

DATA TRANSMISSION SYSTEM AND COMPONENTS THEREOF

FIELD OF THE INVENTION

The invention relates to data transmission systems in general and to impact responsive access control systems in particular.

BACKGROUND OF THE INVENTION

In U.S. Pat. No. 4,197,524 to Salem, there is illustrated and described a tap actuated lock for installing on a door's inside surface which is opened when an access combination is tapped on its outside surface. The taps are detected by an impact sensitive device which produces a sensible output in response to an impact. A typical access combination is a four-number code, for example, 4,3,2,5 which requires the tapping of a first set of four taps, a relatively long pause, the tapping of a second set of three taps, a second relatively long pause, the tapping of a third set of two taps, a third relatively long pause and finally the tapping of a fourth and last set of five taps. Such a procedure takes a relatively long time, in fact, anywhere between about 10 to 20 seconds and renders the access combination relatively insecure.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a data transmission system suitable for use with an impact transmissive body and comprising:

- (a) a data transmitting device having a reciprocable impact impeller head for transmitting an encoded series of discrete mechanical impacts to a first surface of an impact transmissive body; and
- (b) a data receiving device having an impact sensitive transducer at a second surface of the impact transmissive body substantially opposite to its first surface for picking up vibrations resultant of said series of impacts.

A data transmission system of the present invention is suitable for a wide range of both unidirectional data transmission applications, for example, transmitting readings constituting data from a sensor or a detector to data collection equipment, transmitting control signals constituting data to actuatable components, for example, a solenoid, a motor, a valve and the like and bidirectional data transmission applications. Thus, envisaged applications include, but are not limited to, those in respect of which conventional wired and remote control data transmission systems may be not convenient to install or suitable to operate, for example, transmitting data respectively through and across the walls of a sealed or pressurized container or a reinforced concrete wall.

In a data transmission system of the present invention, data is preferably encoded as the time intervals between consecutive impacts thereby defining an "average impact baud rate", namely, the average number of impacts per second. For example, in the case of a solenoid driven impeller head whose minimum and maximum time intervals between consecutive impacts is 30 msec and 100 msec, respectively, and the minimum time interval increment between consecutive impacts is about 1 msec, there are 70 distinguishable intervals each of which can represent an instruction code, a data reading, and the like. With such a solenoid driven impeller head, the average impact baud rate is about 20 impacts per second, however, it is envisaged an average impact baud rate of a data transmission system of the present invention can be considerably increased.

A data transmission system of the present invention is particularly suitable for implementation in access control applications, for example, to open a mortise lock, to open a bank safe, to obtain entry into a computerized communication and control network e.g. at an automatic teller machine (ATM) and the like. In such applications, a data transmitting device effectively constitutes an electronically controlled key for typically impacting a single encoded series of impacts, namely, an access combination. In these and other applications, an encoded series of impacts includes, for example, a four interval access combination of 30, 45, 55 and 62 msec which can be transmitted in less than a quarter of a second and is one of a total of 70^4 (i.e. more than 25 million) combinations.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention and to show how the same may be carried out in practice, by way of non-limiting examples, reference will now be made to the accompanying drawings, in which:

FIG. 1 is a schematic block diagram of a data transmission system of the present invention;

FIG. 2 is a pictorial representation of an access control system including an electronic mortise lock and a hand-held, pen-like electronic key;

FIGS. 3 and 4 are respectively a cross sectional view and a block diagram of the electronic key of FIG. 2;

FIGS. 5 and 6 are graphical representations of different types of encoded series of discrete mechanical impacts;

FIGS. 7 and 8 are pictorial representations of the electronic mortise lock of FIG. 2 and a data transmitting device respectively activated by a touch keypad and a remote control;

FIG. 9 is a pictorial representation of an electronic combination padlock and the hand-held, pen-like electronic key of FIG. 2;

FIG. 10 is a cross sectional view of a data transmitting/receiving device;

FIG. 11 is a block diagram of a data transmission system of the present invention for transmitting data from a sensing means to a data collection means;

FIG. 12 is a block diagram of a data transmission system of the present invention for transmitting data from a control means to an actuatable component; and

FIG. 13 is a block diagram of a data transmission system of the present invention for transmitting data between two data processing systems.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference now to the drawings, FIG. 1 shows a data transmission system 1 including an impact sensitive transducer 2 for sensing vibrations resultant of impacts from an impact impeller head 3 transmitted through an impact transmissive body 4 interdisposed therebetween, the impact sensitive transducer 2 being associated with a data receiving device 5 and the impact impeller head 3 being associated with a data transmitting device 6.

Turning now to FIG. 2, there is shown an electronic mortise lock 7 including a data receiving device (not shown) coupled to a microphone 8 adapted for intimate juxtaposition against the inside surface of a solid door 9. The door may be opened by a hand-held, pen-like electronic key 10 constituting a data transmitting device.