LOW POWER OVERRIDE FOR LOCKING DEVICE

FIELD OF THE INVENTION

The present invention generally relates to locking devices, such as electromechanical locks, and more specifically to overriding normal operation of the locking device when there is a low power condition, as well as to a human-machine interface for use with the locking device that uses sensing technology, such as capacitive sensing technology.

BACKGROUND OF THE INVENTION

There are many electrical locking devices, such as but not limited to, electromechanical locks, which are operated by battery power. As long as the battery is sufficiently charged, the battery provides sufficient power to retract one or more locking bolts to open the lock. When an electrical locking device battery runs too low (i.e., is insufficiently charged), it is no longer possible to operate the device and an authenticated operator might find himself locked out.

A common solution to this problem in the prior art is to power the device from an external power source (usually a 9V battery) through connectors that are placed on the outside of the device and allow the operator to provide an identifying authentication and unlock the device.

SUMMARY OF THE INVENTION

~~The~~Embodiments of the present invention seek~~s~~ to provide novel methods and apparatus for overriding normal operation of the locking device when there is a low power condition, as is described more in detail hereinbelow.

The problem in the art is how to prevent a situation wherein the locking device stops working when the battery level drops below a certain operating level. The prior art makes the locking device operable once again by connecting an external battery or other current source to the external side of the locking device.

~~The~~Embodiments of the present invention present~~s~~ a different solution. Unlike the prior art, in embodiments of the present invention, the locking device will not operate until the battery runs out. Instead a low battery charge threshold is defined; if the battery charge gets lowered to this threshold, the locking device stops consuming energy (or uses very little power) and goes into hibernating ("deep sleep") mode. The locking device can be "awakened" for a limited time by a manual operation of the user. ~~The~~Embodiments of the present invention provide~~s~~ a reminder for the user to charge or replace the battery, while at the same time ensuring the user is never locked out.

There is thus provided in accordance with a ~~non-limiting embodiment~~ first aspect of the present invention a system including a locking device that has locked and unlocked positions, a battery for powering operation of the locking device, and a processor for controlling operation of the locking device, wherein the processor has a mode of operation based on a low battery charge threshold, wherein if a charge of the battery gets lowered to the threshold, the locking device goes into a hibernating mode, and the locking device is capable of being awakened for a limited time by a ~~manual~~ user operation.

In accordance with an embodiment of the present invention an external wakeup switch connected to internal wakeup circuitry for awakening the locking device from the hibernating mode.

There is also provided in accordance with ~~an embodiment~~ a second aspect of the present invention a method for operating a locking device including overriding normal operation of the locking device, which is powered by a battery, wherein if a charge of the battery gets lowered to a low battery charge threshold, the locking device goes into a hibernating mode, and the locking device is capable of being awakened for a limited time by a user operation, ~~e.g., a manual operation~~ and providing an external wakeup switch connected to internal wakeup circuitry for awakening said locking device from the hibernating mode.

There is also provided in accordance with a third aspect of the present invention a method for operating a locking device comprising: providing a human-machine interface that comprises one or more finger-movement sensing surfaces; and using sensing circuitry to sense a movement of one or more fingers relative to said finger-movement surfaces, said sensing circuitry sending a command signal to a locking device based on the movement sensed.

In accordance with an embodiment of the present invention if the charge of the battery gets lowered to a first low battery charge threshold, the locking device is capable of being unlocked, but a warning is provided of reaching the first low battery charge threshold.

In accordance with an embodiment of the present invention if the charge of the battery gets lowered to a second low battery charge threshold, the locking device is capable of being unlocked only after a time delay.

In accordance with an embodiment of the present invention, upon reaching the second low battery charge threshold or a third threshold, operation of the electrical locking device is not possible.

In accordance with an embodiment of the present invention if the charge of the battery gets lowered to a third low battery charge threshold, the electrical locking device goes into the hibernating mode.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawings in which:

Fig. 1 is a simplified illustration of a system for controlling operation of a locking device, in accordance with an embodiment of the present invention;