United States Patent

[11] 3,595,042

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[21] Appl. No. **862,590**
[22] Filed **Aug. 25, 1969**
[45] Patented **July 27, 1971**
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[54] **LOCKING MECHANISM**
19 Claims, 15 Drawing Figs.

[52] U.S. Cl. 70/276, 70/352
[51] Int. Cl. E05b 47/00
[50] Field of Search ..... 70/276, 352, 413, 382; 209/111.8; 200/45; 340/149 A

[56] **References Cited**

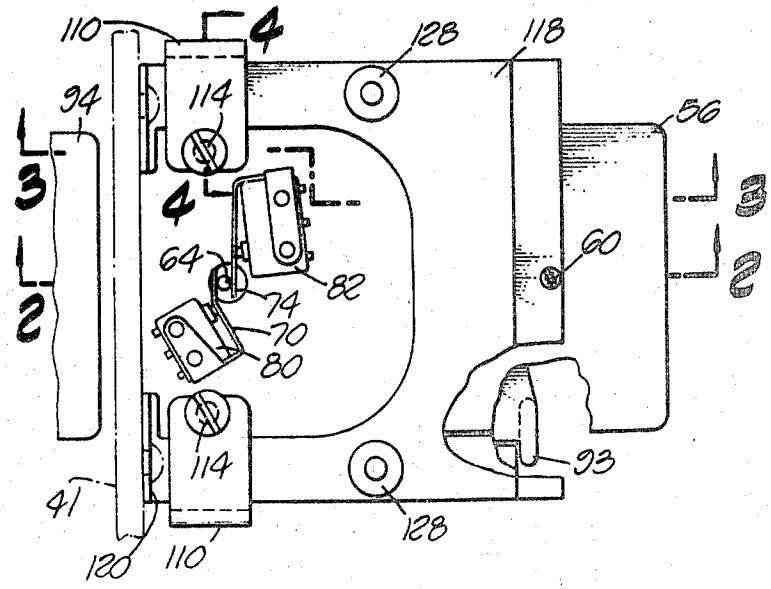
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Primary Examiner—James A. Leppink
Assistant Examiner—Robert L. Wolfe
Attorneys—Paul L. Gardner, George J. Netter and Kendrick and Subkow

ABSTRACT: An improved, programmable locking mechanism, particularly useful for controlling access to restricted areas, such as parking lots, convention centers, private clubs, and the like. The access control unit is adapted to be operated by a properly coded pass card provided with a plurality of magnetized areas or portions (commonly referred to as magnetic "spots") arranged in a predetermined pattern. The unit includes electromagnetic means for selectively nullifying or changing the polarity of the magnetic spots to validate or invalidate the pass card. The unit further comprises a locking pin core adapted to be moved by a properly coded pass card to a forward position wherein it will actuate a suitable switch to operate a barrier (e.g., parking lot gate, door, turnstile, etc.) or an indicator. The core is slidable between a fixed upper plate and a fixed lower plate, and is provided with a plurality of locking pin channels extending vertically through the thickness thereof. The lower plate functions as a locking plate. It is provided with a plurality of wells or recesses which are in substantial alignment with the locking pin channels in the core when the core is in its rearward (locked) position. A plurality of magnetic locking pins are slideably mounted in the core channels and normally extend into the locking plate wells to normally inhibit relative movement between the core and locking plate. A program card receiving slot or pocket is provided adjacent the upper surface of the core, between the fixed upper plate and a top plate, for receiving a program card; and a pass card receiving slot is provided adjacent the lower surface of the core between the locking plate and a bottom plate, for receiving a properly coded pass card. The program card has magnetized portions or "spots" arranged therein in a predetermined pattern designed to attract selected locking pins out of their respective recesses in the locking plate, and the magnetized spots in a properly coded pass card are arranged in a pattern to repel the remaining locking pins out of the locking plate recesses to free the core for forward movement. The unit is operated by inserting a properly coded pass card into its slot and against a flange on the core to urge the core to its forward position and actuate a switch which will operate the barrier or indicator. The access control unit is further provided with one or more electromagnets located beneath the pass card receiving slot for nullifying or reversing the polarity of one or more of the magnetic spots in the pass card, thereby changing the magnetic coding on the card. This prevents the card from being reused to operate the same unit a second time since not all of the locking pins will be repelled out of their locking plate wells by the altered coding of magnetic spots on the card.

The pass card may be "revalidated" (recoded to restore the original magnetic code on the card) by inserting the card into another access control unit. This second unit is programmed to receive the altered pass card and nullify or reverse the polarities of some of the magnetic spots therein to restore the original magnetic code on the card. The second unit may, for example, be located at the exit from the restricted area and programmed to be operated by the altered pass card to actuate a barrier control switch.



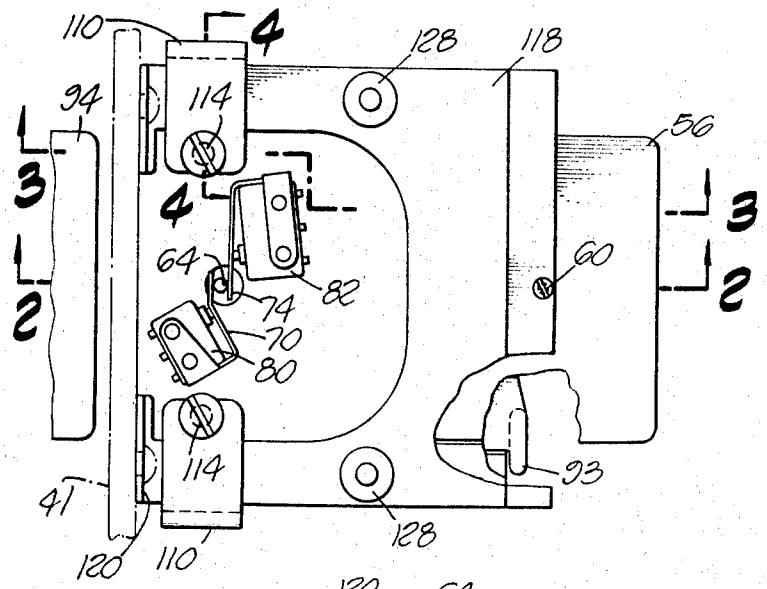


FIG. 1.

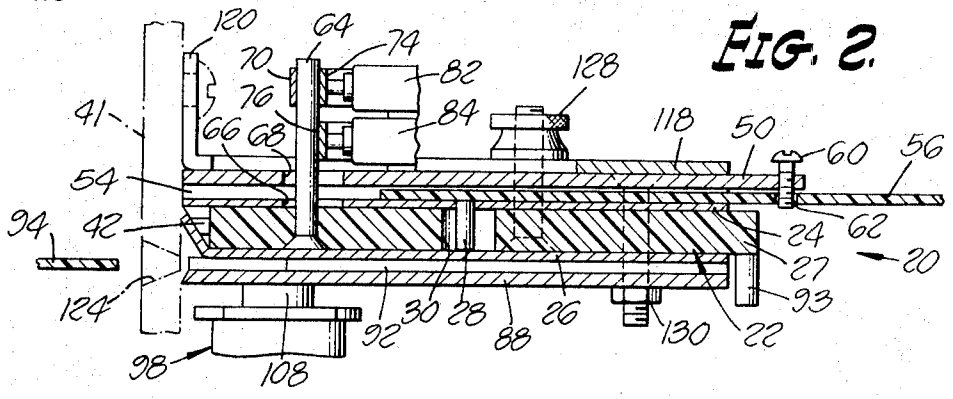


FIG. 2.

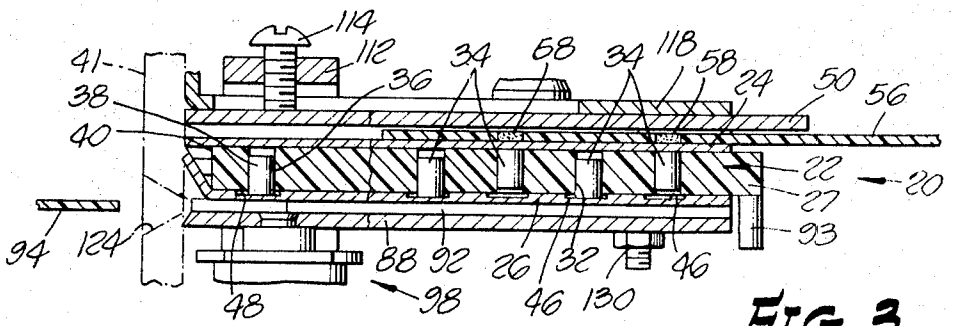


FIG. 3.

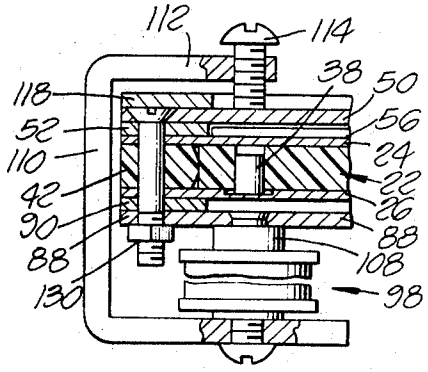


FIG. 4.

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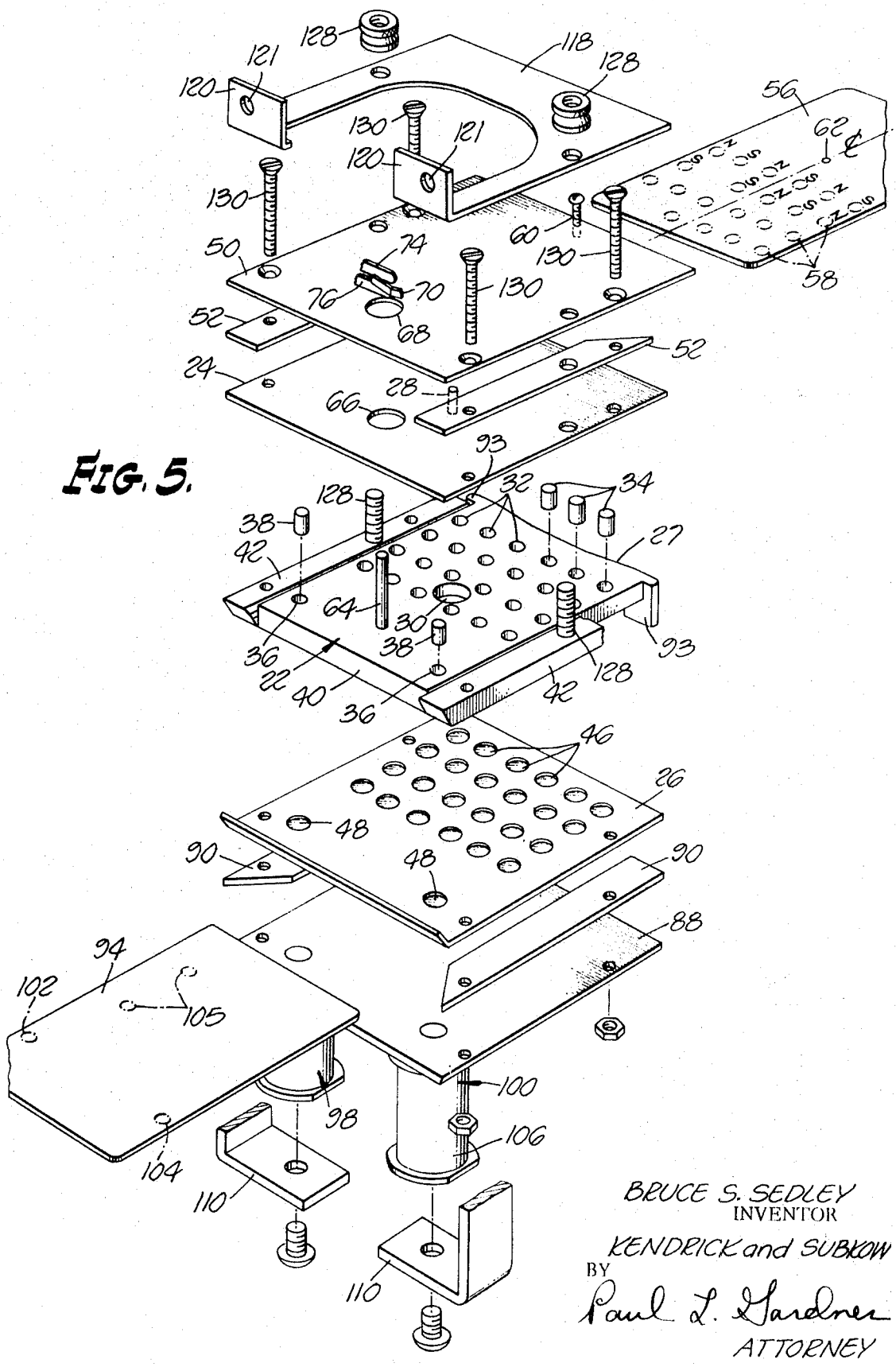


FIG. 5.

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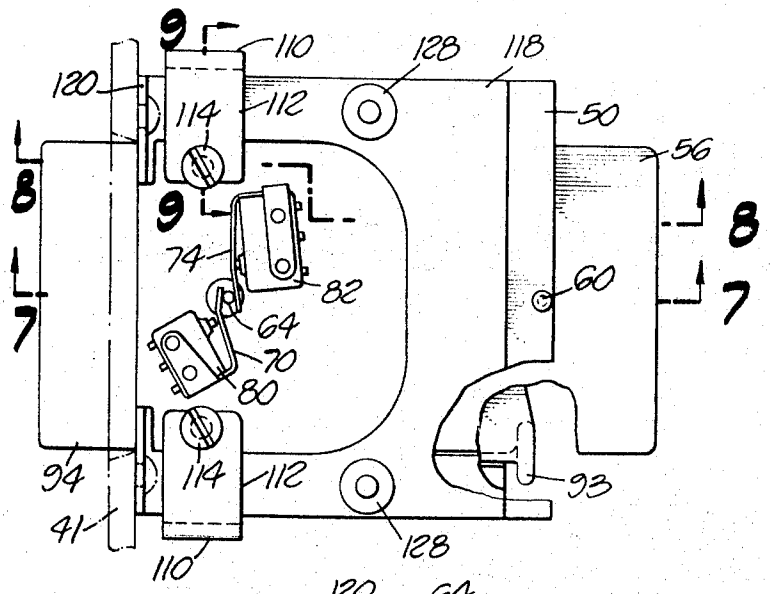


FIG. 6.

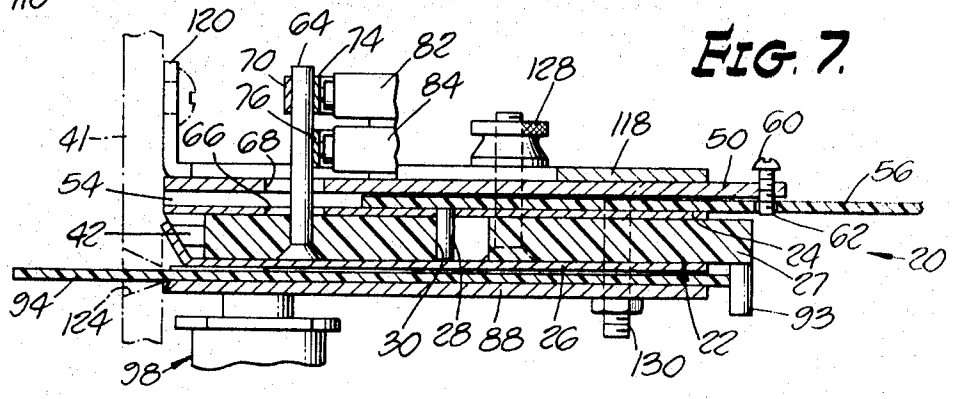


FIG. 7.

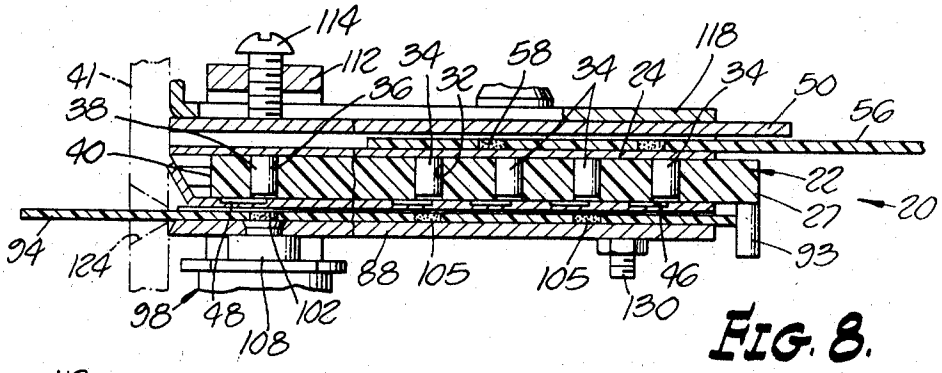


FIG. 8.

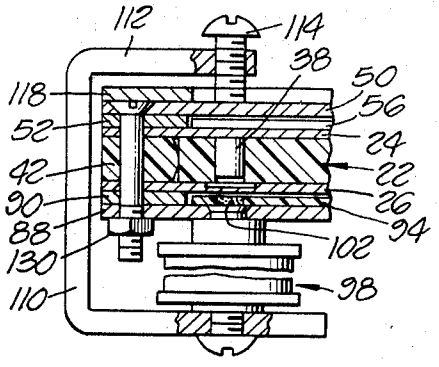


FIG. 9.

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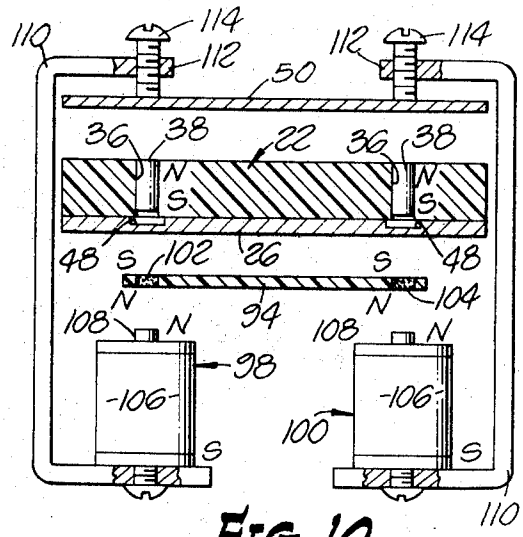


FIG. 10.

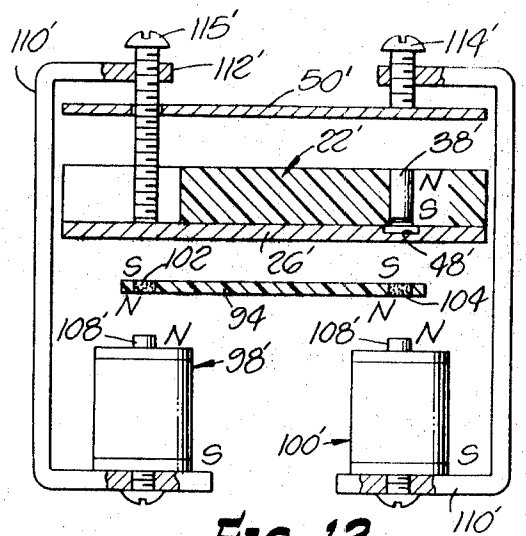


FIG. 12.

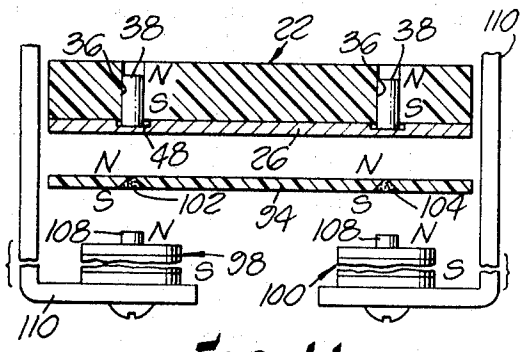


FIG. 11.

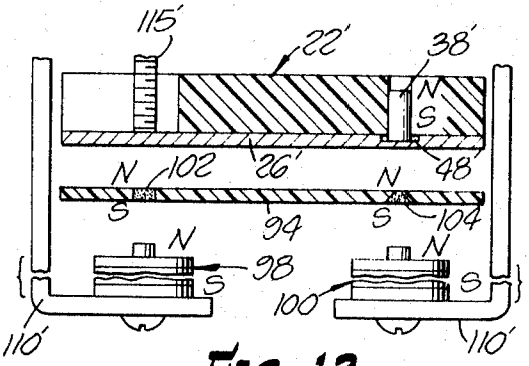


FIG. 13.

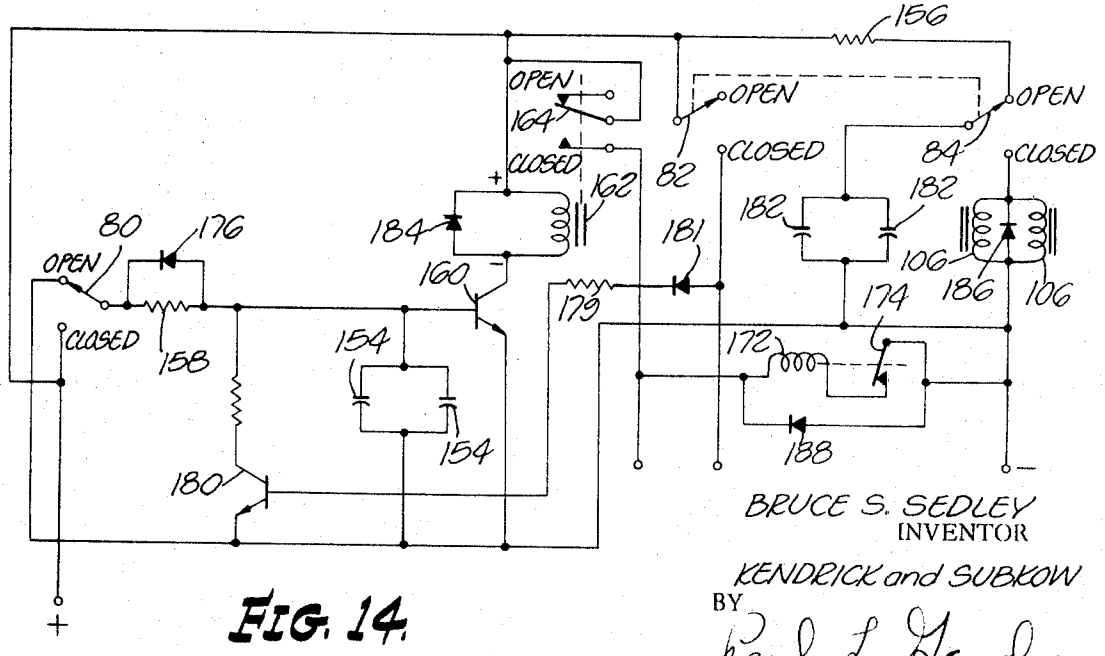


FIG. 14.

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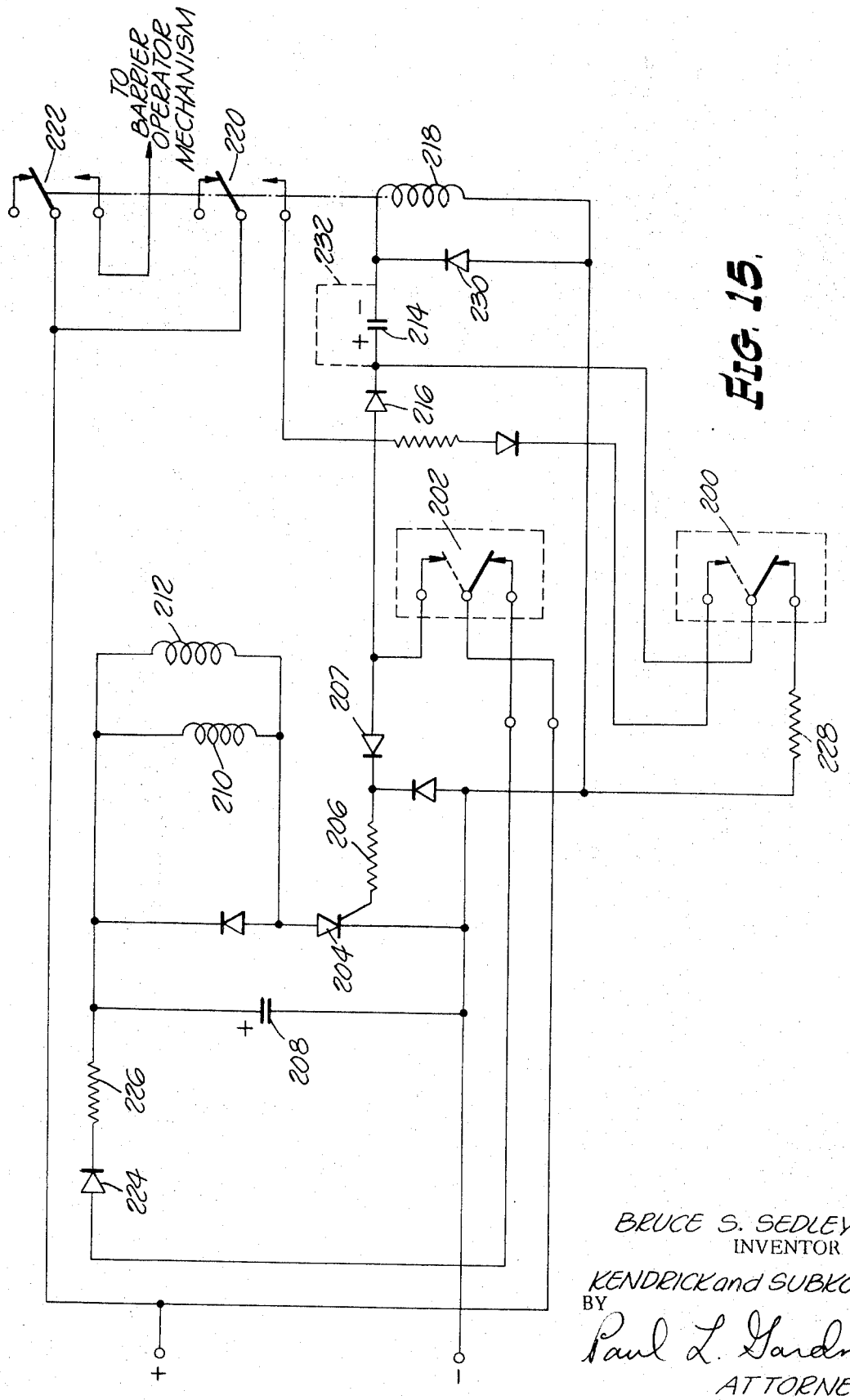


FIG. 15.

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LOCKING MECHANISM

BACKGROUND OF THE INVENTION

The present invention relates to access control units, and more particularly to an improved, magnetically programmable, card-operable locking unit provided with means for selectively invalidating the magnetically coded pass cards used to operate the unit to prevent the pass cards from being used to operate the unit a second time until they have been validated by another unit.

Card-operable access control units or locking mechanisms, such as those disclosed in U.S. Pat. Nos. 2,595,769 and 2,648,729, have been found to be particularly useful for controlling access to various restricted areas, such as parking lots, convention halls, private clubs, etc. Such a unit typically comprises a plate or core having one or more locking pins slideably received therein, and at least one locking plate disposed adjacent to the core. The locking plate is provided with locking wells or recesses which normally receive the ends of the locking pins to inhibit relative movement between the core and the locking plate. This type of unit may be employed, for example, to open a barrier and gain access to a desired area by inserting a properly coded pass card into the unit. A properly coded pass card is one which contains discrete, magnetized elements arranged in a predetermined pattern to attract the locking pins out of the locking plate wells and permit movement of the core relative to the locking plate. Movement of the core typically actuates a suitable switch or mechanism to open the barrier to the restricted area. Some of the locking plates in these prior art units are provided with both enlarged and smaller wells, recesses or holes. The pass cards designed for use with these units will attract the proper locking pins out of the smaller holes and into the enlarged holes to permit movement of the core a distance sufficient to effect operation of a barrier control switch.

One problem associated with the use of the type of access control units described above has been that some individuals having properly coded pass cards have, after using the cards to gain entrance to the restricted area, given their cards to other, unauthorized individuals who reuse the cards to enter the area. For example, at conventions, where it is often desired to have certain people admitted through specific doors or gates at specific times, it has been common practice for some convention delegates to use their cards to enter the restricted area, collect one or more properly coded pass cards form other delegates inside the area, and take these cards to unauthorized individuals outside the area who then reuse the cards to gain entrance to the restricted area. Similarly, when such access control units are employed in parking lots or garages, it is possible for a card holder to enter the lot and either pass his card back to another individual who reuses the card to gain access to the lot or garage, or leave his card in the unit to permit the following driver to use it to gain entry.

Attempts have been made to provide magnetically coded card-operable access control units with electromagnets for altering the magnetic properties of one or more magnetic elements on the pass cards to render the cards ineffective after one or more uses in the unit. Such a unit is shown, for example, in U.S. Pat. No. 2,931,953. This unit is designed, when operated, to actuate a pair of electromagnets which alter the magnetic properties of magnetic metal strips embedded in the pass cards. The magnetic metal strips are polarized in a direction parallel to the length of the card, and exhibit a preferred direction of magnetism, i.e., along the length of the card. The magnetic strip may thus be characterized as "anisotropic."Such magnetic strips necessarily occupy a relatively large area of the pass card, and thus restrict the number of strips which may be provided in a single card.

It is often desirable in the types of access control units described above to periodically change the combination of the units (i.e., the arrangement of the locking pins), to render useless pass cards which would previously operate the unit. This

may be desirable, for example, in parking lot access control units where new pass cards are issued periodically upon the payment of the required fee. While such a combination-changing function may be accomplished by providing the pin carrying core with more channels than locking pins, and periodically rearranging the pattern of the magnetic pins in the channels, it may be accomplished far more quickly and efficiently by employing a combination set card or program card. This concept is disclosed in U.S. Pat. No. 3,444,711 issued May 20 , 1969 to the applicant of the present application.

In view of the foregoing, it is an object of the present invention to provide an improved access control unit which overcomes all of the disadvantages and deficiencies associated with the prior art units, while retaining all of their advantages and useful functions. This has been accomplished by the unit and system of the present invention, preferred embodiments of which are described in detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a top plan view, partially broken away, of an access control unit constructed in accordance with the teachings of the present invention; the unit is shown in its locked position prior to the insertion of a properly coded pass card which ill unlock it;

FIG. **2** is a sectional side elevation view, taken along the line **2–2** of FIG. **1**;

FIG. **3** is a sectional side elevation view, taken along the line **3–3** of FIG. **1**;

FIG. **4** is a sectional side elevation view, taken along the line **4–4** of FIG. **1**, showing one of the forward end portions of the unit;

FIG. **5** is an exploded perspective of the access control unit shown in FIGS. **1—4**;

FIG. **6** is a plan view similar to FIG. **1**, but showing the unit with a pass card inserted therein;

FIG. **7** is a sectional side elevation view taken along the line **7–7** of FIG. **6**;

FIG. **8** is a sectional side elevation view taken along the line **8–8** of FIG. **6**;

FIG. **9** is a sectional side elevation view taken along the line **9–9** of FIG. **6** and showing one of the forward end portions of the unit;

FIG. **10** is a front elevation view of the locking unit shown in FIGS. **1—9**, partially in section and with parts of the unit deleted for the sake of clarity;

FIG. **11** is a front elevation view similar to FIG. **10**, showing the various parts of the unit after a pass card has been inserted to unlock the unit:

FIG. **12** is a front sectional elevation view similar to FIG. **10** showing an alternative embodiment of an improved locking unit constructed in accordance with the teachings of the present invention;

FIG. **13** is a front sectional elevation view similar to FIG. **12** showing the various parts of the unit after the pass card has been inserted to operate the unit; and

FIGS. **14** and **15** are schematic diagrams of electronic circuits which may be employed in conjunction with the access control units illustrated in FIGS. **1—13**.

DESCRIPTION OF A PREFERRED EMBODIMENT

The access control mechanism **20** shown in the drawings comprises a locking pin plate or core **22** slideably mounted between a fixed upper plate **24** and a fixed lower plate **26** which functions as a locking plate. The core **22** is slideable longitudinally between a rear position (FIGS. **2** and **3**) and a forward position (FIGS. **7** and **8**). A spacer pin **28** is mounted on the underside of the upper plate **24**, extends downwardly through a hole **30** in the core **22** and terminates directly adjacent to the upper surface of the locking plate **26**. The spacer pin **28** functions to maintain the proper distance between the upper plate **24** and the locking plate **26**. In the absence of such a spacer pin or an equivalent structure, the plates **24** and **26**

might tend to buckle toward one another and prevent or inhibit free sliding movement of the core **22**.

The forward portion **27** of the core **22** is provided with a plurality of channels **32**, **32**...**32** extending vertically through the thickness thereof for slideably receiving magnetic locking pins **34**, **34**...**34**. Two additional channels **36**, **36** are provided adjacent the rear edge **40** of the core **22**, and magnetic locking pins **38**, **38** are slideably mounted in these channels. As best shown in FIGS. **5**, **10** and **11**, the channels **36**, **36** are located on opposite sides of the longitudinal centerline of the core **22**, and are spaced an equal distance therefrom. Thus, the channels **36**, **36** are symmetrically located with respect to the longitudinal centerline of the core. The channels **36**, **36** are also equally spaced from the rear edge **40** of the core **22**, as shown in FIG. **5**.

For the sake of reference, those portions or edges of the various parts of unit **20** furthest from the front mounting wall **41** (shown in phantom lines in FIGS. **2**, **3**, **7** and **8**) are designated herein as being the forward portions or edges (e.g., forward portion **27** of core **22**), and those portions or edges closest to the mounting wall **41** are designated as the rear portions or edges (e.g., rear edge **40** of core **22**).

A pair of guide bars **42**, **42** are provided on either side of the core **22** for preventing lateral displacement of the core while permitting longitudinal movement.

The locking plate **26** is provided with a pattern of wells or recesses **46**, **46**...**46** in the forward portion thereof, and a pair of similar recesses **48**, **48** adjacent the rear portion thereof. These recesses **46**, **46**...**46** and **48**, **48** register or align with the channels **32**, **32**...**32** and **36**, **36** respectively, when the core **22** is in its rear (FIG. **3**) position. Until a properly coded (i.e., magnetized) pass card is inserted into the unit, the force of gravity maintains the magnetic locking pins **34** and **38** in a downward position wherein they extend through the bottoms of the core channels **32**, **36** and into the locking plate recesses **46**, **48** to prevent sufficient forward movement of the core **22** to activate the switches **82** and **84**. It will be noted that the recesses **46**, **48** in the locking plate **26** are of slightly greater diameter than the channels **32**, **36** in the core **22**, thereby permitting the core to be moved a very small distance relative to the locking plate recesses. This arrangement is provided for actuating a warning signal, in a manner described in detail below, when an improperly coded card or other device is employed in an attempt to operate the unit **20**.

A top plate **50** is mounted above the upper plate **24** and is spaced therefrom by a pair of spacer bars **52**, **52** to define a program card receiving slot **54**. The slot **54** is designed to receive a generally flat program card or combination set card **56** provided with a plurality of polarized magnetic areas or portions **58**, **58**...**58** (commonly referred to as "spots") arranged in a predetermined pattern. The SPOTS **58**...**58** function to program the access control mechanism **20** in a manner described in detail hereinafter.

A locking screw **60** is provided adjacent the forward end of the top plate **50** for maintaining the program card **56** in position in the slot **54**. To this end, the program card **56** is provided with an aperture **62** designed to receive the end of the positioning screw **60**.

An actuator shaft or post **64** is carried by the core **22** and extends upwardly through enlarged apertures **66** and **68** in the upper and top plates **24** and **50**, respectively. The upper end of the actuator post **64** extends between several leaf springs **70**, **74**, **76** which normally urge the actuator post **64** and the core **22** to a rearward position (FIGS. **1**—**3**). In this position the leaf spring **70** is biased into contact with a tamper switch **80** to maintain that switch in its open position, and the leaf springs **74**, **76** are biased away from a pair of control switches **82**, **84** to maintain those switches in their open positions.

A bottom plate **88** is mounted beneath the locking plate **26** and is spaced therefrom by a pair of bars **90**, **90** to define a pass card receiving slot **92**. As best shown in FIG. **5**, the rear edges of the spacer bars **90**, **90** and the forward edges of the spacer bars **52**, **52** are bevelled to facilitate insertion of the pass card **94** and the program card **56**, respectively.

A pair of electromagnets **98**, **100** are mounted on the underside of the bottom plate **88**. Each of the electromagnets **98**, **100** comprises a coil **106** and a core **108** connected to a bracket **110** which functions as an extension thereof. Each bracket **110** extends upwardly and terminates in an upper end **112** in substantial alignment with the core **108**. A downwardly extending screw **114** is provided in the upper terminal end **112** for completing the magnetic field return path. It will be noted that the magnetic path between the core end **108** and the field return screw **114** of each of electromagnets **98**, **100** are in substantial alignment with the polarized magnetic spots **102**, **104** on the pass card **94** and the rear core channels **36**, **36** when the pass card has moved the core **22** to operating position (the position of FIGS. **7** and **8**).

The access control mechanism **20** further includes a cover plate **118** having a pair of upturned ears **120**, **120** provided with mounting holes **121**, **121** at the rear end thereof for attaching the mechanism to the wall **41** of a suitable casing (not shown). As best shown in FIGS. **2**, **3**, **7** and **8**, the casing wall **41** is provided with a slot **124** in substantial alignment with the pass card receiving slot **92**, for facilitating insertion of a pass card. The various elements of the unit **20** are held assembled by conventional screw and nut assemblies **128**, **128** and **130**, **130**,**130**, **130**.

The program card **56** and the pass card **58** may be of the type shown and described in U.S. Pat. No. 3,444,711. Such cards may, for example, comprise a sheet of bonded barium ferrite composite material, i.e., a material which has ferrite particles suspended in a rubber or plastic binder, which may be sandwiched between plastic or paper cover sheets.

OPERATION

Initially, the program or combination set card **56** having a desired pattern of polarized magnetic spots **58**, **58**...**58** thereon is inserted into the program card receiving slot **54** from the forward end of the access control unit **2**— until the positioning aperture **62** in the program card substantially underlies the positioning screw **60**. The screw **60** is then turned until it extends into the aperture **62** to prevent longitudinal displacement of the card. Lateral displacement of the card is inhibited by the guide bars **52**, **52**.

With the program card so positioned in the slot **54** (FIG. **3**), the polarized magnetic spots **58**, **58**...**58** in the card will overlie one or more of the polarized magnetic locking pins **34**, **34**...**34** in the core **22**. The directions of polarization of the magnetic spots in the program card and the locking pins are such that one or more selected locking pins **34**, **34**...**34** are attracted upwardly toward the program card and out of the recesses **46**, **46**...**46** in the locking plate **26**.

When a properly coded pass card **94** (one having magnetic spots **102**, **104** and **105**, **105**...**105** polarized and positioned so as to repel the magnetic locking pins not attracted by the program card) is inserted into the pass card receiving slot **92** and pushed forwardly, those locking pins **34** and **36** not attracted by the program card will be repelled upwardly and out of their respective locking wells **46** and **48** in the locking plate **26**.

With all of the locking pins **34** and **38** urged upwardly and out of the locking plate wells **46**, **48**, the pass card **94** may be further inserted against the core flange **93** to move the core further forwardly (FIGS. **6**, **7** and **8**). As the core **22** is moved forwardly, the actuator post **64** carried thereby will move away from the tamper switch **80** and into contact with barrier control switches **82** and **84** to actuate these switches. Continued forward movement of the core **22** is prevented by the switches **82**, **84**, the apertures **66**, **68** in which the actuator post **64** travels, and the spacing post **28**.

When the pass card **94** is fully inserted in the slot **92** to the position shown in FIGS. **6**, **7**, and **8**, the magnetized spots **102**, **104** on the rear portion of the pass card will be in substantial alignment with the pole pieces or tips **108**, **10** of the electromagnets **98**, **100**, and the actuator post **64** will actuate the barrier control switches **82**, **84**. Activation of the switches **80**, **82**, and **84** completes an electronic circuit (FIG. **14**, described

in detail below) to energize the electromagnets **98, 100** and reverse or nullify the polarities of the magnetic spots **102, 104**.

Since the pole tips **108, 108** of the electromagnets **98, 100** are below and relatively close to the pass card **94**, the electromagnets will effectively nullify the polarities of the magnetized areas **102, 104** on the upper surface of the pass card while creating a strong area of reversed polarity on the bottom surface of the card. The field strengths of the magnetic spots **102, 104** are schematically represented in FIG. **11**. Energization of the electromagnets has had the effect of nullifying the previous south polarities of the spots on the top surface of the card to either no polarities at all, or possibly small north polarities. On the bottom surface of the card strong south polarities have been created. This effect is schematically depicted in FIG. **11** where the bases of the triangular (in cross section) spots represent the stronger poles.

With the magnetic spots **102, 104** on the pass card **94** so altered, these spots will no longer repel magnets **38, 38** out of their respective locking wells **48, 48**. In fact, since the polarities of the magnetic locking pins **38, 38** are the same as the polarities of the electromagnets **98, 100** these locking pins will be forcibly attracted downwardly toward the locking plate **26**.

Subsequent withdrawal of the pass card **94** permits the switch actuating leaf springs **70, 74, 76** to return the core **22** to its original rearward position (FIGS. **2** and **3**). All of the magnetic locking pins **34, 38** will then drop back into their respective holes **46, 48** in the locking plate **26** to again lock the core in place and prevent sufficient forward movement of the core to actuate the barrier control switches **82, 84**.

If the magnetic pass card **94** with the polarities of the areas **102, 104** so altered is reinserted into the unit **2**— right-side-up, the magnetized spots **105, 105...105** thereon will still repel the magnetic locking pins **34, 34...34** out of their respective locking wells **46, 46...46** in the locking plate **26**. However, the repolarized or nullified magnetic spots **102, 104** will not repel the magnets **38, 38** out of their respective locking wells **48, 48** and will thus not release the core **22** for sufficient forward movement to actuate the switches **82, 84**. Thus, the pass card **94** may not be reused to operated the unit **20** until the card has been "revalidated."

This may best be understood by referring to FIGS. **7, 8, 10** and **11**. In FIG. **10**, the pass card **94** has been fully inserted into the pass card receiving slot and the magnetized spots **102, 104** (polarized with their south poles facing upwardly) are in substantial alignment with the magnetic locking pins **38, 38** and the channels **36, 36** in the core **22**. Since the south poles of the spots **102, 104** and the magnetic pins **38, 38** face one another, the pins will be repelled upwardly out of the locking plate wells **48** to permit the core **22** to be moved relative to the locking plate **26** (assuming that the program card **56** and the pass card **94** are properly coded to attract and/or repel the remaining locking pins **34, 34...34** out of their respective locking plate wells **46, 46...46**). As best shown in FIG. **11**, when the core **22** is moved to its forward position (FIGS. **7** and **8**) the magnetized spots **102, 104** on the rear portion of the pass card **94** and the magnetic locking pins **38, 38** will be in substantial alignment with the poles of the electromagnets **98, 100**, and the actuator post **64** carried by the core **22** will actuate the switches **82, 84** to energize the electromagnets and reverse or nullify the polarities of the spots **102, 104** to render them incapable of repelling the pins **38, 38**. If an attempt is made to use the altered pass card **94** again, without revalidating it, by inserting the card into the unit **20**, right-side-up, the magnetic pins **38, 38** will remain in the locking plate wells **48, 48** and inhibit sufficient movement of the core to actuate the switches **82, 84**.

If an attempt is made to reuse the altered card by turning it upside down and inserting it into the unit, the strong south poles of the spots **102, 104** now underlying and facing the south poles of the respective locking wells **48, 48** will repel the locking pins **38, 38** upwardly. However, not all of the spots **105, 105...105** will be in alignment with all of the pins **34, 34...34** in the forward programmable portion of the core **22**, and some or all of these pins **34** will remain in their locking wells **46** to prevent the core from being moved sufficiently forward to actuate the barrier control switches **82, 84**.

Thus, the pass card **94** may not be reused to operate the unit **20** until it has been "revalidated." The card may thus be characterized as a "single use" card. Such single use cards may be employed to advantage in a variety of situations. For example, such a card may be used to to an individual to permit him to gain access to a restricted area only one time. When the individual leaves the area, he would be required to return the card to an admitting office or guard. Thereafter, the card may be "revalidated" in a suitable unit (such as the "exit" unit discussed below) to permit reissuance and reuse of the card. If the individual fails to return the card, it will serve him no purpose since the card, with the polarities of the spots **102, 104** altered, cannot be reused to operate the unit **20**.

The pass card **94** may be "revalidated" to permit it to be used again in the unit **20** by inserting the card in a unit which will restore the magnetic spots **102, 104** to their original polarities. Such a "revalidation" unit may be virtually identical to the unit **20**, and may be placed at the exit from the same restricted area where the unit **20** is employed at the entrance. Changing an "entrance unit" to an "exit unit," or vice versa, may be accomplished by simply reversing (i.e., turning over) the program card **56** in the program card receiving slot **54**. As shown in FIG. **5**, the magnetic spots **57, 57...57** on the program card **56** and the locking pins **34, 34...34** in core channels **32 32...32** may be arranged in rows of six (or other even number) across, evenly spaced from one another on either side of the centerline of the card end core, and with the polarities thereof alternating. However, there must be at least one area of the program card which is not magnetized according to the foregoing pattern, so that one or more of the underlying locking pins **34, 34...34** will not be attracted by the program card when the card is in place in the unit. It is this or these nonattracted pins that will be repelled by a properly coded pass card inserted into the unit.

Since the magnetic spots on the program card **56** are symmetrically located with respect to the longitudinal centerline of the card, when the card is inverted the polarity pattern of the spots on the card and the locking pins will be the same as before the card was inverted, except that the locations of the nonmagnetic areas on the card will be shifted to locations symmetrically opposite from their original (right-side-up) positions. As a result, the pins underlying these nonmagnetic areas will remain in their respective locking wells in the locking plate. When a properly coded pass card **94** is turned upside down and inserted into the unit, the magnetic spots **105, 105...105** thereon will repel those pins **34, 34...34** not attracted by the program card, and the rear spots **102, 104** will repel the rear locking pins **38, 38**.

Further forward insertion of the pass card into this "exit" unit will activate the switches **82, 84** to again energize the electromagnets **98** and **100** and restore the polarities of the spots **102, 104** to their original conditions. The pass card **94** can now be employed once again to operate an "entrance" unit until it has first been inserted in an "entrance" unit.

It should be noted that the program card **56**, when inserted into the program card receiving slot **54** and secured in position by locking screw **60**, does not extend rearwardly beyond the post **64**. Thus, the program card does not overlie the rear locking pins **38, 38**, so none of the magnetic spots thereon will attract or repel these rear pins.

It is apparent from the foregoing that an entrance unit may be readily converted to an "exit unit" by simply turning the program card upside down, and the "exit unit" may be operated by a properly coded pass card also turned upside down. Several access control units virtually identical to unit **20** may be employed in a system for controlling entrance to and exit from a restricted area. Any of the units could serve as an entrance or an exit unit, the number of entrance and exit units depending upon the anticipated flow of traffic at any given time. For example, at a convention 10 units might be

employed as entrance units in the morning, and two as exit units. At lunchtime the same units may be changed to provide 10 exit units and two entrance units. At the conclusion of the convention, all units may be employed as exit units to permit quick egress and recoding or "revalidation" of the pass cards for entry at the next session of the convention. The pass cards may be printed with the legend: "USE THIS SIDE UP FOR ENTRANCE" on one side, and "USE THIS SIDE UP FOR EXIT" on the reverse. To simplify the legend, one side of the card could be designated the STAR side, and the other the ARROW side. Appropriate changeable signs mounted on each access control would then read either "INSERT STAR SIDE UP" or "INSERT ARROW SIDEUP."

Selective entrance control can be accomplished by changing the program card codes for each set of entrance and exit units. Thus persons would be admitted only through doors or gates having units coded to be unlocked by their specific cards. Master and submaster coding can be accomplished by providing additional magnetic spots sn the pass card, so that the same pass card will operate several locks coded by various program cards.

The units may be mounted on pedestals so that they can be swiveled from facing the interior to facing the exterior of the restricted area to accommodate persons entering and leaving through the same entry.

To prevent a person from using his card to enter the restricted ares, then using it right away in an exit unit, and then passing it back to someone on the outside, an usher or guard may be stationed at each unit and red or green indicator lights or a warning buzzer may be provided on the housing of the unit to inform the usher of the status of the card being presented. For example, a green light may indicate that the card is acceptable, while a red light or warning buzzer may indicate an improperly inserted card, or a card that has been used and passed back. Of course, no guard is required when the access control units are employed in conjunction with turnstiles, parking gates or other barriers that limit access to the restricted area to one person or car at a time.

Where the units are used in a parking lot, it is desirable to install a vehicle detector in series with each unit so that a car must be standing at the unit when it is used. This prevents someone from entering the lot, inserting his pass card in the exit unit to revalidate the card as he is walking out, and subsequently giving the card to another person to use.

One purpose of the switch is to actuate an alarm or warning signal when an improperly coded pass card or other device (e.g., a knife blade) is inserted into the pass card receiving slot **92** in an unauthorized attempt to operate the unit **20**. As noted above, the locking plate wells **46** and **48** are slightly wider or larger in diameter than the core channels **32, 36** and the locking pins **34, 38**. Accordingly, if an improperly coded pass card is inserted into the slot **92** and pushed forwardly against the flange **93** of the core **22**, the core will move slightly forwardly until the locking pins contact the forward ends of their respective locking plate wells **46, 48**. Although this movement of the core is not sufficient to actuate the switches **82, 84**, it is sufficient to actuate the switch **80** and complete a circuit (FIG. **14**, described in detail below) to operate a suitable warning device and alert a guard that an unauthorized individual is attempting to operate the unit.

An electronic circuit **150** for use in conjunction with the access control unit **20** is schematically illustrated in FIG. **14**. The circuit functions as follows:

When an improperly coded pass card or foreign element (e.g., a knife blade) is inserted into the receiving slot **92** and pushed against the core flange **93**, the core **22** and the actuator post **64** carried thereby will move forwardly a slight distance (determined by the difference between the diameter of the locking plate wells **46, 48** and the diameter locking pins **34, 38**). This slight movement of the actuator post **64** away from the switch **80** is sufficient to actuate the switch **80**, but is insufficient to actuate the switches **82, 84**.

With the switch **80** closed and the switches **82, 84** open, the capacitors **154, 154**, which had previously been charging through a resistor **156**, will charged through a resistor **158**. The capacitors **154, 154** will continue to charge until a transistor **160** is turned on, whereupon, after a delay determined by the RC time constant of resistor **158** and capacitors **154, 154**, the coil of a relay **162** will be energized to actuate the switch **164**. The closing of switch **164** completes a circuit to energize a buzzer coil **172** and sound an alarm and turn on a warning light (not shown). This will alert appropriate personnel that an unauthorized individual is attempting to operate the access control unit **20**.

When the improper card or element is removed from the slot **92**, the leaf springs **74, 76** will urge the actuator post **64** and core **22** back to their rearward position (FIGS. **2** and **3**), in which position the actuator post **64** contacts and deactuates the switch **80**. Thereupon capacitors **154, 154** will discharge through diode **176** and resistor **158** to the negative side of the power supply, and relay coil **162** will return to its original, deenergized condition, cutting off the alarm and warning light.

When a properly coded pass card is inserted into the receiving slot **92**, all of the locking pins **34, 38** will be repelled or retracted upwardly out of the locking plate recessed **46, 48** to permit the core **22** to be pushed to its forward position (FIGS. **7** and **8**). As the core **22** moves forwardly, the actuator post **64** will first move away from the switch **80** to actuate it, and thereafter will move into contact with the switches **82** and **84** to close them. The capacitors **154, 154** will then begin to charge through resistor **158**. However, with the switches **82** and **84** being closed immediately after the closing of switch **80**, transistor **180** will be turned on through resistor **179** and diode **181** to discharge capacitors **154, 154** before they have been sufficiently charged to turn on transistor **160** and actuate the relay **162** and the warning buzzer **172** and/or warning light (not shown).

When the switches **82, 84** are closed, capacitors **182, 182** will discharge through switch **84** into the coils of electromagnets **98, 100** to nullify or reverse the polarities of the magnetic spots **102, 104** on the pass card **94** in the manner described above.

The closing of switch **82** will actuate a suitable mechanism (not shown) to open or unlock a barrier (e.g., a parking lot gate, turnstile, door, etc.) and/or turn on a light to indicate that the person attempting to gain access is authorized.

When the pass card **94** is removed from the slot **92**, the leaf springs **74, 76** will return the actuator post **64** and the core **22** to their original rearward positions (FIGS. **2** and **3**). This will close switches **80, 82** and **84**, and capacitors **154,154** will discharge through diode **176** and resistor **178** to ground.

Diodes **184, 186** and **188** are "coasting diodes" provided to protect the coils of electromagnets **162, 106** and **172**, respectively.

In some situations it may be desirable to permit use of the pass card **94** to sequentially operate "entrance" and "exit" units without having to turn the card upside down. Another embodiment of an access control which permits such use of the pass card is shown in FIGS. **12** and **13**. Unit **20'** is similar to unit **20** described above, but is provided with only a single locking pin **38'** in the rear portion of the core **22'**, and includes a longer field return screw **115'** in place of one of the shorter screws **114** of unit **20**. The screw **115'** extends downwardly through the top plate **50'** , the upper core guide plate **24'** (not shown in FIG. **12**), and a cutout section **117'** of the core **22'** , to the locking plate **26'**. The remainder of the unit **20'**, including the pattern of the locking pins in the forward portion of the core **22'**, is identical to the unit **20**.

To operate the unit **20'** (FIGS. **12** and **13**), the pass card **94** is inserted into the pass card receiving slot of the unit. The south poles of the magnetic spot **104** and the locking pin **38'** will repel one another, driving the locking pin **38'** upwardly and out of the locking plate well **36'**. Simultaneously, the spots (not shown) on the forward portion of the pass card and the spots on the program card (not shown) will repel and attract

the other locking pins out of their respective recesses in the locking plate 26'. This will permit the pass card 94 to move the core 22' forwardly and actuate the switches to open the barrier (not shown) and energize the electromagnets 98', 100'. The energized electromagnets will nullify or reverse the polarity of the pass card spot 102 and will reverse the polarity of the spot 104, as shown in FIG. 13.

It will be noted that only one locking pin 38' and only one channel 36' are provided in unit 20'. The section of core 22' where the other channel 36' would be located is cut away to permit the core to move relative to the locking plate 26' even though the long iron screw 115' extends down to the locking plate 26'. The long screw 115' enhances the magnetic field of its respective electromagnet 98' and insures a reversal of the polarity of the spot 102 and a strong field at the upper surface of this spot. The distance between the core tip 108' of the opposite electromagnet 100' and the smaller screw 114' above it decreases the effectiveness of the magnetic field produced by the electromagnet 100. However, it is only necessary to weaken the magnetic strength of the spot 104 sufficiently to prevent it from repelling the pin 38' during an attempted reuse of the card in the same unit.

The pass card 94 may later be employed to operate a complementary "exit unit" (not shown) which is essentially a "mirror image" of the unit 20'. The magnetic locking pin 38' in this complementary unit (not shown) and its channel 36' will be located on the opposite side of the core 22' above the electromagnet 98', and the polarity of the pin will be opposite to the polarity of the pin 38' in the entrance unit 20'. The longer screw 115' will also be on the opposite side of the complementary unit, overlying the electromagnet 100'.

When the pass card 94, with the polarities of its spots 102, 104 altered as shown in FIG. 13, is inserted right-side-up, into the "exit" unit (not shown), the strong spot 102 through the pass card will be located under the locking pin 38' and above the electromagnet 98'. The north poles of the spot 102 and the magnetic locking pin 38' will face one another, thereby repelling the pin 38' out of its locking well, and, assuming the remainder of the program card and the pass card are properly coded, the pass card 94 may be pushed forwardly to actuate the exit barrier control switch and energize the electromagnets 98', 100' in a manner like that described above relative to unit 20. This will reverse the polarity of spot 104 and nullify or reverse the polarity of spot 102, thereby restoring the polarities of these spots to their original conditions. The card 94' can then be used again to operate the "entrance" unit 20' shown if FIG. 12. No pass card 94 can be used to operate the "exit" unit (not shown) until it has first been inserted into an "entrance" unit.

It should be noted that a system using complementary units like unit 20' will eliminate the requirement of the user turning the pass card over to operate the exit unit. However, it is not possible to readily convert an "entrance" unit to an "exit" unit in such a system because the units are constructed differently.

The circuit illustrated in FIG. 15 is designed to prevent an access control unit 20 or 20' from being operated more than once by repeated insertions of a single pass card. In the past it has been noted that in some cases repeated, successive actuation of a control unit could be effected by slight withdrawal of the card (withdrawal a distance insufficient to permit the locking pins 34 and 38 to drop into their respective wells 46 and 48 in the locking plate 26) and reinsertion of the card to again actuate the switches 82 and 84 and operate the control device (e.g., barrier on light).

Referring to FIG. 15, when a properly programmed pass card 94 is inserted into the unit 20, tamper switch 200 and the barrier control switch 202 (provided in lieu of dual switches 82, 84 in unit 20, FIGS. 1—11) will be closed (broken line position in FIG. 15). A silicon control rectifier 204 will then be turned on through resistor 206 and diode 207. This will cause capacitor 208 to discharge through the SCR 204 into coils 210 and 212 (the coils for electromagnets 98 and 100), thereby reversing or nullifying the polarities of spots 102 and 104 on the pass card.

The capacitor 214 will then charge through rectifier 216 and relay coil 218, pulling in the relay and closing relay switches 220 and 222. Switch 222 operates the access control device (barrier or light). Switch 220 completes the circuit through the tamper switch 200 to permit the capacitor 214 to continue charging. When the current charging capacitor 214 reduces, the relay coil 218 will no longer hold the switches 220, 222, and the unit will return to its original condition. The opening of switch 222 will cut the power to the control device, while the opening of the switch 220 stops the charging of the capacitor 214. Thus, relay switches 220 and 222 will remain closed for a relatively short period of time, determined by the capacitor 214 and the characteristics of relay coil 218, and will not again close to actuate the control device until another valid pass card is inserted into the unit.

When the pass card is withdrawn from the unit sufficiently to allow the locking pins to enter their respective locking wells, the tamper switch 200 will deactuate, discharging capacitor 214 through diode 216 and resistor 228, so that the subsequent insertion of a valid pass card will repeat the operating cycle of the unit. The switches 200 will return to their original positions (solid line positions of FIG. 15), capacitor 208 will recharge through diode 224 and resistor 226, and the magnetic locking pins 34, 38 will drop into their respective wells 32, 36 in the locking plate 26 to again lock the unit 20. Diode 230 shorts out the relay coil 218 to prevent the coil from closing relay contacts 220 and 222 during discharge.

A jumper 232 may be provided across the capacitor 214 to latch in the relay coil 218 if a pulse-type operation is not desired. This latching circuit is only broken when the tamper switch 200 deactuates as a pass card is removed. Accordingly, when such a jumper 232 is provided, only one sustained closure of switches 220, 222 may be maintained when a valid pass card has been inserted into the unit.

As noted above, when the access control units of the present invention are provided in parking lots, garages, or the like, it may be desirable to install a vehicle detector in series with each unit so that a car may be standing at the unit when it is used. This arrangement will prevent an individual with a valid pass card from entering the parking lot, "revalidating" the card by inserting it into the "exit" unit without leaving the lot in his automobile, and subsequently passing the card to another person to use. Utilizing the circuit shown in FIG. 15, this result may be accomplished by having the power supplied through the vehicle detector (not shown). In the absence of a vehicle at the "exit" unit, this unit could not be actuated to activate the electromagnet coils 210, 212 and realter the polarities of the spots 102, 104 on the rear of the pass card. Insertion of a properly programmed card (in the absence of a vehicle) will activate the switches 200 and 202, but since no power is supplied to the circuit, relay coil 218 will not be energized, the SCR 204 will not fire, and no current will be supplied to the electromagnets.

From the foregoing, it will be appreciated that numerous advantages may be realized through the use of access control units and systems according to the teachings of the present invention. The use of pass cards having isotropic material permits the creation of magnetic poles which may be polarized in a direction vertically through the thickness of the cards (not possible with cards of anisotropic material), thereby permitting a pass card of given dimensions to be provided with a relatively large number of magnetized portions or spots (i.e., more "data"). This may be highly desirable, for example, when it is desired to provide a pass card designed to control access to a plurality of restricted areas.

The employment of electromagnetic means for nullifying the polarity of one or more of the magnetic spots on the pass cards to restrict reusage of the card, and the employment of such means for selectively permitting or preventing use and/or reuse of the cards in one or several units of an access control system is an additional advantage which may be realized by the use of units and systems of the present invention.

The use of a combination set card or program card (such as card **56**) which may be employed to quickly, efficiently and effectively change the locking combination of the locking pins in the access control unit, and to selectively convert an "entrance" unit to an "exit" unit by simply inverting the card gives rise to still other advantages realized through the use of access control units constructed according to the teachings of this invention.

The foregoing and other features render the access control units of this invention remarkably flexible, effective and economical to manufacture and use.

I claim:

1. An improved access control unit adapted to be operated by a key member having at least one magnetized portion therein, said improved unit comprising:

a magnetic locking element slideably disposed for movement between a locking position and a unlocking position;

means normally biasing said magnetic locking element into its locking position;

means defining a key member receiving opening in said unit for receiving a key member having at least one magnetized portion therein, for urging said locking element to its unlocking position;

electromagnetic means having opposite poles spaced from one another and positioned on opposite sides of said key member receiving opening and in substantial alignment with one another;

said electromagnetic means being operative, when energized, to alter the polarity of the magnetized portion in a key member inserted in the key member receiving opening; and

control switch means operative in response to a properly magnetically coded key member being inserted into the key member receiving opening for energizing said electromagnetic means.

2. An improved access control unit adapted to be operated by a key member having at least one magnetized portion therein, said improved unit comprising:

a plurality of magnetic locking pins slideably disposed for movement between locking positions and unlocking positions;

means normally biasing said magnetic locking elements into their locking positions;

means defining a program member receiving opening in said unit for receiving a program member having at least one magnetized portion therein for urging at least one of said magnetic locking elements to its unlocking position;

means defining a key member receiving opening in said unit for receiving a key member having at least one magnetized portion thereon for urging another of said magnetic locking elements to its unlocking position;

electromagnetic means mounted in close proximity to said key member receiving opening;

said electromagnetic means being operative, when energized, to alter the polarity of the magnetized portion in the key member when the key member is inserted into the key member receiving opening; and

control switch means operative in response to insertion of a properly magnetically coded key member in said key member receiving opening to energize said electromagnetic means.

3. An improved access control unit adapted to be operated by a key member having at least one magnetized portion therein, said improved unit comprising:

a core member having a longitudinal centerline;

means defining a pair of channels extending through one surface of said core member;

said core member channels being located on opposite sides of said longitudinal centerline of said core member, equally spaced therefrom, and in substantial alignment with one another;

a magnetic locking element slideably disposed in at least one of said core member channels for movement between a locking position and an unlocking position;

means normally biasing said magnetic locking pin into its locking position;

means defining a key member receiving opening in close proximity to said core member for receiving a key member having at least two magnetized portions therein, at least one of which is adapted to urge said magnetic locking element into its unlocking position; and

electromagnetic means mounted in said unit and positioned to be in substantial alignment with each of the two magnetized portions in a properly magnetically coded key member when the key member is inserted in the key member receiving opening to operate the unit.

4. An improved access control unit according to claim **3**, wherein said core member includes means defining at least one additional channel extending through one surface thereof, and an additional magnetic locking element is slideably disposed in said additional channel; and further comprising means defining a program member receiving opening in said unit for receiving a program member having at least one magnetized portion, thereon adapted to urge said additional locking element to its unlocking position.

5. An improved access control unit adapted to be operated by a key member having at least one magnetized portion therein; said improved unit comprising:

a core member having a channel extending through one surface thereof;

a magnetic locking element slideably disposed in said core channel;

a locking member disposed in juxtaposition to said core member;

means defining a locking recess in said locking member;

said locking recess facing said core channel and being in substantial alignment therewith for normally receiving one end of said locking element to prevent substantial relative movement between said core member and said locking member;

means defining a key member receiving opening in close proximity to said core member and said locking member for receiving a key member having at least one magnetized portion therein adapted to urge said locking pin out of said locking recess and cause substantial relative movement between said core member and said locking member;

electromagnetic means having opposite poles spaced from one another and positioned on opposite sides of said key member receiving opening in substantial alignment with one another; said electromagnetic means being operative, when energized, to alter the polarities of the magnetized portion of the key member when the key member is inserted into said key member receiving opening to create substantial relative movement between said core member and said locking member; and

control switch means operative in response to substantial relative movement between said core and said locking member for energizing said electromagnetic means.

6. An improved access control unit adapted to be operated by a key member having at least one magnetized portion therein, said improved unit comprising:

a core having a plurality of channels extending through one surface thereof;

magnetic locking elements slideably disposed in said core channels;

a locking member disposed in juxtaposition to said core;

means defining a plurality of locking recesses in said locking member; each of said locking recesses facing one of said core channels and being in substantial alignment therewith for normally receiving one end of the locking element therein to prevent substantial relative movement between said core and said locking member;

means defining a key member receiving opening in close proximity to said core and said locking member for receiving a key member having at least one magnetized portion therein adapted to urge one of said locking pins out of its respective locking recess and cause substantial

relative movement between said core and said locking member;

means defining a program member receiving opening in close proximity to said core and said locking member for receiving a program member having at least one magnetized portion therein adapted to urge one of said locking pins out of its respective locking recess;

electromagnetic means mounted in close proximity to said key member receiving opening;

said electromagnetic means being operative, when energized, to alter the polarity of the magnetized portion in the key member when the key member is inserted into the key member receiving opening to create substantial relative movement between said core and said locking member; and

control switch means operative in response to substantial relative movement between said core and means.

7. An improved access control unit according to claim 6, wherein said electromagnetic means comprises an electromagnet having opposite poles spaced from one another and positioned on opposite sides of said key member receiving opening in substantial alignment with one another, said poles of said electromagnet being positioned to be in substantial alignment with the magnetized portion in the key member when the key member is inserted into the key member receiving opening to create substantial relative movement between said core and said locking member.

8. An improved access control unit according to claim 6, wherein each of said magnetic locking elements is polarized.

9. An improved access control unit according to claim 8, wherein at least one of said magnetic locking elements is polarized to be opposite in polarity to another of said magnetic locking pins.

10. An improved access control unit adapted to be operated by a key member having at least one magnetized portion thereon; said improved unit comprising:

a core having a channel extending through one surface thereof;

a magnetic locking element slideably disposed in said core channel;

a locking member disposed in juxtaposition to said core;

means defining a locking recess in said locking member;

said locking recess facing said core channel and being in substantial alignment therewith for normally receiving one end of said locking element to prevent substantial relative movement between said core and said locking member;

said locking recess being wider than said locking element to permit limited relative movement between said core and said locking member when said locking pin is extending into said locking recess;

means defining a key member receiving opening in close proximity to said core and said locking member for receiving a key member having at least one magnetized portion therein for urging said locking element out of said locking recess and causing substantial relative movement between said core and said locking member;

control switch means operative in response to substantial relative movement between said core and said locking member; and

warning switch means operative in response to limited relative movement between said core and said locking member for actuating a warning signal.

11. An improved access control unit adapted to be operated by a pass card having at least one magnetized portion therein; said improved unit comprising:

a generally planer core member having a channel extending through one surface thereof;

a magnetic locking element slideably disposed in said channel;

a generally planer locking plate disposed adjacent to said core member;

means defining a locking recess in said locking plate; said locking recess facing said core channel and being in substantial alignment therewith for normally receiving one end of said magnetic locking element to prevent substantial relative movement between said core member and said locking plate;

means defining a pass card receiving slot in close proximity to said core member for receiving a pass card having at least one magnetized portion therein adapted to urge said locking pin out of said locking plate recess and permit substantial relative movement between said core and said locking member;

electromagnetic means having opposite poles spaced from one another and positioned on opposite sides of said pass card receiving slot; said opposite poles being in substantial alignment with one another; said electromagnetic means being operative, when energized, to alter the polarities of the magnetized portion in the pass card when the pass card is inserted into said pass card receiving slot to create substantial relative movement between said core member and said locking plate; and

control switch means operative in response to substantial relative movement between said core member and said locking plate for energizing said electromagnetic means.

12. An improved, programmable access control unit adapted to be operated by a pass card having at least one magnetized portion therein; said improved unit comprising:

a generally planer core member having a plurality of channels extending through one surface thereof;

magnetic locking pins slideably disposed in said core channels;

a generally planer locking plate disposed adjacent to said core;

means defining locking recesses in said locking plate; each of said locking recesses facing one of said core member channels and being in substantial alignment therewith for normally receiving one end of the locking pin therein to prevent substantial relative movement between said core member and said locking plate;

means defining a pass card receiving slot in close proximity to one surface of said core member for receiving a pass card having at least one magnetized portion therein adapted to urge at least one of said locking pins out of its respective locking recess and permit substantial relative movement between said core member and said locking plate;

means defining a program card receiving slot in close proximity to the other surface of said core for receiving a program card having at least one magnetized portion therein adapted to urge at least one of said locking pins out of its respective locking recess;

electromagnetic means mounted in close proximity to said pass card receiving slot;

said electromagnetic means being operative, when energized, to alter the polarity of the magnetized portion in the pass card when the pass card is inserted into the pass card receiving slot to create substantial relative movement between said core member and said locking plate; and

control switch means operative in response to substantial movement between said core member and said locking plate for energizing said electromagnetic means.

13. An improved access control unit according to claim 12, wherein said electromagnetic means comprises an electromagnet having opposite poles spaced from one another and positioned on opposite sides of the pass card receiving slot; said opposite poles of said electromagnet being in substantial alignment with one another, and being adapted to be in substantial alignment with a magnetized portion on the pass card when the pass card is inserted into the pass card receiving slot to create substantial relative movement between said core member and said locking plate.

14. An improved access control unit adapted to be operated by a pass card having magnetized portions therein; said improved unit comprising:

a generally planer core member having a longitudinal centerline;

means defining a pair of channels extending through at least one surface of said core member;

said channels being located on either side of said centerline of said core member in substantial alignment with one another and equally spaced from said longitudinal centerline;

a magnetic locking element slideably disposed in at least one of said core member channels;

a generally planer locking plate disposed adjacent to said core member;

means defining at least one locking recess in said locking plate; said locking recess being in substantial alignment with said core member channel having said one magnetic locking element slideably disposed therein;

means defining a pass card receiving slot in close proximity to said core member and said locking plate for receiving a pass card having magnetized portions therein, at least one of which is adapted to urge said one magnetic locking element out of its respective locking plate recess when the pass card is inserted into the pass card receiving slot;

electromagnetic means mounted in said unit and positioned to be in substantial alignment with magnetized portions in a pass card when the pass card is inserted into said pass card receiving slot to create substantial relative movement between said core member and said locking plate;

control switch means operative in response to substantial relative movement between said core member and said locking plate for energizing said electromagnetic means to alter the polarities of the magnetic portions on the pass card which are in substantial alignment therewith.

15. An improved access control unit according to claim **14**, wherein said core member further includes at least one additional channel extending through one surface thereof, and further including a magnetic locking element disposed in said additional channel, and wherein said locking plate includes a locking recess in substantial alignment with said additional channel; and further comprising means defining a program card receiving slot in close proximity to said core member and said locking plate for receiving a program card having at least one magnetized portion therein for urging said additional magnetic locking element out of its respective locking plate recess.

16. An improved access control unit adapted to be operated by a properly magnetically coded pass card; said improved unit comprising:

a generally planer core member having a longitudinal centerline;

said core member including a forward portion having a plurality of channels extending vertically through the thickness thereof, and a rear portion having at least two channels extending vertically through the thickness thereof;

generally elongated, polarized, magnetic locking pins disposed in said channels in said forward portion of said core member and in at least one of said channels in said rear portion of said core member;

a generally planer locking plate disposed adjacent to and beneath said core member;

means defining a plurality of locking recesses in said locking plate; each of said locking recesses facing one of said channels in said core member and being in substantial alignment therewith for normally receiving one end of the magnetic locking pin disposed in that channel to prevent substantial relative movement between said core member and said locking plate;

flange means carried by said core member and adapted to be contacted by a pass card to move said core member forwardly relative to said locking plate;

means defining a pass card receiving slot beneath said locking plate for receiving a pass card having a plurality of magnetized portions therein arranged in a predetermined pattern for urging at least some of the polarized, magnetic locking pins out of their respective recesses in said locking plate, and for contacting said flange member on said core member to move said core member forwardly relative to said locking plate;

at least two electromagnets mounted in said unit, each electromagnet including a lower pole disposed beneath said pass card receiving slot and an upper pole disposed above said pass card receiving slot; said lower and upper poles of each electromagnet being in substantial alignment with one another and being positioned to be in substantial alignment with one of said channels in the rear portion of said core member when said core member has been moved forwardly by a properly coded pass card inserted into said pass card receiving slot; and

control switch means operatively associated with said core member for energizing said electromagnets when said core member is moved a substantial distance forwardly relative to said locking plate.

17. An improved access control unit according to claim **16** and further comprising means defining a program card receiving slot above said core member for receiving a program card having a plurality of magnetized portions therein for urging at least some of the polarized magnetic locking pins in the channels in the forward portion of said core member out of their respective locking recesses in said locking plate.

18. An improved access control unit according to claim **17**, and further comprising means for limiting the extent to which a program card can be inserted into said program card receiving slot, to thereby prevent a program card from being inserted in said program card receiving slot to such an extent that the program card would overlie and affect the magnetized locking pins in the rear channels in the core member.

19. An improved access control unit according to claim **16**, wherein said recesses in said locking plate are wider than said locking pins to permit limited relative movement between said core and said locking member when said locking pins are extending into their respective locking recesses in said locking plate; and further comprising warning switch means operative in response to limited forward movement of said core member relative to said locking plate for actuating a warning signal.