Nov. 22, 1966 F. J. RUSSELL ETAL 3,287,046

LOW-FRICTION RETRACTOR

Original Filed Oct. 16, 1961 2 Sheets-Sheet 1

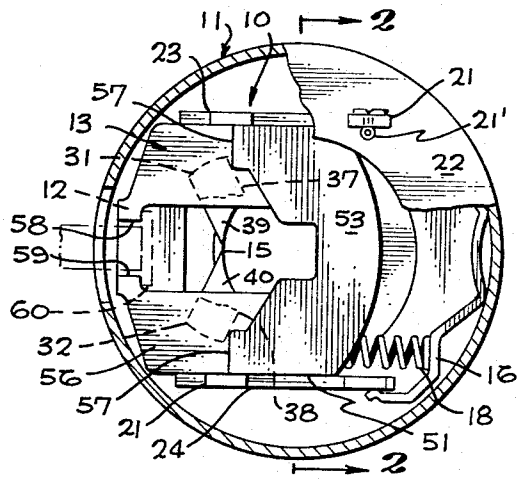


Fig. 1

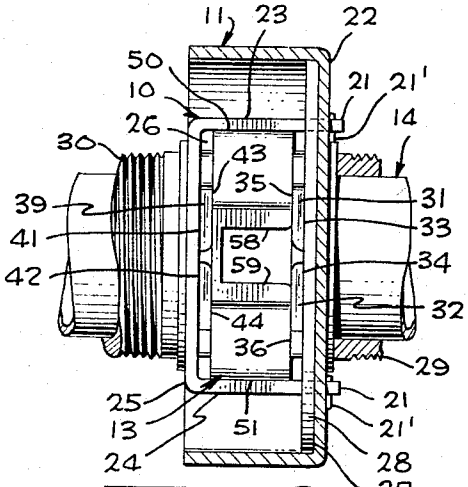


Fig. 2

Fig. 4

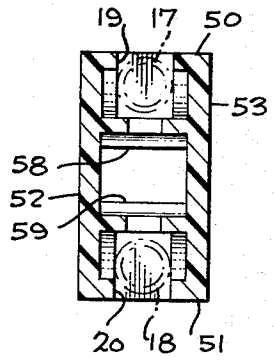


Fig. 3

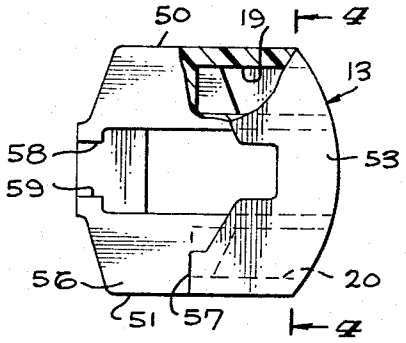
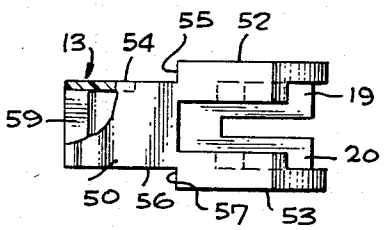


Fig. 5



FRED J. RUSSELL
GEORGE B. SOLOVIEFF
INVENTORS

BY
Beehler & Arant
ATTORNEYS

Nov. 22, 1966 F. J. RUSSELL ETAL 3,287,046

LOW-FRICTION RETRACTOR

Original Filed Oct. 16, 1961 2 Sheets-Sheet 2

Fig. 6

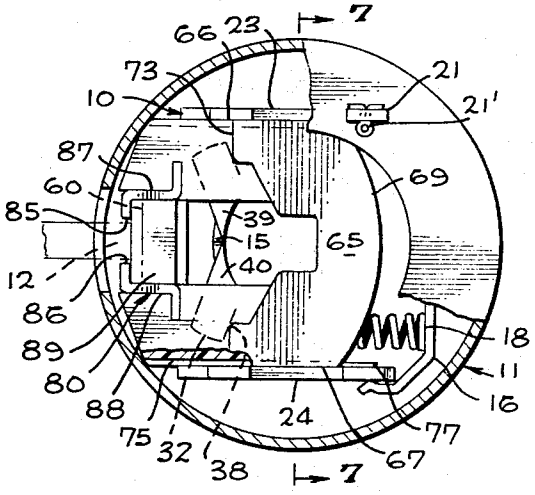


Fig. 7

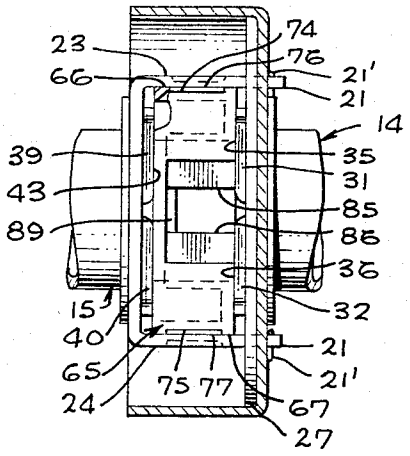


Fig. 8

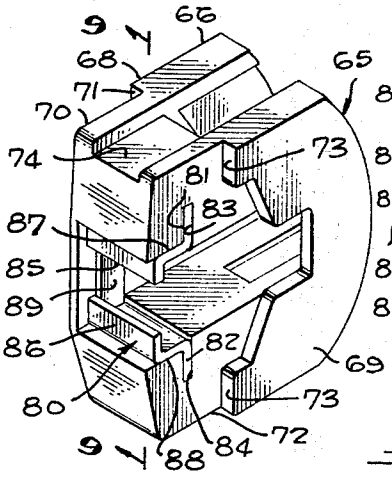


Fig. 9

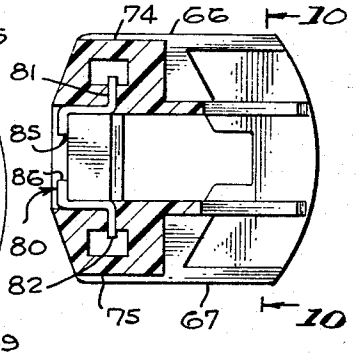


Fig. 10

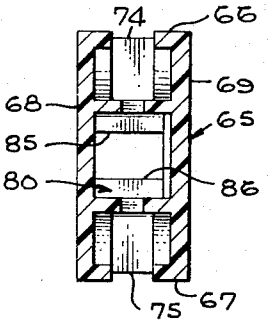


Fig. 11

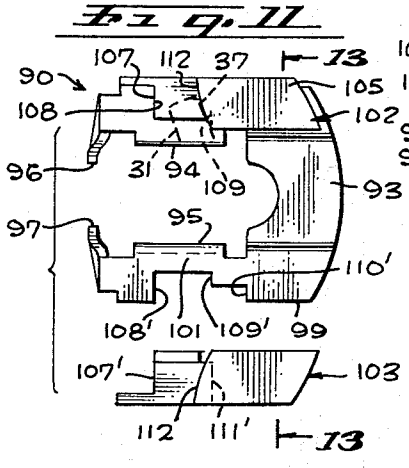


Fig. 13

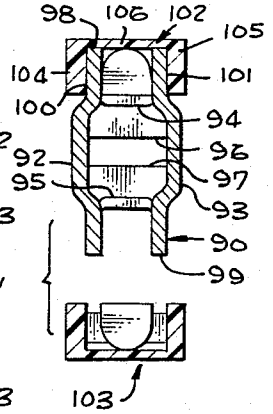
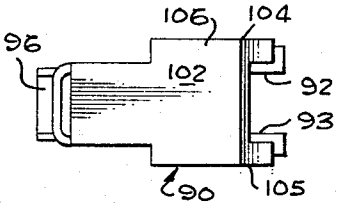


Fig. 12



FRED J. RUSSELL
GEORGE B. SOLOVIEFF
INVENTOR.

BY
Beehler & Arant
ATTORNEYS

United States Patent Office

3,287,046

Patented Nov. 22, 1966

3,287,046

LOW-FRICTION RETRACTOR

Fred J. Russell, 7635 Otis St., South Gate, Calif., and George B. Solovieff, San Clemente, Calif.; said Solovieff assignor to said Russell

Original application Oct. 16, 1961, Ser. No. 145,133. Divided and this application Sept. 14, 1965, Ser. No. 487,261

3 Claims. (Cl. 292—169)

This is a division of patent application Serial No. 145,133, filed October 16, 1961.

The invention relates to door locks and has reference especially to that portion of the lock commonly identified as a retractor for the latch bolt and its relationship to portions of the lock which confine it. In still greater particular, the invention relates to a corelationship between different kinds of materials in order to take advantage of new low-friction materials in certain strategic locations, while at the same time preserving in the lock the necessary ruggedness and dependability required of hardware of this kind.

The conventional arrangement of door locks of the kind here under consideration consists of a metal frame providing a chamber more or less at the mid-area of the lock in which spindles on opposite sides are mounted for rotation and within which is a retractor slide either made of formed sheet metal or some type of metal casting designed to be fastened to the tailpiece of a latch bolt assembly and to reciprocate by rotating retractor elements of the spindles. Under pressure exerted by the reciprocating elements, exterior portions of the retractor slide rub against interior portions of the frame as the frame guides the retractor slide during its movement. The frictional forces, of course, must be overcome by rotation of the spindles. A sufficient clearance must be provided between the retractor slide and the surrounding frame so that the friction will not be too great. The clearances, however, must not be too free, since, otherwise, the operation of the lock will be too noisy or the lock will not operate properly. Problems therefore are inherently present in an all metal lock.

It is therefore among the objects of the invention to provide a new and improved retractor slide for a door lock which is either entirely or partially constructed of low-friction material arranged in such fashion that ruggedness and durability of the parts are not sacrificed.

Another object of the invention is to provide a new and improved retractor slide for a door lock constructed mainly of nonmetallic, low-friction material for all portions of the slide which have to move against either the surrounding frame or with relation to actuation by the spindles, so that a maximum degree of advantage will be taken of the low-friction characteristics of the slide.

Still another object of the invention is to provide a new and improved retractor slide for a door lock which is entirely constructed of nonmetallic, low-friction material arranged in such fashion as to provide multiple advantages of low-friction character, in that exposed portions of the slide in those areas which are prone to engage metallic surfaces all present low-friction engaging areas partly to ease the guiding relationship of the slide in its frame, partly to minimize the effect of friction when the spindle is moved against it, partly to minimize the frictional resistance of other portions of the slide where it engages with the surrounding frame, and further, to minimize wear of the retractor and all lock parts which associate with the retractor.

Also included among the objects of the invention is to provide a new and improved multiple piece retractor slide for a door lock, wherein certain interior parts and, on occasion, parts requiring appreciable tensile strength continue to be constructed of metal but wherein nonmetallic low-friction material is joined with the metal portions, so that all frictionally engaging surfaces of the slide consist of the low-friction material.

With these and other objects in view, the invention consists in the construction, arrangement, and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims, and illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a cross sectional view through the mid-portion of a door lock, showing the side face of a retractor slide in elevation.

FIGURE 2 is a longitudinal sectional view taken on the line 2—2 of FIGURE 1.

FIGURE 3 is a side elevational view of the retractor slide alone, partially broken away to show the interior.

FIGURE 4 is a cross sectional view taken on the line 4—4 of FIGURE 3.

FIGURE 5 is a plan view of the retractor slide of FIGURE 3 partially broken away.

FIGURE 6 is an end elevational view of the mid-portion of a door lock partially broken away showing a second form of the invention.

FIGURE 7 is a longitudinal sectional view taken on the line 7—7 of FIGURE 6.

FIGURE 8 is a side perspective view of the retractor slide alone, of the form of invention of FIGURE 6.

FIGURE 9 is a side elevational view partially broken away taken substantially on the line 9—9 of FIGURE 8.

FIGURE 10 is a cross sectional view taken on the line 10—10 of FIGURE 9.

FIGURE 11 is a side elevational exploded view of still another form of retractor slide.

FIGURE 12 is a plan view of the retractor slide of FIGURE 11.

FIGURE 13 is a cross sectional view taken on the line 13—13 of FIGURE 11.

In an embodiment of the invention chosen for the purpose of illustration, there is shown the mid-portion of a door lock embodied in a frame **10**, a housing **11** surrounding the frame, a tailpiece **12** of a latch bolt assembly (not shown), a retractor slide **13** reciprocatably mounted in the frame and attached to the tailpiece **12**, and spindles **14** and **15** rotatably mounted with respect to the frame for manipulating the retractor slide **13**. The foregoing elements of a door lock of the nature here under consideration are substantially conventional and further include a spring keeper **16**, retained in part by the housing **11** and in part by the frame **10**, in position to confine springs **17** and **18** in their respective pockets **19** and **20** in the retractor slide **13** so as normally to urge the retractor slide **13** in a direction from right to left as viewed in FIGURE 1. As shown, the frame has feet **21** which extend through a wall **22** of the housing **11** to locate the frame **10** in position. The frame **10** includes

upper and lower end walls **23** and **24** and a side wall **25** which define a chamber **26**. The other side wall **27** of the chamber **26** comprises the mid-portion of a disc **28** which fits within the housing **11** against the inside face of the wall **22**. The frame **10** and the housing **11** are held together by cotter pins **21'** which project through holes in feet **21**, as shown in FIGURES 1 and 2.

Inside faces of the end walls **23**, **24** and inside faces of side walls **25** and **27** present sliding surfaces on the four sides of the chamber **26** and assist in confining reciprocation on the retractor slide **13** to a path of movement reciprocating in a transverse direction.

In practice, a spindle bearing **29** forms part of the stationary elements of the lock and it may, for example, be attached to the disc **28**. A similar spindle bearing **30** on the opposite side is attached to the side wall **25** and forms part of the frame **10**. The spindle **14**, which is ordinarily a hollow tubular spindle, has retractor arms **31** and **32** at its inner end within the chamber **26**, and these arms **31** and **32** extend substantially radially outwardly from the spindle **14**. The arms **31** and **32** have faces **33** and **34** on the left side, as viewed in FIGURE 2, which bear against the inside face of the side wall **27**. Faces **35** and **36** of the arms **31** and **32** on the opposite side are substantially in contact with an adjacent portion of the retractor slide **13**. In addition, as shown in FIGURE 1, there is a driving area on an edge **37** of the arm **31** and a driving area on an edge **38** of the arm **32**.

Similarly, the spindle **15** is provided with retractor arms **39** and **40** which are constructed in substantially the same fashion as the arms **31** and **32** and are similarly mounted on the opposite side of the retractor slide **13** for the same purpose. In this instance, faces **41** and **42** of the respective arms **39** and **40** bear against the inside face of the side wall **25**. Opposite faces **43** and **44** are in substantial alignment with the adjacent side of the retractor slide **13**.

In the invention herein disclosed, the retractor slide **13** in the form of the invention of FIGURES 1 through 5 inclusive consists of a single solid piece of nonmetallic low-friction plastic material. Materials which have proven practical and successful include nylon and Delrin. Although other plastic materials also may be acceptable, those chosen need to be able to provide a sufficient amount of tensile strength when injection molded in the form shown or otherwise formed in the shape, proportions, and sectional thickness suggested in the disclosure of FIGURES 3, 4 and 5 and other portions of the drawings.

As appears more clearly in FIGURES 3, 4, and 5, the retractor slide **13** has upper and lower edges **50** and **51** at respective upper and lower sides as viewed in the drawings. It is sufficient that there be adequate area on both edges **50** and **51** although the edges **50** and **51** may take the configuration shown in FIGURE 5 in order to accomodate a practical, lightweight retractor slide member. Opposite side faces **52** and **53** extend between the edges **50** and **51** to form portions of the side walls of the retractor slide **13**. A recessed portion **54** forms a step or shoulder **55** adjoining the side face **52**, whereas a recessed portion **56** on the opposite side forms a step portion or shoulder **57** adjoining the side face **53**. The shoulder in each instance is somewhat composite in its delineation, as shown by the shoulder **57** in FIGURE 1. Jaws **58** and **59** are spaced apart, as shown in FIGURES 1, 2 and 3, in order to receive therebetween the tailpiece **12** and to retain a crosspiece **60** in engagement with the retractor slide **13**. It will be noted that the jaws **58**, **59** are thickened substantially, so as to provide sufficient ruggedness and strength to serve effectively under tension as the tailpiece **12** is manipulated by action of the retractor slide **13**. A rear edge **61** is rounded, as shown, largely as a matter of convenience and to provide some degree of clearance.

In the operation of this form of the device, either of the spindles **14** or **15** may be rotated in a direction either clockwise or counterclockwise in order to reciprocate the retractor slide **13**, and hence the latch bolt, by means of the tailpiece **12**. Assuming, by way of example, that the spindle **14** is to be manipulated, rotation of the spindle **14** in a clockwise direction, as shown in FIGURE 1, forces the driving area of the edge **37** against the shoulder **57** of the retractor slide **13** to move the slide **13** from left to right as viewed in FIGURE 1. Inasmuch as the shoulder **57** is of nonmetallic, low-friction material, namely, the same material from which the retractor slide **13** is constructed, friction between the edge **37** and the shoulder **57** is minimized materially, thus reducing the friction and wear at these contact points. At the same time, and during transverse movement of the retractor slide **13**, the edges **50** and **51** of the slide **13** bear against adjacent areas or faces respectively of the walls **23** and **24** of the frame **10**, and the side faces **52** and **53** of the slide **13** bear against the inside faces respectively of the walls **25** and **27** of the frame **10**. Here again, since the edges **50** and **51** and the side faces **52** and **53** are of the same nonmetallic, low-friction material as the slide **13** itself, there will be a minimum of friction and wear as they move against the metallic inside surfaces of the frame **10**. The low-friction guidance thus provided is a substantial and material improvement, permitting closer tolerances, less frictional resistance, and less wear. Should there be contact between end faces of the retractor arms **31**, **32** and **39**, **40** of spindles **14**, **15** and the surface of recessed portions **54** and **56**, such contact will also be a low-friction sliding contact. By reason of the low-friction sliding engagement of a suitable material for the retractor slide **13** itself, it is possible to reduce allowable tolerances, if desired, in the relationship of the cooperating parts without risk of increasing frictional resistance to an objectionable degree. In point of fact, frictional resistance is actually decreased and the combined result of this substantial reduction in friction throughout the three distinct areas described makes possible a much smooher acting and more durable interior mechanism. Moreover, after manipulation by one or another of the spindles **14**, **15** to retract the retractor slide **13**, the same low-friction effect continues when the slide **13** is returned to initial position by action of the springs **17** and **18**.

In the form of invention illustrated in FIGURES 6 through 10 inclusive, a retractor slide **65** is somewhat different in its construction, although the remaining portions of the lock mechanism with which it is associated are all substantially standard and as described in connection with the first identified form of the device. In this instance, the slide **65** is provided with upper and lower edges **66** and **67** joined respectively by side faces **68** and **69**. A recessed portion **70** on one side forms a step or shoulder **71** adjacent the face **68**. On the other side, a recessed portion **72** forms a step or shoulder **73** adjacent the face **69**. Actually, there are two steps or shoulders formed by the recessed portions and side faces, as clearly shown in FIGURE 8.

If desired, a guide slot **74** may be provided on the upper edge, and a similar guide slot **75** may be provided on the lower edge of the retractor slide **65**. When such an expedient is employed, a guide track **76** is extended inwardly from the upper end wall **23**, and a similar guide track **77** is extended inwardly from the lower end wall **24**, as shown in FIGURES 6 and 7. Adequate clearance is provided between the track and the slot in each instance and between the side faces **68**, **69** and the corresponding inside faces of the side walls **25** and **27** of the frame **10** (shown in FIGURE 2), and the low-friction guidance thus created adds materially to the effectiveness of operation of the slide **65**.

In this form of device, a metal piece indicated generally by the reference character **80** (see FIGURE 8) is inserted in the retractor slide **65**. The metal piece **80** has upper and lower legs **81** and **82** respectively anchored in place in slots **83** and **84**. Jaws **85** and **86** are joined to

the legs **81**, **82** by sections **87** and **88** and a transverse member **89**. The jaws **85** and **86** are spaced apart a distance sufficient to accommodate the tailpiece **12** of the latch bolt housing and to hold behind them the crosspiece **60**. In this form of device, substantially all of the low-friction advantages are retained, and jaws of thinner gauge material, but of edequate tensile strength, are incorporated for operation with the tailpiece **12**.

In still another form of the invention, as illustrated in FIGURES 11, 12, and 13, a retractor slide indicated generally by the reference character **90** is constructed as a multiple piece member wherein the low-friction advantages are retained. In this form of the invention, the body of the retractor slide **90** is of formed sheet material, providing, as shown, sections **92** and **93** on opposite sides. The sections **92** and **93** are joined by transverse sections **94** and **95**. Jaws **96** and **97** extend toward the left as shown in FIGURES 11 and 12 in a position suited to engage the tailpiece **12** of an appropriate latch bolt assembly. It will be noted that upper and lower edges **98** and **99** respectively are spaced apart a distance less than the distance between upper and lower edges **50** and **51** respectively of the frame **10**. Moreover, side surfaces **100** and **101** are spaced apart a distance less than the distance between inside faces respectively of the side walls **25** and **27** of the frame **10**. The distance between sections **92** and **93** is also less than the distance between the side walls **25** and **27**, although greater than the distance between side surfaces **100** and **101**. In other words, the metal portion of the retractor slide **90** is smaller throughout its cross section by a measurable degree than the space within which it is to be operated. To fill the space neatly and to provide a smooth-working, adequate clearance, upper and lower shoes **102** and **103** respectively are installed. The upper shoe **102**, for example, has side elements **104** and **105** overlying respectively side surfaces **100** and **101**. A wearing section **106** interconnects the side elements **104** and **105**. A projection **107** extends downwardly between shoulders **108** and **109** of the metal portion of the retractor slide **90**, whereby to secure the shoe **102** in a fore and aft direction relative to the metal portion of the retractor slide **90**. A similar projection **107'** on the shoe **103** extends between and is retained by similar shoulders **108'** and **109'**. Still another shoulder, as for example the shoulder **110'**, may also be provided if desired to additionally bear against the surface **111'** of the projection **107'**. A similar relationship may also be provided in connection with the shoe **102**.

Further still in this form of device, the side element **105**, for example, on the right side as viewed in FIGURE 11, is provided with an arcuate shoulder **112** having the same low-friction characteristics inherent in the material of the shoe **102**, which is constructed of a nonmetallic plastic material such as has already been identified with the retractor slide **13**. When both of the shoes **102** and **103** are constructed as described and of the same material, they present upper and lower low-friction sliding surfaces to slidably engage respectively the upper and lower edges **50** and **51** of the frame **10**. Here also, side faces of the shoes **102** and **103**, and particularly those portions of the shoes **102** and **103** identified as the side elements **104** and **105**, are positioned so that they can slidably engage the inside face of side wall **25** on one side and the inside face of side wall **27** on the other side, thereby to add to the low-friction guiding support for the slide when it reciprocates.

Further still, the shoulders as represented, for example, by the arcuate shoulder **112** afford low-friction contact with the retractor arms **31** and **32** and especially the edges **37** and **38**. A similar shoulder **112'** cooperates with the retractor arms **39** and **40**.

Still further, since the same retractor arms **31** and **32** overlie the projections **107**, **107'**, any sliding contact which may exist between respectively adjacent faces of the retractor arms **31**, **32** and the shoes **102**, **103** will be low-friction engagements. Accordingly, the multiple piece retractor slide of FIGURES 11 through 13 inclusive, by virtue of employment of the shoes in the manner and form described, builds all of the low-friction advantages of the retractor slides of the first and second described forms of the invention into what is otherwise a metal retractor slide. At the same time, virtually all of the advantages of a metal retractor slide are accomplished.

While the invention has herein been shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein, but is to be accorded the full scope of the claims, so as to embrace any and all equivalent devices.

Having thus described the invention, what is claimed as new in support of Letters Patent is:

1. In a door lock device, a frame assembly and a spindle rotatably mounted on the frame assembly having a rotationally facing driving area thereon, the combination of a multiple piece retractor slide mounted on said frame for operating a latch bolt assembly comprising a molded nonmetallic low-friction material having surfaces on opposite sides in sliding engagement with the frame assembly, a shoulder in a position of engagement with said driving area, and an end edge on said slide adapted to face in the direction of the latch bolt assembly, said edge having an opening therein, and metal insert means embedded in said slide, said insert means having jaws extending toward each other across said opening and leaving a space therebetween for engagement with said latch bolt assembly.

2. In a door lock device, a frame assembly and a spindle rotatably mounted in the frame assembly, said spindle comprising a retractor arm at the inner end extending in a generally radial direction relative to the spindle and including a rotationally facing driving area on said retractor arm, the combination of a multiple piece low-friction retractor slide mounted in said frame for operating a latch bolt assembly, said retractor slide comprising a molded nonmetallic low-friction material having surfaces on opposite sides in sliding engagement with the frame assembly, a shoulder in a position of engagement with the driving area of said retractor arm whereby said retractor slide is operated by rotation of the spindle, an edge of said slide adapted to face in the direction of the latch bolt assembly, said edge having an opening therein, and a metal insert means in said edge of said retractor slide, said insert means having opposite portions thereof embedded in the retractor slide, intermediate portions extending from the interior of said opening toward said edge and exterior portions having inwardly facing oppositely positioned jaws projecting part-way across said opening, said jaws having a space therebetween for engagement with said latch bolt assembly.

3. In a door lock device, a frame assembly comprising axially spaced parallel transverse faces and diametrically spaced parallel walls connecting said faces, a latch bolt assembly, a spindle rotatably mounted on the frame comprising at least one retractor arm at the inner end extending in a generally radially outward direction relative to the spindle, a rotationally facing driving area on said retractor arm, the combination of a retractor slide mounted in said frame for operating a latch bolt assembly, said retractor slide comprising a metal body having a height and breadth smaller than the height and breadth of the frame, and a molded shoe of nonmetallic low-friction material on each diametrically opposite edge of said slide, each shoe having an edge face extending along and forming an outermost edge face of the retractor slide in sliding engagement with the respective wall of the frame, each said shoe having opposite side elements extending over opposite side faces of the retractor slide to locations wider than the retractor slide and in sliding engagement with respective transverse faces of the frame, and

each said shoe having at least one shoulder in contact with the driving area of the retractor arm.

References Cited by the Examiner

UNITED STATES PATENTS

2,897,515	8/1959	Collins	16—93 X
2,933,794	4/1960	Biesecker.	
2,946,614	7/1960	Russell.	
2,953,405	9/1960	Kubik	292—160
2,959,439	11/1960	Russell at al.	292—1
3,024,502	3/1962	Howard	16—93 X
3,112,944	12/1963	Adler	292—169
3,125,366	3/1964	Cetrune et al.	292—169
3,128,115	4/1964	Patriquin et al.	

EDWARD C. ALLEN, *Primary Examiner.*

R. E. MOORE, *Assistant Examiner.*