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(71) Applicant: **VON DUPRIN, INC.**
Indianapolis, IN 46219 (US)

(72) Inventors:
- **Nigro, Daniel N., Jr.**
  Ocean Springs, Mississippi 39564 (US)
- **Siller, Eugene Karl**
  Indianapolis, IN 46250 (US)

(74) Representative: **Feakins, Graham Allan et al**
RAWORTH, MOSS & COOK
RAWORTH HOUSE
36 Sydenham Road
Croydon, Surrey CRO 2EF (GB)

(54) Roller guide for a deadbolt

(57) A roller guide for use with a slidable deadbolt (10) which uses two rollers (22, 23), one positioned proximate each face of the deadbolt. Preferably, one roller (23) is attached to a deadbolt housing and the other roller is axially offset and is attached to the strike (22).

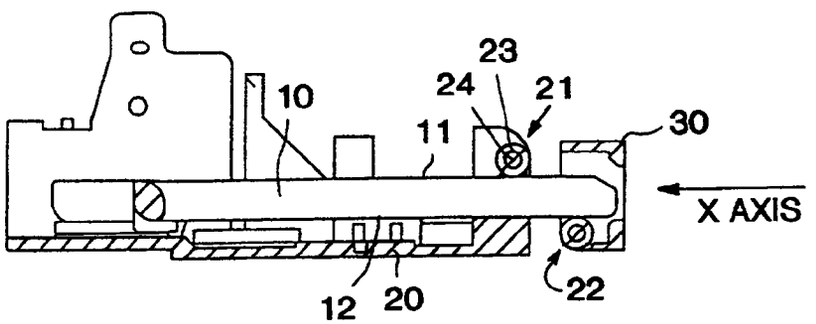

FIG. 2A

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Description

[0001] This invention relates generally to deadbolts and more particularly to roller guides for deadbolts.

[0002] An exit alarm lock is a door lock assembly that sounds an audible horn or alarm at the push-activated release of the locking element. These door locks are often used on the back doors of retail establishments such as restaurants and strip malls as a deterrent to unauthorized egress through the openings upon which the devices are installed. Their use is typically provoked by a security event such as internal shrinkage by employees or customers. Because internal as well as external security is an important issue for doors upon which these devices are installed, it is important that the design of the latching be robust and dependable. As these devices must release the latching reliably in the event of a panic situation, the design of the releasing mechanism must be durable and consistent. Additionally, a panic situation may lead to a scenario in which more than one person is attempting to pass through the exit opening. In this case, it is possible that one or more persons may actually apply force to the door face directly thereby preloading the latching mechanism. Design of the deadbolt supports must minimize deadbolt internal forces and resistive frictional forces in this preloaded condition.

[0003] According to one aspect of the present invention, there is provided, in combination, a housing, a deadbolt slidable within the housing, the deadbolt being moveable between a retracted position and an extended position, the deadbolt having spaced apart first and second faces,a strike positioned proximate the housing, a first roller attached to the housing and positioned adjacent the first face of the deadbolt and a second roller attached to the strike and being positioned adjacent the second face of the deadbolt when the deadbolt is in the extended position.

[0004] According to a second aspect of the present invention there is provided, in combination, a housing, a deadbolt axially slidable within the housing, the deadbolt being moveable between a retracted position and an extended position, the deadbolt having spaced apart first and second faces, a strike positioned proximate the housing, a roller means for minimizing resistive forces on the deadbolt, the roller means comprising a first roller proximate the deadbolt first face and a second roller proximate the deadbolt second face, the first roller being axially spaced from the second roller.

[0005] For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

Figs. 1A to 1C are plan views of a deadbolt and roller guide in an extended position, in an intermediate position between extended and retracted, and in a retracted position; and

Figs. 2A to 2C are cross-sectional views of Figs. 1A to 1C, respectively.

Fig. 1A shows a deadbolt 10 which is preferably for use with an exit alarm lock.

[0006] A deadbolt 10 is slidably mounted in a housing 20. Preferably, the deadbolt 10 is used with an exit alarm lock. The deadbolt 10 is axially slidable between an extended position (see Figs. 1A and 2A) and a retracted position (see Figs. 1C and 2C). Two roller guides or rollers 21, 22 are provided to guide the deadbolt 10 as it moves between the retracted and extended positions. Each roller 21, 22 consists of an outer roller 23 about a central pin 24. Preferably, the rollers 21, 22 are positioned to minimize the resistive forces on the deadbolt 10. One roller 21 is attached to the housing 20 and is proximate a first face 11 of the deadbolt 10 and the other roller 22 is attached to the strike 30 and is proximate a second face 12 of the deadbolt 10.

[0007] Referring to Figs. 1A and 2A, it can be seen that the deadbolt 10 rests within the lock housing 20 which is designed to allow freedom of sliding along the X axis. A bell crank contact point is on a shoulder 14 on the deadbolt 10, and the deadbolt 10 rests between the strike roller 22 and the housing roller 21 on its front end and on rear support rails 15 towards its back end.

[0008] When a load is applied to the door on which the exit device with deadbolt 10 is attached, a resultant force N1 is transmitted from the strike roller 22 to the bottom deadbolt face 12 as shown in Fig. 2B. Forces N2 and N3 are resultant forces which act to keep the deadbolt 10 in equilibrium from linear or rotational motion. When a force P is applied to the deadbolt shoulder 14 acting to retract the deadbolt 10, it must overcome the resistive forces F1, F2 and F3 for successful unlatching. In the present invention, F2 and F3 are minimized by three elements. First of all, the distance L between the forces is minimized so as to reduce the magnitude of N2 and the internal bending stress present within the deadbolt 10. Secondly, the rollers 21 22 are used at both the strike/deadbolt interface and at the housing/deadbolt contact. The third element is that the ratio of the roller to pin diameter be kept as large as possibly to minimize the rolling friction without sacrificing the pin strength. The preferred ratio is 1.5 to 1 (outer roller 24 outer diameter to pin 24 diameter) with a most preferred ratio of 2 to 1. A preferred pin diameter is 0.1875 inches.

[0009] The primary functions of the deadbolt 10 in an exit alarm lock are to secure the opening when extended and to allow consistent retraction when depression of the pushbar occurs thereby unlatching the door. Because situations can arise in which people must exit a building quickly, it is important that the deadbolt retraction operate reliably and with low resistive forces, particularly when a preload is applied to the door face.

[0010] In designing the deadbolt supports to utilize dual rollers spaced closely together with a maximized

roller/pin ratio, resistive forces present under a preload condition can not act to bind the mechanism and prevent retraction. These elements are designed without compromising the device's ability to sustain high static loads for security purposes. This practice enables the device a greater ability to take advantage of the security characteristics of deadbolt latching while affording the latching release capabilities of a conventional latchbolt design panic exit device.

Claims

1. In combination, a housing, a deadbolt slidable within the housing, the deadbolt being moveable between a retracted position and an extended position, the deadbolt having spaced apart first and second faces, a strike positioned proximate the housing, a first roller attached to the housing and positioned adjacent the first face of the deadbolt and a second roller attached to the strike and being positioned adjacent the second face of the deadbolt when the deadbolt is in the extended positioned.

2. A combination according to claim 1, wherein the first roller is positioned proximate an end of the housing through which the deadbolt extends when the deadbolt is in the extended positioned and the second roller is positioned proximate an end of the strike into which the deadbolt extends when the deadbolt is in the extended position.

3. A combination according to claim 1, wherein the first roller is proximate the first face of the deadbolt when the deadbolt is in the retracted position and when the deadbolt is in the extended position.

4. A combination according to claims 1, 2 or 3, wherein each roller consists of an outer roller element rotatable on a central pin, and the ratio of the outer roller element outer diameter to the central pin diameter is at least 1.5 to 1.

5. A combination according to claim 4, wherein the ratio of the outer roller element outer diameter to the central pin diameter is 2 to 1.

6. In combination, a housing, a deadbolt axially slidable within the housing, the deadbolt being moveable between a retracted position and an extended position, the deadbolt having spaced apart first and second faces, a strike positioned proximate the housing, a roller means for minimizing resistive forces on the deadbolt, the roller means comprising a first roller proximate the deadbolt first face and a second roller proximate the deadbolt second face, the first roller being axially spaced from the second roller.

7. A combination according to claim 6, wherein the first roller is attached to the housing and the second roller is attached to the strike.

8. A combination according to claim 6 or 7, wherein each roller consists of an outer roller element rotatable on a central pin, and the ratio of the outer roller element outer diameter to the central pin diameter is at least 1.5 to 1.

9. A combination according to claim 8, wherein the ratio of the outer roller element outer diameter to the central pin diameter is 2 to 1.

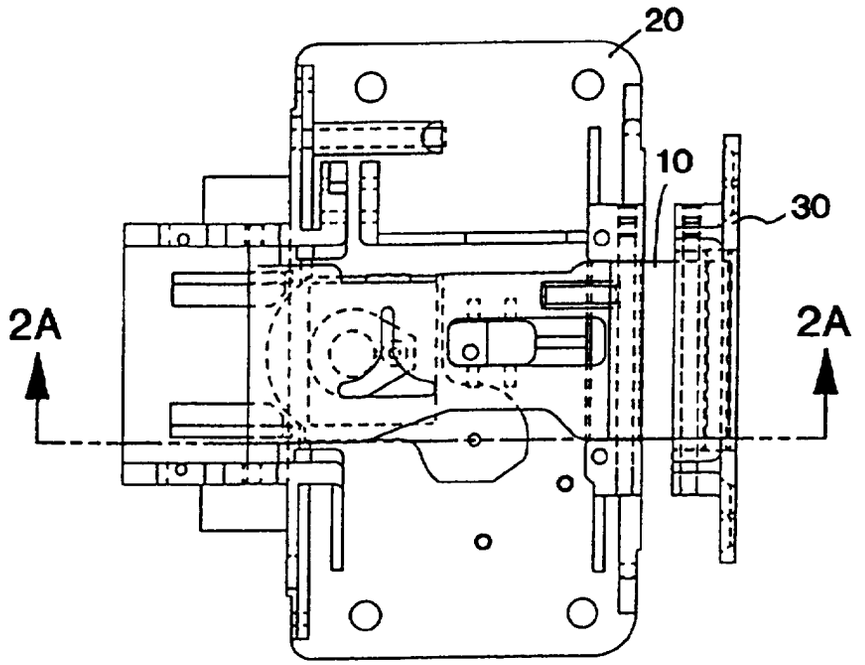

FIG. 1A

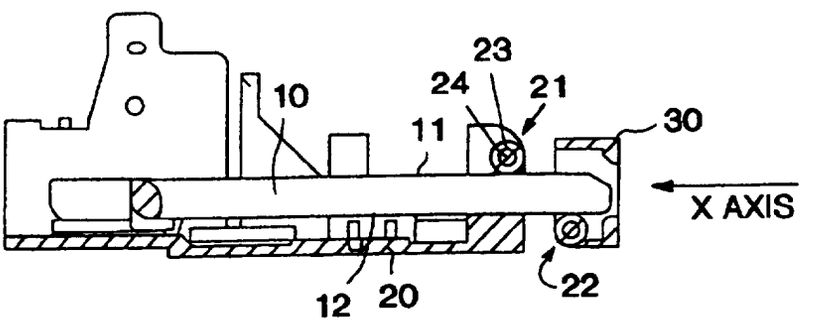

FIG. 2A

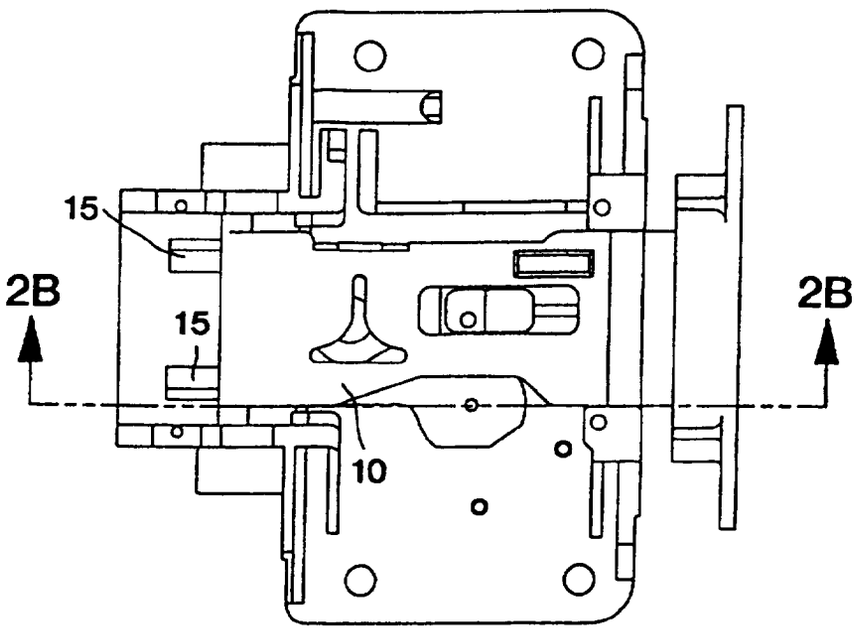

FIG. 1B

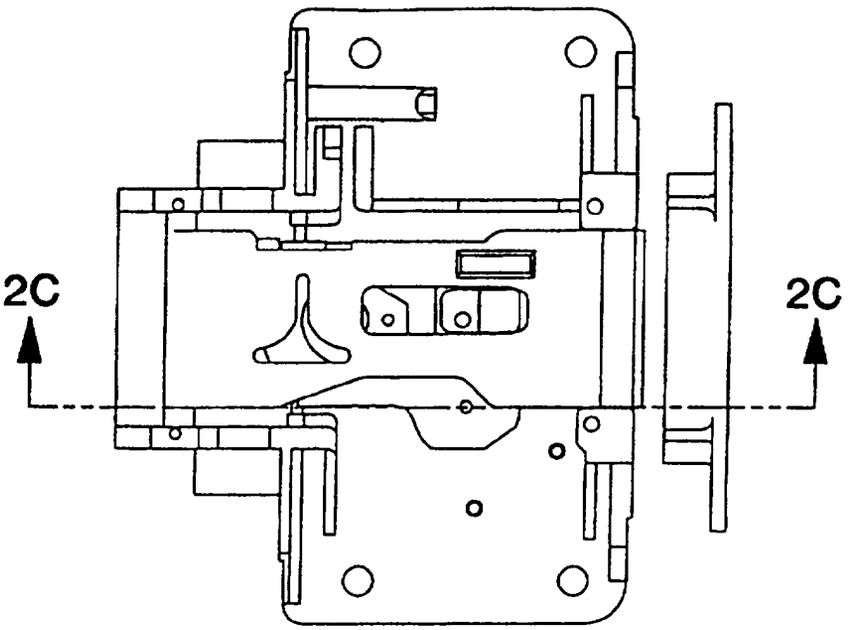

FIG. 1C

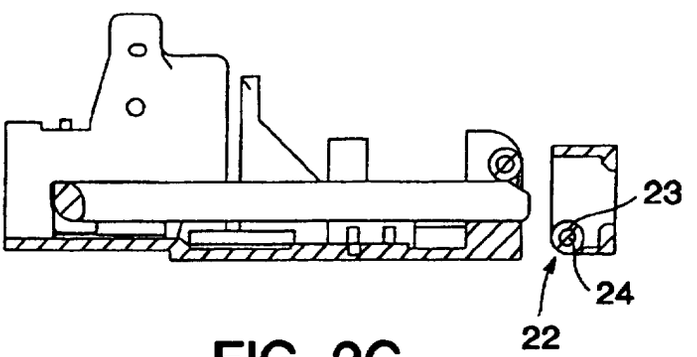

FIG. 2C

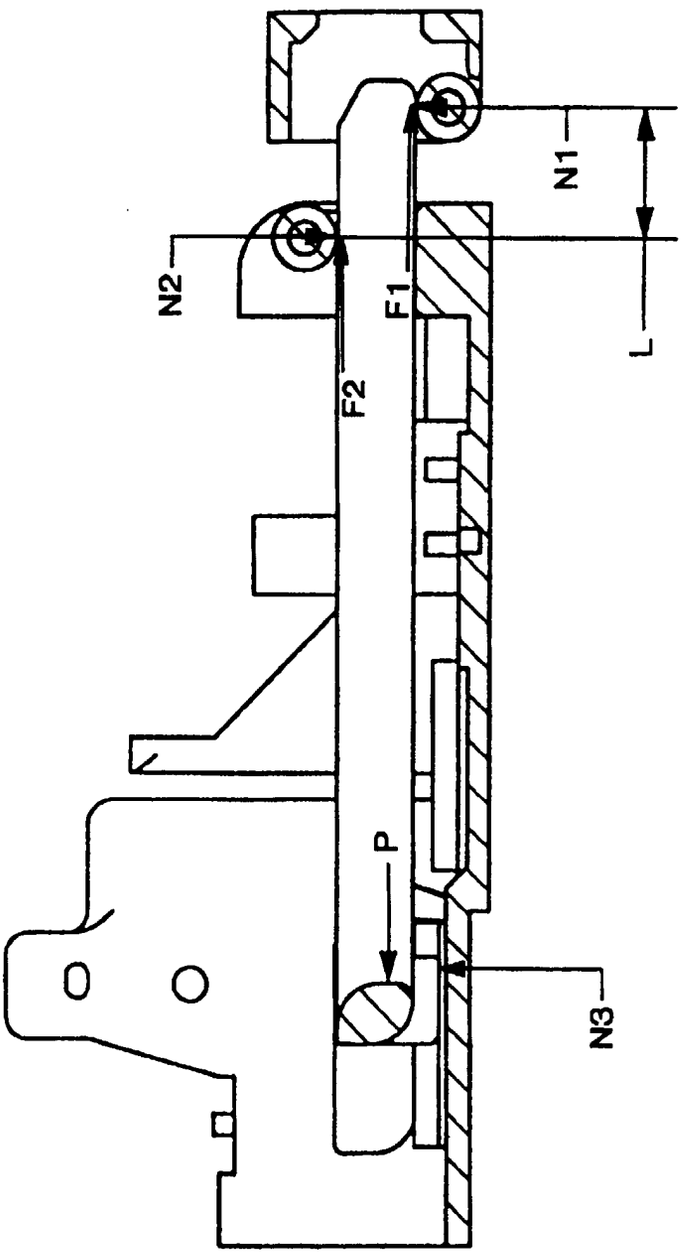

FIG. 2B