May 4, 1965 J. F. DYBEN 3,181,856

DOOR CONTROL MECHANISM

Filed Dec. 13, 1962 2 Sheets-Sheet 1

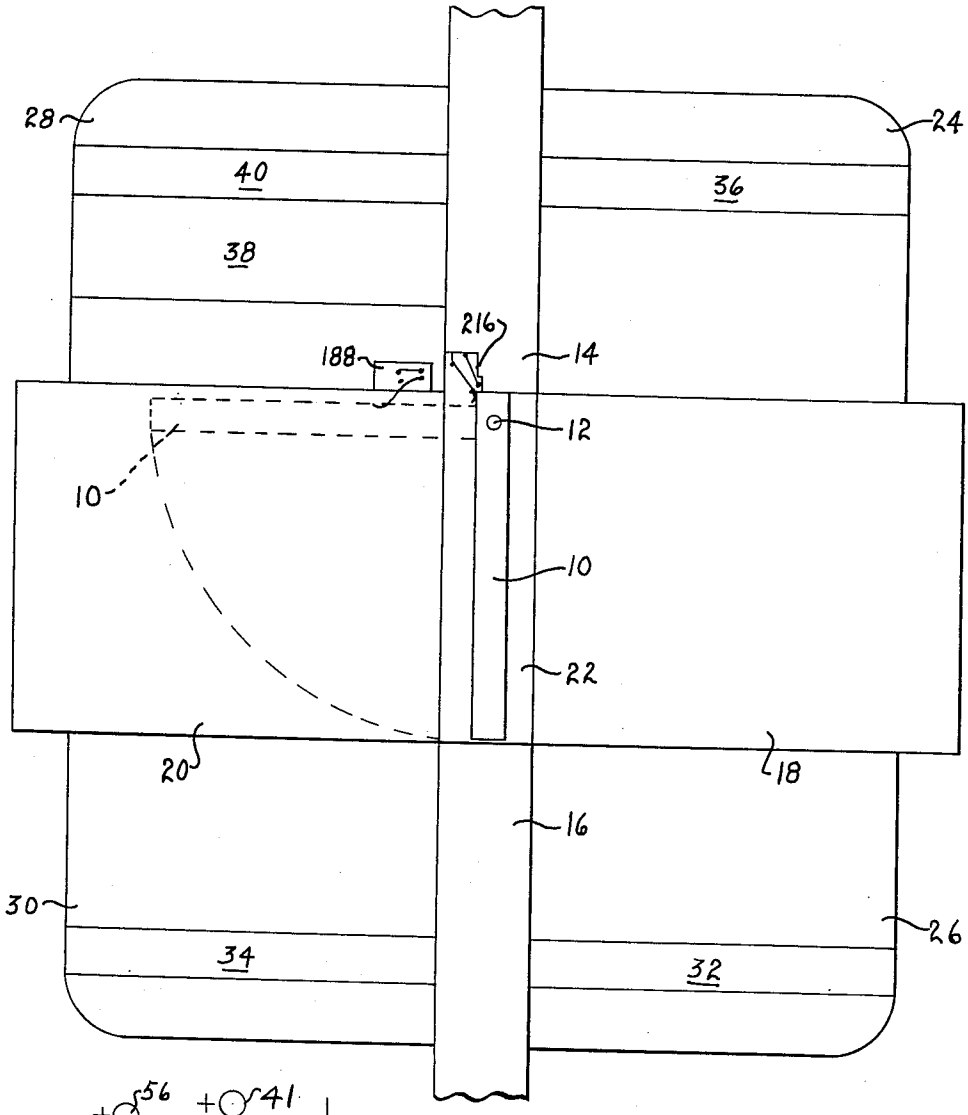

FIG. 1

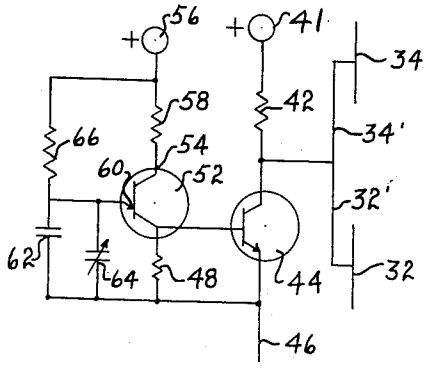

FIG. 2

INVENTOR.
JERRY F. DYBEN
BY Hobbs & Easton
ATTORNEYS

May 4, 1965 J. F. DYBEN 3,181,856

DOOR CONTROL MECHANISM

Filed Dec. 13, 1962 2 Sheets-Sheet 2

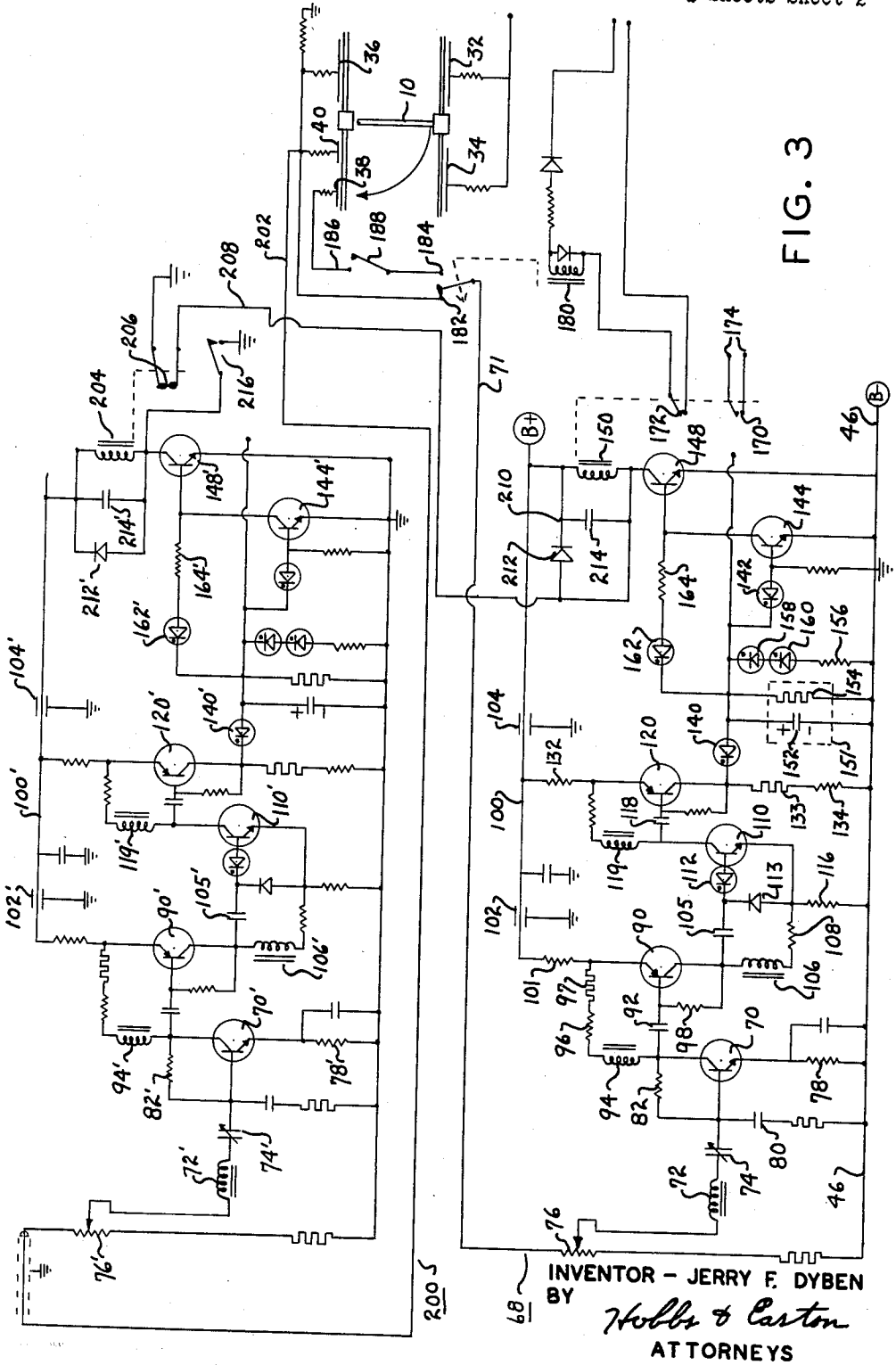

FIG. 3

United States Patent Office 3,181,856 Patented May 4, 1965

3,181,856

DOOR CONTROL MECHANISM

Jerry F. Dyben, South Bend, Ind., assignor to Communications Research, Inc., South Bend, Ind., a corporation of Indiana

Filed Dec. 13, 1962, Ser. No. 244,378
11 Claims. (Cl. 268—65)

The present invention relates to a door control mechanism and more particularly to a door control mechanism which operates a door automatically in response to the presence of a person or object in front of the door.

With the advent of the supermarket and similar establishments handling a large number of people, automatically operated entrance and exit doors have virtually become essential, since those entering and leaving the establishments usually are carrying heavy loads of packages and the like or are pushing a cart loaded with purchases, and are often carrying or leading small children and/or pets. In the past, as well as at the present time, these entrance and exit doors have been operated either by a light beam and a photo-electric cell or mats installed on both sides of the doors for controlling electrically operated door opening and closing mechanisms. Both types of these widely used door control and operating mechanisms have certain inherent disadvantages or characteristics which render them unsafe under certain conditions or which require excessive amounts of service and repair and frequent replacement. The photo-electric cell type will operate satisfactorily under most conditions when adults or large children use the door in the normal manner; however, it will occasionally fail to function properly in response to various types of carts and objects, and small children and pets. Further, dead spots in the control mechanism are difficult to eliminate, and hence the door may fail to function or cease to function at critical stages in the opening and holding operation, occasionally resulting in serious injury to the one passing through the door. Although the mat type door control overcomes most of the disadvantages and difficulties inherent in the photo-electric cell type, the mat type also has certain inherent disadvantages, including dead spots between mats on the entrance and exit sides of the door, frequent and expensive mat repair and replacement operations, and non-responsiveness to objects approaching the door in advance of a person or vehicle without contacting the mat. Most of these difficulties may be overcome by specially designing the mats for various installations or including special features, and these special designs and features render the installation and service costs excessive or prohibitive. It is therefore one of the principal objects of the present invention to provide a door control and operating mechanism which is responsive to the presence of a person or object in a relatively large area on the entrance side of the door and without the person or object necessarily contacting the floor or other physical control member, and which will respond to the presence of relatively small bodies over a wide vertical range.

Another object of the invention is to provide a door control mechanism which can be easily installed, either temporarily or permanently, without reconstructing or damaging the floor or wall structure on either side of the door, and which after installation requires little or no service or other attention to maintain it in satisfactory operating condition.

Still another object of the invention is to provide an automatically operated door control mechanism which will operate safely and efficiently under adverse operating conditions and in spite of careless and attempted improper use of the door.

A further object of the invention is to provide a control mechanism of the aforesaid type which is relatively simple and compact and is constructed of standard components readily available on the market, and which can be readily adapted to a variety of different types of installations and uses without altering the basic design or mechanism.

Additional objects and advantages of the invention will become apparent from the following description and accompanying drawings, wherein:

FIGURE 1 is a diagrammatical view of a door and control mechanism embodying the present invention;

FIGURE 2 is a schematic diagram of a portion of the circuit of the present door control mechanism; and

FIGURE 3 is a schematic diagram of the basic circuit used in conjunction with the circuit of FIGURE 2 for controlling a door operating mechanism.

Referring more specifically to the drawings and to FIGURE 1 in particular, numeral **10** designates the door pivotally mounted on a pivot hinge **12** within door frame members **14** and **16**, the door being so mounted by hinge **12** that it swings toward the left from the fully closed position shown in full lines to the fully opened position shown in broken lines. The floor **18** forms the approach to the door, and the floor **20** forms the exit from the door. The two floor portions **18** and **20** are separated by a sill **22**, the two floor portions and sill being solid, non-movable members of conventional construction. Positioned vertically along each side of the door at the entrance are railing structures **24** and **26**, and positioned along the exit are railing structures **28** and **30**, the four railing structures being positioned vertically and disposed in close proximity to the opposite edges of the door opening; however, in the drawings, the railing structures are shown lying horizontally on a plane with the floor in order to better show and illustrate in a single view the relationship and operation of the parts forming the present control mechanism installed adjacent the door.

Mounted on railing structures **26** and **30** on the entrance and exit sides of the door, respectively, are transmitter antennas **32** and **34**, and mounted on railing structure **24** is receiving antenna **36**, and on railing structure **28** are receiving antennas **38** and **40**. The transmitter and receiving antennas when in operation form capacitors and create an electrical field between the railing structures on opposite sides of the entrance and exit sides of the door for sensing the presence of a person or object approaching or passing through the door. The signal thus created is transmitted to a control mechanism for operating the door in response thereto, as will be more fully described hereinafter. This type of door installation is designed primarily for use in conjunction with supermarkets and similar establishments, and a multiple installation would normally be used, one for the entrance of the customers into the establishment and the other for the exit of the customers, the two installations being placed side-by-side and the railing structures **26** and **30** being adapted to support two antennas for the adjacent doors. The particular type of door design and railing structure are used herein merely for the purpose of illustrating the invention and do not form a limitation thereon.

The transmitter circuit is shown in the schematic diagram of FIGURE 2 and is connected to antennas **32** and **34** by leads **32'** and **34'**, respectively. In this circuit, a positive buss **41** is connected through a resistor **42** to the antennas and to the collector of an NPN transistor **44**. The emitter of transistor **44** is connected to a negative buss **46**, and the base voltage of transistor **44** is set from buss **46** through a resistor **48**. The base voltage on transistor **44** is forward biased cyclically by the circuit including a unijunction **52**. Terminal **54** of unijunction **52** is connected to a positive buss **56** through a resistor **58**, while terminal **60** is connected to buss **46** through capaci-

tor 62 and variable capacitor 64, connected in parallel, and to buss 56 through a resistor 66. The values of these components are chosen to render transistor 44 slightly conducting by maintaining a reverse bias on the base of the transistor through resistor 48 except for a short period in every cycle when the action of unijunction 52 connects buss 56 with the base of transistor 44 to forward bias the base and allow current to flow from buss 41 to buss 46. Throughout the remainder of this description, the values of the components are assumed to be such as to allow current to flow from buss 41 to buss 46 for 5 microseconds out of every 50 microseconds, giving a frequency of 10,000 cycles per second; however, this rate is readily varied by varying capacitor 64. If desired, a more powerful oscillator circuit may be utilized in place of the one including transistor 44.

Referring to primary control circuit 68 in FIGURE 3, antenna 36 for sensing the presence of a person or object approaching door 10 is connected to the base of an NPN transistor 70 through lead 71 and a resonating circuit consisting of a coil 72, and variable capacitor 74, and through a variable resistor 76 and resistor 78 in series to buss 46. Resistor 76 is varied to vary the amount of energy reaching the base of transistor 70, as will be described later. A slight forward bias is maintained on the base of transistor 70 by resistor 82. Capacitor 80 is a filter capacitor to reduce undesirable high frequency signals. Resistor 78 provides a slight amount of degeneration for more stable operation. The values of the components are chosen in such a manner that transistor 70 acts as a class C amplifier, and the resonating circuit containing components 72 and 74 is tuned to 10 kc.

The collector of transistor 70 is connected to a PNP transistor 90 through a circuit consisting of a capacitor 92, coil 94, and resistors 96 and 97 connected, in series in the order named, between the base and emitter of the transistor, with the collector of transistor 70 being connected between capacitor 92 and coil 94. The coil is wound in such a manner that it is a parallel resonant circuit at 10 kc. The base of transistor 90 is also connected to its collector through a resistor 98, and the emitter is connected to a positive buss 100 through a resistor 101. Feedthrough capacitors 102 and 104 are provided for buss 100 to prevent high frequency signals which may appear on buss 100 from reaching the transistors. Transistors 70 and 90 form two stages of an amplifier, which may be modified by changing the number of stages or the power or by any other desired modification without departing from the present invention.

The collector of transistor 90 is connected through a resonating circuit consisting of a capacitor 105, a coil 106, wound in the same manner as coil 94, and a resistor 108, in series in the order named, between the base and emitter of a transistor 110, with a zener diode 112 connected between the capacitor and the base, and with the collector of transistor 70 connected between the capacitor and the coil. Although this resonating circuit acts to amplify the signal coming from the transistor 90 in much the same manner as the circuit between transistors 70 and 90, a diode 113 having one end connected between capacitor 105 and zener diode 112, and its other terminal connected to the emitter of transistor 110 acts to pass only the positive portions of the waves coming from transistor 90. Furthermore, zener diode 112 cuts off from transistor 110 all but the higher positive values of the remaining portions of the waves. Thus, only a pulsing D.C. current whose peak voltage depends on the value of field between antennas 32 and 36 reaches the base of transistor 110. Resistor 116 stabilizes the operation between the emitter of transistor 110 and buss 46.

The collector of transistor 110 is connected through a circuit consisting of a capacitor 118 and coil 119 to a PNP transistor 120, with the capacitor and coil in series between the base and the emitter of transistor 120. The emitter of transistor 120 is connected to buss 100 through

a resistor 132. The collector of transistor 110 is connected between coil 119 and capacitor 118. The positive going signal on the base of transistor 110 is amplified and inverted 180° so that a negative going pulse is produced across coil 119 and coupled to the base of transistor 120 through capacitor 118. The negative going signal on the base of transistor 120 produces a positive going signal across thermistor 133 and resistor 134.

The collector of transistor 120 is connected through zener diodes 140 and 142 to the base of transistor 144. The amplified signal of the collector of transistor 144 is connected to the base of transistor 148 and the collector of transistor 148 is connected to relay 150, the emitters of transistors 144 and 148 being connected to negative buss 46. A circuit 151, including capacitor 152 and thermistor 154, has been included in the circuit to eliminate the effect of temperature changes on transistor 144. The resistor 156 and zener diodes 158 and 160, connected between transistors 120 and 144 and buss 46 provide a stabilized minimum bias, and a zener diode 162 and resistor 164 between transistors 120 and 144 are connected to the base of transistor 148 to act as a level difference sensing circuit.

The pulses from transistor 120 are developed across thermistor 133 and resistor 134, and zener diode 140 passes only the most positive portion of the wave form. Capacitor 152 and thermistor 154 form the main body for the filtering of the D.C. pulses to some steady state D.C. value. The value of this energy depends upon whether a person is in the field or whether an increase in signal is accomplished by an object or body such as a basket being struck across the field and allowing an increase in signal. Zener diodes 158 and 160 and resistor 156 form a circuit of holding the D.C. level to some reference value. Zener diode 162 is a higher value zener and the energy level in the condition with no person in the door is high enough to keep transistor 148 conducting, and therefore relay 150 in an energized state. Zenery action of diode 142 is higher than that of zener diode 162, and functions to increase the signal strength, raising the D.C. level and allowing zener diode 162 to conduct harder, and would try to make transistor 148 conduct more. However, zener diode 142 would make transistor 144 conduct, which would back bias transistor 148, thus causing the relay to deenergize. This condition is necessary in that the energy established in the field between antennas 32 and 36 will normally be absorbed by a body, but in case a metallic basket or in case of a person contacts the transmitter antenna, they become part of the transmitting circuit and thus shorten the distance between the transmitter and the receiving antenna, causing an increase in the signal rather than the normal decrease required to activate the door. This increase in signal would be detrimental to operation of the door since it would normally keep transistor 148 conducting and therefore relay 150 energized. The circuit function of diode 142 in response to the signal increase causes transistor 144 to conduct, and through transistor 148 back biases transistor 148, causing the condition of cutoff for transistor 148, thus deenergizing relay 150, and providing a voltage level between two extremes.

Relay 150 operates two sets of contacts indicated by numerals 170 and 172. Contacts 170 control circuit 174 controlling the operation of the power mechanism for opening and closing the door. This type of mechanism is well known and readily available on the market and hence will not be described herein. Contacts 172 control the circuit of reed relay 180, which in turn controls contacts 182 in lead 71 and contacts 184 in a holding circuit consisting of antenna 38, lead 186 and mechanically operated switch 188, switch 188 being closed by the door when it reaches substantially fully opened position. The reed relay 180 alternates on negative half 60 cycles between contacts 182 and 184, with the combined energy level in the two circuits, identified by leads 71 and 186, not being sufficient to operate relay 150 to open contacts 170 and

thereby close the door while a person or object is in the electrical field between the respective transmitting and receiving antennas. It is seen that antenna **38**, which controls the circuit including lead **186**, is substantially larger than antennas **36** and **40** since it must receive its signal through door **10** when it is in opened position.

The safety control circuit identified generally by numeral **200** is basically the same as the main control circuit previously described; consequently, identical components and subcircuits will be designated by the same numerals with primes in the safety control circuit to identify respective components and subcircuits and will not be described in detail herein. The primary safety circuit consists of antenna **34** of the transmitter and receiving antenna **40**, the latter antenna being connected by lead **202** with the safety control circuit previously mentioned controlling solenoid relay **204** including contacts **206** of the safety circuit. One contact of the relay is connected with a source of electrical energy and the other contact is connected by lead **208** to the input line of relay **150** between transistor **148** and the relay. A delayed action circuit **210** consisting of a diode **212** and capacitor **214** prevents chattering of relay **150** when the safety circuit is initially operated. An overcontrol switch **216** is actuated by the door and, as the door is opened, the switch closes, thus maintaining relay **204** in its energized condition and thereby contacts **206** in their opened position to prevent the safety circuit from interfering with the operation of the door after a person has started therethrough.

In the operation of the present door control mechanism initially with no person or object between antennas **32** and **36**, the energy level between the two antennas is sufficient to energize relay **150** and thus maintain switch **170** of the door operating circuit open and the door closed, as shown in FIGURE 1. Likewise, the energy level between antennas **34** and **40** is sufficient to energize relay **204** and thus maintain contacts **206** open and the safety circuit inoperable. Receiver antenna **36** is coupled to the input of the open E.S.P. system through contacts **182** of relay **180** to the potentiometer **76**, the potentiometer energy level is adjusted so that relay **150** is normally energized, and contacts **170** and **172** are normally opened when relay **150** is energized. When a person enters the electric field between antennas **32** and **36**, the electric field energy therebetween drops as a result of the ground absorbing effect of the person's body. When enough energy from the electric field has been absorbed, relay **150** deenergizes and contacts **170** and **172** close, contacts **170** energizing the door opening mechanism and contacts **172** applying 60 cycles current to relay **180**. The circuit of relay **180** permits only the negative portion of the 117 volt 60 cycle A.C. to energize the relay. When relay **180** is energized, receiver antenna **36** is removed from the circuit and receiver antenna **38** is connected to the input of the opened E.S.P. system through micro-switch **188** which is closed when the door is fully opened. The energy now received by the opened E.S.P. system is chopped so that half its energy is received from antenna **36** and half from antenna **38**. The chopped energy now received by the opened E.S.P. system is such that when a person is standing in receiver **36** field or between fields **36** and **38** or in field **38**, the composite energy will not be large enough to energize relay **150**. Only when no person or object is in the field will be the two composite field energies be equal and sufficient to energize relay **150**. When this condition is met, the contacts **170** and **172** open and allow the door to close.

If a person should attempt to pass in the wrong direction through the door, the energy level between antennas **34** and **40** would drop and relay **204** would be deenergized, thus closing contacts **206**, which completes the safety circuit to relay **150**, and this prevents deenergization of the latter relay and hence prevents closing of contacts **170** and **172**, if a person should enter the field between antennas **32** and **36** while the person is still on the wrong side of the closed door, i.e. in the field between antennas **34** and **40**. In normal operation of the door, the safety circuit is deenergized as the door opens by the opening of switch **216** as the door opens; i.e. as the door is opened it energizes relay **204**, opening contacts **206** and thus disabling the safety circuit' After the person has passed through the door and beyond railings **28** and **30**, the energy level between transmitter and receiving antennas rises sufficiently to energize relay **150**, thus opening contacts **170** and **172** and permitting the door operating mechanism to close the door.

While the present mechanism has been described with reference to a door control mechanism, the mechanism can be readily adapted to various other types of operations with minor modifications, and the reference to the door control mechanism is intended primarily as a means of illustrating one embodiment and use of the present invention and, when used in the claims, is intended to include other similar applications and installations.

I claim:

1. For use with a door having an entrance side and an exit side and being mounted to swing away from the entrance side: a control mechanism comprising a transmitter and receiver antenna on opposite sides of the entrance of the door, a transmitter and receiver antenna on opposite sides of the exit of the door, the receiver antenna on the exit side of the door being larger than the receiver antenna on the entrance side thereof, a circuit for said transmitter antennas for creating an electrical field between the respective transmitter and receiver antennas, a circuit for opening and closing the door, a relay having contacts for controlling the last mentioned circuit, said relay being energized to open said contacts, an amplifier circuit responsive to the electrical field between the antennas on the entrance side of the door for energizing said relay, a holding circuit for said relay having a reed relay for operating said first mentioned relay on one-half of the combined energy from the electrical fields between the respective transmitter and receiver antennas at the entrance and exit of the door, said first mentioned relay having contacts for controlling said holding circuit whereby said holding circuit is deenergized when said relay is energized, said holding circuit having a switch closed when said door approaches fully opened position, a safety circuit connected to and controlling said first mentioned relay, a relay for controlling said safety circuit having contacts for controlling said safety circuit, said relay being energized to open said safety contacts, a second receiver antenna on the exit side of the door adjacent said first mentioned antenna on the exit side of the door, an amplifier circuit responsive to the full electrical field between the transmitter antenna on the exit side of the door and said last mentioned receiver antenna for energizing said safety relay, and an overcontrol switch for said safety relay closed by opening of the door for rendering said safety circuit inoperative.

2. For use with a door having an entrance side and an exit side and being mounted to swing away from the entrance side: a control mechanism comprising a transmitter and receiver antenna on opposite sides of the entrance of the door, a transmitter and receiver antenna on opposite sides of the exit of the door, the receiver antenna on the exit side of the door being larger than the receiver antenna on the entrance side thereof, a circuit for said transmitter antennas for creating an electrical field between the respective transmitter and receiver antennas, a circuit for opening and closing the door, a relay having contacts for controlling the last mentioned circuit, said relay being energized to open said contacts, an amplifier circuit responsive to the electrical field between the antennas on the entrance side of the door for energizing said relay, a holding circuit for said relay having a reed relay for operating said first mentioned relay on one-half of the combined energy from the electrical fields between the respective transmitter and receiver antennas at the entrance and exit of the door, said first

mentioned relay having contacts for controlling said holding circuit whereby said holding circuit is deenergized when said relay is energized, said holding circuit having a switch closed when said door approaches fully opened position, a safety circuit connected to and controlling said first mentioned relay, and means for rendering said safety circuit inoperative when the door is opened.

3. For use with a door having an entrance side and an exit side and being mounted to swing away from the entrance side: a control mechanism comprising a transmitter and receiver antenna on opposite sides of the entrance of the door, a transmitter and receiver antenna on opposite sides of the exit of the door, a circuit for said transmitter antennas for creating an electrical field between the respective transmitter and receiver antennas, a circuit for opening and closing the door, a relay having contacts for controlling the last mentioned circuit, said relay being energized to open said contacts, an amplifier circuit responsive to the electrical field between the antennas on the entrance side of the door for energizing said relay, a holding circuit for said relay having a reed relay for operating said first mentioned relay on one-half of the combined energy from the electrical fields between the respective transmitter and receiver antennas at the entrance and exit of the door, a safety circuit connected to and controlling said first mentioned relay, a relay for controlling said safety circuit having contacts for controlling said safety circuit, said relay being energized to open said safety contacts, a second receiver antenna on the exit side of the door adjacent said first mentioned antenna on the exit side of the door, a circuit responsive to the full electrical field between the transmitter antenna on the exit side of the door and said last mentioned receiver antenna for energizing said safety relay, and an overcontrol switch for said safety relay closed by opening of the door for rendering said safety circuit inoperative.

4. For use with a door having an entrance side and an exit side and being mounted to swing away from the entrance side: a control mechanism comprising a transmitter and receiver antenna on opposite sides of the entrance of the door, a transmitter and receiver antenna on opposite sides of the exit of the door, the receiver antenna on the exit side of the door being larger than the receiver antenna on the entrance side thereof, a circuit for said transmitter antennas for creating an electrical field between the respective transmitter and receiver antennas, a circuit for opening and closing the door, a relay having contacts for controlling the last mentioned circuit, said relay being energized to open said contacts, an amplifier circuit responsive to the electrical field between the antennas on the entrance side of the door for energizing said relay, and a holding circuit for said relay having a reed relay for operating said first mentioned relay on one-half of the combined energy from the electrical fields between the respective transmitter and receiver antennas at the entrance and exit of the door, said first mentioned relay having contacts for controlling said holding circuit whereby said holding circuit is deenergized when said relay is energized, said holding circuit having a switch closed when said door approaches fully opened position.

5. In a control mechanism for use with a door having an entrance side and an exit side and being mounted to swing away from the entrance side: a transmitter and receiver antenna on opposite sides of the entrance of the door, a transmitter and receiver antenna on opposite sides of the exit of the door, a circuit for said transmitter antennas for creating an electrical field between the respective transmitter and receiver antennas, a circuit for opening and closing the door, a relay having contacts for controlling the last mentioned circuit, said relay being energized to open said contacts, a circuit responsive to the electrical field between the antennas on the entrance side of the door for energizing said relay, and a holding circuit for said relay having a reed relay for operating said first mentioned relay on one-half of the combined energy from the electrical fields between the respective transmitter and receiver antennas at the entrance and exit of the door, said first mentioned relay having contacts for controlling said holding circuit whereby said holding circuit is deenergized when said relay is energized, said holding circuit having a switch closed when said door approaches fully opened position.

6. For use with a door having an entrance side and an exit side and being mounted to swing away from the entrance side: a control mechanism comprising a transmitter and receiver antenna on opposite sides of the entrance of the door, a transmitter and receiver antenna on opposite sides of the exit of the door, the receiver antenna on the exit side of the door being larger than the receiver antenna on the entrance side thereof, a circuit for said transmitter antennas for creating an electrical field between the respective transmitter and receiver antennas, a circuit for opening and closing the door, a relay having contacts for controlling the last mentioned circuit, an amplifier circuit responsive to the electrical field between the antennas on the entrance side of the door for energizing said relay and including means for deenergizing said relay when the electrical field either decreases below or increases above predetermined values, a holding circuit for said relay having a reed relay for operating said first mentioned relay on one-half of the combined energy from the electrical fields between the respective transmitter and receiver antennas at the entrance and exit of the door, said first mentioned relay having contacts for controlling said holding circuit whereby said holding circuit is deenergized when said relay is energized, said holding circuit having a switch closed when said door approaches fully opened position, a safety circuit connected to and controlling said first mentioned relay, a relay for controlling said safety circuit having contacts for controlling said safety circuit, a second receiver antenna on the exit side of the door adjacent said first mentioned antenna on the exit side of the door, an amplifier circuit responsive to the full electrical field between the transmitter antenna on the exit side of the door and said last mentioned receiver antenna for energizing said safety relay, and an overcontrol switch for said safety relay closed by opening of the door for rendering said safety circuit inoperative.

7. For use with a door having an entrance side and and exit side and being mounted to swing away from the entrance side: a control mechanism comprising a transmitter and receiver antenna on opposite sides of the entrance of the door, a transmitter and receiver antenna on opposite sides of the exit of the door, a circuit for said transmitter antennas for creating an electrical field between the respective transmitter and receiver antennas, a circuit for opening and closing the door, a relay having contacts for controlling the last mentioned circuit, a circuit responsive to the electrical field between the antennas on the entrance side of the door for energizing said relay, a holding circuit for said relay having a reed relay for operating said first mentioned relay on one-half of the combined energy from the electrical fields between the respective transmitter and receiver antennas at the entrance and exit of the door, said first mentioned relay having contacts for controlling said holding circuit whereby said holding circuit is deenergized when said relay is energized, said holding circuit having a switch closed when said door approaches fully opened position, a safety circuit connected to and controlling said first mentioned relay, a relay for controlling said safety circuit having contacts for controlling said safety circuit, a second receiver antenna on the exit side of the door adjacent said first mentioned antenna on the exit side of the door, and a circuit responsive to the full electrical field between the transmitter antenna on the exit side of the door and said last mentioned receiver antenna for energizing said safety relay.

8. In a control mechanism for use with a door having an entrance side and an exit side and being mounted to swing away from the entrance side: a transmitter and receiver antenna on opposite sides of the entrance of the door, a transmitter and receiver antenna on opposite sides of the exit of the door, a circuit for said transmitter antennas for creating an electrical field between the respective transmitter and receiver antennas, a circuit for opening and closing the door, a relay having contacts for controlling the last mentioned circuit, a circuit responsive to the electrical field between the antennas on the entrance side of the door for energizing said relay, and a holding circuit for said relay having a reed relay for operating said first mentioned relay on one-half of the combined energy from the electrical fields between the respective transmitter and receiver antennas at the entrance and exit of the door, said first mentioned relay having contacts for controlling said holding circuit whereby said holding circuit is denergized when said relay is energized, said holding circuit having a switch closed when said door approaches fully opened position, a safety cricuit connected to and controlling said first mentioned relay, and means for rendering said safety circuit inoperative when the door is opened.

9. In a control mechanism for use with a door having an entrance side and an exit side and being mounted to swing away from the entrance side: a transmitter and receiver antenna on opposite sides of the entrance of the door, a transmitter and receiver antenna on opposite sides of the exit of the door, a circuit for said transmitter antennas for creating an electrical field between the respective transmitter and receiver antennas, a circuit for opening and closing the door, a relay having contacts for controlling the last mentioned circuit, a circuit responsive to the electrical field between the antennas on the entrance side of the door for energizing said relay, a holding circuit for said relay having a reed relay for operating said first mentioned relay on one-half of the combined energy from the electrical fields between the respective transmitter and receiver antennas at the entrance and exit of the door, a safety circuit connected to and controlling said first mentioned relay, and means for rendering said safety circuit inoperative when the door is opened.

10. In a control mechanism for use with a door having an entrance side and an exit side and being mounted to swing away from the entrance side: a transmitter and receiver antenna on opposite sides of the entrance of the door, a transmitter and receiver antenna on opposite sides of the exit of the door, a circuit for said transmitter antennas for creating an electrical field between the respective transmitter and receiver antennas, a circuit for opening and closing the door, a relay having contacts for controlling the last mentioned circuit, a circuit responsive to the electrical field between the antennas on the entrance side of the door for energizing said relay, and a holding circuit for said relay having a reed relay for operating said first mentioned relay on one-half of the combined energy from the electrical fields between the respective transmitter and receiver antennas at the entrance and exit of the door.

11. In a control mechanism for use with a door having an entrance side and an exit side and being mounted to swing away from the entrance side: a transmitter and receiver antenna on opposite sides of the entrance of the door, a transmitter and receiver antenna on opposite sides of the exit of the door, a circuit for said transmitter antennas for creating an electrical field between the respective transmitter and receiver antennas, a circuit for opening and closing the door, a relay having contacts for controlling the last mentioned circuit, a circuit responsive to the electrical field between the antennas on the entrance side of the door for energizing said relay and including means for operating said relay when the electrical field either decreases below or increases above predetermined values, and a holding circuit for said relay having a reed relay for operating said first mentioned relay on one-half of the combined energy from the electrical fields between the respective transmitter and receiver antennas at the entrance and exit of the door.

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CHARLES E. O'CONNELL, *Primary Examiner.*

HARRISON R. MOSELEY, *Examiner.*