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LOCKING APPARATUSES, SYSTEMS, AND METHODS OF PROVIDING ACCESS CONTROL

Abstract

Apparatuses, systems, and methods are provided for detecting an alert status of a locking apparatus for an entry point. An external force may be received at a locking apparatus operating in a locked state and determining a first indicia corresponding to the received external force, separately receiving an indication of the external force at an accelerometer of the locking apparatus and determining a second indicia corresponding to the received indication of the external force, comparing the first indicia and the second indicia to determine an alert condition, and selectively performing at least one alert operation corresponding to the determined alert condition.

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Background/Summary

CROSS-REFERENCES TO RELATED APPLICATIONS [0001] This application is a continuation application to U.S. Non-Provisional patent application Ser. No. 17/390,025, dated Jul. 30, 2021, which claims benefit of U.S. Provisional Patent Application No. 63/058,970, dated Jul. 30, 2020, entitled “Locking Apparatuses, Systems, and Methods of Providing Access Control,” and which are hereby incorporated by reference in their entirety. [0002] A portion of the disclosure of this patent document contains material that is subject to copyright protection. The copyright owner has no objection to the reproduction of the patent document or the patent disclosure, as it appears in the U.S. Patent and Trademark Office patent file or records, but otherwise reserves all copyright rights whatsoever.

BACKGROUND

[0003] The present disclosure related generally to an apparatus for resisting movement of an object. More specifically, the present disclosure relates to a mounted locking apparatus which is configured to prevent a door or other means of entry from being opened while the locking apparatus is in a locked state.

[0004] Traditional door lock mechanisms such as deadbolt locks are used to prevent or resist access to an interior of a location. Traditional deadbolt lock mechanisms are well known in the art. However, deadbolts can often be overcome with no tools and relatively little force. This may occur because the deadbolt must be mounted within the door itself and secured to a door frame. A deadbolt, mounted within the door, typically extends from the inner body of the door and into a small recess within the door face. In order for an intruder to break through a door locked using a typical deadbolt mechanism, the intruder need only kick the door at the weakest point, the lock strike plate. Even when fully engaged, a deadbolt is only able to apply resistive force across a small area of a door and door frame. Furthermore, traditional deadbolts are easily defeated, for example by lock bumping.

[0005] Therefore, in order to increase security and to protect against traditional door lock mechanism shortcomings, what is needed is an improved locking apparatus capable of providing greater strength and resiliency.

BRIEF SUMMARY

[0006] In accordance with aspects of the invention, apparatuses, systems, and methods are provided for enabling intrusion detection and prevention at a premises, including a control system therefore and control method.

[0007] According to a first aspect of the present disclosure, provided is a method of detecting an alert status of a locking apparatus for an entry point. The method includes receiving an external force at a locking apparatus operating in a locked state and determining a first indicia corresponding to the received external force, separately receiving an indication of the external force at an accelerometer of the locking apparatus and determining a second indicia corresponding to the received indication of the external force, comparing the first indicia and the second indicia to determine an alert condition, and selectively performing at least one alert operation corresponding to the determined alert condition.

[0008] The determining the first indicia corresponding to the received external force may include determining an amount of flex of a lifting member of a locking apparatus caused by the external force. The external force may be a force of a door opening inwardly into an interior space securable by the locking apparatus.

[0009] The first indicia may be determined according to a status of an electromechanical switch of the locking apparatus.
[0010] The comparing the first indicia and the second indicia may include determining a sensitivity setting and applying the sensitivity setting to a result of the comparing the first indicia and the second indicia to determine the alert condition.
[0011] The alert condition may include transmitting an indication of the alert condition to an external device. The transmitting the indication of the alert condition may include wirelessly transmitting the indication of the alert condition. The transmitting the indication of the alert condition to the external device may include wirelessly transmitting the indication of the alert condition to an electronic device associated with the locking apparatus.
[0012] According to a further aspect of the present disclosure, provided is a locking apparatus including a body, a lifting member coupleable to the body, at least a portion of the lifting member configured to move relative to the body according to a command position relating to a locking status, the lifting member comprising (i) a contact surface configured to restrict movement of an object, and (ii) an electromechanical switch, the lifting member configured to receive an external force, an accelerometer coupled to the body, the accelerometer configured to receive an indication of the external force received at the lifting member, and a control circuit configured to determine a first indicia corresponding to the received external force at the lifting member and to determine a second indicia corresponding to the received indication of the external force by the accelerometer.
[0013] The control circuit may compare the first indicia and the second indicia to determine an alert condition; and to selectively perform at least one alert operation corresponding to the determined alert condition. The control circuit may determine a sensitivity setting and applying the sensitivity setting to a result of the comparing the first indicia and the second indicia to determine the alert condition.
[0014] The control circuit may determine an amount of flex of the lifting member caused by the external force. The locking apparatus may restrict movement of a door into an interior space securable by the locking apparatus, and wherein the external force is a force of the door opening inwardly into the interior space securable by the locking apparatus.
[0015] The locking apparatus may include a transceiver, and the control circuit may control the transceiver to communicate a representation of the determined alert condition. The control circuit may cause the transceiver to wirelessly transmit the representation of the determined alert condition.
[0016] According to a still further aspect of the present disclosure, provided is a method of controlling a locking apparatus. The method includes selecting a threshold value, the threshold value corresponding to a force value associated with the locking apparatus, detecting a force received at the locking apparatus, comparing the detected force to the selected threshold value, determining an alarm condition status based at least in part upon the comparison of the detected force to the selected threshold value, and selectively performing at least one alarm operation corresponding to the determined alarm condition status.
[0017] Determining the alarm condition status may include determining a locking status of the locking apparatus. The locking status of the locking apparatus may be determined to be a locked status, the determining the alarm condition status including providing a time delay after determining that the locking apparatus is in the locked state. The alarm condition status may be determined to be a no alarm status when the locking apparatus is determined to be operating in an unlocked status after expiration of the time delay. The alarm condition status may be determined to be an active alarm status when the locking apparatus is determined to be operating in the locked status after expiration of the time delay, wherein a control circuit of the locking apparatus transmits at least one alarm status communication responsive to the active alarm status determination.
[0018] Numerous other objects, features, and advantages of the present invention will be readily

apparent to those skilled in the art upon a reading of the following disclosure when taken in conjunction with the accompanying drawings.

Description

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0019] FIG. **1** is an elevated perspective view of a locking apparatus according to an exemplary embodiment.

[0020] FIG. **2** is an elevated perspective view of an interior section of a power housing of a locking apparatus according to an exemplary embodiment.

[0021] FIG. **3** top internal view of an outer housing of a locking apparatus according to an exemplary embodiment.

[0022] FIG. **4** is an elevated perspective view of an interior portion of a central member of a locking apparatus according to an exemplary embodiment.

[0023] FIG. **5** is a bottom view of a locking apparatus according to an exemplary embodiment.

[0024] FIG. **6** is a side view of a locking apparatus and a riser according to an exemplary embodiment.

[0025] FIG. **7** is a side view of a locking apparatus and a connection plate according to an exemplary embodiment.

[0026] FIG. **8** is a side view of a locking apparatus in a locked state according to an exemplary embodiment.

[0027] FIG. **9** is a side view of a locking apparatus in an unlocked state according to an exemplary embodiment.

[0028] FIG. **10** is an overhead view of a sliding door Implementation of a locking apparatus in a locked state according to an exemplary embodiment.

[0029] FIG. **11** is an overhead view of a sliding door Implementation of a plurality of locking apparatuses in unlocked states according to an exemplary embodiment.

[0030] FIG. **12** is a sideview of a mounting bracket for a locking apparatus and a locking apparatus according to an exemplary embodiment.

[0031] FIGS. **13**A-B respectively illustrate a locking apparatus in a locked state and a locking apparatus in an unlocked state according to an exemplary embodiment.

[0032] FIG. **14** is a sideview of a locking apparatus having a slot-type connection point according to an exemplary embodiment.

[0033] FIG. **15** illustrates a partial internal view of a central member of a locking apparatus according to an exemplary embodiment.

[0034] FIG. **16** illustrates a partial bottom perspective view of a central member in according to an exemplary embodiment.

[0035] FIG. **17** illustrates a zoomed view of a partial internal view of a central member according to an exemplary embodiment.

[0036] FIG. **18** illustrates a partial top elevational view of a central member according to an exemplary embodiment.

[0037] FIG. **19** illustrates a raised perspective view of a portion of an internal view of a central member according to an exemplary embodiment.

[0038] FIG. **20** illustrates a top perspective view of a locking apparatus according to an exemplary embodiment.

[0039] FIG. **21** illustrates a perspective view of a partial internal view of a central member and an outer housing of a locking apparatus according to an exemplary embodiment.

[0040] FIG. **22** illustrates a flowchart of an exemplary embodiment of a process of performing a detection process for a locking apparatus according to aspects of the present disclosure.

[0041] FIG. **23** illustrates a partial top view of a block diagram of an exemplary embodiment of a locking apparatus according to aspects of the present disclosure.
[0042] FIG. **24** illustrates a partial block diagram of an exemplary embodiment of a control circuit according to aspects of the present disclosure.

DETAILED DESCRIPTION

[0043] While the making and using of various exemplary embodiments of the present disclosure are discussed in detail below, it should be appreciated that the present disclosure provides many applicable inventive concepts that can be embodied in a wide variety of specific contexts. The specific embodiments discussed herein are merely illustrative of specific ways to make and use the invention and do not delimit the scope of the invention.

[0044] Where the various figures may describe embodiments sharing various common elements and features with other embodiments, similar elements and features are given the same reference numerals and redundant description thereof may be omitted below.

[0045] To facilitate the understanding of the embodiments described herein, a number of terms are defined below. The terms defined herein have meanings as commonly understood by a person of ordinary skill in the areas relevant to the present invention. Terms such as “a,” “an,” and “the” are not intended to refer to only a singular entity, but rather include the general class of which a specific example may be used for illustration. The terminology herein is used to describe specific embodiments of the invention, but their usage does not delimit the invention, except as set forth in the claims. The phrase “in one embodiment,” as used herein does not necessarily refer to the same embodiment, although it may.

[0046] Conditional language used herein, such as, among others, “can,” “might,” “may,” “e.g.,” and the like, unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain embodiments include, while other embodiments do not include, certain features, elements and/or states. Thus, such conditional language is not generally intended to imply that features, elements and/or states are in any way required for one or more embodiments or that one or more embodiments necessarily include logic for deciding, with or without author input or prompting, whether these features, elements and/or states are included or are to be performed in any particular embodiment.

[0047] The term “signal” as used herein may include any meanings as may be understood by those of ordinary skill in the art, including at least an electric or magnetic representation of current, voltage, charge, temperature, data or a state of one or more memory locations as expressed on one or more transmission mediums, and generally capable of being transmitted, received, stored, compared, combined or otherwise manipulated in any equivalent manner.

[0048] The term “user interface” as used herein may unless otherwise stated include any input-output module with respect to the hosted server including but not limited to web portals, such as individual web pages or those collectively defining a hosted website, mobile applications, desktop applications, telephony interfaces such as interactive voice response (IV R), and the like. Such interfaces may in a broader sense include pop-ups or links to third party websites for the purpose of further accessing and/or integrating associated materials, data or program functions via the hosted system and in accordance with methods of the present invention.

[0049] The terms “controller,” “control circuit” and “control circuitry” as used herein may refer to, be embodied by or otherwise included within a machine, such as a general purpose processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA) or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed and programmed to perform or cause the performance of the functions described herein. A general-purpose processor can be a microprocessor, but in the alternative, the processor can be a controller, microcontroller, or state machine, combinations of the same, or the like. A processor can also be implemented as a combination of computing devices, e.g., a combination of a DSP and a microprocessor, a plurality of microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration.

[0050] The term "communications medium" as used herein with respect to data communication between two or more parties or otherwise between communications network interfaces associated with two or more parties may refer to any one of, or a combination of any two or more of, telecommunications networks (whether wired, wireless, cellular or the like), a global network such as the Internet, local networks, network links, Internet Service Providers (ISP's), and intermediate communication interfaces.

[0051] To the extent that the term "includes" or "including" is used in the specification or the claims, it is intended to be inclusive in a manner similar to the term "comprising" as that term is interpreted when employed as a transitional word in a claim. Furthermore, to the extent that the term "or" is employed (e.g., A or B) it is intended to mean "A or B or both." When the applicants intend to indicate "only A or B but not both" then the term "only A or B but not both" will be employed. Thus, use of the term "or" herein is the inclusive, and not the exclusive use. See, Bryan A. Garner, A Dictionary of Modern Legal Usage 624 (2d. Ed. 1995). Also, to the extent that the terms "in" or "into" are used in the specification or the claims, it is intended to additionally mean "on" or "onto." Furthermore, to the extent the term "connect" is used in the specification or claims, it is intended to mean not only "directly connected to," but also "indirectly connected to" such as connected through another component or multiple components.

[0052] With reference to FIG. **1**, provided is a locking apparatus **100** in accordance with an exemplary embodiment of the present disclosure. Locking apparatus **100** may comprise a central member **110** having a lifting member **112** and at least one stop member **114** located at an end thereof. In one embodiment, the locking apparatus **100** may comprise one or more of an outer housing **120** and power housing **130** connected thereto. The locking apparatus **100** may be modularly formed of a central member **110** and one or more of outer housing **120** and power housing **130**. As used herein, the term "central" may denote aspects other than or in addition to a physical location. For example, the term "central" as used herein may convey an operational aspect and/or interrelationship as applied. In one exemplary embodiment, at least one of the outer housing **120** and power housing **130** may be physically located at a central location of an assembled locking apparatus **100** without departing from the spirit or scope of the present disclosure. Although described with reference to a lock or locking, it should be appreciated that the locking apparatus **100** functionally operates as a barrier to restrict movement of an object, and thus should not be narrowly construed as merely a traditional lock, and does not require a particular "key" or physical or electronic unlocking device to operate. Accordingly, the locking apparatus **100** may take the form of a barrier apparatus consistent with the disclosure provided herein.

[0053] In one embodiment, the overall structure of the locking apparatus **100** may form a convex quadrilateral such as a trapezoid. In the exemplary embodiment illustrated at FIG. **1**, for example, the central member **110** may be rectangularly shaped, while the outer housing **120** and power housing **130** may be shaped as a trapezoid. However, the shape of each of the central member **110**, outer housing **120**, and power housing **130** may vary based upon desired usage, thus an overall shape of the locking apparatus **100** may vary.

[0054] At least a portion of lifting member **112** of central member **110** may be configured to elevate during operation of the locking apparatus **100**. In one exemplary embodiment described herein, at least a portion of the lifting member **112** may be elevated more at a proximal side of the locking apparatus **100** relative to a door frame than at a distal side relative to the door frame. In doing so, a force applied at the lifting member **112** by contact with a door or other object may be translated downwardly along the lifting member **112** and into a surface to which the locking apparatus is mounted, thereby increasing an amount of force capable of being resisted by the locking apparatus **100**.

[0055] An inner portion of the lifting member **112** may comprise notches, divots, or cam receptacles. The notches, divots, or cam receptacles may be configured to be placed in contact with at least one cam **440** (as illustrated at FIG. **4** and described herein) of the central member **110**. In one embodiment, the at least one cam **440** may be placed in constant contact with the lifting member **112** during operation. In an alternate embodiment, the at least one cam **440** may be configured to be placed in contact with the lifting member **112** only during particular operations, such as increasing a height of the lifting member **112** and/or decreasing the height of the lifting member **112**.

[0056] The lifting member **112** may comprise a single structural element in one embodiment or may comprise a plurality of structural elements without departing from the spirit and scope of the present disclosure. For example, in one embodiment the lifting member **112** may be formed of two or more structural elements which are configured to nest within each other when the locking apparatus **100** operates in an unlocked state, and to expand to separate associated heights when operating in a locked state. In one implementation, at least one of the plurality of structural elements may be selected based on a desired overall height of the lifting member **112** in a locked state. In a separate embodiment, the plurality of structural elements may collectively be arranged at a single height when in a locked position, and/or may provide for a single or a plurality of contact points with a door or object whose movement is intended to be restricted. When a plurality of nested structural elements are used for lifting member **112**, a gap distance between a contact surface of the lifting member **112** and the door or object whose movement is intended to be restricted may be reduced as compared to a single lifting member embodiment. In addition to lifting member **112**, a height of the at least one stop member **114** may be manipulated within the scope of the present disclosure. This may be accomplished, for example, based on a connection between the lifting member **112** and at least one stop member **114** and/or by connection between at least one cam **440** and the at least one stop member **114**.

[0057] In one embodiment, locking apparatus **100** may comprise a single central member **110** without either or both of outer housing **120** and power housing **130** connected thereto. In another embodiment, one or more central members **110** may be connected to form a single locking apparatus **100**. In this configuration, the plurality of central members **110** may communicate with one another to coordinate operation and function as a single member. In an alternate embodiment, a plurality of central members **110** may be interconnected as separate locking apparatuses **100**, each operating independently of one another. Because of the modular nature of locking apparatus **100**, a size associated with each component of the locking apparatus **100** may vary, and the ultimate size of a locking apparatus **100** depends on a size and number of each central member **110**, outer housing **120**, and/or power housing **130** connected thereto. Each of the central member **110**, outer housing **120**, and/or power housing **130** may be implemented in various sizes to permit usage in any intended application. For example, a central member **110** may be implemented having various widths and associated contact surface size, such that a central member **110** may have a width such as ten inches, thirty-six inches, or any other desired size based on implementation.

[0058] Outer housing **120** may be configured to physically and/or electrically connect to a central member **110**. For example, an outer housing **120** may be connected to a central member **110** by moving the outer housing **120** inwardly towards the at least one stop member **114**. In this example, the outer housing **120** or central member **110** may comprise a connection mechanism which detachably connects the outer housing **120** and central member **110** when the outer housing **120** is moved inwardly relative to the central member **110**. Alternatively or in conjunction with attachment to the central member **110**, the outer housing **120** and central member **110** may connect via at least a portion of the at least one stop member **114**.

[0059] Each of the central member **110**, outer housing **120**, and/or power housing **130** may be formed of a durable material and each form a cavity therein. Examples of durable materials which may be used are glass-filled nylon such as nylon 66, metals such as aluminum, titanium, or the like, plastics, or any other material capable of structural rigidity sufficient for operating conditions of the locking apparatus **100**. The central member **110**, outer housing **120**, and power housing **130** may each have a cavity formed therein configured to house internal components.

[0060] When combined, the locking apparatus may be configured to be arranged in an elongated structure with one or more central members **110**, outer housings **120**, and/or power housings **130** connected at one or more of opposing longitudinal ends of a central member **110**. At least one other central member **110**, outer housing **120**, or power housing **130** may, in various embodiments, be attached to a central member **110** at any surface of the central member **110**, based on a desired operational configuration (e.g., at a location other than a longitudinal end). Electrical connection(s) between internal components of central member **110** and between central member **110**, outer housing **120**, and power housing **130** may be accomplished by means of conventional wiring and connectors, which are not illustrated in the drawings for purposes of promoting clarity.

[0061] In one exemplary embodiment, the outer housing **120** may be configured with a locking mechanism **122** housed therein. Locking mechanism **122** may optionally be configured as a push/pull type manual unlock, a pressure sensitive foot pedal, or any other means of manual operation capable of engaging and/or disengaging an operational status of the locking apparatus **100**. As illustrated, for example, in FIG. **2**, a push-pull type mechanism may comprise an operating arm **224**, crossmember **226**, and engagement arm **228**. Operating arm **224** and engagement arm **228** may be connected to each other by means of interconnection with the crossmember **226**. Although crossmember **226** is illustrated in FIG. **2** as being connected to operating arm **224**, engagement arm **228**, and a central pivot point **227** by means of screws or bolts, any fastening means capable of attaching the crossmember **226** to the operating arm **224**, engagement arm **228**, and pivot point **227** may be used within the spirit and scope of the present disclosure.

[0062] In operation, the locking mechanism **122** may be configured to permit manual engagement or disengagement of the locking apparatus **100**. For example, in one exemplary embodiment, the locking mechanism **122** may be configured such that at least a portion of operating arm **224** extends to protrude from an outer surface of the outer housing **120** when the locking apparatus **100** operates in a locked mode. If a user desires to manually disengage the locking apparatus **100**, the user may push the operating arm **224** inwardly towards the central member **110**. The movement of the operating arm **224** may cause the crossmember **226** to rotate relative to the pivot point **227**, for example in either a clockwise or counterclockwise direction. Based on its attachment to the engagement arm **228**, crossmember **226**'s rotation may cause the engagement arm **228** to move in an engagement direction. In one embodiment, the engagement direction may be a longitudinal direction associated with the central member **110**. Movement in the engagement direction may activate a manual release **420** of actuator **405** (illustrated at FIG. **4**) to manipulate an operating status of the locking apparatus **100** in a manner as described herein.

[0063] Either alternatively or in addition to a push/pull type mechanism, other means of manual operation are contemplated within the scope of the present disclosure. For example, a foot pedal (not illustrated) may be used at an outer surface of the outer housing **120** to manipulate a manual release associated with the locking apparatus **100**. For example, a foot pedal **54** and associated structure as described in Provisional Patent Application 62/038,393 (as incorporated by reference herein in its entirety) may be implemented for manual operation.

[0064] Outer housing **120** may further comprise an illuminating member **129**. Illuminating member **129** may comprise a lighting element such as a light emitting diode (LED) or the like which is powered either by a power source (e.g., a battery or other input power) associated with the outer housing **120**, or by an electrical connection to central member **110** or power housing **130**. In one embodiment, a faceplate containing a logo or other item desired to be illuminated may be placed atop the illuminating member **129** to provide backlighting for the faceplate. In one exemplary embodiment, the illuminating member **129** may be configured to vary an illumination color based on a status of the locking apparatus **100**. For example, the illuminating member **129** may display a first color while the locking apparatus operates in an unlocked mode, while a second color may be displayed while the locking apparatus operates in a locked mode. The illuminating member **129** may also be configured to vary a color or display mode for purposes of conveying information to a user. For example, the illuminating member may provide various color or display patterns to convey lock status, information related to usage (e.g., battery backup power usage, etc.), device pairing status, or any other information desired to be conveyed by the locking apparatus **100**. Electrical connection(s) between internal components of outer housing **120** and between outer housing **120** and central member **110** may be accomplished by means of conventional wiring and connectors, which are not illustrated in the drawings for purposes of promoting clarity.

[0065] In one embodiment, one or more power housings **130** may be connected to a central member **110**. As illustrated in FIG. **3**, power housing **130** may comprise one or more of a power input **132** and battery **134**. Power input **132** may be configured to be located at an outer surface of the power housing **130** and to receive input power from an external source (e.g., a power adapter or other power input means). In one embodiment, the power input **132** may be connected to the battery **134** and may be configured to provide charging power to the battery **134** when a power source is connected to the power input **132**. Electrical connection(s) between internal components of power housing **130** and between power housing **130** and central member **110** may be accomplished by means of conventional wiring and connectors, which are not illustrated in the drawings for purposes of promoting clarity.

[0066] Battery **134** may comprise a lithium-ion, aluminum-ion, sodium-nickel chloride, polymer, or other battery design which is configured to provide sufficient power storage, durability, and/or thermal properties. Alternatively or in addition to the above-noted battery designs, battery **134** may comprise or include at least one ultracapacitor. In one exemplary embodiment, the battery **134** may comprise a rechargeable lithium-ion battery. The location of battery **134** and design within the power housing **130** may be configured so as to increase the longevity of holding a charge and to prevent damage to the battery **134** (e.g., by means of water damage, electrical charge, or wear and tear). The battery **134** may be positioned within the cavity of the power housing **130**. In one embodiment, the battery **134** may be located within an insulated compartment **136**. The insulated compartment **136** may be configured to be waterproof and to electrically insulate the battery **134** therein.

[0067] In one embodiment a battery backup **135** may be used either as part of battery **134** or as a standalone backup. The battery backup **135** may comprise, for example, one or more alkaline batteries electrically connected to the locking apparatus **100**. The battery backup **135** may be used to provide power to the locking apparatus **100** in the event that the battery **134** has insufficient capacity or is incapable of meeting a power demand of the battery **134**. For example, the battery backup **135** may provide power in the event that battery **134** is fully discharged, is not operating properly, or is low on power. In an exemplary embodiment, the one or more alkaline batteries may be selected so as to provide six months or more of operating the locking apparatus **100** according to ordinary usage. The battery backup **135** may comprise three AAA batteries in one embodiment.

[0068] In one exemplary embodiment, the locking apparatus **100** may provide a notice to a user that the locking apparatus **100** is operating on battery backup power. The locking apparatus **100** may communicate a status to a user in a number of ways. For example, the locking apparatus **100** may emit a noise such as a beep, either continuously or at a specified interval, the illuminating member may blink to indicate backup power, the locking apparatus **100** may transmit and electronic communication to convey backup power usage to a user, etc.

[0069] Power housing **130** may be configured to provide electrical power to the central member **110**, for example by use of matching connectors **138** located at the power housing **130** and central member **110**. In one exemplary embodiment the matching connectors may be located within at least one of the cavities of the power housing **130** and central member **110**. For example, power housing **130** may comprise a power housing connector **138** configured to electrically connect to a corresponding connector of central member **110**. In one embodiment, the corresponding connector of central member **110** may be associated with a stop member **114**; however the corresponding connector of central member **110** may additionally or alternatively be associated with the central member **110** of itself or internal component therein.

[0070] FIG. **4** illustrates internal components within the cavity of central member **110** according to an exemplary embodiment. A bottom surface of the central member **110** may comprise a base **401** (e.g., a body). At least one opening **402** may be formed in the base **401** at a distal side of the central member **110** relative to a door frame. The at least one opening **402** may have at least one rotation-enabling member **403** to permit at least a portion of lifting member **112** to elevate during operation. Central member **110** may further comprise an actuator **405**. Actuator **405** may be variously implemented to provide for lifting power necessary to raise and/or lower lifting member **112** during operation. In one exemplary embodiment, the actuator **405** may comprise a servo; however any actuating device capable of manipulating a physical location of lifting member **112** may be used within the spirit and scope of the present disclosure. The actuator **405** may be mounted to the base **401** using mount **415** attached to or formed by the base **401**. Actuator **405** may comprise a coupler **410** for connecting to an external translating member. In one embodiment, actuator **405** may be configured to provide an output corresponding to a locked and an unlocked state. For example, the actuator **405** may be configured in one embodiment to provide output rotation at a designated amount in a designated direction corresponding to each state.

[0071] Actuator **405** may further comprise a manual release **420**. Manual release **420** may be configured to receive an input and to transition actuator **405** to a different operating state. For example, the manual release **420** may be configured to transition actuator **405** to an unlocked state from a locked state when an input is received from locking mechanism **122**. Alternatively, the manual release **420** may be configured to permit purely manual operation by changing an operating state of the locking apparatus **100** when an input is received (i.e., by switching between a current locked state to an unlocked state or between a current unlocked state to a locked state upon receiving input).

[0072] In one embodiment, the coupler **410** of actuator **405** may attach to a shaft **425** at a shaft coupler **430**. As illustrated, for example, at FIG. **4**, the coupler **410** of actuator **405** and the shaft coupler **430** of shaft **425** may be implemented using matching notches to permit interconnection. However, connecting notches are not required to be used to connect the actuator **405** and shaft **425**, and in one embodiment, the shaft **425** may connect directly to the actuator **405**. The shaft **425** may be connected to the base **401** of central member **110** by means of at least one coupler **435**. The at least one coupler **435** may be configured to hold the shaft **425** in position relative to the base **401**, actuator **405**, and/or lifting member **112**.

[0073] At least one cam **440** may be connected to the shaft **425**. The at least one cam **440** may be configured to rotate in a manner consistent with shaft **425** during operation, and may be placed in contact with an inner surface of the lifting member **112**. Although two cams **440** are illustrated in FIG. **4**, only one cam **440** may be used, or three or more cams **440** may be used without departing from the spirit and scope of the present disclosure. In one embodiment the at least one cam **440** may be positioned relative to the shaft **425** such as to reduce potential damage to components of the central member **110** when an external force is applied to lifting member **112** or any other portion of locking apparatus **100**. Furthermore, the at least one cam **440** may be configured to maintain an angle relative to the lifting member **112** such that an external force applied to the lifting member **112** or other portion of locking apparatus **100** will not cause the at least one cam **440** to move or the shaft **425** to rotate. As such, in one embodiment, the configuration of the at least one cam **440** and shaft **425** may be such that structural rigidity and locking integrity is increased.

[0074] In one embodiment, the actuator **405** may cause the shaft **425** to rotate the at least one cam **440** such that an external surface of the lifting member **112** attains a predetermined angle relative to a surface upon which the locking apparatus **100** is mounted. The predetermined angle may be determined at a time of manufacture or may be configured by a user. The predetermined angle may be configured such that a contact position of the at least one cam **440** is perpendicular to the lifting member **112**. The predetermined angle may vary based upon intended operation. For example, a smaller angle may be preferable where a small distance exists between a surface that the locking apparatus **100** is mounted upon and an object whose movement is to be retrieved, when compared to a greater distance. Alternatively, a larger angle may be preferable to resist an external force pushing downward upon an exterior surface of the lifting member **112**. In one exemplary embodiment, a predetermined angle of between 15 and 20 degrees may be used. However, any angle may be used within the scope of the present disclosure for a corresponding intended purpose.

[0075] Central member **110** may further comprise a control circuit **450**. In one embodiment, the control circuit **450** may be attached to the base **401** by means of circuit mount **460**. In one embodiment, control circuit **450** is configured to control power distribution within the locking apparatus **100** and to enable automated control of the locking apparatus **100**. In one exemplary embodiment, the control circuit **450** may comprise a transceiver **455** to send and receive control signals. In one embodiment, the transceiver **455** may comprise a wired or wireless connection medium. At least a portion of the transceiver **455** may be accessible from an outer surface of the locking apparatus **100** or may be wholly within the cavity of the central member **110**. Transceiver **455** may permit communications across a communication medium using known communications protocols or proprietary communication protocols. For example, the transceiver **455** may permit the use of Ethernet, Bluetooth, Wi-Fi, a wireless application protocol, an IEEE 802 standard, or any other communications protocol, configuration, or implementation. It should be appreciated that in various embodiments, the locking apparatus **100** may be configured in a manual operating mode, without using or requiring the control circuit **450**.

[0076] In one exemplary embodiment, the transceiver **455** may be configured to communicate with a software application running on a device. For example, the transceiver **455** may be configured to send and receive messages relating to a user device running the software application (e.g., by means of a user interface executed upon a device). The software application may be configured such that a user of the software may cause the control circuit **450** to actuate various operations corresponding to a user's command. For example, the software may enable a user to request that the locking apparatus **100** operate in either a locked or unlocked state. Upon receiving a requested operation at the transceiver **455**, the control circuit **450** may control the locking apparatus **100** to perform the desired operation. The control circuit **450** may permit a great variety of desired automation and remote control capabilities. For example, in one exemplary embodiment, the control circuit **450** may be paired with a user device (e.g., using the Bluetooth protocol). After pairing, the control circuit **450** may be programmed to ensure that the locking apparatus **100** operates in an unlocked state whenever the paired user device is within a predetermined distance of the locking apparatus **100** (e.g., within ten feet).

[0077] Similarly, the control circuit **450** may, in one embodiment, permit the locking apparatus **100** to detect at least one device other than a paired user device and to notify an owner of the locking apparatus of an identifier associated with the detected device and/or provide the ability to remotely transition the locking apparatus **100** to a locked or unlocked state. The control circuit **450** may further enable the locking apparatus **100** to be programmed to operate in a locked or unlocked state at a predetermined time or event in one embodiment.

[0078] FIG. **5** illustrates a bottom view of an assembled locking apparatus according to an exemplary embodiment. As illustrated, central member **110** may comprise a bottom surface **510**, outer housing **120** may comprise a bottom surface **520**, and power housing **130** may comprise a bottom surface **530**. Each of the bottom surfaces **510**, **520**, and **520** may be configured to include at least one mounting location **550**. Each mounting location **550** may be used to secure the locking apparatus **100** to a surface upon which it is intended to be mounted.

[0079] Locking apparatus **100** may be attached to a surface upon which it is intended to be mounted using any one of at least one bolt, at least one hook and loop fastener, an adhesive material (e.g., any double sided tape, a tape such as 3M™ VHB™, etc.), or any other means of attachment, either alone or in combination. Furthermore, the means of attaching the locking apparatus **100** to the surface upon which it is intended to be mounted may be located upon at least one surface of the locking apparatus **100**, the surface upon which it is intended to be mounted, or any combination thereof. In one exemplary embodiment, the locking apparatus **100** may comprise at least one opening at a bottom surface thereof which may be used to mount the locking apparatus **100** to an intended mounting location by placing a bolt, screw, nail, tape, or other affixing element into or through the at least one opening and into or onto the surface upon which the locking apparatus **100** is intended to be mounted. Optionally, the at least one opening may be provided by means of a mounting bracket configured to be placed between the locking apparatus **100** and mounting surface during installation.

[0080] At least one of the central member **110**, outer housing **120**, and power housing **130** may be placed In contact with a threshold and/or door frame to provide bracing and/or structural rigidity. The locking apparatus **100** may optionally be mounted to the threshold and/or door frame by means the same or similar mounting means as described herein.

[0081] In addition to use of a predetermined angle, other mechanisms for adjusting to a height between a surface upon which the locking apparatus **100** is mounted and a door height are contemplated within the scope of the present disclosure. For example, as illustrated at FIG. **6**, a riser **600** may be used to increase an overall height of the locking apparatus **100**. In one embodiment, the locking apparatus **100** may be mounted to the riser **600**. The locking apparatus **100** may be mounted to the riser **600** at mounting point **610**. Mounting point **610** may comprise any means of attaching the locking apparatus **100** to the riser **600** and/or surface **620**. In one embodiment, the locking apparatus **100** may be attached to the riser **600** using screws or other fastening means.

[0082] The locking apparatus **100** may optionally be attached to the riser **600** using any single element or combination of at least one bolt, at least one hook and loop fastener, an adhesive material (e.g., any double sided tape, a tape such as 3M™ VHB™, etc.), or any other means of attachment. Furthermore, the means of attaching the locking apparatus **100** to the riser **600** may be located upon at least one surface of the locking apparatus **100**, at least one surface of the riser **600**, or any combination thereof.

[0083] In an alternative exemplary embodiment, a riser **600** may be placed atop an upper surface of lifting member **112** to increase an overall height thereof. In this configuration, the riser **600** may be attached directly to a top surface of riser **600** or may be attached to any portion of the locking apparatus **100** where such attachment is capable of preventing movement of the riser **600** relative to the locking apparatus **100**.

[0084] In one exemplary embodiment, the riser **600** may be configured to conform to legal requirements for threshold height. For example, the riser **600** may be configured or adjusted to satisfy a one-half inch height requirement in accordance with the Americans with Disabilities Act (ADA). Because threshold height may vary widely based upon installation and indoor floor height, riser **600** may be used to help satisfy ADA height requirements, as well as to form an ideal contact surface between the locking apparatus **100** and an object whose movement is intended to be restricted. In one embodiment, the riser **600** may, for example, provide for at least one inch of lift and/or at least 30 degrees of elevation to the lifting member **112**.

[0085] In one embodiment, the locking apparatus **100** may be configured to attach to a connection plate **700**, as illustrated at FIG. **7**. Connection plate **700** may be formed of any durable and/or rigid material capable of attachment to the locking apparatus **100**. The connection plate **700** may be used in one embodiment to facilitate attachment of the locking apparatus **100** to the surface (e.g., surface **720**) upon which the locking apparatus **100** is intended to be mounted. For example, the connection plate may provide pre-cut screw or bolt holes, may have double sided tape provided at predetermined locations, etc.

[0086] The connection plate **700** may be further configured to provide additional structural integrity and/or rigidity to the locking apparatus **100**. In one embodiment, the connection plate may be designed for installation at a time when a door frame is installed. The connection plate **700** may be configured to be placed under door sill **710** and/or to attach to one or more surfaces of the door sill **710** in order to provide additional strength and rigidity. In one embodiment, the connection plate **700** may be connected to a sill frame and/or mounting bracket.

[0087] Connection plate **700** may be used either in place of or in addition to riser **600** as desired. For example, a thickness of the connection plate **700** may be adjustable or possess a thickness so as to incorporate desired features of riser **600**.

[0088] In one embodiment, the connection plate **700** may comprise a universal installation plate (UIP) configured to permit installation of a locking apparatus according to a particular desired implementation. Although the use of a UIP is not required to be installed with a locking apparatus **100**, use of a UIP may expand installation capability, for example to accommodate a particular floor surface, a distance of the locking apparatus **100** from a door frame, or a particular property makeup of a floor surface. The UIP may be configured to adjust to a plurality of door applications. A UIP may be mounted in a plurality of ways, for example, under a door threshold, between a door and a sill plate, or any other door, frame, or floor surface configuration. In one embodiment, the locking apparatus **100** may be configured to attach to a pressure treated main door sill plate associated with a foundation of a structure such as a building.

[0089] FIG. **8** illustrates a side view of an exemplary implantation of the present disclosure when the locking apparatus **100** is in a locked state. As illustrated in FIG. **8**, a locking apparatus **100** may be mounted upon an intended mounting surface **810** (e.g., an interior floor). In the embodiment illustrated at FIG. **8**, the locking apparatus **100** is mounted to the intended mounting surface **810** and/or threshold **820** using at least one fastener **815**. At least one surface of the locking apparatus **100** may be optionally placed in contact with threshold **820**. Door **830** may be configured to open inwardly toward the locking apparatus **100**. When door **830** is opened, it may contact the lifting member **112** of locking apparatus **100** at a contact surface a. As previously described, a height of the contact surface a may be manipulated using riser **600**, connection plate **700**, or a combination thereof (see FIGS. **6-7**), to achieve an optimal contact surface area between the locking apparatus **100** and door **830**.

[0090] In operation, as the door **830** is placed in contact with the contact surface a, force associated with opening the door inwardly may be translated across the lifting member **112** of the locking apparatus **100** and through the bolts **815** and intended mounting surface **810** and/or threshold **820**. By doing so, door opening may be resisted or prevented, and entry may be denied. Furthermore, by providing a floor-mounted locking mechanism, existing entry prevention mechanisms may be enhanced. Because forces received at the contact surface a of locking apparatus **100** are translated into the intended mounting surface **810** and/or threshold **820**, forces far exceeding that needed to defeat existing door lock mechanisms may be received by the locking apparatus **100** without permitting entry.

[0091] FIG. **9** illustrates a side view of an exemplary implantation of the present disclosure where the locking apparatus **100** is in an unlocked state. As shown in FIG. **9**, when the locking apparatus **100** is in an unlocked state, door **830** is free to open inwardly without being placed in contact with contact surface a, since contact surface a is nested within the locking apparatus **100** when operating in the unlocked mode.

[0092] Although the present disclosure generally illustrates a floor-mounted locking mechanism, one or more locking apparatuses **100** in accordance with the present disclosure may be implemented at any surface upon which movement of an object to be restrained may be restricted. For example, at least one locking apparatus **100** may be positioned at a vertical portion of a door or window frame or sill and may operate in the same manner as previously described to restrict movement of an object whose movement is intended to be restricted.

[0093] For example, FIG. **10** illustrates a locking apparatus **100** configured to restrict movement of a sliding door **1000** which moves horizontally relative to a door frame **1050**. In this embodiment, the locking apparatus **100** may be positioned such that when lifting member **112** is in a locked state, the sliding door **1000** is blocked from opening by either the sliding door **1000** or frame **1050** being placed in contact with the contact surface a of the locking apparatus **100**. As noted in FIG. **10**, the locking apparatus **100** may be positioned at either of the sliding door **1000** or frame **1050** in this embodiment to provide a similar or same result.

[0094] FIG. **11** illustrates an exemplary embodiment in which sliding doors **1101** and **1102** are configured to open and close by moving along one or more tracks **1120** enclosed by rails **1150**. In this exemplary embodiment, one or more locking apparatuses **100** may be implemented at each of sliding doors **1101** and **1102** to restrict movement of the doors along track **1120**. For example, sliding doors **1101** and **1102** may be prevented from opening when lifting members **112** of locking apparatuses **100** are in a locked position, as contact between the contact surfaces a of the locking apparatuses **100** and the rails **1150** prevent the sliding doors **1101** and **1102** from moving outwardly along rails **1150**.

[0095] FIG. **12** illustrates a mounting bracket **1200** according to an exemplary embodiment. In one embodiment, the locking apparatus **100** may be attached to a mounting bracket **1200**. Alternatively, the locking apparatus may be attached to mounting bracket **1200** at time of installation and mounting to at least one of threshold **820** and surface **1210**, for example, by placing a screw, bolt, portion of double sided tape, etc. through at least one opening into which screws **1250** and/or **1275** are placed, as illustrated in FIG. **12**. In one embodiment, a carpet or other top surface **1290** may be removed to properly mount the mounting bracket **1200** and locking apparatus **100** to the surface **1210**. Although screw **1275** is not illustrated as penetrating through a portion of the locking apparatus **100**, it should be understood that both the mounting bracket **1200** and locking apparatus **100** may be secured to the threshold **820** by means of screw **1275**, for example by pre-forming a passage through an outer surface of the locking apparatus **100**, or by drilling through or otherwise penetrating an outer surface of the locking apparatus **100** either before installing the screw **1275** or at the time of installing screw **1275**.

[0096] In one embodiment, mounting bracket **1200** may be formed of metal, plastic, glass-filled nylon, or any other material capable of rigidity and durability during operation of the locking apparatus **100**. In one embodiment, the connection plate **700** may be formed, at least in part, by a mounting bracket **1200**. For example, the connection plate **700** may comprise mounting bracket **1200** attached to or otherwise connected with an extending portion which extends under a door frame or sill.

[0097] FIGS. **13**A-B illustrate a locking apparatus **100** in a locked state (FIG. **13**A) and in an unlocked state (FIG. **13**B) in accordance with an exemplary embodiment of the present disclosure. In one embodiment, at least a portion of the at least one stop member **114** may be configured to elevate at a same or similar rate to that of lifting member **112**, and may be configured to reach a positional height in a locked state of the lifting member **112** or at least a portion thereof. Each at least one stop member **114** may be configured to elevate using at least one cam in a similar manner to that of lifting member **112**, or may be connected to lifting member **112** in a manner which permits a height of the at least one stop member **114** to be manipulated. Although illustrated as comprising a single surface whose height is manipulated, in one exemplary embodiment, the lifting portion may comprise a plurality of lifting sections each having respective contact surfaces with a device whose movement is intended to be restricted.

[0098] FIG. **14** illustrates a side view of a locking apparatus **100** according an exemplary embodiment of the present disclosure. In the embodiment illustrated by FIG. **14**, at least one cam **440** may be configured with a connector **1450** at a surface thereof. The connector **1450** may be configured to be received by and connected to a slot **1460** located at an interior surface of the lifting member **112**. In one embodiment, connection between the connector **1450** and slot **1460** may permit the at least one cam **440** to control both lifting and lowering of a height associated with the lifting member **112**. By placing the connector **1450** into the slot **1460**, movement of the cam **440** may cause a position of the connector **1450** within the slot **1460** to move such that at least one of a lifting motion and a lowering motion is achieved based on movement of the cam **440**.

[0099] FIG. **15** illustrates a partial internal view of an exemplary embodiment of a central member **1500** of a locking apparatus. Connected to a bottom portion **1501** of the central member **1510** may beat least one actuator **1505**. In various embodiments, the actuator **1505** may be equivalent to the actuator **405** previously described herein. The actuator **1505** is configured in one embodiment to connect to at least one lifting arm **1510**. The lifting arm **1510** is configured to translate rotational movement output from the actuator **1505** to cause at least one of contact with a surface of a lifting member **112** (not illustrated in FIG. **15**) of a central member **1500** and movement of the lifting member **112** via the lifting arm **1510**.

[0100] At least one adjustment member **1515** (e.g., strap **1515**) may be connected one or more contact points of the central member **1500**. In one exemplary embodiment, the adjustment member **1515** may comprise a material capable of flexing and translating forces received at the adjustment member **1515**. The adjustment member **1515** may take the form of any substance or material capable of being placed in tension (such as, for example, a nylon strap, nylon webbing, rubber material, plastic material, a flexible woven, nonwoven, or textile member, etc.). In one exemplary embodiment, the adjustment member **1515** is a flexible woven or textile strap. However, the adjustment member **1515** is capable of taking the form of any segment, strand, or portion of material capable of receiving and/or transmitting one or more forces (e.g., a rope, string, or strand of material, a segment or portion of substance, etc., without departing from the spirit and the scope of the present disclosure.

[0101] The adjustment member may include one or more contact terminals **1517**. Each contact terminal **1517** is configured to connect to at least a portion of the central member **1500**. For example, one or more contact terminal **1517** may be configured to connect to a corresponding pin located at a lifting member **112** associated with the central member **1500**. The adjustment member **1515** and central member **1500** are configured in one exemplary embodiment such that at least a portion of the adjustment member **1515** is wound or wrapped around a portion of a contact surface of the central member. For example, as illustrated in FIG. **15**, the adjustment member **1515** may be wound through one or more apertures **1519** in a portion of the central member **1500**. The adjustment member **1515** is configured to connect to the lifting member **112** at two contact terminals **1517** while also being looped through one or more apertures **1519** in the exemplary embodiment illustrated by FIG. **15**. By doing so, the adjustment member is placed in tension and may absorb and translate forces received at one or more portions of the central member **1500**.

[0102] The central member **1500** may comprise at least one dog **1530**. In one exemplary embodiment, dog **1530** is configured to connect to a surface of the bottom portion **1501**. The dog **1530** may be rotatively coupled to a dog leg (e.g., latch), the dog leg being configured to restrict or stop movement of the dog **1530** in at least one direction. The dog **1530** includes a contact means **1540**, for example at an end of the dog **1530** opposite to that connected to the bottom portion **1501**. The contact means **1540** may variously comprise one or more connection mechanisms configured to be placed in contact and/or remain in contact with a surface of the lifting member **112** during operation. For example, the contact means **1540** may take the form of a pin, a roller, a bearing, or the like, without departing from the spirit and the scope of the present disclosure. In one exemplary embodiment, the contact means **1540** may be connected to the lifting member **112**, for example using a pin as illustrated in FIG. **15**.

[0103] The central member **1500** is configured in one exemplary embodiment such that as the lifting member **112** is raised relative to the bottom portion **1501**, the dog **1530** rotates outwardly relative to the bottom portion **1501**. The dog leg of the dog **1530** may be configured to limit or restrict movement of the dog **1530** in a direction opposite to the outward direction (e.g., based on a locking position, an incremental position, or the like). In one embodiment, the dog **1530** is configured with a release such that, based at least in part upon either manual or automated input, the dog **1530** is capable of releasing so as to allow the lifting member **112** to lower towards to the bottom portion **1501**. The dog **1530** may be variously configured at least in part upon a desired or predetermined amount of weight or force received in a direction towards to the bottom portion **1501** to cause the dog **1530** to release the dog leg and permit the lifting member **112** to lower. For example, the dog **1530** may be configured to release if a weight greater than that of the lifting member **112** is received at the dog **1530**, may be configured to release if the weight received at the dog **1530** is greater than 25 pounds, 50 pounds, 75 pounds, 100 pounds, or any other dynamically determined or predetermined criteria.

[0104] The central member **1500** may further comprise at least one tab **1520**. The tab **1520** may comprise at least one opening **1525**. The opening **1525** in one exemplary embodiment is configured to correspond with a pin configured to be received through the opening **1525**. Each tab **1520** and opening **1525** is configured to correspond with at least one tab or opening of the lifting member **112** such that the central member **1500** and lifting member **112** are capable of being connected to one another via the pin.

[0105] The central member **1500** may further comprise at least one mounting point **1550**. The central member **1500** may be attached to a surface using any one of at least one bolt, at least one hook and loop fastener, an adhesive material (e.g., any double sided tape, a tape such as 3M™ VHB™, etc.), or any other means of attachment, either alone or in combination, received via the at least one mounting point **1550**. Furthermore, the means of attaching the central member **1500** to a surface may be located upon at least one surface of the central member **1500**, a surface upon which it is intended to be mounted, or any combination thereof. In one exemplary embodiment, the central member **1500** may comprise at least one opening at the bottom portion **1501** which may be used to mount the central member to a mounting location by placing a bolt, screw, nail, tape, or other affixing element into or through the at least one opening and into or onto the surface upon which the central member **1500** is to be mounted. Optionally, the at least one opening may be provided by means of a mounting bracket configured to be placed between the central member **1500** and mounting surface during installation.

[0106] FIG. **16** illustrates a partial bottom perspective view of a central member **1600** in accordance with an exemplary embodiment. Central member **1600** comprises a bottom portion **1601** and a lifting member **1612**. In the embodiment illustrated by FIG. **16**, the bottom portion **1601** may be equivalent to the previously described bottom portion **1501** and the lifting member **1612** may be equivalent to the previously described lifting member **112**. The central member **1600** may comprise an adjustment member **1615** configured to connect the bottom portion **1601** and lifting member **1612**. The adjustment member **1615** may be configured to pass through one or more apertures **1617** of the bottom portion **1601**. At least a portion of the adjustment member **1615** may be configured to similarly pass through one or more apertures of the lifting member **1612** (e.g., in the manner illustrated at FIG. **18**).

[0107] The central member **1600** may include at least one dog **1630** similar to that described above with reference to dog **1530**. The lifting member **1612** may comprise at least one opening **1614**. The opening **1614** may be configured to receive one or more pins configured to pass through at least a portion of the at least one opening **1614**. In one exemplary embodiment, the lifting member **1612** may be configured to connect to one or more hinges to interconnect the lifting member **1612** and bottom portion **1601** of the central member **1600** (e.g., in the manner illustrated by FIG. **19**). The central member **1600** may comprise at least one stop member **1620** located at an end thereof. In various embodiments, the stop member **1620** may function as previously described with reference to stop member **114**.

[0108] FIG. **17** illustrates a zoomed view of a partial internal view of a central member **1700** according to an exemplary embodiment. The central member **1700** comprises a lifting member (e.g., lifting member **112**) having an adjustment member **1715** configured in the manner previously described (e.g., with reference to adjustment members **1515**, **1615**). The central member **1700** may include one or more contact terminals **1517** passing at least partially through an adjustment member **1715**. Each contact terminal **1517** may have a contact surface **1730** configured to be placed in contact with a conductive contact surface **1710** located at the lifting member **112**. Each conductive contact surface **1710** may further comprise at least one conductive path, for example connecting the conductive contact surface with a control circuit, such as a printed circuit board associated with the locking apparatus (e.g., control circuit **450**). One or more conductive paths may be configured to be shared between a plurality of conductive terminal contacts in one embodiment.

[0109] In operation, the control circuit may be configured to detect a force received by the locking apparatus by detecting a contact status between one or more contact terminals **1517** and one or more conductive contact surfaces **1710**. For example, in one embodiment the control circuit may be configured to detect a disconnected status between a contact terminal **1517** and conductive contact surface **1710**. Based at least in part upon the detected disconnected status, the control circuit may determine that an attempted entry has occurred and may contact at least one of a user, a homeowner, a landlord, a renter, a police representative, a security company, or any other entity having an interest in an attempted entry while the locking apparatus is maintained in a locked state. The lifting member **112** may be configured with one or more receiving portions **1720**, each receiving portion being configured to receive at least a portion of a contact terminal **1517** corresponding to an adjustment member **1715**.

[0110] FIG. **18** illustrates a partial top elevational view of a central member **1800** according to an exemplary embodiment. The central member **1800** includes at least a lifting member **1812** connected to a bottom portion (e.g., bottom portion **1501**) via the at least one passage **1830** formed on the lifting member **1812**. At least one shaft **1835** is configured to pass through the passage **1830** and at least one tab **1520** of the bottom portion. In one exemplary embodiment, the lifting member **1812** and the bottom portion (e.g., bottom portion **1501**) are connected via a hinge created via the shaft **1835** passing through the at least one passage **1830** of the lifting member **1812** and the at least one tab **1520** of the bottom portion.

[0111] The central member **1800** comprises at least one adjustment member **1815**. The adjustment member **1815** may be connected to the bottom portion (e.g., bottom portion **1501**) in the manner previously described. The adjustment member **1815** may further be connected to the lifting member **1812** via one or more apertures **1860**. For example, the adjustment member **1815** may be wound through a plurality of apertures **1860** located at one or more surfaces of the lifting member **1812**, as illustrated in the embodiment provided in FIG. **18**.

[0112] The adjustment member **1815** may include one or more contact terminals **1817**. Each contact terminal **1817** is configured to connect to at least a portion of the central member **1800**. For example, one or more contact terminal **1817** may be configured to connect to a corresponding pin located at a lifting member **1812** associated with the central member **1800**. The adjustment member **1815** and central member **1800** are configured in one exemplary embodiment such that at least a portion of the adjustment member **1815** is wound or wrapped around a portion of a of the bottom portion (e.g., bottom portion **1501**). For example, as illustrated in FIG. **15**, the adjustment member **1515** may be wound through one or more apertures **1519** in a portion of the central member **1500**. The adjustment member **1815** is configured to connect to the lifting member **1812** at two contact terminals **1817** while also being looped through one or more apertures **1519** in the exemplary embodiment illustrated by FIG. **15**. By doing so, the adjustment member is placed in tension and may absorb and translate forces received at one or more portions of the central member **1800**.

[0113] The central member **1800** may comprise at least one resilience member **1820** associated with the adjustment member **1815**. In one embodiment, each resilience member **1820** comprises an element configured to receive, transmit, or receive and transmit one or more forces applied to the adjustment member **1815**. Each resilience member **1820** is configured to connect to at least one surface of the lifting member **1812** and to translate one or more forces through the resilience member **1820**.

[0114] By incorporating a flexible adjustment member **1815** with the resilience members **1820**, implementations consistent with the present disclosure are capable of manipulating a contact surface angle of the lifting member **1812** relative to an object whose movement is intended to be impeded or restricted (such as a door, window, etc.). For example, an opening door maintains a circular path in an opening direction. The present disclosure provides a locking apparatus contact surface capable of adjusting to maintain contact with a door through at least a portion of a door opening path based on at least one of flexibility of the adjustment member **1815** and at least one resilience member **1820**. Thus, whereas a non-adjustable contact surface provides a reduced contact surface and thus increased centralized force on both the door and the locking apparatus at the reduced contact surface, the present disclosure permits a more evenly-distributed force across the lifting member, thereby reducing negative effects of focused energy on both the door and the locking apparatus. In embodiments where the resilience member **1820** is a spring, the spring's motion permits rotation of the lifting member **1812** such that the entire front (contact) edge of the lifting member **1812** may be placed in contact with a contact surface of the door in order to more efficiently transfer energy to protect the door. The adjustment member **1815** may be configured both to manipulate a position of the lifting member **1812** and to focus energy received from an object when the locking apparatus is operating in a locked position, similar to a spring function. The spring motion also permits rotation of the lifting member **1812** such that the entire front edge of the lifting member **1812** may be placed in contact with a contact surface of the object in order to more efficiently transfer energy to protect the object.

[0115] In various exemplary embodiments, the lifting member **1812** may be configured to rotate without using the at least one resilience member **1820**. For example, the lifting member **1812** may be connected to the central member **1800** via the adjustment member **1815** alone. The adjustment member **1815** may take the form of an adjustment member **1515**, as previously described herein, and the adjustment member **1815** may be configured to provide both energy absorption and tilt or rotation of the lifting member **1812** in a manner at least similar to that previously described herein.

[0116] The central member **1800** may include a selector **1870**. In one exemplary embodiment, the selector **1870** comprises an opening through a portion of the lifting member **1812**. The selector **1870** may comprise a toggle **1875**. The toggle **1875** may take the form of a moveable portion configured to move within the opening of the selector **1870**. In one exemplary embodiment, the toggle **1875** is configured to correspond to manual locking mode criteria. For example, the toggle **1875** may be defined with two positions relative to the selector **1870**, one position corresponding to manual operation, and one position corresponding to automated operation. The position of the toggle **1875** is configured to be set either at the time of manufacturing, or may be dynamically manipulated (e.g., by an installer or purchaser) after the time of manufacturing. In one exemplary manner of operation, a user of a locking apparatus consistent with the embodiment illustrated at FIG. **18** is capable of causing the lifting member **1812** to elevate to a locked position using a lifting selector associated with a pedal as described, for example, with reference to FIG. **19**.

[0117] When the toggle **1875** is in a manual operation mode position and an input is received from a user at the pedal of the locking apparatus, the lifting member **1812** may be caused to elevate to a locked position. A manual unlocking mechanism may be variously implemented, but in one embodiment may be performed by providing a downward force, pressure, or weight upon at least a portion of the locking apparatus (e.g., by stepping downward upon an elevated lifting member **1812**). Optionally or alternatively, a locking apparatus consistent with the present disclosure may be transitioned from a locked state to an unlocked state by providing an input to the locking apparatus (e.g., by depressing a pedal associated with the locking apparatus). The exemplary pedal may comprise a single pedal for both locking and unlocking the locking apparatus, or a plurality of pedals may be provided, for example including one lifting pedal and one lowering pedal, without departing from the spirit and the scope of the present disclosure.

[0118] FIG. **19** illustrates a raised perspective view of a portion of an internal view of a central member **1900** according to an exemplary embodiment. The central member **1900** includes at least a bottom portion **1901** and lifting member **1912**. Each of the bottom portion **1901** and lifting member **1912** may take the form of the previously described bottom portion and lifting member without departing from the spirit and the scope of the present disclosure.

[0119] The central member **1912** may further comprise a hinge **1920**. In one exemplary embodiment, the hinge **1920** may comprise a lower portion **1922** and an upper portion **1924** being connected via at least one pin **1926**. Alternatively, the hinge **1920** may take the form of a unibody hinge, without the need for the pin **1926**. The upper portion **1924** of hinge **1920** may be configured to connect to the lifting member **1912** via at least one pin **1916**, with at least a portion of at least one pin **1916** being configured to be received at one or more apertures **1914** at the lifting member **1912**. The lower portion **1922** of the hinge **1920** may be configured to connect to the bottom portion **1901** in one embodiment via at least one pin **1928**. The at least one pin **1928** may be configured in one embodiment to pass through at least a portion of the bottom portion **1901** (e.g., through the at least one opening **1525** of tab **1520** as previously described).

[0120] FIG. **20** illustrates atop perspective view of an exemplary embodiment of a locking apparatus **2000**. The locking apparatus may comprise one or more of a central member **2010**, an outer housing **2020**, and a power housing **2030**. The outer housing may comprise a pedal **2025** for enabling manual operation (e.g., as previously described herein with reference to the push/pull type mechanism and foot pedal **54** and associated structure described in Provisional Patent Application 62/038,393 (as incorporated by reference herein in its entirety).

[0121] FIG. **21** illustrates an exemplary embodiment of a locking apparatus showing a perspective view of a partial internal view of a central member **2010** and outer housing **2020** in accordance with the present disclosure. The pedal **2025** may be configured to contact a manual operation engager **2027**. In one exemplary embodiment, the manual operation engager **2027** comprises a level configured to adjust a physical position based upon the presence or absence of contact with a surface of the pedal **2025**. For example, the manual operation engager **2027** may be positioned relative to a pivot and the pedal **2025**, where contact with the pedal **2025** causes at least a portion of the manual operating engager **2027** at an end opposite to the pedal **2025** to raise or lower within a portion of the central member **2010**. If the toggle **1875** within the selector **1870** restricts movement of the manual operating engager **2027**, manual operation may be prevented. Manual operation may be enabled when a position of the toggle **1875** corresponds to a manual operation mode, and movement of the manual operating engager **2027** when the pedal **2025** is manipulated by a user may cause the lifting member **112** to raise or lower as previously described herein (e.g., based at least in part upon contact between the manual operating engager **2027** and a surface of the lifting member **112**.

[0122] FIG. **22** illustrates a flowchart of an exemplary embodiment of a process for performing a detection process for a locking apparatus according to aspects of the present disclosure. The process **2200** begins at an operation **2202** where the control system of the locking apparatus is activated. In various embodiments, the control system may be performed, either in whole or in part, by at least one component of the control circuit **450**. The control system may be activated by a user, either manually at the locking apparatus or remotely from the locking apparatus. Additionally or alternatively, at least one operation of the control system may be activated automatically or otherwise based at least in part upon one or more operations not associated with a user.

[0123] The process continues to an operation **2204** where a status of one or more detection devices is determined. The one or more detection devices may include an accelerometer, an electromechanical switch, or any other sensing element configured to measure and/or to determine a status of movement, intrusion, unusual activity, a notification event, or any other form of detectable or determinable information relating to a locking apparatus described herein. The control circuit **450** may be configured to receive a plurality of inputs from one or more detection devices. In one exemplary embodiment, the control circuit **450** is configured to receive at least one input corresponding to an accelerometer and at least one input from an electromechanical switch, although more or fewer detection devices and/or inputs may be used without departing from the spirit and scope of the present disclosure.

[0124] The process may continue to an operation **2206** where it is determined whether an impact, contact, or motion (e.g., an event) is detected by via at least one detection device, such as an accelerometer, electromechanical switch, motion sensor, glass break detector, or any other form of detection device. Impact, contact, or motion may be determined, for example using the control circuit **450**, by detecting a break of contact of the electromechanical switch, an observed value of the accelerometer, set of data or detection information from one or more detection devices, or combination thereof. If no impact, contact, or motion is detected at operation **2206** the process may return to operation **2204**. If impact, contact, or motion is detected at operation **2206**, the process may continue by selectively performing an impact, contact, or motion verification operation. The verification operation may include comparing one or more values measured by or determinable from information of one or more detection devices. In various embodiments, one or more thresholds, values, or ranges may be associated with one or more detection devices. For example, a value measured by or determinable from information associated with an accelerometer may be compared to a value measured by or determinable from information associated with an electromechanical switch. Each of the accelerometer and the electromechanical switch may selectively have one or more data values and/or ranges of values associated with at least one of impact, contact, or motion. One or more data values and/or ranges of values may be compared to one another to verify an impact, contact, or motion associated with a locking device.

[0125] Systems and methods consistent with the present disclosure may include the ability for the control circuit **450**, a back-end server, and/or a user device communicatively coupleable to the locking apparatus **100** to comparatively and/or iteratively determine an alert criteria associated with an impact, contact, or motion associated with a locking apparatus **100**. For example, if a measured value at an accelerometer indicates an impact, contact, or motion event, one or more values associated with another detection device may be observed or obtained to determine if a similar impact, contact, or motion event was measured or can be determined (e.g., using one or more values or ranges of values associated with one or more detection devices). One or more settings or weights may be applied to measured or observed values from the detection devices. For example, using a user interface provided by an electronic device of a user, the user may select one or more event settings. Event settings may relate to event alert sensitivity in various embodiments. For example, a user may adjust, either statically or dynamically, a detection sensitivity setting for one or more detection devices, an alert criteria such as event verification via multiple detection devices, a sequence of performing event verification, or any other operational or functional setting associated with the locking apparatus **100**, the detection devices, user settings, and/or combination thereof.

[0126] The process may continue at an operation **2210** where an event alert is optionally generated. The event alert may be selectively determined, at least in part, according to one or more event settings. One or more event settings may include a default setting without requiring user intervention. At least one event alert may be selectively transmitted from the control circuit **450** at operation **2212**, for example via wireless communication of the transceiver **455** such as by Wi-Fi, Bluetooth, Z-wave, or any other wireless communication protocol and/or network. At least one event alert may additionally or alternatively be transmitted via wired communications from the transceiver **455**. In various embodiments, a user associated with a locking apparatus **100** may receive at least one event alert or notification at an electronic device associated with the user, such as a smart phone, computer, smart watch, or any other electronic device capable of receiving communications and conveying a message or indication of a message to a user thereof. The process may then end or may selectively return to operation **2204**.

[0127] FIG. **23** illustrates a partial top view of a block diagram of an exemplary embodiment of a locking apparatus according to aspects of the present disclosure. The system **2300** illustrated by FIG. **23** may include a locking apparatus **100** having a strap **1515** coupled between a strap coupler **2310** attached to a body of the locking apparatus **100** and a conductor **2320** coupled at an opposing end of the strap **1515**. At least one section of the strap **1515** may be coupled to and/or capable of being placed in contact with at least a portion of the locking apparatus **100**, for example at a lifting member and/or body thereof. An electromechanical switch **2330** may be removably coupleable with the conductor **2320**. A gap G may be formed between the electromechanical switch **2330** and the conductor **2320** during operation of the locking apparatus **100**, for example when an impact or force is received by the lifting member of the locking apparatus **100**. A gap G may be associated with an open switch setting of the electromechanical switch **2330**. When in a locked state, the electromechanical switch **2330** and the conductor **2320** may be coupled together to form a closed setting of the electromechanical switch **2330**. One or more of the conductor **2320** and the electromechanical switch **2330** may be coupleable to the control circuit **450**, for example via at least one bus **2340**.

[0128] A locking apparatus **100** may include a body and a lifting member coupleable to the body, at least a portion of the lifting member may be configured to move relative to the body according to a command position relating to a locking status of the locking apparatus. The lifting member in an exemplary embodiment may include (i) a contact surface configured to restrict movement of an object, and (ii) an electromechanical switch, the lifting member configured to receive an external force. A n accelerometer may be coupled to the body of the locking apparatus. The accelerometer may receive an indication of the external force received at the lifting member. The locking apparatus may further include a control circuit configured to determine a first indicia corresponding to the received external force at the lifting member and to determine a second indicia corresponding to the received indication of the external force by the accelerometer.

[0129] FIG. **24** illustrates a partial block diagram of an exemplary embodiment of a control circuit **450** according to aspects of the present disclosure. The control circuit **450** may include a microprocessor **2410**, an accelerometer **2420**, a storage **2430**, a display unit **2440**, and/or a transceiver **455**. Although illustrated as being physically part of the control circuit **450** it should be appreciated that one or more components of the control circuit **450** of FIG. **24** may be physically and/or logically remote from the body of the control circuit **450**. As used herein, the microprocessor **2410** may be, in whole or in part, a general-purpose processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), afield programmable gate array (FPGA) or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed and programmed to perform or cause the performance of the functions described herein. A general-purpose processor can be a microprocessor, but in the alternative, the processor can be a controller, microcontroller, or state machine, combinations of the same, or the like. A processor can also be implemented as a combination of computing devices, e.g., a combination of a DSP and a microprocessor, a plurality of microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration.

[0130] The accelerometer **2420** may be part of the control circuit **450** or may be otherwise communicatively coupleable to the control circuit **450**. The accelerometer **2420** may be a capacitive Micro-Electro-Mechanical System (MEMS) type, a piezoresistive type, a piezoelectric style accelerometer, or any other device capable of detection motion or impact and capable of generating and/or providing a signal as output corresponding thereto. The accelerometer **2420** may be configured to detect motion of associated with the accelerometer **2420** and to generate at least one signal corresponding thereto. One or more output signals of the accelerometer **2420** may be provided to the control circuit **450** to enable operations described herein.

[0131] The storage **2430** may be configured as a volatile and/or non-volatile memory element configured to store at least one set of information used by or in association with the locking apparatus **100**. This includes, for example, control logic, operating parameters, or any other set(s) of relevant data. The control circuit **450** may include or otherwise be coupleable to a display unit **2440**. The display unit **2440** may be configured to visually convey at least one set of control and/or operating information, for example to a user of the locking apparatus **100** (e.g., regarding a status, event condition, etc.). The transceiver **455** of the locking apparatus **100** of FIG. **24** may be configured to operate in the manner previously described herein.

[0132] During operation, forced entry may be attempted which causes the strap **1515** of the locking apparatus **100** to flex along with the lifting member coupled thereto. The lifting member may be configured to flex along a contact surface thereof to meet an openable object placed in contact therewith through the attempted intrusion or other contact between the openable object and the contact surface of the lifting member. The locking apparatus **100** may be configured to detect forces associated therewith, including accelerometer-based, electromechanically, or a hybrid of multiple approaches. The locking apparatus **100** may be configured to send a notification to another system and/or directly to a user device using a communication link which could be, but is not limited to, hard wire signaling, Wi-Fi, Z-wave, Zigbee, Bluetooth, cellular, or any other wireless or wired method. In practice, the openable object may traverse a gap between the lifting member and the openable object to be placed in contact with the lifting member. The locking apparatus **100** may detect contact with the openable object at the lifting member and may determine an alert event, such as an attempted entry via the control circuit **450**. The locking apparatus **100** may transmit a notification via a communication link to another system and/or user device relating to the alert event.

[0133] Using a communication channel, users may be allowed to set a device sensitivity setting remotely. This may place a setting relating to the accelerometer that varies the force required to trigger an entry alert back into the system (e.g., a back-end system or user device). For example, a sensitivity setting may be set to “light force” so that any activity around a door triggers the notification, or it may be set it to “heavy force” which requires significant force to send the notification. Sensitivity settings may be of a fixed type and amount (e.g., light, medium, or heavy) or may be dynamically selectable, in whole or in part, using a slider or toggle.

[0134] Metal contacts such as the conductor **2320** and electromechanical switch **2330** may act as a normally closed electromechanical switch. When force is applied at the lifting member by virtue of contact with an openable object, the force is transferred to a woven (e.g., textile) strap **1515**. The strap **1515** may tighten under the force and pull the metal plates apart thereby opening the switch. The control circuit **450** may be used to detect the now open switch which has changed state under the exerted force and thus created an electrical signal that represents the force. One or more control schemes may then be implemented in a manner consistent with the previous disclosure herein.

[0135] Further consistent with implementations of the present disclosure, a method is provided for detecting an alert status of a locking apparatus for an entry point. The method includes receiving an external force at a locking apparatus operating in a locked state and determining a first indicia corresponding to the received external force, separately receiving an indication of the external force at an accelerometer of the locking apparatus and determining a second indicia corresponding to the received indication of the external force, comparing the first indicia and the second indicia to determine an alert condition, and selectively performing at least one alert operation corresponding to the determined alert condition. The determining the first indicia corresponding to the received external force may include determining an amount of flex of a lifting member of a locking apparatus **100** caused by the external force. The external force may be a force of an openable object (e.g., a door) opening inwardly into an interior space securable by the locking apparatus **100**. The first indicia may be determined according to a status of an electromechanical switch **2330** of the locking apparatus **100**.

[0136] The comparing the first indicia and the second indicia may include determining a sensitivity setting and applying the sensitivity setting to a result of the comparing the first indicia and the second indicia to determine the alert condition. An indication of the alert condition may be transmitted to an external device, such as a back-end server and/or user device. The transmitting the indication of the alert condition may include wirelessly transmitting the indication of the alert condition. The transmitting the indication of the alert condition to the external device may include wirelessly transmitting the indication of the alert condition to an electronic device associated with the locking apparatus.

[0137] According to aspects of the present disclosure, during operation an acceleration detection system of a locking apparatus **100** may use an accelerometer **2420** (e.g., as multi-axis accelerometer or other form of accelerometer or detection element) to monitor an environment for movement and/or force in any direction. The accelerometer **2420** may be configured in a manner as to receive or otherwise measure one or more forces exerted on the locking apparatus **100**, for example by translating the motion and/or acceleration in the accelerometer **2420**. At least a portion of the accelerometer **2420** may be mounted to the locking apparatus **100** in various embodiments to permit such measurement by the accelerometer **2420**. At least one selectable threshold may be implemented in association with measured motion and/or acceleration. For example, the accelerometer **2420** may be associated with a selectable threshold ranging from small forces up to significant blows to the locking apparatus **100**. At least one selectable threshold may be set by an end user of the locking apparatus **100** (e.g., using an app or other interface or portal associated with the end user and/or locking apparatus **100**. Additionally or alternatively, permitting the use of a selectable threshold value may permit acceleration and/or force detection to be tuned at any time, to be calibrate to a door, an installation, and/or other environmental condition(s) associated with a location of a locking apparatus **100**.

[0138] When an accelerometer **2420** detects a force, the force magnitude of the detected force may be compared against an associated selectable threshold value. If the force measurement is larger than the configured threshold, then a signal may be sent from the accelerometer **2420** to the control circuit **450**, for example via an interrupt over a communication bus. The control circuit **450** may handle the event (e.g., immediately upon receipt) and may optionally filter the alert before forwarding the alert to an alert system. If the locking apparatus **100** is in an unlocked position, the control circuit **450** may be configured to filter and optionally ignore the force event trigger from the accelerometer **2420**. This condition may be desired, as the unlocked position implies no need for an alert. However, logic such as general motion detection may be implemented consistent with the present disclosure, for example by sending one or more alerts even when the lock is in an unlocked position, which may indicate an interaction worth tracking in some manner.

[0139] If, however, the lock is in the locked position and the accelerometer **2420** sends a force event trigger, the system may enter a short wait state (such as a delay). The wait state timing may be, for example, a fraction of a second, low single digit seconds, or any other applicable timing without departing from the spirit and scope of the present disclosure. Once the wait time has expired, the control circuit **450** may check the lock state using a sensor such as an accelerometer or other mechanism that can detect a lock state (such as locked or unlocked). In various exemplary embodiments, a Hall effect sensor (e.g., a permanent magnet) configured to move with a locking mechanism of the locking apparatus **100** and converts the lock state to a digital signal that the control circuit **450** can query or otherwise obtain information regarding at any time.

[0140] If the control circuit **450** queries the lock state and the locking apparatus **100** is operating in the unlocked position, the control circuit **450** may ignore the event, as it was likely triggered by a manual unlock by the user (e.g., using a foot pedal). This logic may be used to differentiate motion events stemming from manual unlocking from those are uncharacterized and thus could be a legitimate motion alert. If, however, the control circuit **450** queries the lock state and the locking apparatus **100** remains in the locked position, the control circuit **450** may register the event with a downstream system to process an alarm condition or alert. If a detected force or motion generates a legitimate alarm condition, an alert message may be sent via wired or wireless protocol to a device that can further process the event (such as, for example, by generating audible and/or visual alerts, sending alerts to one or more mobile devices, notifying cloud-connected services, and/or alerting other panels, readouts, or systems, or the like)

[0141] The previous detailed description has been provided for the purposes of illustration and description. Thus, although there have been described particular embodiments of the present invention of new and useful locking apparatuses, systems, and methods of providing access control. it is not intended that such references be construed as limitations upon the scope of this invention.

Claims

1. A method of controlling a locking apparatus, comprising: selecting a threshold value, the threshold value corresponding to a force value associated with the locking apparatus; receiving an indication of an external force at an accelerometer of the locking apparatus and determining a force magnitude corresponding to the received indication of the external force; comparing the force magnitude of the external force to the selected threshold value; determining an alarm condition status based at least in part upon the comparison of the force magnitude of the external force to the selected threshold value; and selectively performing at least one alarm operation corresponding to the determined alarm condition status.

2. The method of claim 1, wherein the determining the alarm condition status comprises determining a locking status of the locking apparatus.

3. The method of claim 2, wherein the locking status of the locking apparatus is a locked status, and wherein the determining the alarm condition status comprises providing a time delay after determining that the locking apparatus is in the locked status.

4. The method of claim 3, wherein the alarm condition status is determined to be a no alarm status when the locking apparatus is determined to be operating in an unlocked status after expiration of the time delay.

5. The method of claim 4, wherein the alarm condition status is determined to bean active alarm status when the locking apparatus is determined to be operating in the locked status after expiration of the time delay.

6. The method of claim 5, wherein a control circuit of the locking apparatus transmits at least one alarm status communication responsive to the active alarm status determination.

7. The method of claim 1, wherein the alarm condition comprises transmitting an indication of the alarm condition to an external device.

8. The method of claim 7, wherein the transmitting the indication of the alarm condition comprises wirelessly transmitting the indication of the alarm condition.

9. The method of claim 7, wherein the transmitting the indication of the alarm condition to the external device comprises wirelessly transmitting the indication of the alarm condition to an electronic device associated with the locking apparatus.

10. A locking apparatus, comprising; a body; a lifting member coupleable to the body, at least a portion of the lifting member configured to move relative to the body relating to a locking status, the lifting member comprising a contact surface configured to restrict movement of an object, the lifting member configured to receive an external force; an accelerometer coupled to the body, the accelerometer configured to detect the external force and measure the external force as a force magnitude; and a control circuit configured to determine the force magnitude corresponding to the received external force at the lifting member and to compare against the force magnitude against an associated selectable threshold value.

11. The locking apparatus of claim 10, wherein the control circuit is further configured to determine an alarm condition status based at least in part upon the comparison of the force magnitude of the detected force to the selected threshold value.

12. The locking apparatus of claim 11, wherein the control circuit is further configured to selectively perform at least one alarm operation corresponding to the determined alarm condition status.

13. The locking apparatus of claim 11, wherein the control circuit is configured such that the comparing the force magnitude and the associated selectable threshold value includes determining a sensitivity setting and applying the sensitivity setting to a result of the comparing the force magnitude and the associated selectable threshold value to determine the alarm condition.

14. The locking apparatus of claim 11, further comprising a transceiver, the control circuit configured to control the transceiver to communicate a representation of the determined alarm condition.

15. The locking apparatus of claim 14, wherein the control circuit is configured to cause the transceiver to wirelessly transmit the representation of the determined alarm condition.

16. The locking apparatus of claim 11, wherein the control circuit is further configured to determine a locking status of the locking apparatus, wherein the locking status of the locking apparatus is a locked status, and wherein the determining the alarm condition status comprises providing a time delay after determining that the locking apparatus is in the locked status.

17. The locking apparatus of claim 10, wherein the locking apparatus is configured to restrict movement of a door into an interior space securable by the locking apparatus, and wherein the external force is a force of the door opening inwardly into the interior space securable by the locking apparatus.

18. The locking apparatus of claim 10, wherein the selectable threshold is configured to be set by an end user of the locking apparatus by using an application or other interface associated with an end user or the locking apparatus.

19. The locking apparatus of claim 10, further comprising: a H all effect sensor configured to move with a locking mechanism of the locking apparatus and convert a lock state of the locking apparatus to a digital signal.

20. The locking apparatus of claim 10, wherein the control circuit comprises a display unit configured to visually convey at least one set of control and/or operating information regarding a status of the locking apparatus.
