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The Director

of the United States Patent and Trademark Office has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this United States

Patent

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Katherine Kelly Vidal

Director of the United States Patent and Trademark Office

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If the application for this patent was filed on or after December 12, 1980, maintenance fees are due three years and six months, seven years and six months, and eleven years and six months after the date of this grant, or within a grace period of six months thereafter upon payment of a surcharge as provided by law. The amount, number and timing of the maintenance fees required may be changed by law or regulation. Unless payment of the applicable maintenance fee is received in the United States Patent and Trademark Office on or before the date the fee is due or within a grace period of six months thereafter, the patent will expire as of the end of such grace period.

Patent Term Notice

If the application for this patent was filed on or after June 8, 1995, the term of this patent begins on the date on which this patent issues and ends twenty years from the filing date of the application or, if the application contains a specific reference to an earlier filed application or applications under 35 U.S.C. 120, 121, 365(c), or 386(c), twenty years from the filing date of the earliest such application ("the twenty-year term"), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b), and any extension as provided by 35 U.S.C. 154(b) or 156 or any disclaimer under 35 U.S.C. 253.

If this application was filed prior to June 8, 1995, the term of this patent begins on the date on which this patent issues and ends on the later of seventeen years from the date of the grant of this patent or the twenty-year term set forth above for patents resulting from applications filed on or after June 8, 1995, subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b) and any extension as provided by 35 U.S.C. 156 or any disclaimer under 35 U.S.C. 253.

US011739560B1

(12) **United States Patent**
Tobias et al.

(10) **Patent No.: US 11,739,560 B1**
(45) **Date of Patent: Aug. 29, 2023**

(54) **SYSTEM AND APPARATUS FOR SENSING AND PROVIDING ALERTS FOR DEADBOLT LOCK STATUS**

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(72) Inventors: **Marc Tobias**, Pittsburgh, PA (US); **Tobias Bluzmanis**, Miramar, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **18/162,203**

(22) Filed: **Jan. 31, 2023**

Related U.S. Application Data

(63) Continuation-in-part of application No. 17/988,225, filed on Nov. 16, 2022.

(60) Provisional application No. 63/354,734, filed on Jun. 23, 2022.

(51) **Int. Cl.**

E05B 41/00	(2006.01)
E05B 47/02	(2006.01)
E05B 47/00	(2006.01)

(52) **U.S. Cl.**
CPC ***E05B 41/00*** (2013.01); ***E05B 47/026*** (2013.01); *E05B 2047/0069* (2013.01)

(58) **Field of Classification Search**
CPC G01D 5/14; E05B 41/00; E05B 63/0017; Y10T 70/5319
USPC 70/129
See application file for complete search history.

(56) **References Cited**

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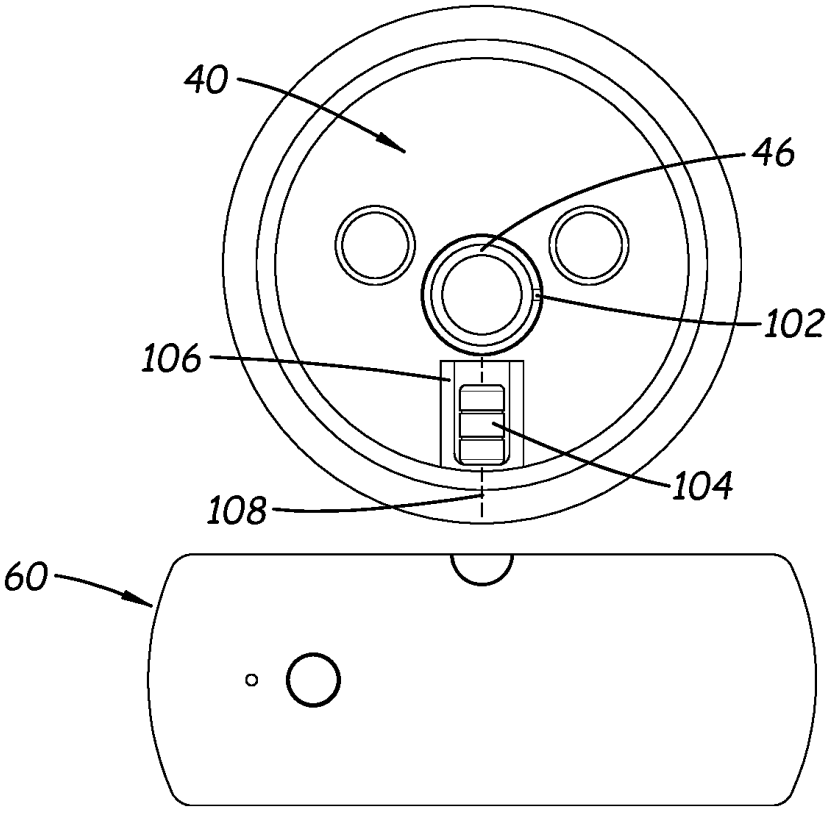
(74) *Attorney, Agent, or Firm* — Jeffrey A. Proehl; Woods, Fuller, Shultz & Smith PC

(57) **ABSTRACT**

A deadbolt lock status sensing assembly for monitoring status of a deadbolt member of a deadbolt assembly on a door may include a sensible element mountable on one of the door and the deadbolt assembly, and a sensing element mountable on one of the door and the deadbolt assembly. The sensing element and the sensing element may be configured to move with respect to each other when the deadbolt member of the deadbolt assembly moves between an extended condition and a retracted condition of the deadbolt.

14 Claims, 10 Drawing Sheets



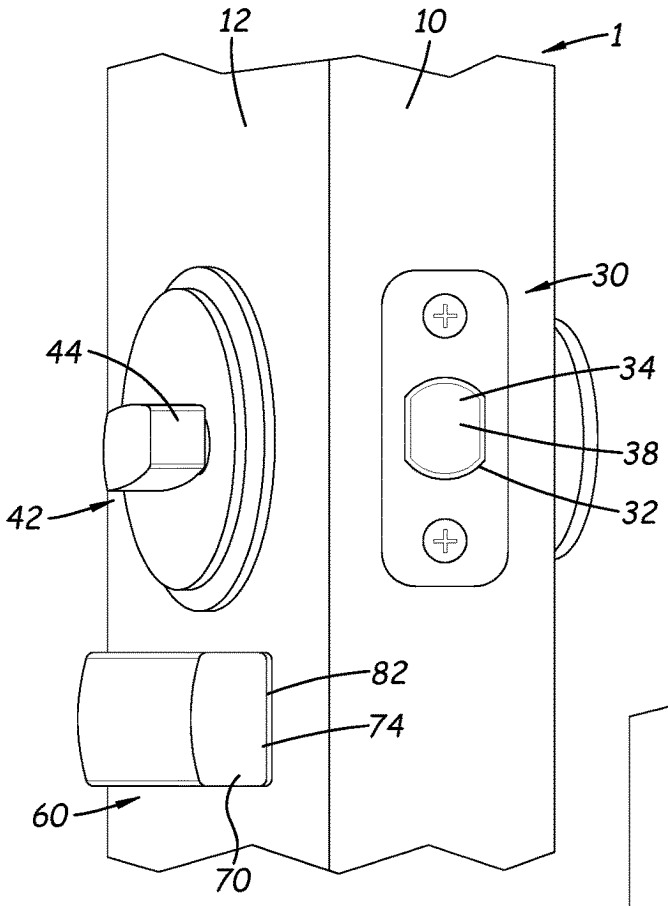


FIG. 1

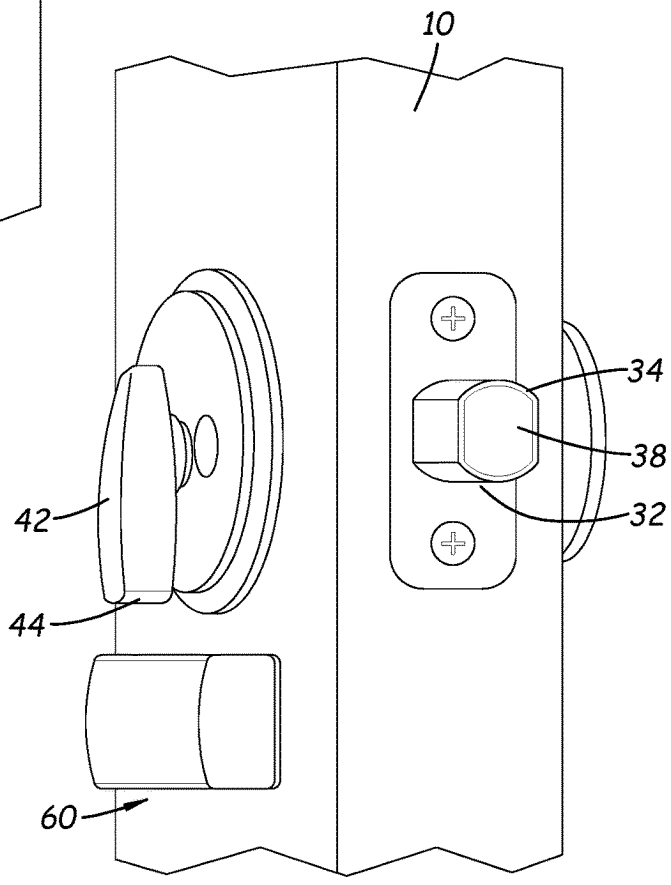


FIG. 2

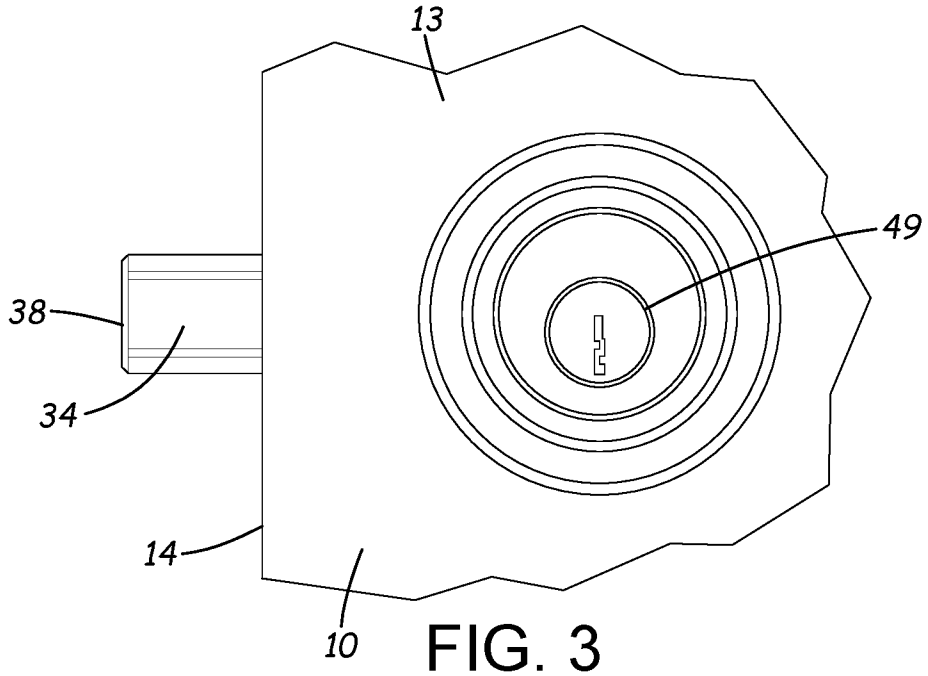


FIG. 3

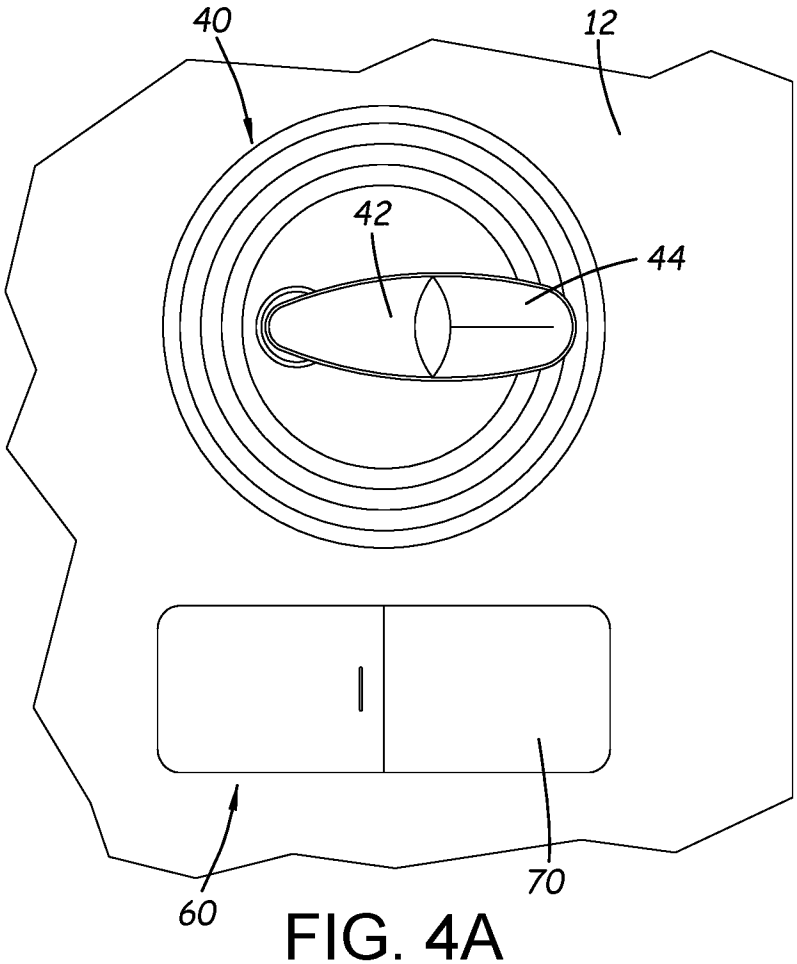


FIG. 4A

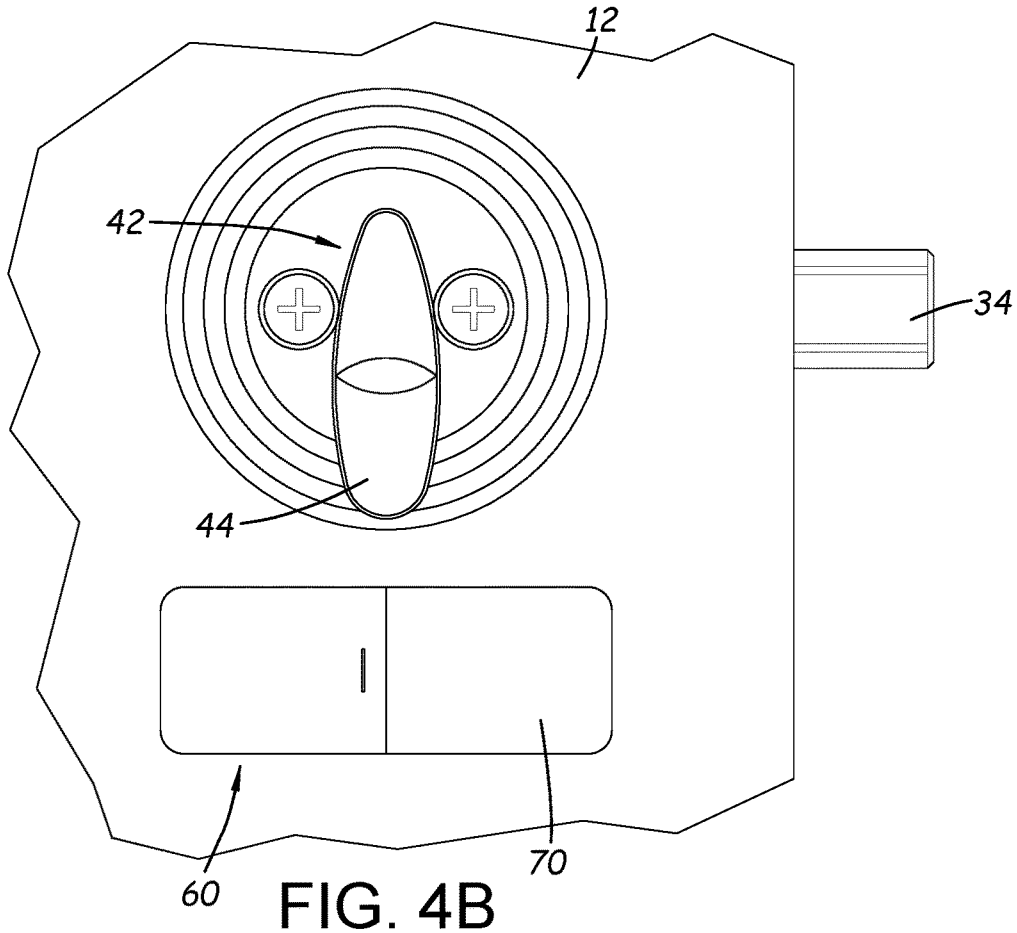


FIG. 4B

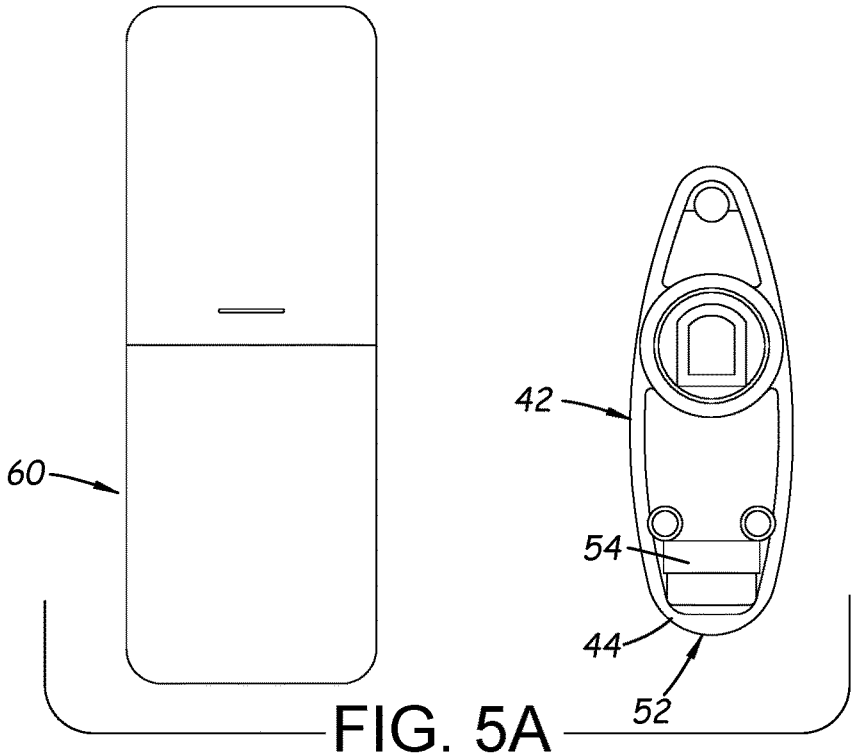


FIG. 5A

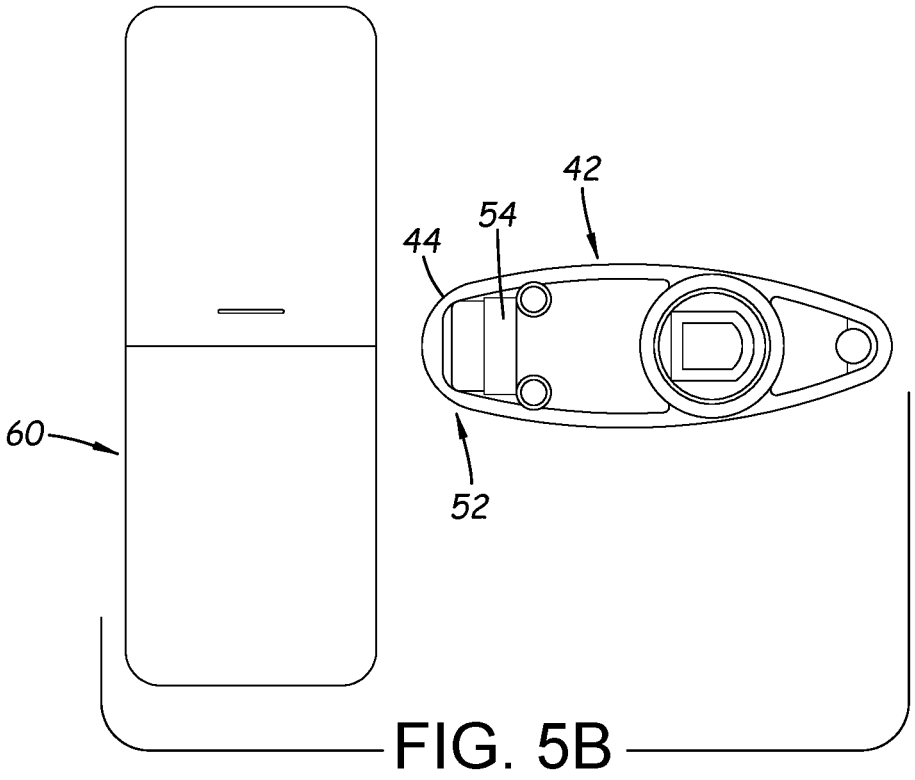


FIG. 5B

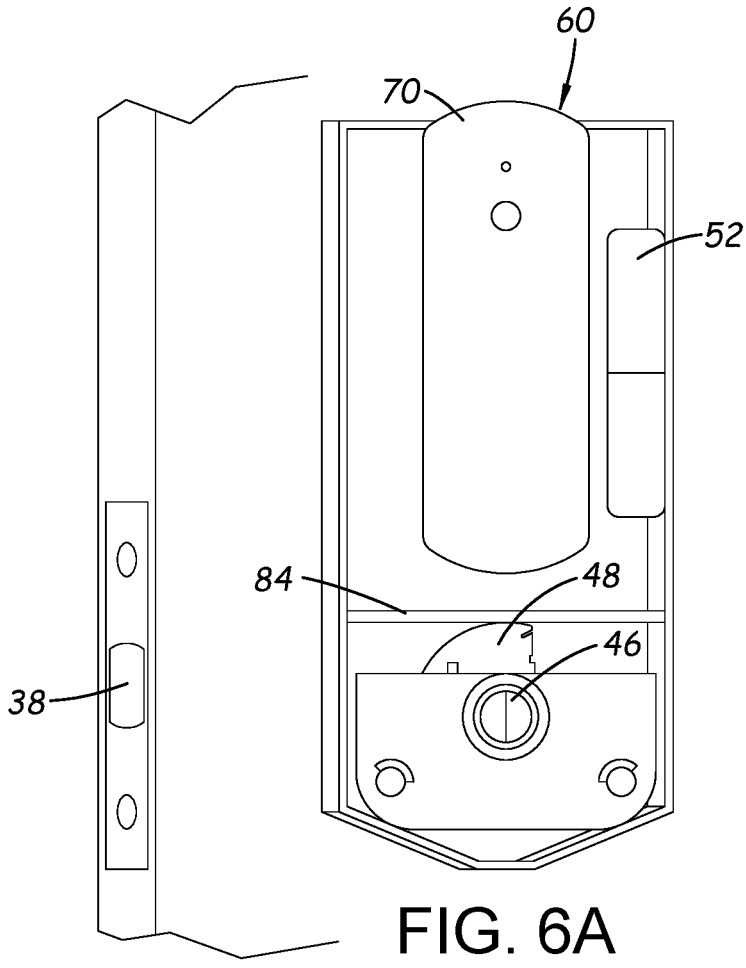


FIG. 6A

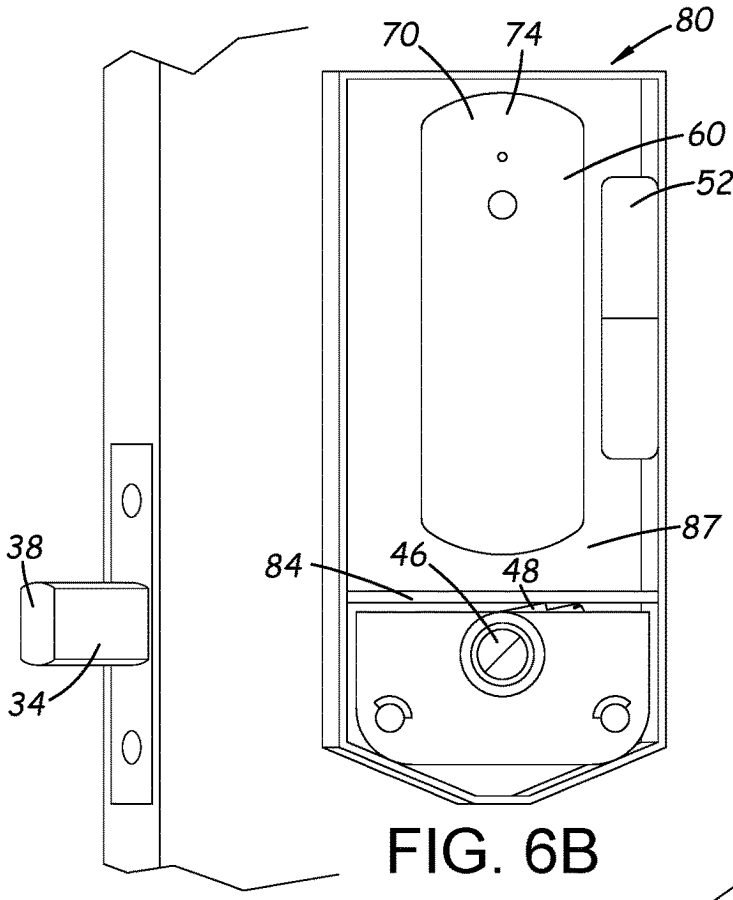


FIG. 6B

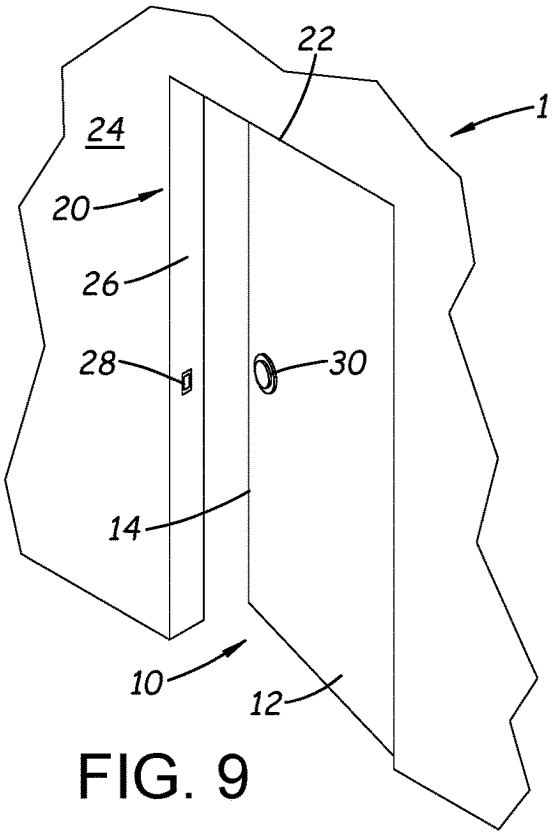


FIG. 9

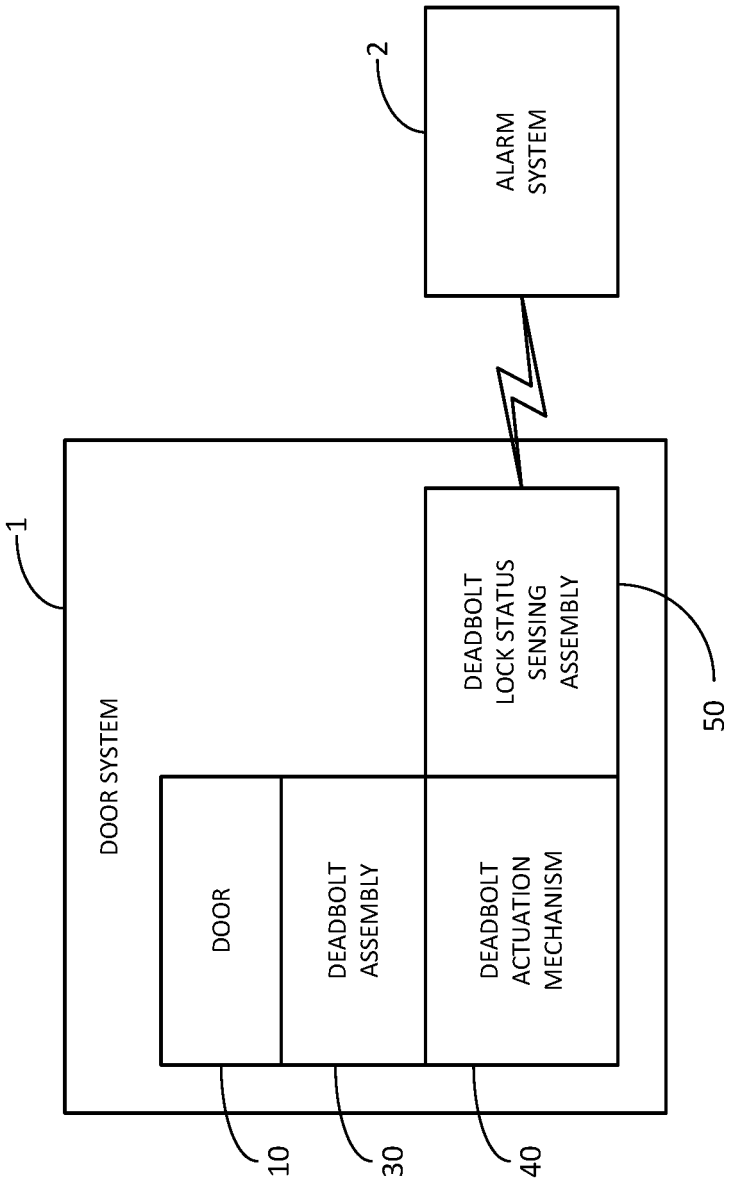

2
ALARM SYSTEM
1
DOOR SYSTEM
DEADBOLT LOCK STATUS SENSING ASSEMBLY
50
DOOR
DEADBOLT ASSEMBLY
DEADBOLT ACTUATION MECHANISM
10
30
40

FIG. 7

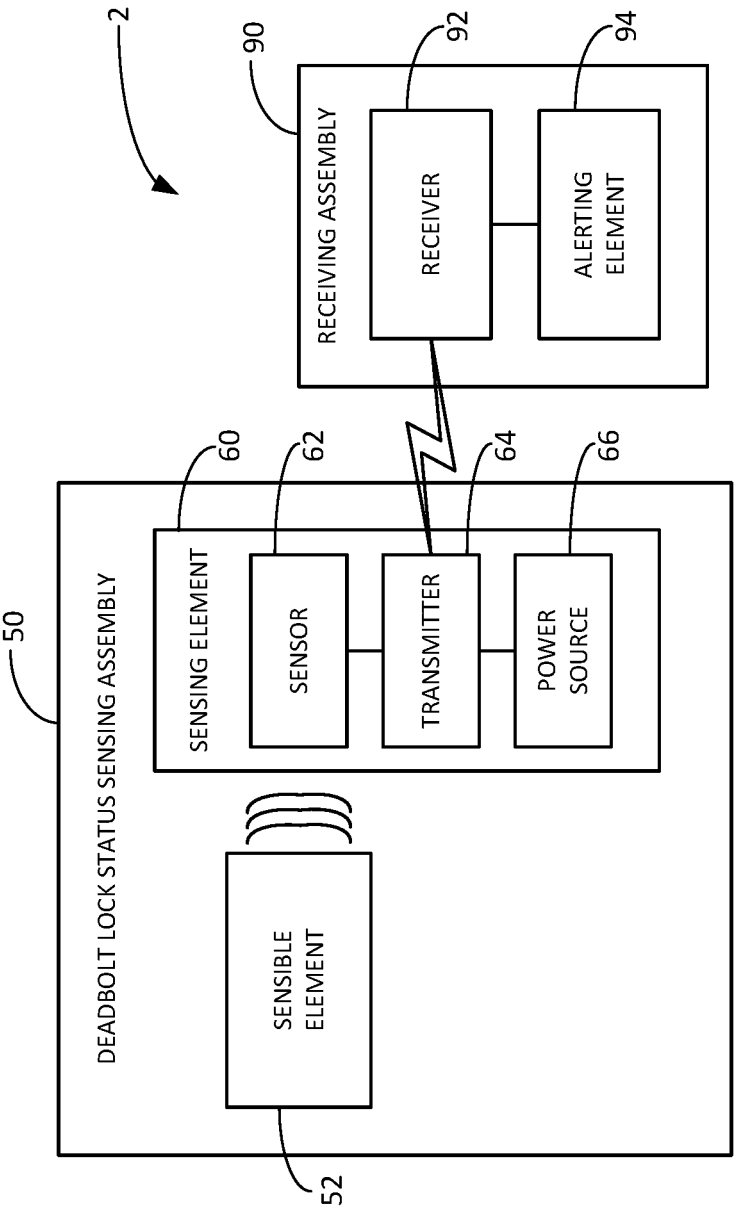

2
90
92
94
RECEIVING ASSEMBLY
RECEIVER
ALERTING ELEMENT
60
62
64
66
50
SENSING ELEMENT
SENSOR
TRANSMITTER
POWER SOURCE
DEADBOLT LOCK STATUS SENSING ASSEMBLY
SENSIBLE ELEMENT
52

FIG. 8

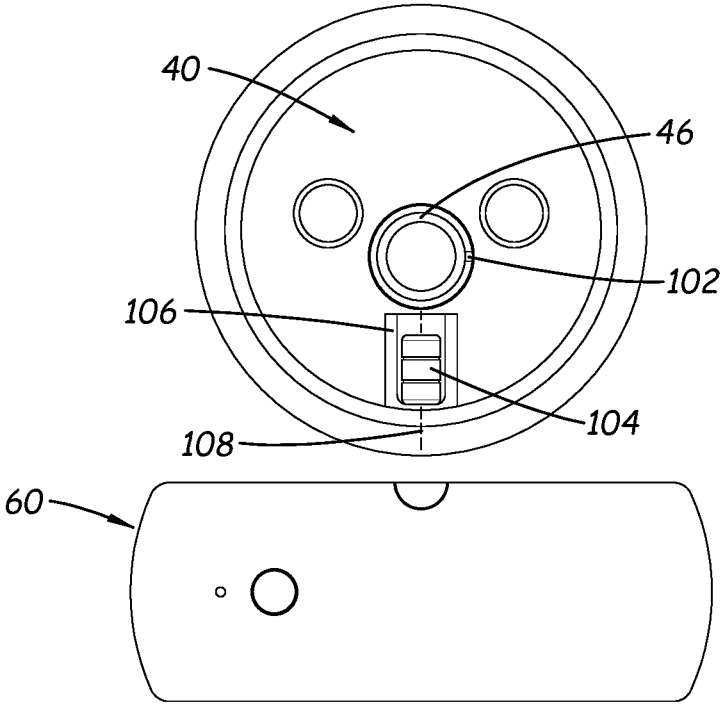


FIG. 10

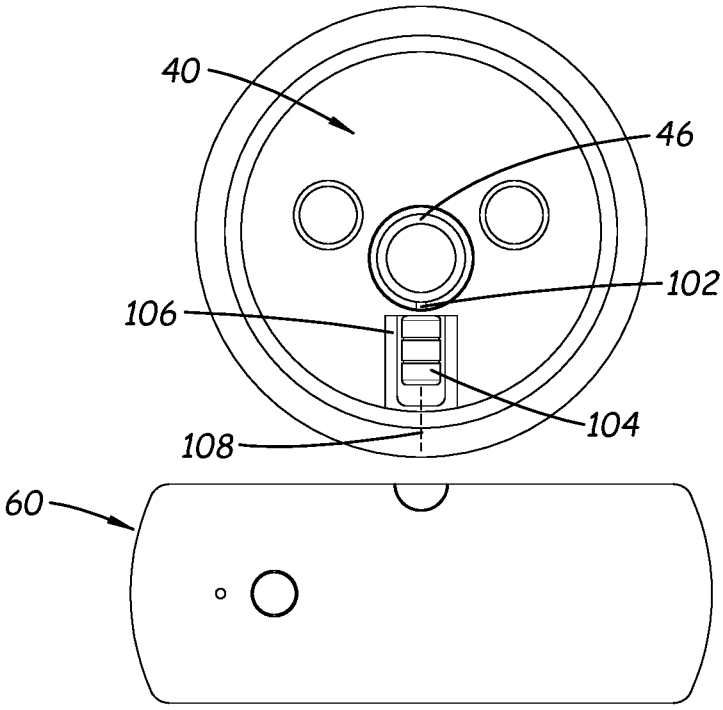


FIG. 11

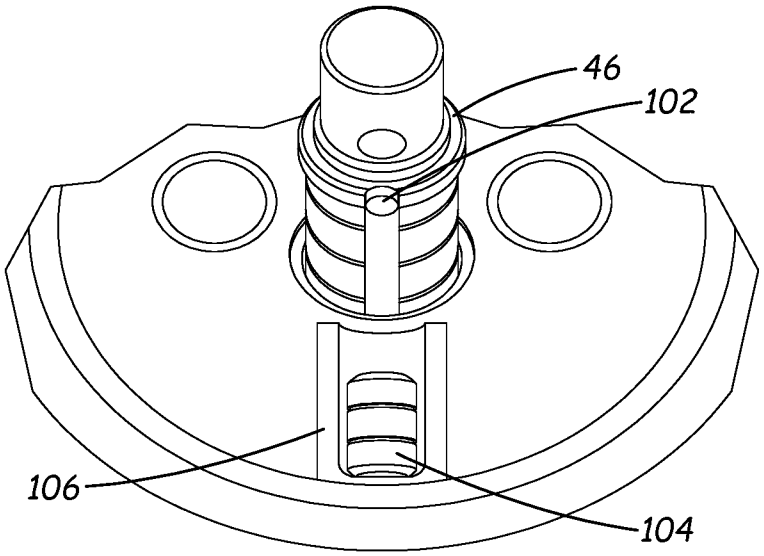
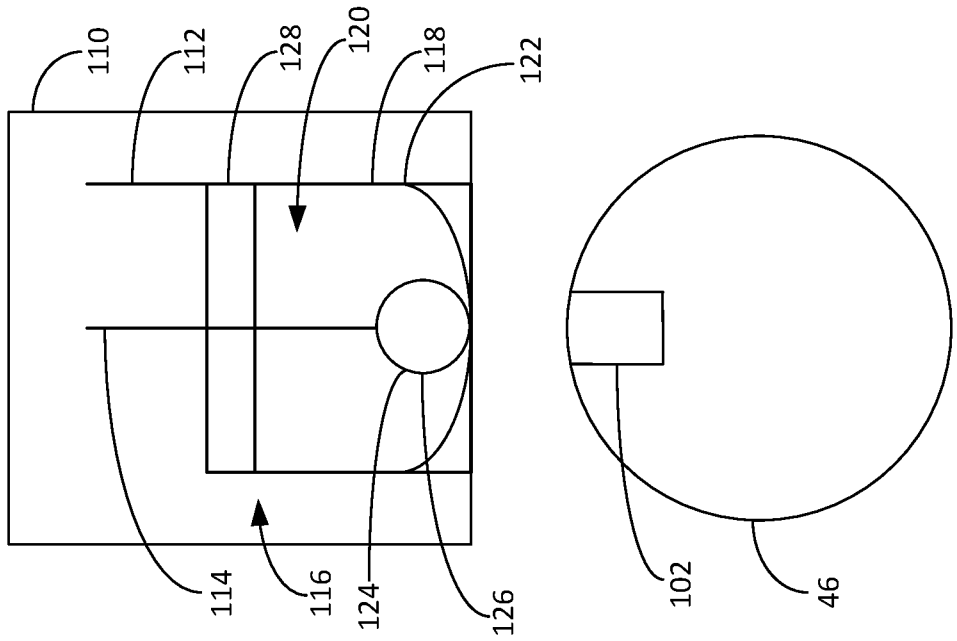


FIG. 12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112
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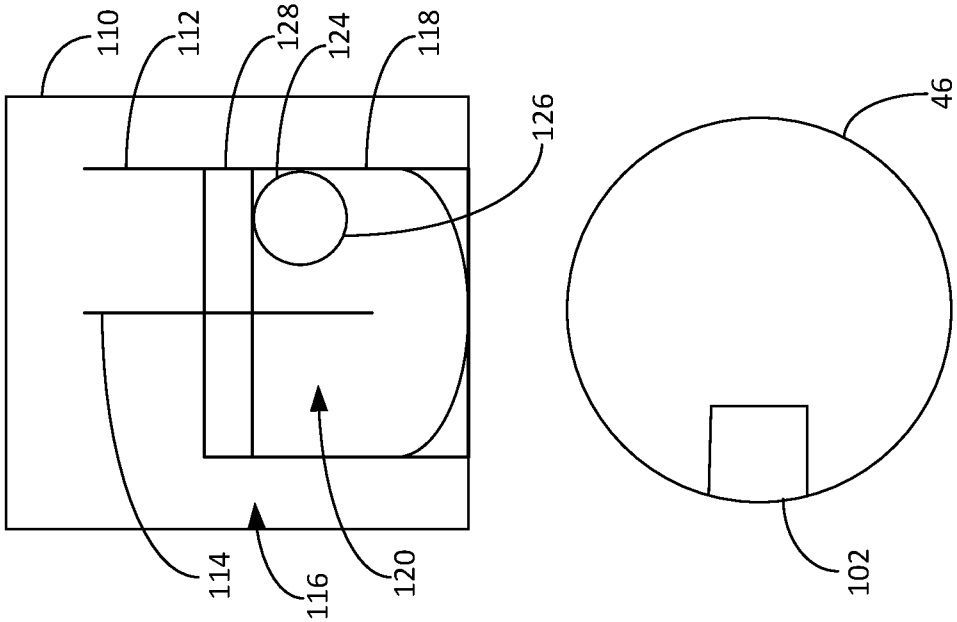
FIG. 14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120
46
102

FIG. 13

SYSTEM AND APPARATUS FOR SENSING AND PROVIDING ALERTS FOR DEADBOLT LOCK STATUS

REFERENCE TO RELATED APPLICATIONS

This application is a continuation in part of U.S. Nonprovisional patent application Ser. No. 17/988,225, filed Nov. 16, 2022, which claimed the priority benefit of U.S. Provisional Patent Application No. 63/354,734, filed Jun. 23, 2022, both of which are hereby incorporated by reference in their entireties.

BACKGROUND

Field

The present disclosure relates to door locking apparatus and more particularly pertains to a new system and apparatus for sensing and providing alerts for deadbolt lock status for providing a remote indication of the positional status of a deadbolt of a deadbolt lock.

SUMMARY

In some aspects, the present disclosure relates to a deadbolt lock status sensing assembly for monitoring status of a deadbolt member of a deadbolt assembly on a door. The status sensing assembly may comprise a sensible element mountable on one of the door and the deadbolt assembly, and the sensible element may be magnetically active. The assembly may also include a sensing element mountable on one of the door and the deadbolt assembly. The sensible element and the sensing element may be configured to move with respect to each other when the deadbolt member of the deadbolt assembly moves between an extended condition and a retracted condition of the deadbolt.

There has thus been outlined, rather broadly, some of the more important elements of the disclosure in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. There are additional elements of the disclosure that will be described hereinafter and which will form the subject matter of the claims appended hereto.

In this respect, before explaining at least one embodiment or implementation in greater detail, it is to be understood that the scope of the disclosure is not limited in its application to the details of construction and to the arrangements of the components set forth in the following description or illustrated in the drawings. The disclosure is capable of other embodiments and implementations and is thus capable of being practiced and carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting.

As such, those skilled in the art will appreciate that the conception, upon which this disclosure is based, may readily be utilized as a basis for the designing of other structures, methods and systems for carrying out the several purposes of the present disclosure. It is important, therefore, that the claims be regarded as including such equivalent constructions insofar as they do not depart from the spirit and scope of the present disclosure.

The advantages of the various embodiments of the present disclosure, along with the various features of novelty that characterize the disclosure, are disclosed in the following descriptive matter and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The disclosure will be better understood and when consideration is given to the drawings and the detailed description which follows. Such description makes reference to the annexed drawings wherein:

FIG. **1** is a schematic perspective view of a new system for sensing and providing alerts for deadbolt lock status, with the deadbolt in a retracted condition and the deadbolt thumbturn in the unlocking position, according to the present disclosure.

FIG. **2** is a schematic perspective view of the system for sensing and providing alerts for deadbolt lock status, with the deadbolt in an extended condition and the deadbolt thumbturn in the locking position, according to the present disclosure.

FIG. **3** is a schematic side view of the system for sensing and providing alerts for deadbolt lock status, according to an illustrative embodiment.

FIG. **4**A is a schematic side view of the system with the deadbolt thumbturn in the unlocking position in relation to the sensing element of the sensing assembly, according to an illustrative embodiment.

FIG. **4**B is a schematic side view of the system with the deadbolt thumbturn in the locking position in relation to the sensing element of the sensing assembly, according to an illustrative embodiment.

FIG. **5**A is a schematic rear view of an exemplary thumbturn in the unlocking position with sensible element in the unlock location in an illustrative depiction of the relationship with the sensing element, according to an illustrative embodiment.

FIG. **5**B is a schematic rear view of an exemplary thumbturn in the locking position with sensible element in the lock location in an illustrative depiction of the relationship with the sensing element, according to an illustrative embodiment.

FIG. **6**A is a schematic rear view of another exemplary deadbolt lock status sensing assembly shown with elements of a deadbolt actuation mechanism and having an external cover removed to show the mechanism in the unlocking position with the sensing element in the unlock location, according to an illustrative embodiment.

FIG. **6**B is a schematic rear view of the exemplary deadbolt lock status sensing assembly of FIG. **7**A with the deadbolt actuation mechanism shown in the locking position with the sensing element in the lock location, according to an illustrative embodiment.

FIG. **7** is a schematic diagram of an embodiment of the new system in relations to an alarm system.

FIG. **8** is a schematic diagram of an embodiment of the new deadbolt lock status sensing assembly, according to an illustrative embodiment.

FIG. **9** is a schematic perspective view of a door in a door frame formed in a wall of a building structure.

FIG. **10** is a schematic side view of elements of an illustrative embodiment of the system with optional features, and showing the deadbolt assembly partially disassembled with the active element of the sensible element in the lock location and the reactive element in the uninfluenced position.

FIG. **11** is a schematic side view of elements of an illustrative embodiment of the system with optional features, and showing the deadbolt assembly partially disassembled

with the active element of the sensible element in the unlock location and the reactive element in the influenced position.

FIG. **12** is a schematic perspective view of the deadbolt cam bar partially withdrawn from the deadbolt assembly, to show detail of the active element.

FIG. **13** is a schematic diagram of a magnetic field sensor of a reactive component in an uninfluenced condition by the active component

FIG. **14** is a schematic diagram of the magnetic field sensor of the reactive component in an influenced condition by the active component

DETAILED DESCRIPTION

With reference now to the drawings, and in particular to FIGS. **1** through **14** thereof, a new system and apparatus for sensing and providing alerts for deadbolt lock status embodying the principles and concepts of the disclosed subject matter will be described.

In some aspects, the disclosure relates to a door system **1** which may be employed in conjunction with an alarm system **2** and may broadly include a door **10**, a door frame **20** of a building structure, a deadbolt assembly **30** mounted on the door for securing the door in the closed position with respect to the door frame, a deadbolt actuation mechanism **40** for operating the deadbolt assembly, and a deadbolt lock status sensing assembly **54** communicating a status of a deadbolt of the deadbolt assembly. In further aspects, the disclosure relates to the deadbolt lock status sensing assembly **50** separate of other elements of the system **1**.

In greater detail regarding elements of the disclosure, the door **10** generally has opposite broad faces **12**, **13** and at least one edge face **14** that extends between the broad faces. The door **10** may also have suitable structure for incorporating a deadbolt assembly, which may include a primary channel which extends through the door and between the broad faces **12**, **13**, as well as a secondary channel which extends from the edge face **14** to the primary channel.

Another element of the system **1**, door frame **20**, may define an opening **22** formed in a wall **24** of a building structure, and the door **10** is usually mounted on the door frame **20** in a manner that permits movement of the door with respect to the doorframe between an open condition, which may be characterized by the door being moved away from portions of the door frame to permit movement through the opening of the door frame, a closed condition, which may be characterized by the door obstructing movement through the door frame and the door frame **20** extending about the door when the door is in the closed condition. The doorframe **20** may include a latch portion **26** of the door frame which extends along at least the one edge face **14** of the door when the doors in the closed condition, and the latch portion may have a bolt cavity **28** formed therein.

The deadbolt assembly **30** is mounted on the door **10** for selectively securing the door in the door frame **20**. The deadbolt assembly **30** may be at least partially positioned in the primary channel of the door, and may also be at least partially positioned in the secondary channel of the door. The deadbolt assembly **30** may include a deadbolt frame **32** mountable on the door, such as by at least part insertion of the frame into the secondary channel of the door and the frame **32** may also at least partially extend into the primary channel of the door.

The deadbolt assembly **30** may further include a deadbolt member **34** which is movably mounted on the door **10** such that the deadbolt member is movable along a portion of the deadbolt frame and a portion of the secondary channel. The deadbolt member **34** may be selectively extendable and retractable with respect to the door, such as from the edge face **14** of the door. The deadbolt member **34** may be movable between an extended condition and a retracted condition with respect to the door. Illustratively, the extended condition of the deadbolt member **34** may be characterized by a portion of the deadbolt member being extended from the door and extended into the bolt cavity **28** of the door frame. The retracted condition of the deadbolt member **34** may be characterized by the entirety, or substantially the entirety, of the member **34** being withdrawn into the door so as not to protrude from the door to any significant degree. The deadbolt member **34** may have an inboard end and an outboard end **38**, with the inboard end being generally positioned in the secondary channel of the door and the outboard end being extended from the door when the deadbolt member is in the extended condition.

The deadbolt actuation mechanism **40** is configured to move the deadbolt member **34** between the extended and retracted condition, usually by physical operation or manipulation of elements of the mechanism by a user. The deadbolt actuation mechanism **40** may be mounted on the deadbolt frame **32** and engage the deadbolt member **34** to produce movement of the member **34**. In greater detail, illustrative embodiments of the deadbolt actuation mechanism **40** may include a deadbolt thumbturn **42** which is configured to permit physical (e.g., finger) manipulation of the deadbolt actuation mechanism.

The deadbolt thumbturn **42** may be movable between a locking position and an unlocking position. The locking position of the thumbturn **42** may correspond to the extended condition of the deadbolt member **34** and the unlocking position may correspond to the retracted condition of the deadbolt member. The deadbolt thumbturn **42** is typically rotatable with respect to the deadbolt frame, and may rotate approximately 90 degrees from the locking position to the unlocking position. The deadbolt thumbturn **42** may include a knob which is elongated in shape, and may have a first end **44** which is movable between a first position, when the thumbturn is in the locking position, and a second position, when the thumbturn is in the unlocking position. It will be recognized that other types of elements may be utilized to permit finger manipulation of the deadbolt actuation mechanism, and may result in other types of movement of the element between locking and unlocking positions such as, for example, linear or translational movement between the locking and unlocking positions.

The deadbolt activation mechanism **40** may further include a deadbolt cam bar **46** which is rotatable with respect to the deadbolt frame **32** to move the deadbolt member between the extended and retracted conditions. The deadbolt thumbturn **42** may be mounted on the deadbolt cam bar **46** such that the thumbturn and the cam bar move as a unit. Further, a deadbolt cam **48** may be mounted on the cam bar **46** so that the cam rotates with the cam bar, and may have a camming surface. The deadbolt actuation mechanism **40** may also include a lock cylinder **49** which is actuated by a key and is typically located on the side of the door that is opposite of the side of the door on which the deadbolt thumbturn is located.

The deadbolt lock status sensing assembly **50** may be configured to monitor the status of the deadbolt of the deadbolt assembly, and may sense at least one position of the deadbolt thumbturn **42**. In some implementations, the sensing assembly **50** may sense a change in the status of the deadbolt, such as a change in the position status of the

deadbolt. Illustratively, the status sensing assembly **50** may be configured to sense the locking position of the deadbolt thumbturn.

The status sensing assembly **50** may comprise a sensible element **52** which is mountable on the door **10** and provides a sensible indicator for the position of the deadbolt member **30** by association with a component of the deadbolt actuation mechanism **40**. The sensible element may be magnetically active, and may be at least partially formed from magnetically active material. Illustratively, the sensible element **52** may comprise a magnet **54** that generates a magnetic field proximate to the first end **44** of the deadbolt thumbturn.

In embodiments such those shown in FIGS. **1** through **5**, the sensible element **52** may be configured such that a position of the sensible element is changed as a result of operation of the deadbolt actuation mechanism **40**. Illustratively, the sensible element **52** may be mounted on the deadbolt thumbturn **42**, and the position of the sensible element may be moved when the deadbolt thumbturn moves between the locking and unlocking positions. The sensible element **52** may have a lock location when the deadbolt thumbturn is in the locking position and the deadbolt member is in the extended condition, and the sensible element may have an unlock location when the deadbolt thumbturn is in the unlocking position and the deadbolt member is in the retracted condition. In embodiments such as those shown in FIGS. **6**A and **6**B, the sensible element **52** has a fixed position with respect to the door **10**, and the sensible element may correspondingly be mounted on the door in the fixed position.

The status sensing assembly **50** may further comprise a sensing element **60** which is configured to sense the sensible element **52** when the deadbolt thumbturn is in at least one of the locking and unlocking positions, and may also provide an alert corresponding to the sensed position. The sensing element **60** may be mounted on the door **10** to move with the door between the conditions of the door.

In embodiments such as those shown in FIGS. **1** through **6**, the sensing element **60** is fixedly mounted on the door at a fixed position. The sensing element **60** of such embodiments may be configured to sense at least one position of the thumbturn **42** based upon movement of the sensible element **52** with respect to the fixed position of the sensing element. Illustratively, the sensing element **60** may be being configured to sense the positon of the sensible element **52** when the sensible element is in the lock location. Optionally, but less preferably, the sensing element may be configured to detect the positon of the sensible element when the sensible element is in the unlock location. In embodiments such as those shown in FIGS. **6**A and **6**B, the sensing element **60** is movably mounted on the door **10**, and the sensing element may be configured to be moved by the deadbolt actuation mechanism **40** as the mechanism **40** moves the deadbolt member **34** between the extended and retracted conditions. The sensing element **60** may have an unlocked location corresponding to the retracted condition of the deadbolt member (see, e.g., FIG. **6**A) and a locked location corresponding to the extended condition of the deadbolt member (see, e.g., FIG. **6**B).

The sensing element **60** may comprise a sensor **62** configured to sense at least one of the positions of the deadbolt. The sensor **62** may be configured to generate a status signal corresponding to one or more specific sensed positions of the thumbturn (e.g., via the position or location of the sensing element). Optionally, the sensor **62** may be configured to generate the status signal upon sensing a change of position of the thumbturn (e.g., via the position or location of the sensing element). The sensor **62** may be sensitive to the magnetic field of the sensible element **52**, and produce the status signal based upon detecting the proximity or relative strength of the magnetic field of the sensible element. The sensing element **60** may further include a transmitter **64** configured to receive the status signal from the sensor, and wirelessly transmit the status signal to a receiver. A power source **66** of the sensing element **60** may provide power to elements of the element **60**, such as the sensor **62** and the transmitter **64**. In some embodiments, the sensing element **60** may include a case **70** which defines an interior and has an exterior surface **74**. Elements of the sensing element **60**, such as the sensor **62** and the transmitter **64**, may be positioned in the interior of the case.

The sensing element **60** may also have an attachment structure **80** provided on the element **60**, such as on the case **70**, for mounting the sensing element on the door **10**. In embodiments such as shown in FIGS. **1** through **5**, the attachment structure **60** may be positioned on the exterior surface **74** of the case to fixedly attach the case to the door **10**. Illustratively, the attachment structure **80** may include an adhesive **82** on the exterior surface. In embodiments such as shown in FIGS. **6**A and **5**B, the attachment structure **80** may comprise a slider **84** on which other elements of the sensing element **60** may be mounted, such as the case **70** and the sensor **62**, may be mounted. The slider **84** may be configured to be moved by the deadbolt actuation mechanism **40**, such as by the deadbolt cam of the actuation mechanism. The slider **84** may be positioned so as to support the sensing element **60** in a positon that is adjacent to the sensible element **52** in at least one position of the sensing element with respect to the sensible element, which would permit the sensor **62** to sense the magnetic field of the sensible element. Embodiments of the types shown in FIGS. **6**A and **6**B may also include a track forming element **86** on which the slider **84** is mounted for facilitating translational movement of the slider with respect to the door **10**. The slider **84** may be slidably mounted on the track forming element **86**, and the track forming element **86** may be mounted on the door.

The deadbolt lock status sensing assembly **50** may be interfaced to a receiving assembly **90** configured to receive the status signal from the sensing element **60**, and the receiving assembly may form a portion of an alarm system **2**. The receiving assembly **90** may include a receiver **92** configured to wirelessly receive the status signal from the transmitter **64** of the sensing element. The receiving assembly **90** may also include an alerting element **94** in communication with the receiver **92** to receive the status signal from the receiver and produce a perceptible alert based upon receipt of the status signal.

In other implementations of the system, such as embodiment **100** illustratively shown in FIGS. **10** through **14**, the sensible element of the lock status sensing assembly may include multiple components, such as an active component **102** and a reactive component **104**. In such embodiments, the active component **102** may be actively moved by movement of the deadbolt actuation mechanism, and may be moved by direct physical agency. The reactive component **104** on a four may be reactively moved by movement of the active component, and may be moved by indirect non-physical agency. Illustratively, the active **102** and reactive **104** components may be magnetically attracted or attractable to each other.

In the illustrative embodiments, the active component **102** may be mounted on the deadbolt cam bar **46** of the deadbolt actuation mechanism such that the active component **102** is

directly rotated with the cam bar **46** when the cam bar is rotated. Illustratively, the active component **102** may be embedded in the deadbolt cam bar **46** such that the active component is rotated between the locked location (e.g., FIG. **10**) and the unlocked location (e.g., FIG. **11**) by rotation of the deadbolt cam bar, such as by rotation of the deadbolt thumbturn **42** or by rotation of a key in a lock cylinder associated with the deadbolt assembly.

In embodiments, the reactive component **104** may be mounted on the deadbolt frame **32** or other mounting point stationary with respect to the door **10**. The reactive component **104** may be positioned in a chamber **106**, and may be movable in the chamber between an uninfluenced position (e.g., FIG. **10**) and an influenced position (e.g., FIG. **11**). In operation, movement of the active component **102** to a relatively closer proximity to the reactive component **104** may cause the reactive component to move to or toward the influenced position. Conversely, movement of the active component **102** to a relatively further proximity to the reactive component **104** may permit the reactive component to move to or toward the uninfluenced position. In embodiments, the reactive component **104** may be biased toward the uninfluenced position.

In some illustrative implementations, the chamber **106** may be elongated in the direction of and along a movement axis **108** that radiates from the deadbolt cam bar **46**. The reactive component on a four may be movable in the chamber **106** along the movement axis **108**, such as in translational movement along the movement axis. The reactive component **104** may be biased to or toward the uninfluenced position by the influence of gravity, such as when the movement axis **108** is substantially vertically oriented with the influenced position being located generally above the uninfluenced position. The sensing element **60** may be configured to detect a change in the position of the reactive component **104** from the uninfluenced position to or toward the influenced position and/or from the influenced position to or toward the uninfluenced position.

In some further illustrative implementations, the reactive component, or in some implementations, the sensing element, may act as a magnetic field sensor that senses the presence of the magnetic field of the active component. The reactive component or sensing element may comprise a magnetic field sensor **110** which is configured to sense the field emanating from the active component **102**. The magnetic field sensor **110** may have a first state and a second state. In some implementations, the first state may provide electrical continuity between a pair of electrical contacts **112**, **114** and the second state may exhibit electrical discontinuity between the electrical contacts. The magnetic field sensor **110** may be biased toward one of the states, and illustratively the magnetic field sensor **110** may be biased toward the first state. Optionally, the sensor **110** may be biased toward the second state.

Significantly, the magnetic field sensor **110** may be changed from one of the states to the other one of the states by variations in the magnitude of the field strength of the magnetic field generated by the active component **102** caused by the relative proximity of the sensor **110** to the active component.

In greater detail, the magnetic field sensor **110** may comprise the pair of electrical contacts **112**, **114**, and a continuity creating structure **116** configured to create and remove electrical continuity between the electrical contacts. The continuity creating structure **116** may comprise a housing **118** which may define an interior chamber **120** and have an exterior **122**. The pair of contacts **112**, **114** may be mounted on the housing **118**, and at least a portion of each of the electrical contacts may be exposed on the exterior **122** of the housing. In some embodiments, the housing **118** may be in electrical continuity with the first electrical contact **112** and the housing **118** may be electrically isolated from the second electrical contact **114**.

The magnetic field sensor **110** may further include a continuity element **124** which may be configured to alternately provide and remove continuity between the first **112** and second **114** electrical contacts. The continuity element **124** may be positioned in the interior chamber **120** of the housing, and may be movable in the chamber between one or more continuity positions and one or more discontinuity positions. In the illustrative embodiments, the one or more continuity positions of the continuity element **124** may correspond to the first state of the magnetic field sensor **110**, and the one or more discontinuity positions may correspond to the second state of the magnetic field sensor.

The continuity element **124** may be magnetically receptive such that the object is influenced by a magnetic field, and may be biased to move toward a source of a magnetic field. Illustratively, the continuity element **124** may be formed of a ferrous material. Thus, the continuity element **124** may be biased to move toward the magnetic field generating device. The continuity element **124** may be electrically conductive such that the element is able to conduct electricity, and an outer surface **126** of the continuity element may be electrically conductive and formed of an electrically conductive material. Illustratively, the outer surface **126** may have a spherical shape.

The magnetic field sensor **110** may also comprise a biasing element **128** for biasing the continuity element **124** toward the one or more positions that correspond to one of the states of the field sensor. The biasing element **128** may further bias the continuity element **124** away from the one or more positions corresponding to another one of the states of the magnetic field sensor. For example, in embodiments, the biasing element **128** is positioned on the housing **118** to urge the continuity element **116** toward the continuity positions. In such embodiments, the biasing element **128** may be positioned on the housing **118** to urge the continuity element away from the discontinuity positions. As a further example, in further embodiments, the biasing element **128** is positioned on the housing **118** to urge the continuity element **116** toward the discontinuity positions. In such embodiments, the biasing element **128** may be positioned on the housing **118** to urge the continuity element away from the continuity positions.

The biasing element **128** may be configured to produce a magnetic field to cause the biasing of the continuity element into one of the states, and may be formed of a magnetic material. Advantageously, the influence of the magnetic field of the active component may be able to overcome the influence of the magnetic field of the biasing element **128** on the continuity element **124**, when the active component **102** is sufficiently proximate to the magnetic field sensor of reactive component **102** or the sensor element **60**.

Some highly suitable devices for providing the functionality of the magnetic field sensor **110** is disclosed in, for example, U.S. Pat. No. 7,023,308 of Randall Woods, which is hereby incorporated by reference in its entirety. Suitable devices for performing the function of the magnetic field sensor may be commercially available from Magnasphere Corporation of Waukesha, Wis.

It should be appreciated that in the foregoing description and appended claims, that the terms "substantially" and "approximately," when used to modify another term, mean

"for the most part" or "being largely but not wholly or completely that which is specified" by the modified term.

It should also be appreciated from the foregoing description that, except when mutually exclusive, the features of the various embodiments described herein may be combined with features of other embodiments as desired while remaining within the intended scope of the disclosure.

In this document, the terms "a" or "an" are used, as is common in patent documents, to include one or more than one, independent of any other instances or usages of "at least one" or "one or more." In this document, the term "or" is used to refer to a nonexclusive or, such that "A or B" includes "A but not B," "B but not A," and "A and B," unless otherwise indicated.

With respect to the above description then, it is to be realized that the optimum dimensional relationships for the parts of the disclosed embodiments and implementations, to include variations in size, materials, shape, form, function and manner of operation, assembly and use, are deemed readily apparent and obvious to one skilled in the art in light of the foregoing disclosure, and all equivalent relationships to those illustrated in the drawings and described in the specification are intended to be encompassed by the present disclosure.

Therefore, the foregoing is considered as illustrative only of the principles of the disclosure. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the disclosed subject matter to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to that fall within the scope of the claims.

We claim:

1. A deadbolt lock status sensing assembly for monitoring status of a deadbolt member of a deadbolt assembly on a door, the status sensing assembly comprising:

a sensible element mountable on one of the door and the deadbolt assembly, the sensible element being magnetically active;

a sensing element mountable on one of the door and the deadbolt assembly;

wherein the sensible element and the sensing element are configured to move with respect to each other when the deadbolt member of the deadbolt assembly moves between an extended condition and a retracted condition of the deadbolt;

wherein the sensible element includes an active component and a reactive component, the active component being configured to be actively moved by movement of a deadbolt actuation mechanism and the reactive component being reactively moved by movement of the active component; and

wherein the active and reactive components are magnetically attractable to each other.

2. The assembly of claim **1** wherein the sensible element comprises a magnet generating a magnetic field; and

wherein the sensing element is configured to sense a change in proximity of the magnetic field to the sensing element.

3. The assembly of claim **1** wherein the deadbolt assembly includes a deadbolt actuation mechanism configured to move the deadbolt member between the extended and retracted conditions; and

wherein the sensible element is configured to change position of the sensible element with respect to the sensing element as a result of operation of the deadbolt actuation mechanism.

4. The assembly of claim **1** wherein the active component mounted on a deadbolt cam bar of the deadbolt assembly such that the active component is directly rotated with the cam bar when the cam bar is rotated such that the active component is rotated between a locked location and a unlocked location by rotation of the deadbolt cam bar.

5. The assembly of claim **4** wherein the reactive component has an influenced position and an uninfluenced position, the reactive component being biased toward the uninfluenced position; and

wherein a relatively closer proximity of the active component to the reactive component causes the reactive component to move to the influenced position and a relatively further proximity of the active component to the reactive component permits the reactive component to move to the uninfluenced position.

6. The assembly of claim **5** wherein the reactive component is mounted on a deadbolt frame of the deadbolt assembly in a chamber formed in the deadbolt frame.

7. The assembly of claim **6** wherein the chamber is elongated along a movement axis radiating from the deadbolt cam bar, the reactive component being movable in the chamber along the movement axis, the reactive component translating along the movement axis in the chamber between the influenced position and the uninfluenced position.

8. The assembly of claim **7** wherein the chamber is configured such that the movement axis is substantially vertically oriented, the reactive component being biased to the uninfluenced position by gravity.

9. The assembly of claim **7** wherein the sensing element is configured to detect a change in the position of the reactive component between the uninfluenced and influenced positions.

10. The assembly of claim **9** wherein the chamber is configured such that the reactive component closes an electrical circuit in one of the influenced and uninfluenced positions of the reactive component and the reactive component opens the electrical circuit in an other one of the influenced and uninfluenced positions of the reactive component.

11. The assembly of claim **4** wherein the active component is embedded in the deadbolt cam bar of the deadbolt assembly.

12. A deadbolt lock status sensing assembly for monitoring status of a deadbolt member of a deadbolt assembly on a door, the status sensing assembly comprising:

a sensible element mountable on one of the door and the deadbolt assembly, the sensible element being magnetically active;

a sensing element mountable on one of the door and the deadbolt assembly;

wherein the sensible element and the sensing element are configured to move with respect to each other when the deadbolt member of the deadbolt assembly moves between an extended condition and a retracted condition of the deadbolt;

wherein the sensible element includes an active component and a reactive component, the active component being configured to be actively moved by movement of a deadbolt actuation mechanism and the reactive component being reactively moved by movement of the active component;

wherein the active component mounted on a deadbolt cam bar of the deadbolt assembly such that the active component is directly rotated with the cam bar when the cam bar is rotated such that the active component is

rotated between a locked location and an unlocked location by rotation of the deadbolt cam bar;

wherein the reactive component has an influenced position and an uninfluenced position, the reactive component being biased toward the uninfluenced position;

wherein a relatively closer proximity of the active component to the reactive component causes the reactive component to move to the influenced position and a relatively further proximity of the active component to the reactive component permits the reactive component to move to the uninfluenced position;

wherein the reactive component is mounted on a deadbolt frame of the deadbolt assembly in a chamber formed in the deadbolt frame;

wherein the chamber is elongated along a movement axis radiating from the deadbolt cam bar, the reactive component being movable in the chamber along the movement axis, the reactive component translating along the movement axis in the chamber between the influenced position and the uninfluenced position;

wherein the sensing element is configured to detect a change in the position of the reactive component between the uninfluenced and influenced positions; and

wherein the chamber is configured such that the reactive component closes an electrical circuit in one of the influenced and uninfluenced positions of the reactive component and the reactive component opens the electrical circuit in an other one of the influenced and uninfluenced positions of the reactive component.

13. The assembly of claim **12** wherein the active component is embedded in the deadbolt cam bar of the deadbolt assembly.

14. A deadbolt lock status sensing assembly for monitoring status of a deadbolt member of a deadbolt assembly on a door, the status sensing assembly comprising:

a sensible element mountable on the deadbolt assembly, the sensible element being magnetically active;

a sensing element mountable on the door;

wherein the sensible element is configured to move with respect to the sensing element when the deadbolt member of the deadbolt assembly moves between an extended condition and a retracted condition of the deadbolt;

wherein the sensible element includes an active component and the sensing element includes a reactive component, the active component being configured to be actively moved by movement of a deadbolt actuation mechanism of the deadbolt assembly and the reactive component being reactively moved by movement of the active component;

wherein the active component is mountable on a deadbolt cam bar of the deadbolt actuation mechanism such that the active component is directly rotated with the cam bar when the cam bar is rotated and the active component is rotated between a locked location and an unlocked location by rotation of the deadbolt cam bar;

wherein the reactive component is located in a chamber and has an influenced position in the chamber and an uninfluenced position in the chamber, the reactive component being biased toward the uninfluenced position in the chamber;

wherein a relatively closer proximity of the active component to the reactive component causes the reactive component to move to the influenced position in the chamber and a relatively further proximity of the active component to the reactive component permits the reactive component to move to the uninfluenced position in the chamber; and

wherein the chamber is configured such that the reactive component closes an electrical circuit in one of the influenced and uninfluenced positions of the reactive component and the reactive component opens the electrical circuit in an other one of the influenced and uninfluenced positions of the reactive component such that the sensing element is configured to detect a change in the position of the reactive component between the uninfluenced and influenced positions and the movement of the active component between the locked and unlocked locations.

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