed on the latch casing. In this exemplary embodiment the latch bolt 129 has its shape in plan limited substantially by parallel surfaces, and the slider 55 moved by the lever 61 carries at its outer end two links 131, 132 having rotatably arranged therebetween a roller 133. When the slider 55 is moved by lever 61 rigidly mounted on the roll back 62, the roller 133 rides along the inclined surface 71 of member 128 causing thereby a corresponding transverse or cross motion of the head of the latch bolt 129.

Finally Figs. 10 to 14 represent another exemplary embodiment wherein instead of an inclined surface causing in the preceding instances the latch bolt to perform its transverse movement a link between the slider and the latch bolt is arranged. Fig. 10 represents in elevation the inner disposition of a latch in its locking position with the cover plate 42 of the latch casing having been removed. For the sake of simplicity there is represented again a latch with one door handle 66 only or respectively with two door handles mounted on a common square shank 64. However it should be understood that with this latch also there may be applied all of the heretofore described types of door handles working independently from one another. All of the heretofore described variations of the details of the latch structure may be also generally used with any of the main typical embodiments of the latch. Figs. 12 and 13 show respectively in similar views the latch after the termination of the first stage of its unlocking or locking movement and the fully unlocked latch, whereas Fig. 14 represents once more separately the slider of such a latch device.

With this embodiment of the latch the latch bolt 141 has substantially again parallel limiting surfaces and it is also arranged to slide longitudinally by means of a pin 39 provided in its rear end in slits 40, 41 of the walls 31, 32 of the latch casing and it is also guided to perform a transverse swinging movement about the said pin 39. Also a leaf spring 43 is adapted to swing the latch bolt towards the base plate 33 of the latch casing when no great external forces are acting thereon. The slider is also provided on its outer end with a roller 58 the rotation axle 57 whereof projects upwardly and downwardly out of the slider and is engaged in slits 142, 143 of the casing walls 31, 32 serving thus as a guide for the longitudinal movement of the slider. The slider is moved in longitudinal direction here also by means of a lever 61 rigidly connected to the door handle 66 by means of a square shank and a roll back 62, a ball shaped head 144 of said lever being engaged in a cavity 59 of the slider. Two links 145, 146 are mounted on the rotation axle 57 of roller 58, said links being swingably engaged on their other end by means of a pin 147 in a cut-out 148 of the latch bolt.

In the locking position of the latch parts represented on Figs. 10 and 11 the links 145, 146 have taken a position substantially at right angles to the latch bolt 14 and by the intermediation of roller 58 they are pressed to the base plate 33 of the latch casing. By this means the latch bolt 149 is forcibly pressed to the abutment 70 of the keeper 52 and in the same way the base plate 33 of the latch casing and therefore also the inner surface of the door are forcibly pressed to the yielding sealing strip 50 on the edge of the door opening. If now by a depression of the door handle 66 the lever 61 is moved clockwise it draws the slider in the in-

termediate position represented on Fig. 12 in which the latch bolt 141 may be swung towards the base plate 33 of the lock casing so far that it will take a position nearly parallel to said base plate. Thereby the pressure exerted by said latch bolt on the keeper and acting in a direction transverse to the plane of the door is relieved. Now the roller 58 bears onto the inner surface of the latch bolt, so that during a further movement of the lever 61 in the above indicated direction the latch bolt is retracted into the latch casing by the slider up to the position represented in Fig. 13 without any great resistance being encountered. When the door is to be closed, the above indicated operative steps are also carried out in an opposite order.

What I claim is:

1. A door latch more particularly applicable to motor vehicles doors being under spring tension when closed, comprising a casing adapted to be secured in a door, a latch bolt mounted slidably and swingably in said casing, a slider shiftably guided in said casing and adapted to be moved between a wall thereof and said latch bolt in parallelism to the sliding forward and backward movement of said latter, a swinging lever movably connected to said slider and being connected for operation by rotary means, door handles operatively connected therewith, spring means secured in the said latch casing and adapted to urge said bolt into its locking position wherein it is engaged behind an abutment secured on the body frame encircling the door opening which frame is also provided with an abutment against which the door bears when said latter is in its fully closed position, the said sliding and swinging or transverse motions of said latch bolt being carried out consecutively only and separately from one another.

2. A door latch of the kind described, comprising a casing adapted to be secured in a door, a latch bolt mounted slidably in said latch casing and adapted to be swung about its inner end in a direction transverse to the plane of the door, a slider adapted to perform forward and backward movements along a base plate of said casing between said plate and said latch bolt, a swinging lever movably connected with said slider and attached to operating means journaled in said latch casing and operated by door handles, and spring means adapted to urge said bolt into its locking position and to press the head of said bolt towards a base plate of said latch casing.

3. A door latch of the kind described, comprising a casing adapted to be secured in a door, a latch bolt mounted slidably in said latch casing and adapted to be swung about its inner end in a direction transverse to the plane of the door, a slider adapted to perform forward and backward movements along a base plate of said casing between said plate and said latch bolt, a swinging lever movably connected with said slider and attached to operating means journaled in said latch casing and operated by door handles, and spring means adapted to urge said bolt into its locking position and to press the head of said bolt towards a base plate of said latch casing, said bolt when the latch is unlocked performing first a transverse motion only and when said motion is terminated an inward or backward motion, whereas said bolt when performing a locking operation moves first longitudinally forwardly and then executes its transverse motion

after said longitudinal motion has been terminated.

4. A door latch of the kind described, comprising a casing adapted to be secured in a door, a latch bolt mounted slidably in said latch casing and adapted to be swung about its inner end in a direction transverse to the plane of the door, a slider adapted to perform forward and backward movements along a base plate of said casing between said plate and said latch bolt, a swinging lever movably connected with said slider, operating means journaled in said latch casing and attached to said lever, door handles attached to said operating means, a spring urging said latch bolt in its longitudinal direction out of said latch casing, and a second spring urging said bolt about its inner end towards the base plate of said latch casing.

5. A door latch of the kind described, comprising a casing adapted to be secured in a door, a latch bolt mounted slidably in said latch casing and adapted to be swung about its inner end in a direction transverse to the plane of the door, a slider adapted to perform forward and backward movements along a base plate of said casing between said plate and said latch bolt, a swinging lever movably connected with said slider and attached to operating means journaled in said latch casing and carrying door handles, spring means adapted to urge said bolt into its locking position and to press the head of said bolt towards a base plate of said latch casing, said slider operating lever being positively connected with door handle means and being adapted to bear on a reinforced portion of said latch bolt causing thereby a longitudinal movement of said latter.

6. A door latch of the kind described, comprising a casing adapted to be secured in a door, a latch bolt mounted slidably in said latch casing and adapted to be swung about its inner end in a direction transverse to the plane of the door, a slider adapted to perform forward and backward movements along a base plate of said casing between said plate and said latch bolt, a swinging lever movably connected with said slider and operated by at least one door handle, spring means adapted to urge said bolt into its locking position and to press the head of said bolt towards a base plate of said latch casing, said slider having an inclined or wedged surface adapted to move said door latch transversely when said slider is performing the final portion of its longitudinal outward movement.

7. A door latch of the kind described, comprising a casing adapted to be secured in a door, a latch bolt mounted slidably in said latch casing and adapted to be swung about its inner end in a direction transverse to the plane of the door, a slider adapted to perform forward and backward movements along a base plate of said casing between said plate and said latch bolt, a swinging lever movably connected with said slider and attached to operating means journaled in said latch casing and carrying door handles, spring means adapted to urge said bolt into its locking position and to press the head of said bolt towards a base plate of said latch casing, said door latch having an inclined or wedged surface adapted to operate a transverse motion thereof when said slider is performing the final portion of its longitudinal outward movement.

8. A door latch of the kind described, comprising a casing adapted to be secured in a door,

a latch bolt mounted slidably in said latch casing and adapted to be swung about its inner end in a direction transverse to the plane of the door, a slider adapted to perform forward and backward movements along a base plate of said casing between said plate and said latch bolt, a swinging lever movably connected with said slider and operated by at least one door handle, spring means adapted to urge said bolt into its locking position and to press the head of said bolt towards a base plate of said latch casing, the base plate of said latch casing having an inclined camming surface adapted to impart a transverse motion of the said door latch when said slider is performing the final portion of its longitudinal outward movement.

9. A door latch of the kind described, comprising a casing provided with a base plate, a cover plate, and a partition wall, and further comprising a latch bolt mounted slidably in said latch casing and consisting of a head portion biased towards said base plate and connected by arm means with a cylindrical reinforced portion of said bolt, said latter being adapted to be swung about said reinforced portion forming its inner end in a direction transverse to the plane of the door, there being provided between the head of said bolt and its reinforced cylindrical portion, a cut-out, a slider performing forward and backward movements along the base plate of said casing between said base plate and said latch bolt in said cut-out, a swinging lever operatively engaging in a cavity of said slider and being rigidly secured to a rotary operating member having a non-cylindrical bore receiving a correspondingly formed shank carrying an inner door handle and an outer door handle both being bodily movable with said rotary operating member and swinging lever.

10. A door latch of the kind described, comprising a casing adapted to be secured in a door, a latch bolt mounted slidably in said latch casing and adapted to be swung about its inner end in a direction transverse to the plane of the door, a slider adapted to perform forward and backward movements along a base plate of said casing between said plate and said latch bolt, a swinging lever movably connected with said slider and attached to operating means journaled in said latch casing and carrying door handles, spring means adapted to urge said bolt into its locking position and to press the head of said bolt towards a base plate of said latch casing, said slider being connected with said latch bolt by link means which, when the slider is in the inner portion of its sliding movement, lie in an acute angle to said latch bolt, whereas when the locking movement of the latch bolt is terminated and the slider is performing the final part of its outward movement said links take a position substantially at right angles to said latch bolt.

11. A door latch of the kind described, comprising a casing adapted to be secured in a door, a latch bolt mounted slidably in said latch casing and adapted to be swung about its inner end in a direction transverse to the plane of the door, a slider adapted to perform forward and backward movements along a base plate of said casing between said plate and said latch bolt, a swinging lever movably connected with said slider and attached to operating means journaled in said latch casing and carrying door handles, spring means adapted to urge said bolt into its locking position and to press the head of said bolt towards a base plate of said latch casing,

roller means carried between said slider and said latch bolt adapted to bear on an inclined surface provided on one of said members when the slider is performing the outer portion of its movement.

12. A door latch of the kind described, comprising a casing adapted to be secured in a door, a latch bolt mounted slidably in said latch casing and adapted to be swung about its inner end in a direction transverse to the plane of the door, a slider adapted to perform forward and backwards movements along a base plate of said casing between said plate and said latch bolt, spring means adapted to urge said bolt into its locking position and to press the head of said bolt towards a base plate of said latch casing, said slider being positively connected with door handle means and being adapted to bear on an abut-

ment on said latch bolt causing thereby a longitudinal movement of said latter.

13. A door latch of the kind described, comprising a casing adapted to be secured in a door, a latch bolt mounted slidably in said latch casing and adapted to be swung about its inner end in a direction transverse to the plane of the door, a slider adapted to perform forward and backward movements along a base plate of said casing between said plate and said latch bolt, spring means adapted to urge said bolt into its locking position and to press the head of said bolt towards a base plate of said latch casing, camming means associated with said bolt and slides, so arranged as to impart a transverse motion to said bolt when said slide is performing the final portion of its longitudinal outward movement.

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