

[54] PUSH-PULL LOCK ACTUATOR

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811,561	6/1951	Germany	292/92

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[22] Filed: **Aug. 10, 1973**

[21] Appl. No.: 387,304

[52] U.S. Cl..... 292/92, 70/462, 292/170,
292/336.3

[51] Int. Cl. E05c 15/02

[58] **Field of Search** 292/21, 92, 166, 167, 170,
292/221, 336.3; 70/92, 462

[56] **References Cited**

UNITED STATES PATENTS

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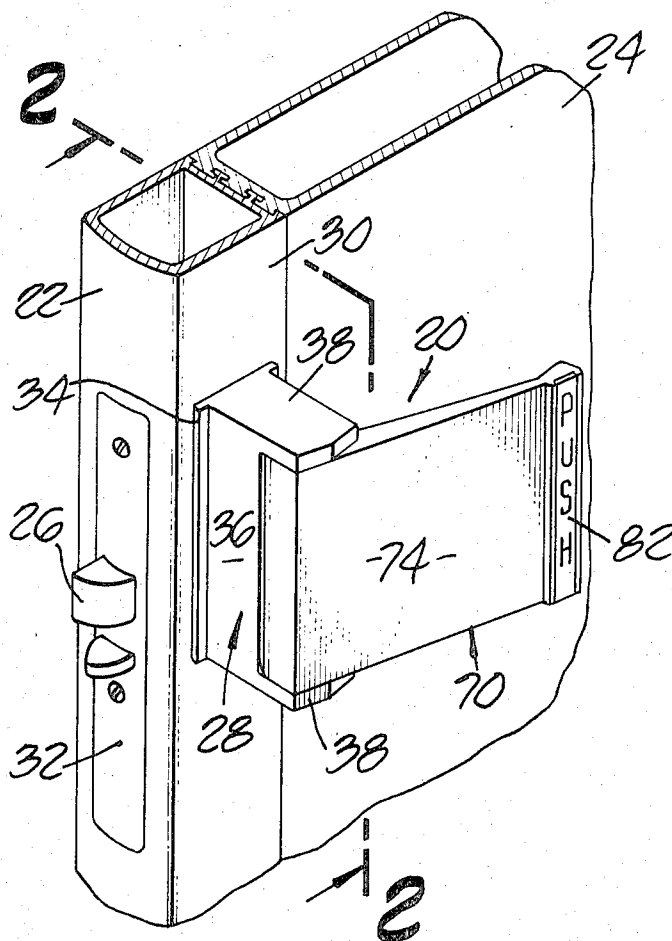
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[57] ABSTRACT

A device for operating rotary actuated door latches including a housing adapted to be mounted on the door proximate the latch, a rotary spindle operably connected with the latch, a spindle rotating member laterally movable within the housing in a plane generally normal to the axis of rotation of the spindle and a push-pull operator or handle member pivotally mounted on the housing and adapted to effect lateral movement of the spindle rotating member in response to push or pull forces exerted on the operator.

7 Claims, 14 Drawing Figures



SHEET 1 OF 2

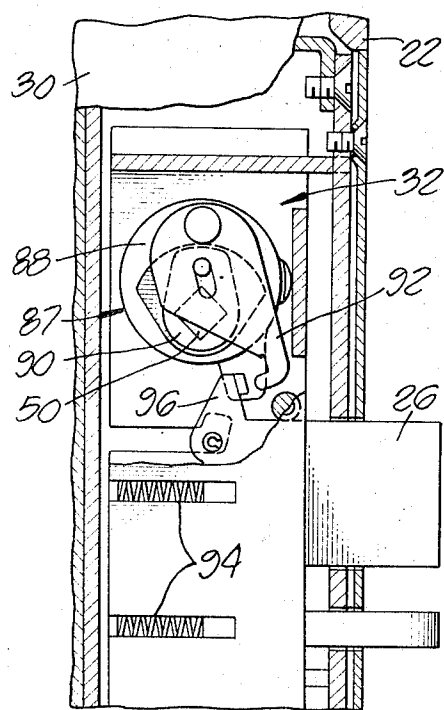
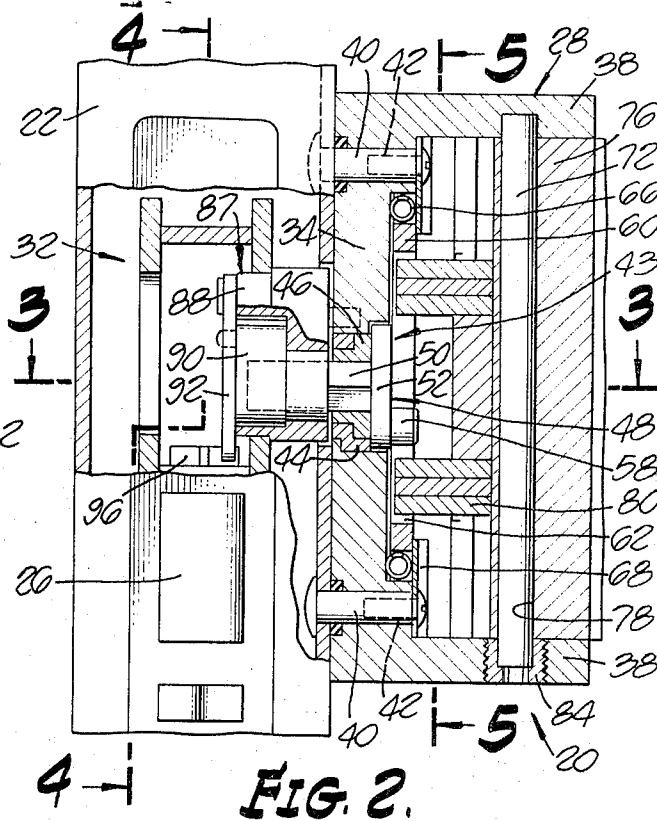
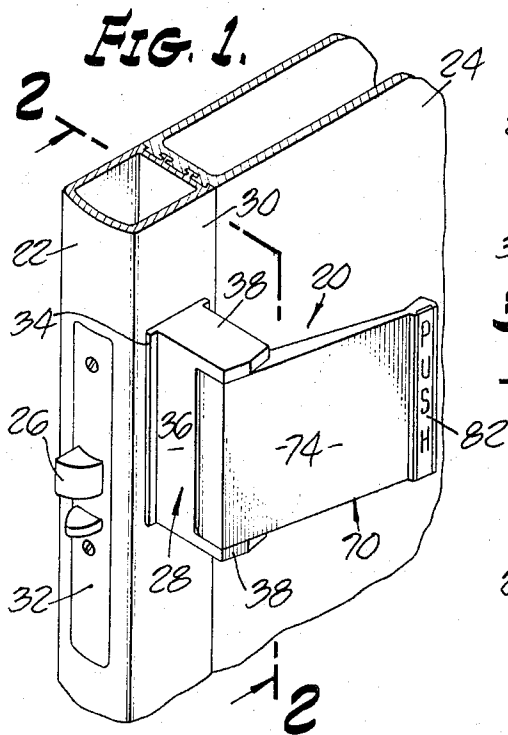


FIG. 4.

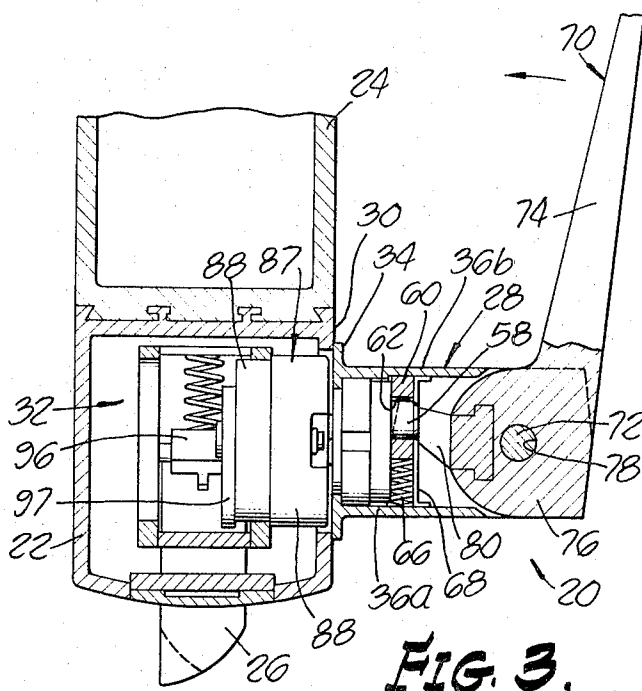


FIG. 3.

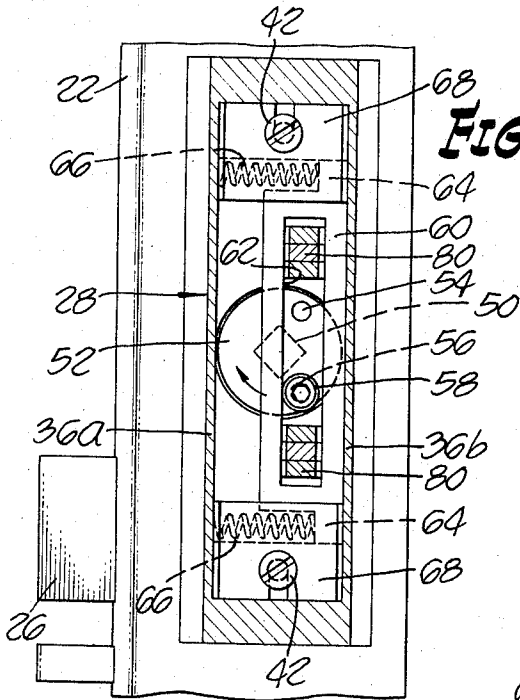


FIG. 5.

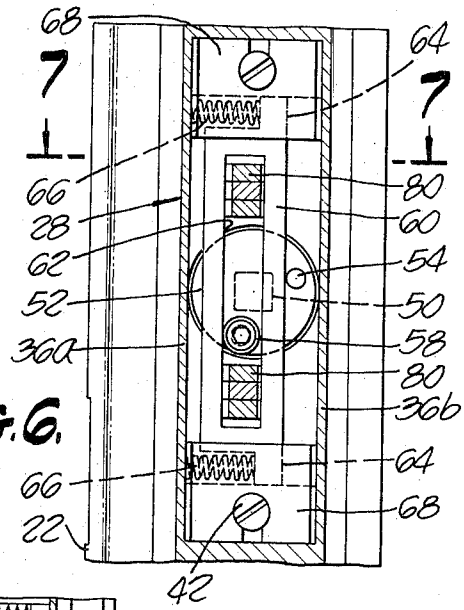


FIG. 6.

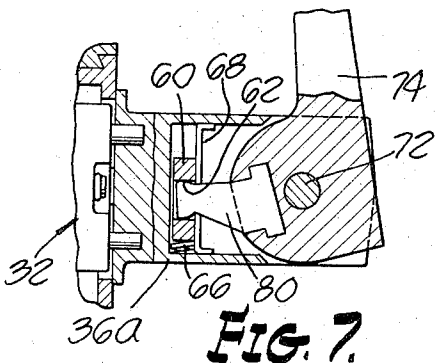


FIG. 7.

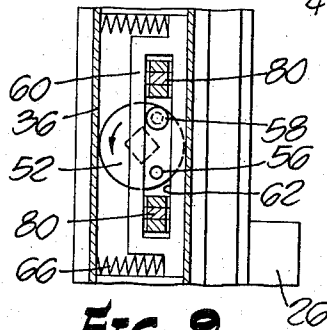


FIG. 9.

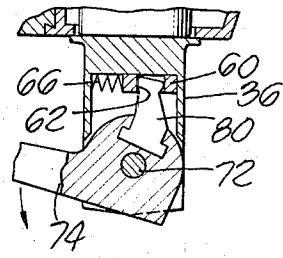


FIG. 10.

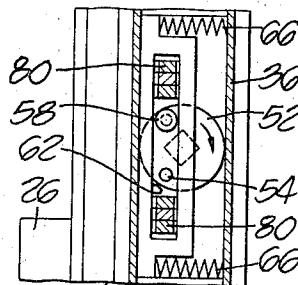


FIG. 11.

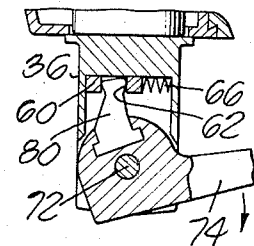


FIG. 12.

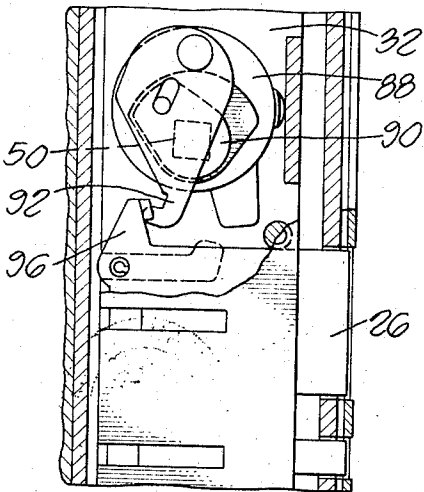


FIG. 8.

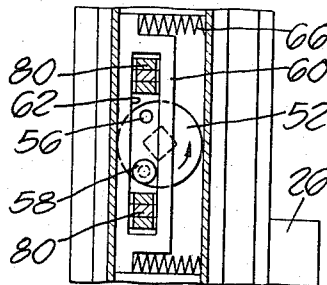


FIG. 13.

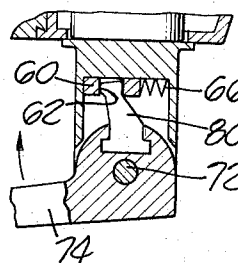


FIG. 14.

PUSH-PULL LOCK ACTUATOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to motion translation mechanisms and more particularly to a mechanism for operating a rotary actuated latch.

2. Discussion of the Prior Art

The great majority of door latches, particularly those used in homes and offices, are rotary operated, i.e., the latch bolt is retracted by rotary motion imparted to the latch. As a general rule, rotatable door knobs are used in conjunction with these latches so that rotation of the knob by the operator will impart the rotary motion necessary to actuate the latch.

For reasons of safety and convenience, it is frequently desirable to replace the standard rotatable knob used with the rotary actuated latch with an easier to operate push or pull type actuator. In such a case, however, unless a special latch mechanism is used it is necessary to convert the push or pull force exerted on the operator into the rotary motion necessary to actuate the standard rotary actuated latch.

Although various types of push-pull door opening devices have been devised in the past, invariably such devices require that the standard rotary actuated latch be replaced with a special latch mechanism designed to operate with the particular push-pull mechanism of the device used. Such devices are often quite expensive, are difficult to install, frequently are not sturdy enough for long term use particularly in commercial buildings or apartments, and in many cases because of their size cannot be used with narrow stile doors and with standard types of locks.

Applicants are familiar with the following prior art patents which serve to clearly illustrate the highly unique nature of the present invention:

U.S. Pat. No. 3,339,959 — W. M. Krantz — Sept. 5, 1967

U.S. Pat. No. 3,518,854 — W. M. Krantz — Sept. 7, 1970

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a simple, rugged mechanism for the conversion of push or pull force into rotary movement.

It is another object of the invention to provide a mechanism of the aforementioned character in which forces generated by pushing or pulling on a pivotally mounted paddlelike actuator are converted into rotary action for the retraction of the bolt of a conventional type of door latch without the use of conventional gears, levers or complex power trains.

It is another object of the invention to provide a mechanism of the type described in the previous paragraph for use on a hinged mounted out-swinging door in which pushing on the paddlelike actuator generates the rotary movement necessary to operate a conventional latch mechanism mounted within the door so as to expeditiously retract the latch bolt.

It is a further object of the invention to provide a mechanism as described in the preceding paragraphs in which a different assembly of the same parts will permit the mechanism to be used with a hinged mounted in-swinging door and a pulling force imparted to the paddlelike acutator will generate the rotary movement

necessary to actuate a conventional latch mechanism mounted within the door.

It is another object of the invention to provide a device of the aforementioned class which can be used with standary rotary actuated latches and can be expeditiously assembled and installed in the field.

It is still another object of the invention to provide a mechanism of the class described which employs a minimum number of parts, is compact, lightweight and inexpensive to manufacture.

In summary, these and other objects of the invention can be realized by a device consisting of a first rotary member including a latch engaging element, a second member operatively connected with the first member and movable laterally with respect thereto and a pivotally mounted activating member coupled with the second member for imparting lateral movement thereto.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary perspective view showing one form of the latch operator of the invention mounted on the lock stile of a right hand hinged door.

FIG. 2 is a view taken along lines 2—2 of FIG. 1 partly broken away to illustrate the internal construction of the latch operator and the manner in which it is operatively coupled with the latch.

FIG. 3 is a cross-sectional view taken along lines 3—3 of FIG. 2 showing a top view of the latch operator.

FIG. 4 is a view taken along lines 4—4 of FIG. 2 partly broken away to show manner in which the latch operator is coupled with the latch and showing the latch at rest with the bolt extended.

FIG. 5 is a view taken along lines 5—5 of FIG. 2 illustrating the mechanism at rest and the manner in which the spindle rotating means of the invention is coupled with the rotary spindle.

FIG. 6 is a view similar to FIG. 5 showing the appearance of the components after the spindle rotating means has been moved laterally relative to the spindle means so as to rotate the spindle.

FIG. 7 is a view taken along lines 7—7 of FIG. 6 showing the position of the activating means or pivotally mounted paddle operator after it has been pushed inwardly so as to actuate the latch.

FIG. 8 is a view similar to FIG. 4 but showing the appearance of the latch after it has been activated by the spindle so as to move the bolt into a retracted position.

FIG. 9 is a generally schematic fragmentary view showing the mechanism at rest, as illustrated in FIG. 5, but with the driving pin of the spindle means located in the upper position so that the spindle will be rotated in a counterclockwise direction in response to lateral movement of the spindle rotating means.

FIG. 10 is a generally schematic fragmentary view showing the reversal of paddle actuator as used with the mechanism when configured as illustrated in FIG. 10 so as to permit the device to be used as a "pull" type operator for left hand reverse doors.

FIG. 11 is a schematic view similar to FIG. 9 but with a reversal of the spindle rotating means so that lateral movement thereof to the right will effect clockwise rotational movement of the spindle.

FIG. 12 is a schematic view similar to FIG. 10 showing a reversal of the paddle operator as used with the mechanism when configured as illustrated in FIG. 11 so as to permit the device to be used as a pull type operator for right hand reverse doors.

FIG. 13 is a schematic view similar to FIG. 11 but with the driving pin of the spindle means located in the lower position so that the spindle will be rotated in a counterclockwise direction in response to lateral movement of the spindle rotating means to the right.

FIG. 14 is a schematic view similar to FIG. 12 showing another reversal of the paddle operator as used with the mechanism when configured as illustrated in FIG. 13 so as to permit the device to be used as a "push" type operator for left hand doors.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, the motion translation mechanism of the invention is shown in the form of a door latch operating mechanism or latch actuating device. More particularly, the device generally designated as 20 in the drawing is shown in a configuration for use in conjunction with a latch of the type typically mounted in the free edge of nose 22 of a hinged door 24 and requiring rotary actuation to retract the latch bolt 26. In FIGS. 1 through 8, the latch operating mechanism is shown as configured for use with a right hand door. As used herein, the term "right hand door" means a door which, when viewed from outside the room, building, etc., is hinged on the right, and swings into the enclosure. A reverse right hand door is one which is hinged on the right, but swings outwardly. A left hand door, on the other hand, is hinged on the left when viewed from outside the building, room, etc.

Referring to FIGS. 1-3, the device can be seen to include a housing 28 which is affixed to the lock stile 30 of the door and is disposed in close proximity with the latch mechanism generally designated in the drawings by the numeral 32. Housing 28 has a base portion 34, generally parallel spaced apart side walls 36 and end walls 38. Fastening means shown here as internally threaded stud members 40 extend through the base portion 34 of the housing and through the face of the lock stile. In conjunction with mating screws 42 the studs serve to removably attach the device to the door.

As best seen in FIG. 2, a rotary first means is carried by the housing and includes latch engaging means 43 for providing rotary actuation to the latch. In this form of the invention the latch engaging means comprises a bushing sleeve 44 mounted in a counterbored opening in base 34, a bushing 46 rotatably carried by the bushing sleeve and a rotary spindle assembly 48. Spindle assembly 48 includes an elongated rotary spindle 50 which is generally rectangular in cross-section and a spindle disc 52 affixed to one end of the spindle. The spindle 50 protrudes through a rectangular opening in bushing 40, extends into the lock stile of the door and is adapted to operatively engage the latch mechanism 32 at the end of the spindle opposite the spindle disc. As illustrated in FIG. 5, provided within spindle disc 52 are upper and lower spaced apart threaded apertures 54 and 56. These apertures are adapted to threadably receive an outwardly extending driver screw 58, the purpose of which will presently be described.

Mounting within housing 28 proximate the first means is a second means for imparting rotary movement to the first means, shown in FIGS. 3 and 5 as a spindle rotating means comprising a substantially flat driver plate 60 having a longitudinally extending aperture on slot 62 thereon. Referring particularly to FIG. 5, it can be seen that driver plate 60 is provided at its

ends with a pair of outwardly extending ears 64 arranged to engage biasing means shown here as a pair of coil springs 66 interposed between ears 64 and one of the side walls 36a of housing 28. The biasing means or springs 66 serve to hold the driver plate normally against the opposite wall 36b of housing 28 to yieldably resist lateral movement of the plate and to return the plate to its at-rest starting position after activation of the device. Removable spring clips 68 fit closely between and frictionally engage the side walls of the housing and serve to hold the springs 66 in position within the housing.

As also shown in FIG. 5, with the driver plate at rest the driver pin 58 of the first means protrudes upwardly through the driver plate slot 62, which slot comprises the first or female interengaging means of the mechanism. With this arrangement, lateral movement of driver plate 60 in a plane generally perpendicular to the axis of rotation of rotary spindle 50, as indicated by the arrow, will cause the spindle assembly to rotate in a clockwise direction relative to bushing plate 44. In a manner soon to be described, it will be seen that this rotary movement of the spindle assembly will actuate the latch mechanism 32 effecting retraction of bolt 26.

Turning again to FIGS. 1 through 3, there is illustrated a third means or activating means for activating the device and for effecting lateral movement of the driver plate of the spindle rotating or second means. This activating means is provided in this embodiment of the invention in the form of paddle operator 70 pivotally mounted on a shaft 72 carried by and extending between the upper portions of end walls 38 of housing 28. Paddle operator 70, which in side elevation is of bell-crank geometry, comprises a lever, or wing portion 74, a body portion 76 having a bore 78 therethrough adapted to accommodate shaft 72 and a second or male interengaging means in the form of angularly extending driving ears 80, the extremity of which are adapted to be received in slot 62 of driver plate 60. Driving ears 80 may be formed integrally with the body portion 76 or they may be separately formed and as shown in the drawings be fixedly held within a suitably configured elongated slot formed in the body portion. Provided at the outer end of the paddle operator wing are channel defining grooves for removably receiving "push-pull" indicating indicia plates 82. To enable the paddle operator to be easily removed from the housing for shipping, a set screw 84 is provided at one end of shaft 72. As shown in FIG. 2, set screw 84 is threadably received within a threaded bore in one of the end walls 38 of the housing and serves to hold the shaft 72 securely in position within the housing in the manner illustrated.

Referring particularly to FIGS. 2 and 4, latch mechanism 32, which forms no part of the present invention, can be seen to include a cam disc 87 including a circular housing member or cam body 88, a spindle receiving member or driver piece 90 rotatably carried within an arcuately shaped opening in member 88 and a lever element or cam 92 operatively coupled with member 90. Bolt 26 of the latch is normally held in an extended position by springs 94 and is connected to a retraction arm 96 which is engageable by lever element 92. As shown in FIG. 8, rotation of the spindle 50 will rotate the spindle receiving member within housing 88 which, in turn, will move lever element 92 to the left, moving retraction arm 96 and bolt 26 into the retracted position. It is to be understood that the configuration of

latch 32 is shown only for purposes of illustration and that use of the latch operating mechanism of the present invention is not limited to use with the particular type of latch illustrated. On the contrary, the device of the invention can be used with numerous types of rotary actuated latches of widely differing configurations.

With the actuator device of the invention affixed to a right hand door and coupled with the latch in the manner illustrated in FIGS. 1-5, a pushing force on the paddle operator wing 74 in the direction of the arrow in FIG. 3 will cause the component parts of the device to move into the positions illustrated in FIGS. 6-8. As can best be seen in FIGS. 6 and 7, the pushing force will result in the paddle operator pivoting about shaft 78. This causes the extremity of driving ear 80, which is disposed within slot 62 of driving plate 60, to move downwardly as viewed in FIGS. 3 and 7. This, in turn, moves the driving plate 60 downwardly against the urging of springs 66. Because driving screw 58 of the spindle assembly extends into slot 62, this movement of driving plate downwardly (FIG. 7) or to the left as viewed in FIG. 6 will cause clockwise rotational movement of the spindle assembly including spindle 50 into the position shown in FIGS. 6 and 8. Referring to FIG. 8, it will be observed that, as previously discussed, rotational movement of the spindle will actuate the latch so as to cause lever element 92 to move arm 96 and bolt 26 into the retracted position. With the bolt thus retracted the door can, of course, be swung inwardly into the room or building. When the paddle operator is released springs 66 will urge the driving plate and the paddle operator once more into the at-rest configuration shown in FIG. 1.

When it is desired to use the latch actuator of the invention with a left hand reverse door, i.e., a door hinged on the left when viewed from outside the enclosure and adapted to swing outwardly toward the operator, the device is reassembled into the "pull" type configuration illustrated in FIGS. 9 and 10. In this configuration, the driving screw 58 is relocated in the upper threaded aperture 54 (FIG. 5) of the spindle assembly disc 52 and the paddle operator is reversed, i.e., turned end for end. Due to the novel configuration of the driving ears 80, with the paddle operator in this position the ears will protrude into the slot 62 of the driving plate 60 in the manner shown in FIG. 10 so that a pulling force on the wing 74 in the direction of the arrow will cause the driving plate to move to the left against the urging of springs 66. This movement of the driving plate will cause driving screw 58 and in turn the spindle assembly to rotate in a counterclockwise direction as indicated in FIG. 9. In the manner previously discussed, rotation of the spindle assembly will effect retraction of the bolt 26 of the latch 32.

When the actuator is to be used with a right hand reverse door, the components are assembled as shown in FIGS. 11 and 12. In this configuration, the driving plate 60 is turned over and the springs 66 are positioned between the driving plate ears 64 and the opposite wall of the housing. Again the paddle operator is reversed so that the driving ears protrude into the slot in the driving plate in the manner illustrated in FIG. 12. With this arrangement, a pulling force on wing 74 will cause the paddle operator to pivot about shaft 72 and in turn cause the driving plate to be moved to the right (FIG. 12). This, in turn, will cause the spindle assembly to be rotated in a clockwise direction and as before will re-

sult in retraction of the bolt of the latch. It is to be understood that for the various configurations of the operator device, the latch mechanism is appropriately located in the lock stile of the door so as to correctly accommodate the direction of swing of the door. It is also to be noted that for the "pull" configuration illustrated in FIGS. 9-12, the appropriate "pull" indicating indicia is emplaced in the channel defining grooves of the paddle operator wing.

The configuration of the device illustrated in FIGS. 13 and 14 adapts it for use with a normal left hand door. As shown in these figures the orientation of the driving plate remains unchanged from the configuration just described, but the driving screw 58 is relocated to the lower threaded aperture 54 in the spindle assembly disc. Once again the paddle operator is reversed so that the driving ears will engage the slot in the driving plate in the manner illustrated. A pushing force in the direction of the arrow of FIG. 14 will cause the driving plate 60 to be moved to the right. This in turn will cause rotation of the spindle assembly in a counterclockwise direction indicated by the arrow of FIG. 13.

The unique versatility of the device is apparent from the preceding discussion. Because of the novel design of the mechanism, its component parts can be readily assembled either prior to shipment or in the field into various configurations so as to permit use of the device on right or left hand inwardly or outwardly swinging doors. It is to be understood that although in the drawings the device is shown in use on only one side of the door with the appropriate cooperating latch mechanism, the device can be used on both sides of the door in the appropriate push-pull configurations.

I claim:

1. A latch operating mechanism adapted to be mounted on a hinged door and operatively coupled with a latch of the type typically mounted in the free edge or nose of the door and requiring rotary actuation to retract the latch bolt thereof, comprising:
 - a. a housing affixed to the door and having laterally spaced apart first and second side walls;
 - b. a first means carried by said housing including a rotary spindle operatively connected with the latch;
 - c. a second means mounted within said housing proximate said first means and comprising a driver plate removably mounted within said housing proximate said first side wall thereof and having a slot formed therein adapted to operatively receive a driving pin provided on said first means, said driver plate being movable laterally within said housing toward said second side wall of said housing in a plane substantially parallel to the plane of the door;
 - d. a paddle operator pivotally carried by said housing comprising:
 1. a lever portion extending outwardly from said housing in a first direction; and
 2. a driving ear extending into said housing and so constructed and arranged as to be operatively received in the slot formed in said driver plate whereby pivotal movement of said paddle operator will impart lateral movement to said driver plate of said second means causing rotation of said rotary spindle of said first means in a first direction; and
 - e. biasing means comprising spring members disposed between said driving plate and said housing

so as to yieldably resist lateral movement of said driver plate within said housing.

2. A latch operating mechanism as defined in claim 1 in which said housing and said driver plate are designed so that the latter is also mountable within said housing proximate said second side wall and is laterally movable within said housing toward said first side wall thereof and in which said housing and said paddle operator are designed so that the latter is pivotally mountable on said housing with said lever portion extending outwardly therefrom in a second direction whereby pivotal movement of said paddle operator will impart lateral movement to said driver plate of said second means causing rotation of said rotary spindle of said first means in a second direction.

3. A latch operating mechanism adapted to be mounted on either a right hand or a left hand hinged door and operatively coupled with the latch of the type requiring actuation by a rotary spindle to retract the latch bolt thereof, comprising:

- a. a housing affixed to the door, said housing having first and second laterally spaced apart side walls;
- b. a first means rotatably carried within said housing comprising:

- 1. a rotatable member;
- 2. a spindle connected to and rotatable with said member, said spindle being operatively associated with the latch; and

- 3. an eccentrically disposed pin connected to and protruding from said rotatable member;

- c. a second means removably mounted within said housing adjacent said first means for imparting rotational movement to said first means, said second means comprising a driver plate movable laterally within said housing in a plane substantially parallel to the plane of the door, said driver plate having a longitudinally extending slot adapted to receive said pin of said first means, said driver plate and said housing being designed so that said driver plate is mountable within said housing proximate said first wall thereof for lateral movement toward said second side wall and is also mountable within said housing proximate said second side wall for lateral movement in an opposite direction toward said first side wall; and

- d. a paddle operator removably pivotally mounted on said housing comprising:

- 1. a lever portion extending outwardly from said housing; and

- 2. a driving ear angularly protruding from said lever portion and adapted to be received within the slot formed in said driver plate, said housing and said paddle operator being designed so that the latter is mountable on said housing in a first position whereby pivotal movement of said paddle operator will impart lateral movement to said driver plate causing rotation of said first means in a first direction and said housing and said paddle operator being designed so that the latter is also mountable in a second position whereby pivotal movement of said paddle operator will impart lateral movement to said driver plate causing rotation of said first means in a second direction.

4. A latch operating mechanism as defined in claim 3 in which said housing and said driver plate are designed so that biasing means is mountable within said housing in a first position in cooperative association with said driver plate for resisting lateral movement thereof in a first direction and is also mountable within said housing in a second position in cooperative association with said driver plate for resisting lateral movement thereof in a second direction.

5. A latch operating mechanism adapted to be mounted on a right or left hand door having a latch of the type requiring rotary actuation to retract the latch bolt comprising:

- a. rotary first means including a latch engaging means for providing rotary actuation to the latch;

- b. second means coupled with said first means for imparting rotary movement thereto and comprising a driver member operatively coupled with said first means, said first and second means being designed so that said driver member is mountable in a first position relative to said first means for lateral movement in a first direction in a plane substantially parallel to the plane of the door whereby said first means is caused to rotate in a first direction and said driver member is also mountable in a second position relative to said first means for lateral movement in a second direction in a plane substantially parallel to the plane of the door whereby said first means is caused to rotate in a second direction; and

- c. a third means coupled with said driver member for imparting lateral movement thereto, said second and third means being designed so that said third means is mountable in a first position relative to said second means for pivotal movement with respect thereto whereby said driver member is moved in a first direction and said third means is also mountable in a second position relative to said second means for pivotal movement with respect thereto whereby said driver member is moved in a second direction.

6. A latch operating mechanism as defined in claim 5 in which:

- a. said rotary first means comprises a rotatable member having an outwardly extending, eccentrically mounted pin;

- b. said third means comprises a pivotally movable paddle operator having a lever portion and a driving ear extending angularly therefrom; and

- c. said driver member has a longitudinally extending slot adapted to operably receive said pin of said first means and said driving ear of said third means.

7. A latch operating mechanism as defined in claim 6 in which said rotatable member and said driver member are designed so that said eccentrically mounted pin is mountable in a first position whereby lateral movement of said driver member causes rotation of said rotatable member in a first direction and said eccentrically mounted pin is also mountable in a second position whereby lateral movement of said driver member causes rotation of said rotatable member in a second direction.

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