

REPLACED SHEETS SG

✓ Description : paged ...2... to paged ...5.....  
 ✓ Claim(s) : paged ...10... to paged ...14.....  
 Drawing(s) : paged ..... to paged .....  
 ✓ Abstract : paged ...9... to paged ...11.....

1

CLOSURE MECHANISM FOR AIRTIGHT DOORS

This invention relates to a closure mechanism for a door and, in particular, to a compression bolt arrangement for an air tight door.

A known prior art door closure arrangement is shown in Figure 1. Conventional locking arrangements of this type for doors (1) usually comprise a striker plate (5) (or keep) received within a door frame (3) and a spring-biased bolt (7) received within a bolt case (2) provided within or on the door (1), the bolt (7) engaging the striker plate (5) upon closing of the door (1). Typically, the closing side (9) of the bolt (7) is tapered so as to facilitate the location of the bolt (7) within the striker plate (5).

These prior art arrangements, whilst adequately performing the function for which they were designed, suffer serious disadvantages when employed in Blast Doors and the like. Specifically, a conventional door (1) does not provide an airtight seal against the door frame (3) thereby possibly allowing poison gases, for example, to permeate between the door (1) and the frame (3). Attempts have been made to overcome this problem by providing a gasket (11), received within the door frame (3), so that, upon closing of the door (1), the gasket (11) comes into abutment with the door (1) and is deformed by the door (1) thereby providing an airtight seal. However, a significant problem exists with such an arrangement in that it is difficult to close such an airtight door and it is difficult to achieve the requisite amount of gasket compression to provide a satisfactory airtight seal.

A second problem associated with the prior art is that the doors may only be sealed in their "airtight" position as no provision is made for a "quick" latching of the door. It is envisaged with a blast door, for example, that situations may prevail in which it is merely necessary

to provide a non-airtight latching arrangement whilst in time of conflict, for example, the door may need to be fully airtight.

5           Specifically, therefore, it is an aim of the present invention to provide an airtight door which is easily sealable and which may be closed in either an airtight position or a non-airtight latched position.

10           In accordance with the present invention, there is provided a closure mechanism for a door hinged to a frame, comprising a bolt and bolt drive mechanism for mounting on a door, and a keep for mounting on the frame of the door, wherein the bolt and keep are shaped such that, as the bolt  
15 enters the keep during use, the door is drawn towards the frame to improve the seal between the door and the frame.

          In one embodiment, the bolt is tapered, the taper causing the door to be drawn towards the door frame as the  
20 bolt enters the keep.

          In another embodiment, the keep includes a tapered portion which causes the door to be drawn towards the door frame as the bolt enters the keep.

25           Although not specifically described herein, in a further embodiment both the bolt may be tapered and the keep may include a tapered portion to assist in driving the door towards the door frame.

30           Preferably, the door frame is provided with a gasket running around its circumference such that closing of the door causes compression of the gasket. The gasket may be seated in a trough, the trough being provided in a portion  
35 of the door frame facing the door's closing face. Alternatively, the gasket may be mounted on the door itself and abut the door frame upon closing of the door.



Preferably, the bolt and keep are provided with initial flat portions so that the bolt may initially enter the keep without drawing the door towards the door frame. By including this feature, the locking mechanism allows the  
5 door to be simply latched rather than fully closed.

In one embodiment, the bolt drive mechanism comprises a cam which, when rotated, extends or retracts the bolt.

10 In another embodiment, the bolt may be extended by means of a cam mounted on a bar which, during use, is driven in a direction substantially perpendicular to the axis of the bolt. In either event, the cam may be shaped to provide two distinct extended positions of the bolt.

15

A lever may be connected to the bolt by a pin, the lever being pivotable and being connected at its other end to a connecting bar for driving one or more other bolts.

20 If the bolt drive mechanism includes a bar, the bar may include a rack which interacts with a drivable pinion.

The bolt may be fitted with a collar against which a spring bears to drive the bolt away from the keep.

25

In another embodiment, the bolt drive mechanism may comprise a pinion connected to a handle, the pinion being engagable with a rack provided on the bolt, thereby enabling the bolt to be wound into and out of the keep.

30

As will be appreciated, the various bolt drive mechanisms described herein may be used in any combination to extend and/or retract a single bolt or a plurality of bolts.

35

Preferred embodiments of the instant invention will now be described, by way of example only, in conjunction with the appended drawings, in which :

Figure 1 is a plan view of a lateral cross-section through a prior art closure mechanism,

Figure 2 is a plan view of a lateral cross-section through a closure mechanism according to the present invention,

Figure 2A is a cross-section through a bolt used in conjunction with the present invention,

Figure 3 is an alternative embodiment to that of figure 2 showing an alternative closure mechanism according to the present invention,

Figure 4 is a vertical cross-section through a door and a bolt case in accordance with the present invention showing one embodiment of a bolt drive mechanism, and

Figures 5 and 6 are second and third embodiments respectively of bolt drive mechanisms.

With reference to Figure 2, a closure mechanism according to the present invention enables a door (15) to be sealed against a door frame (19) so as to provide either an airtight seal or non-airtight seal as required. The door (15) is provided with a tapered bolt (13) which is engageable with a keep or striker plate (17) provided within a cavity in the door frame (19) upon closure of the door and operation of the mechanism. The locking mechanism is contained within a locking chamber (16) provided within a cavity in the door (15). The door frame (19) has a trough (21) running about its circumference into which a gasket (23) is inserted. The gasket (23) is placed so as to be capable of coming into airtight sealing abutment with the door's closing side (25) when the door is fully closed. With reference to Figure 2A, the cross-sectional shape of the bolt (13) may be clearly seen. The bolt (13) has a flat section (31) together with a tapered section (27).

In operation, the door's closing side (25) is initially brought into light contact with the gasket (23). The locking mechanism is then actuated and the flat section (31) of the bolt (13) is extruded into the striker plate

(17). At this point, the door (13) is effectively locked without providing an airtight seal against the gasket (23). Continued actuation of the locking mechanism causes the tapered section (27) to contact the striker plate (17) as the bolt (13) extends further from the door (15). The tapered section (27) on the bolt (13) forces the door (15) to move towards the gasket (23), thereby exerting a compressive force on the gasket (23) and causing the creation of an air tight seal.

10

In this way, the instant invention enables the creation of far superior seals to those achieved by the prior art. The tapered section (27) may be adjusted so as to increase or decrease the compressive force exerted on the gasket (23).

15

Figure 3 shows an alternative embodiment where the striker plate (17) is provided with a tapered surface (33). The bolt in this embodiment is rectangular and has no tapering. The striker plate (17) has a flat section (35) which engages with the bolt (13) to provide a non-airtight seal upon actuation of the locking mechanism. Continued actuation of the mechanism causes the bolt (13) to contact the tapered section (33) of the striker plate (17) thereby exerting a compressive force on the gasket (23) to provide an airtight seal.

20

25

The increased compressive forces provided by such an arrangement necessitate the provision of a strengthened bolt driving mechanism. Figures 4 and 5 show different embodiments of multiple lock driving mechanisms employable with a closure arrangement according to the present invention.

30

35

With reference to Figure 4, a vertical cross section through the door (15) and locking chamber (16) is portrayed. As shown, the bolt (13) is received within a bolt guide (37) inserted within the door (15). Affixed to one end of the

bolt (13) by a pin (42) is a lever (43) which pivots about a pivot point (45). Provided in abutment with the bolt (13) is a cam (41), the cam (41) being connected to a handle (39) provided on the exterior of the door. The lever (43) is  
5 substantially "L" shaped and is connected to the bolt (13) at one end and to a connecting bar (47) at the other. The connecting bar (47) may be connected to other locking means so that actuation of the handle (39) causes all the locking devices on the door to close.

10

In operation, the handle (39) is turned by an operator when it is desired to close the door (15). Operation of the handle causes the cam (41), to which the handle (39) is attached, to rotate. The rotating cam (41)  
15 bears upon the bolt (13) thereby causing the bolt (13) to be extruded from the bolt guide (37). Movement of the bolt (13) causes the connected lever (43) to pivot about the pivot point (45) thereby imparting an associated upward or downward movement to the connecting bar (47). The degree of  
20 movement of the handle is continuously variable so as to enable the bolt to be extruded into the striker plate to such an extent that the door is either in its non-airtight position or its airtight position, or any other position in between. The connecting bar (47) may be connected to other  
25 locking systems so that when the connecting bar (47) is moved in an upward direction all the bolts (13) are extruded from their respective bolt guides. The other locking mechanisms may comprise a similar arrangement to that of Figure 4 without, of course, the need for a handle (39) and  
30 cam (41). To open the door (15), the handle (39) is rotated in the opposite direction thereby moving the cam (41) out of abutment with the bolt (13). The weight of the connecting bar (47) then causes the lever (43) to return to the position shown in Figure 4, thereby withdrawing the bolt  
35 (13). If desired, spring return means may be provided about the bolt (13), in a manner similar to that shown in Figure 5, so as to facilitate the withdrawal of the bolt (13).

Figure 5 shows a second embodiment of the strengthened bolt drive mechanism used in conjunction with a closure mechanism according to the present invention.

5           In this embodiment, the bolt (13) is provided with a collar (49) about one end. Disposed about the bolt (13) and in between the bolt guide (37) and the collar (49) is a helical spring (51) or other spring means. The handle (39) is connected to a pinion (55) which engages a rack (53) on  
10 the connecting bar (47). Repeated winding of the handle (39) causes the pinion (55) to engage the rack (53) thereby winding the connecting bar (47) in an upward or downward direction. Additionally provided on the connecting bar (47) is a cam (57) which is placed so as to engage the collared  
15 end of the bolt (13) upon winding of the handle (39). The cam (57) is provided with a first tapered portion (59), a first flat portion (61), a second tapered portion (63) and a second flat portion (64).

20           In operation, the handle (39) is wound by the operator and the pinion (55) engages the rack (53) provided on the connecting bar (47). As the connecting bar is moved in an upward direction, the first tapered portion (59) of the cam (57) is brought into sliding abutment with the  
25 collared end of the bolt (13). Continued operation of the handle causes the first tapered section (59) of the cam (57) to apply a lateral force to the collared end of the bolt (13) thereby causing the bolt (13) to be extruded from the bolt guide (37) into the striker plate (not shown) and  
30 causing partial compression of the spring means (51). At this point, the door (1) is locked in its non-airtight position. Further operation of the handle (39) causes the flat portion (61) of the cam (57) to slide under the collared end of the bolt (13) without further extruding the  
35 bolt (13) from the bolt guide (37). Continued winding of the handle (39) causes the second tapered portion (63) of the cam (57) to be brought into abutment with the collared end of the bolt (13). The action of the second tapered

portion (63) on the bolt (13) causes the bolt to be further extruded from the bolt guide (37) into the striker plate (not shown) and causes further compression of the spring means (51). In this way, the tapered section (27) of the  
5 bolt (13) or the tapered section (33) on the striker plate slides against the striker plate (17) or bolt (13) respectively and causes the door (15) to compress the gasket (23), thereby creating an airtight seal.

10 As mentioned above, the connecting bar (47) may be further connected to other locking mechanisms by way of a lever, as in figure 4, or by way of further cams provided on the connecting bar (47). Alternatively, the locking bar (47) could be provided with a bolt on its upmost end, so  
15 that the bolt would be extruded into the door frame upon upward movement of the bar (47). It is envisaged that any combination of Figures 4 and 5 may be employed either singly or jointly and such combinations will be obvious to the skilled man in the art.

20 Figure 6 shows a third simpler embodiment of a bolt driving mechanism suitable for use with the instant invention. In this embodiment, the handle (39) is connected to a pinion (65) which engages a rack (67) provided on the  
25 bolt (13). Operation of the handle (39) by the operator causes the pinion (65) to engage the rack (67) on the bolt (13) thereby enabling the bolt to be wound out of or withdrawn into the bolt guide (37). This embodiment may be used as a single lock, or a multiplicity of such devices may  
30 be provided on a door. Alternatively, the embodiment of figure 6 may be combined with the embodiments of figures 4 and 5, or any combination thereof, as necessary.

It will be understood, of course, that the present  
35 invention has been described by way of example only and that various modifications may be made without departing from the scope of the appended claims.

For example, additional means may be provided on the exterior of the door or within the locking chamber so as to lock the handle or cam in a preselected position, thereby further ensuring that the bolt will not be subject to any unwanted movement caused by blast vibrations or the like. Such additional means may alternatively be provided on the bolt and be engageable with corresponding means provided on the interior of the bolt guide. Again, various solutions will be apparent to the man skilled in the art.

10

Additionally, the bolt or striker plate may be provided with a one-stage compressive mechanism so that operation of the handle always causes compression of the gasket.

15

It is also conceivable that an airtight seal may be achievable without the provision of a gasket, although a gasket is obviously preferable for safety.

CLAIMS

1. A closure mechanism for a door hinged to a frame, comprising a bolt and bolt drive mechanism for mounting on  
5 a door, and a keep for mounting on the frame of the door, wherein the bolt and keep are shaped such that, as the bolt enters the keep during use, the door is drawn towards the frame to improve the seal between the door and the frame.
- 10 2. A closure mechanism according to claim 1 wherein the bolt is tapered, the taper in use causing the door to be drawn towards the door frame as the bolt enters the keep.
- 15 3. A closure mechanism according to claim 1 or claim 2 wherein the keep includes a tapered portion which, during use, causes the door to be drawn towards the door frame as the bolt enters the keep.
- 20 4. A closure mechanism according to any preceding claim wherein the bolt and keep are provided with initial flat portions so that the bolt initially enters the keep without drawing the door towards the door frame.
- 25 5. A closure mechanism according to any preceding claim wherein the bolt drive mechanism comprises a cam which, when rotated, extends or retracts the bolt.
- 30 6. A closure mechanism according to any of claims 1 to 4 wherein the bolt is extended by means of a cam mounted on a bar which, during use, is driven in a direction substantially perpendicular to the axis of the bolt.
- 35 7. A closure mechanism according to any preceding claim wherein a lever is connected to the bolt by a pin, the lever being pivotable and being connected at its other end to a connecting bar for driving one or more other bolts.
8. A closure mechanism according to claim 6 or claim 7



wherein, the bar includes a rack which interacts with a drivable pinion.

9. A closure mechanism according to claim 5 or 6 wherein, the cam is shaped to provide two distinct extended positions of the bolt.

10. A closure mechanism according to any preceding claim wherein the bolt is fitted with a collar against which a spring bears to bias the bolt away from the keep.

11. A closure mechanism according to any of claims 1 to 4 wherein, the bolt drive mechanism comprises a pinion connected to a handle, the pinion being engageable with a rack provided on the bolt, thereby enabling the bolt to be wound into and out of the keep.

12. A closure mechanism substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

13. The combination of a door and door frame, comprising one or more closure mechanisms according to any preceding claim.

14. The combination of claim 13 wherein the door frame is provided with a gasket running around its circumference such that closing of the door causes compression of the gasket.

15. The combination of claim 14 wherein the gasket is seated in a trough, the trough being provided in a portion of the door frame facing the door's closing face.

16. The combination of claim 14 wherein the gasket is mounted on the door and abuts the door frame upon closing of the door.

17. A blast door incorporating a closing mechanism

according to claim 1 substantially as hereinbefore described  
with reference to and as shown in the accompanying drawings.



---

This Sheet Has Been Replaced

