Dec. 4, 1956 L. F. DUSING 2,772,905

DOOR LATCH MECHANISM

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Fig. 1

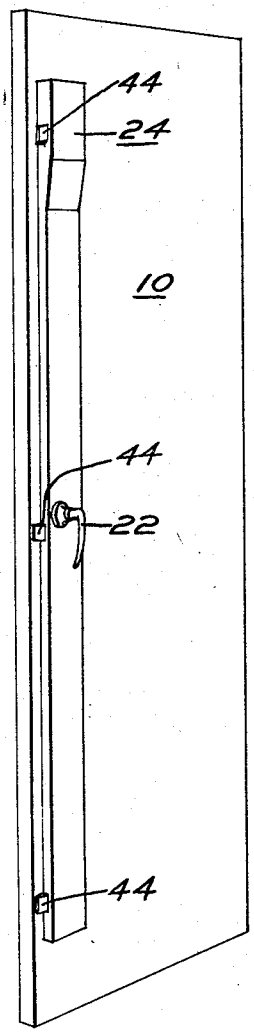


Fig. 2

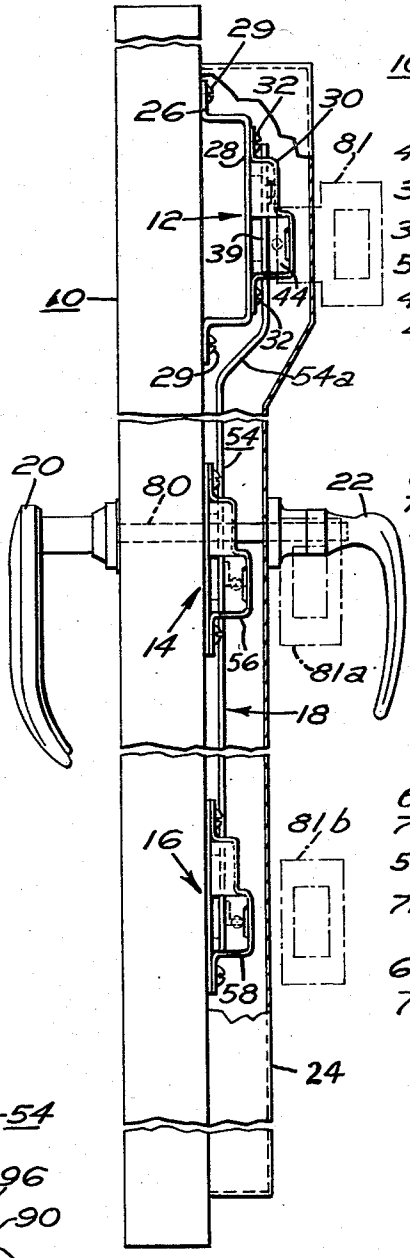
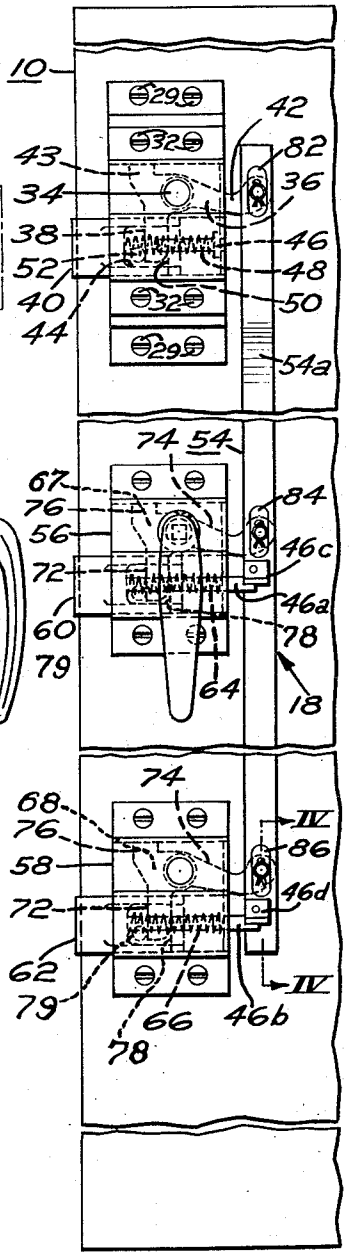


Fig. 3



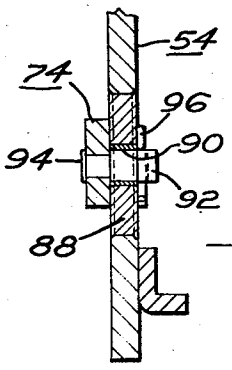


Fig. 4

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DOOR LATCH MECHANISM

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The present invention relates generally to multiple latch door locking arrangements, and more particularly is directed to a spring latch arrangement which is especially adapted for holding massive fire-resistant doors in closed position even under extreme temperature conditions.

An object of this invention is to provide a multiple spring latch arrangement for mounting along the edge of a door, wherein a main latch portion thereof will be arranged to be mounted in outwardly offset relation as compared to a plurality of co-operating spaced auxiliary latch units, the auxiliary latch units being operable upon actuation of the main latch units to retract for clearing their respective door jamb striker plates, whereby all frictional forces incidental to locking of the spring latches will be concentrated in the area of the main spring latch to provide a relatively easily operable and efficient door latching mechanism as compared with prior art multiple spring latch mechanisms of this type.

Another object of this invention is to provide latch operating means in a multiple spring latch arrangement of the aforesaid type including latch interconnection means adapted to be automatically disengaged from each of the respective latch means under pre-determined elevated temperature conditions in order to preclude the possibility of such latch means being forced into door-opening position as a result of wrapping of the connecting linkage due to attainment of such elevated temperature conditions.

Still another object of this invention is to provide a multiple spring door latch arrangement embodying an offset actuating unit, in combination with latch operating means provided with latch interconnection means of the aforesaid type.

Other objects and advantages of this invention will appear in the specification hereinafter.

In the drawing:

Fig. 1 shows a general perspective view of a fire-door embodying one form of the present invention;

Fig. 2 is a fragmentary end elevational view of the device shown in Fig. 1, being partially in section to more clearly illustrate the latching mechanism of the present invention;

Fig. 3 is a fragmentary side elevational view of the device shown in Fig. 2 with the latch mechanism casing being omitted; and,

Fig. 4 is a fragmentary sectional view taken generally along the line IV—IV of Fig. 3.

Referring now more particularly to the drawing, the embodiment of the invention illustrated therein comprises a fire-resistant door **10**, a main latch mechanism **12**, supplemental latch mechanisms **14** and **16**, latch connection means **18**, latch handles **20** and **22**, and a latch casing **24** (Figs. 1, 2 and 3).

The main latch mechanism **12** is shown to be mounted on a flanged support member **26** by affixation to a central offset portion **28** thereof, the member **26** being secured by means of a plurality of screws **29** to the upper portion

of the door **10** adjacent a side edge thereof (Fig. 3). A main latch casing portion **30** will be secured to the offset portion **28** by means of a plurality of screws **32** for further supporting the main latch as more particularly described hereinafter.

The upper portion of the casing **30** is provided with a crank pin **34** fixed in the walls thereof for the purpose of pivotally mounting a bolt-actuating bell crank **36**. The bell crank **36** has a bolt-actuating arm **38** arranged to depend downwardly between the inner side portion **39** of a main bolt member **40** and the outer face of the support flange portion **28**. An opposed crank arm **42** of the crank **36** extends away from the pin **34** to provide a crank actuating arm portion.

These crank arm portions **38** and **42** are limited against further clock-wise movement from the position shown in Fig. 3 by means of a casing-abutment portion **43** as more fully discussed below.

The main bolt member **40** is shaped in the customary manner in order to have a cam surface portion **44** at its outer end for hitting against a door jamb striking plate **81** (shown in dotted lines in Fig. 2) to cam the bolt into retracted position, the back end portion of the main bolt **42** being cut away to provide a recess **44** therein into which extends one end of a compression spring supporting member **46** having its opposite end fixed to the side wall of the casing **30** (Fig. 3). A compression spring member **48** fits over the support member **46** so as to be compressed between the side wall of the casing **30** and the base portion of the recess **44** to resiliently urge the main bolt **40** outwardly into its striker plate engaging position.

The inner side portion **39** of the main bolt **40** is provided with a shoulder portion as indicated at **50** in abutting relation to the rear edge portion of the depending crank arm **38**, and also a protuberance **52** in spaced relation to the portion **50** for abutting the front edge portion of the crank arm **38** (Fig. 3) whereby the main bolt **40** will be actuated between open and closed positions responsive to rotary movements of the crank arm **42**. The abutment portion **43** of the crank **36** limits pivotal movement of the crank in a rotary clock-wise direction so as to retain the main bolt **40** against further movement outwardly as a result of the resilient urge of the spring **48** and thereby will maintain the bolt in assembled relation while being free to be cammed backwardly during a door closing operation as by striking the keeper plate **81**.

The latch connection mechanism **18** will include a crank actuating member **54** disposed generally parallel to the edge of the door **10** preferably inwardly of the latch units **12**, **14** and **16** as shown in Figs. 2 and 3. The member **54** is of generally elongate form bent at its upper end into an offset portion **54(*a*)** as more particularly noted below (Figs. 2 and 3).

The latch units **14** and **16** will be constructed in a manner similar to that described above for the main latch unit **12** with the exceptions noted below. Thus, the latch units **14** and **16** will include latch housings **56—58**; supplemental latch bolts **60—62**; compression latch bolt springs **64—66**; pivotally mounted bell cranks **67—68** each having crank arm portions **72** and **74** and a casing abutment portion **76**; the latch bolts each having a shoulder **78** and a protuberance **79** for engaging the crank arm portions **72** (Figs. 2 and 3); these parts being constructed and arranged in a manner similar to their corresponding parts as described above for the main latch **12**. One exception from the arrangement of the main latch **12** is that the housings **56** and **58** of the latches **14** and **16** preferably will be affixed directly to the center and lower portions of the door **10** in substantially vertical alignment with the unit **12** but being offset from this unit in a direction toward the mounting surface

of the door **10** to position the supplemental latch bolts **60** and **62** in offset relation relative to the main latch bolts **40** thereof for the purpose set forth below. Another exception from the arrangement of the main latch **12** is that the latch bolts **60** and **62** of the supplemental latches **14** and **16** will be provided with integral spring mounting pedestal portions **46**(*a*) and **46**(*b*) extending rearwardly from cut away recesses **44**(*a*) and **44**(*b*) in the back end thereof for supporting the compression springs **64—66** in place of mounting these pedestal portions integrally with their casings as in the case of the main latch **12**. These pedestals **46**(*a*) and **46**(*b*) will extend through their respective casings **56—58** for abutment against a flange portion of a pair of spaced angle-iron tabs **46**(*c*) and **46**(*d*) fixed to the member **54** as shown in Fig. 3. Thus, the supplemental latch bolts **60** and **62** will be precluded from retraction against the resilient urge of their springs **64—66** except upon actuation of the main latch mechanism **12** into retracted position.

As shown most clearly in Fig. 3, the crank connecting member **54** will be pivotally connected, in a manner more fully described below, at spaced positions along its length to the outer ends of the respective bell crank arm portions **36—74—74** of the respective latch mechanisms **12**, **14** and **16**. Of course, it will be appreciated as is commonly known in the art that the handle members **20** and **22** will be mounted on a spindle member **80** fitted through the door **10** and keyed by way of example to the bell crank **74** of the latch unit **14**. Thus, rotation of the handle members **20** or **22** will simultaneously cause all of the bell cranks to retract against the urge of their respective springs **50**, **64** and **66** by virtue of their interconnection through the medium of the member **54** for the purpose of manually opening and closing a door, the handles and the latch bolts of the latch arrangement automatically returning to their normal positions upon release thereof.

It will be appreciated to be a particular feature of the present invention that by virtue of the offset mounting of the main bolt **40**, the cam portion **44** thereof will strike the door striker plate portion of its respective keeper plate **81** (shown in dotted lines in Fig. 2) in advance of the arrival of the supplemental bolts **60** and **62** of the latch units **14** and **16** at their respective keeper plates **81**(*a*) and **81**(*b*) (also shown in dotted lines in Fig. 2). Thus, for example, the intertia of the door when swung toward closed position will provide sufficient force to cause the striker plate portion of the keeper plate **81** to bear against the cam portion **44** of the main bolt **40** to overcome the resilient urge of the compression spring **48** acting thereon and also to simultaneously pivot the bell crank member **36** about its pivotal mounting **34** for actuating the member **54** to simultaneously rotate the bell crank members **74** of the latch devices **14** and **16** and thereby to retract their respective latch bolts **60** and **62** in advance of their arrival at the door jamb.

Therefore, by virtue of the above described arrangement, frictional contacts between the bolts **60** and **62** and their respective keeper plates **81**(*a*) and **81**(*b*) will be avoided to provide an improved highly efficient multiple bolt door locking arrangement in which the number of wear points along the door jamb will be reduced. This will, of course, reduce maintanence costs and will also increase the useful life of locking arrangements embodying the invention. More particularly, the single frictional camming surface makes it possible for all three bolts to be operated simultaneously by normal door closing forces.

Another important feature of the present invention lies in the means for effecting interconnection between the crank operating member **54** and the bell cranks **36—67—68**. As shown in the enlarged detail of Fig. 4, the member **54** will be provided with a plurality of elongate slots **82**, **84** and **86**. These slots will be filled with a low-melting material **88**, as for example lead, by any suitable means so as to be integral with the member **54**. The lead fill **88** is provided with wear-bushing **90** substantially centrally thereof for supporting a connecting pin **92** in journaled relation therethrough. The pin **92** is headed at one end as shown at **94** for pivotally connecting the crank arms as for example the arm portions **74** (Fig. 4), to the member **54** and will be provided with a cotter pin **96** at its opposite end for retaining the parts in assembled relation.

Thus, upon attainment of the preselected melting point of the above fill **88**, the pivotal interconnection between the member **54** and the bell cranks will be released. Hence, in the event of a fire, or extreme heat condition in the vicinity of doors embodying the invention, the multiple latches of the present latching arrangement will become individually operable latch units whereby warpage of the member **54** will not be likely to cause the latch bolts to retract to permit the door to open at an inopportune time before the fire or extreme temperature condition is brought under control.

While one particular embodiment of the present invention has been shown and particularly described in detail herein, it will be understood that the invention is not so limited but that various changes and modifications may be made therein without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. In a fire-door construction, a multiple latch bolt door locking arrangement comprising a main latch bolt assembly operably connected to a plurality of supplemental latch bolt assemblies arranged in vertically aligned relation adjacent the edge of a fire-door, each of the latch bolt assemblies having resiliently outwardly urged bolt means and pivotally mounted bell crank means having one arm of each thereof in engagement with said bolt means, the opposite arms of said bell crank means being pivotally interconnected by a link member for simultaneous movements thereof, said main latch bolt assembly being offset laterally away from the inside door face out of alignment with the supplemental latch bolt assemblies whereby the bolt means of said main latch bolt assembly will strike its keeper plate in advance of the arrival of the bolt means of the supplemental latch bolt assemblies at their respective keeper plates, whereby the bolt means in said main latch bolt assembly will be retracted upon striking its keeper plate and thereby simultaneously retract the bolt means of the supplemental latch bolt assemblies out of contact with their respective keeper plates.

2. In a fire-door construction, a multiple bolt door locking arrangement including a main bolt, a plurality of supplemental bolts arranged in vertically aligned relation adjacent the edge of a fire-door, resilient means urging said bolts into door closing position, a plurality of bell crank means being pivotally mounted in connection with said door bolts for movements therewith, means pivotally interconnecting said bell crank means so that movement of one of said bolts against the urge of said resilient means will correspondingly retract the other bolts, said main bolt being mounted inwardly relative to the other bolts so as to strike its door jamb keeper plate in advance of the arrival of the other bolts whereby the other bolt means will be simultaneously retracted for fitting into their respective keeper plates.

3. In a fire-door construction, in combination, a plurality of spring-pressed bolts in operably interconnected relation for simultaneous retracting movements responsive to actuation of any one thereof, door jamb keeper plates having a bolt striking portion, one of said bolts being positionally offset out of alignment with the remaining latch bolts in order that the former will strike said striking portion of its respective keeper plate in advance of the remaining latch bolts relative to their respective striking portions so as to cause said other latch bolts to retract to clear their respective keeper plate strik-

ing portions incidental to a door closing operation so as to be fitted into their keeper plates with substantially no frictional contact therebetween.

4. In a fire-door construction provided with a plurality of spring latch bolt means at spaced intervals along a side edge thereof, bell cranks each having one arm in engagement with a corresponding bolt means, the other arms of said bell cranks being pivotally connected to an elongate link member by means of a pin member journalled in a bushing supported in a bushing support portion of said link member, the bushing support portion having a preselected melting point, said bolt means being linked for simultaneous operation except upon attainment of said melting point of said bushing support portion whereby warping of said link member due to elevated temperatures will not actuate said bolt means to open the fire-door.

5. In a fire-door construction, a plurality of spring latch bolt means mounted at spaced intervals along a side edge of a fire door, latch bolt actuating means being in operably interconnected relation with each of said latch bolt means for normal simultaneous actuation thereof, said latch bolt actuating means being arranged to embody a relatively low melting point material at spaced positions therein for supporting each of the points of interconnection thereof with each of said spring latch bolts in order that upon occurrence of a temperature above said melting point in the vicinity of the fire-door said supporting material embodied in said member will melt to release said points of interconnection.

6. In a fire-door construction, a multiple latch door locking arrangement comprising a main bolt, a plurality of supplemental bolts, said bolts being arranged in vertically aligned relation adjacent the edge of a fire-door, keeper plate means associated with the door jamb, spring means resiliently urging each of said bolts outwardly into door closing position, means pivotally interconnected to said bolts for normal simultaneous actuation thereof,

said means being arranged to embody a low melting point material for normally supporting the pivotal connections thereof with said bolts whereas upon the occurrence of temperatures above the melting point said material will melt to operably disengage said means from said bolts, said main bolt being offset out of alignment with the supplemental bolts in a direction away from the inside face of the door so that said main bolt will strike said keeper plate means in advance of the arrival of the supplemental bolts thereat during closing of the door whereby said main bolt will be retracted as a result of striking said keeper plate means and thereby will simultaneously retract the supplemental bolts out of contact therewith.

7. In a fire-door construction, a plurality of spring pressed latch bolts mounted at spaced intervals along a side edge of the fire door, a door jamb, keeper plates mounted in said door jamb in horizontal alignment with said latch bolts, one of said keeper plates being laterally offset in the direction of approach of said latch bolts, first means associated with one of said latch bolts for manual retraction thereof, second means connected to said bolts to normally permit simultaneous actuating movements thereof responsive both to manual operation of said first means and retraction of one of said bolts as by camming it to retract incidental to its striking the offset keeper plate in the door jamb, said second means incorporating a low melting point material arranged for normal support of the points of connection with said bolts and operable release thereof upon attainment of the melting point temperature in the vicinity of the door.

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