

Sept. 28, 1943.

H. E. HERSHEY

2,330,355

INDICATING SYSTEM

Filed April 26, 1941

3 Sheets-Sheet 1

FIRST FLOOR SWITCH II

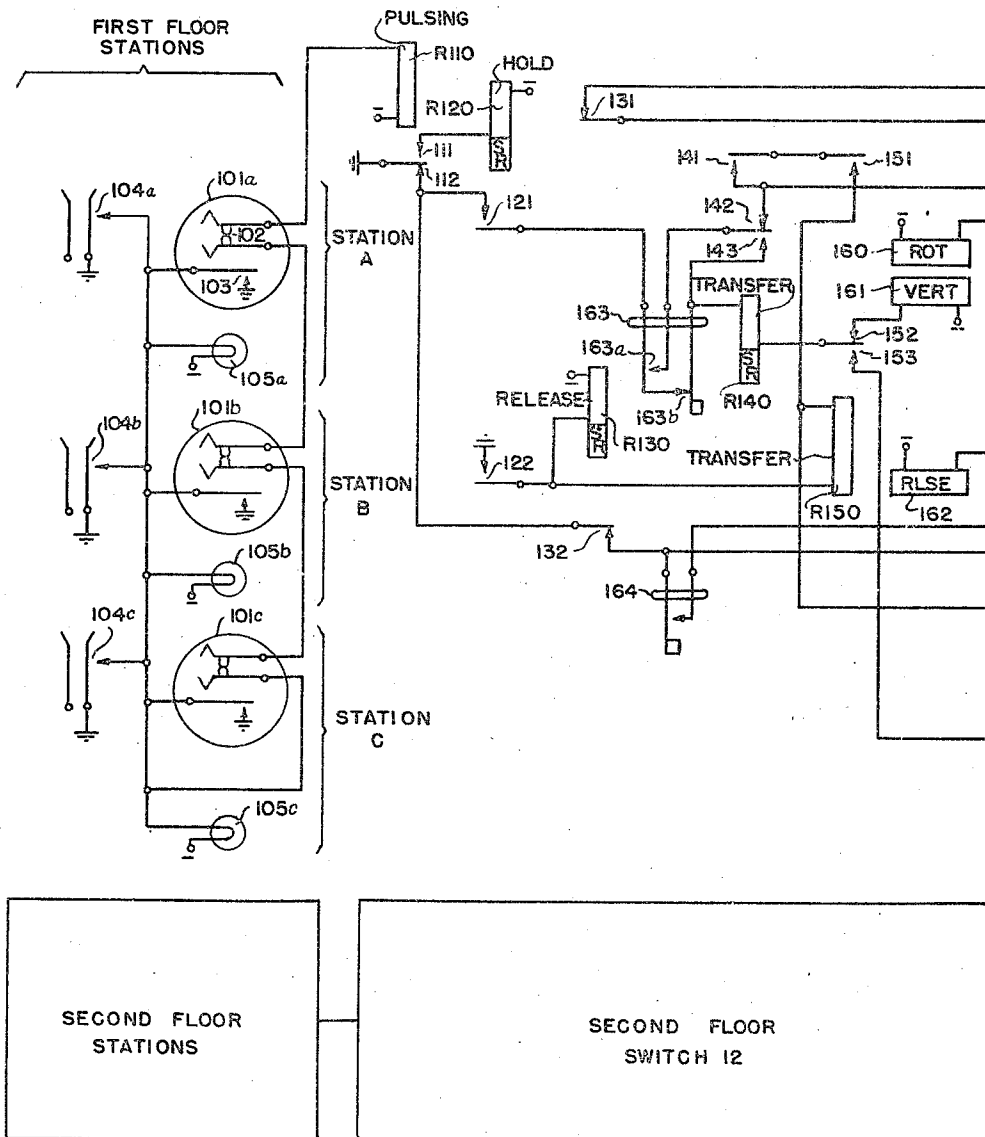


Fig. 1

INVENTOR.  
HARRY E. HERSHEY  
BY *Davis, Lindsey, Smith & Shonta*  
ATTORNEYS

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H. E. HERSHEY

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3 Sheets-Sheet 2

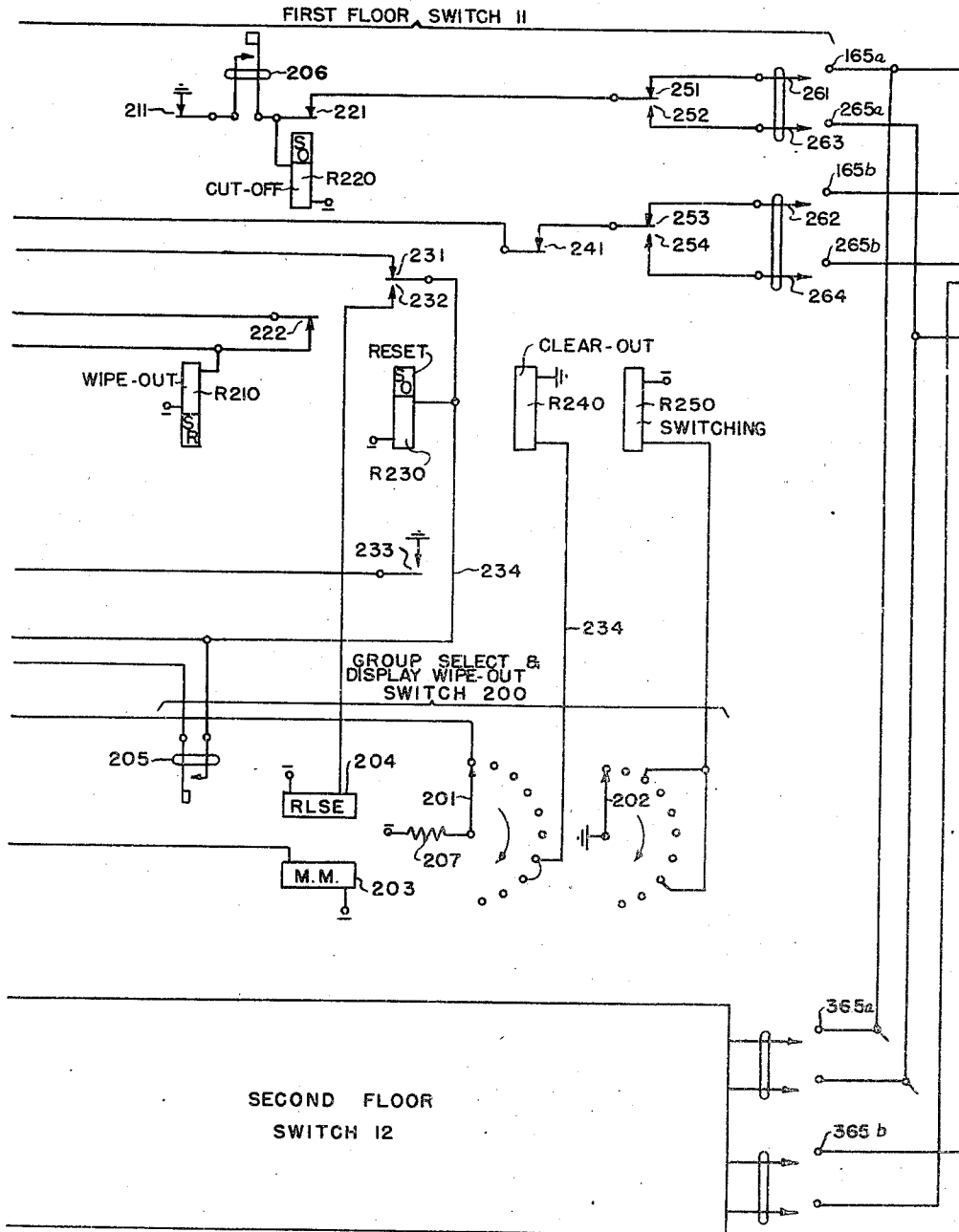


Fig. 2.

INVENTOR.  
HARRY E. HERSHEY

BY *Davis, Lindsey, Smith & Shonts*

ATTORNEYS

Sept. 28, 1943.

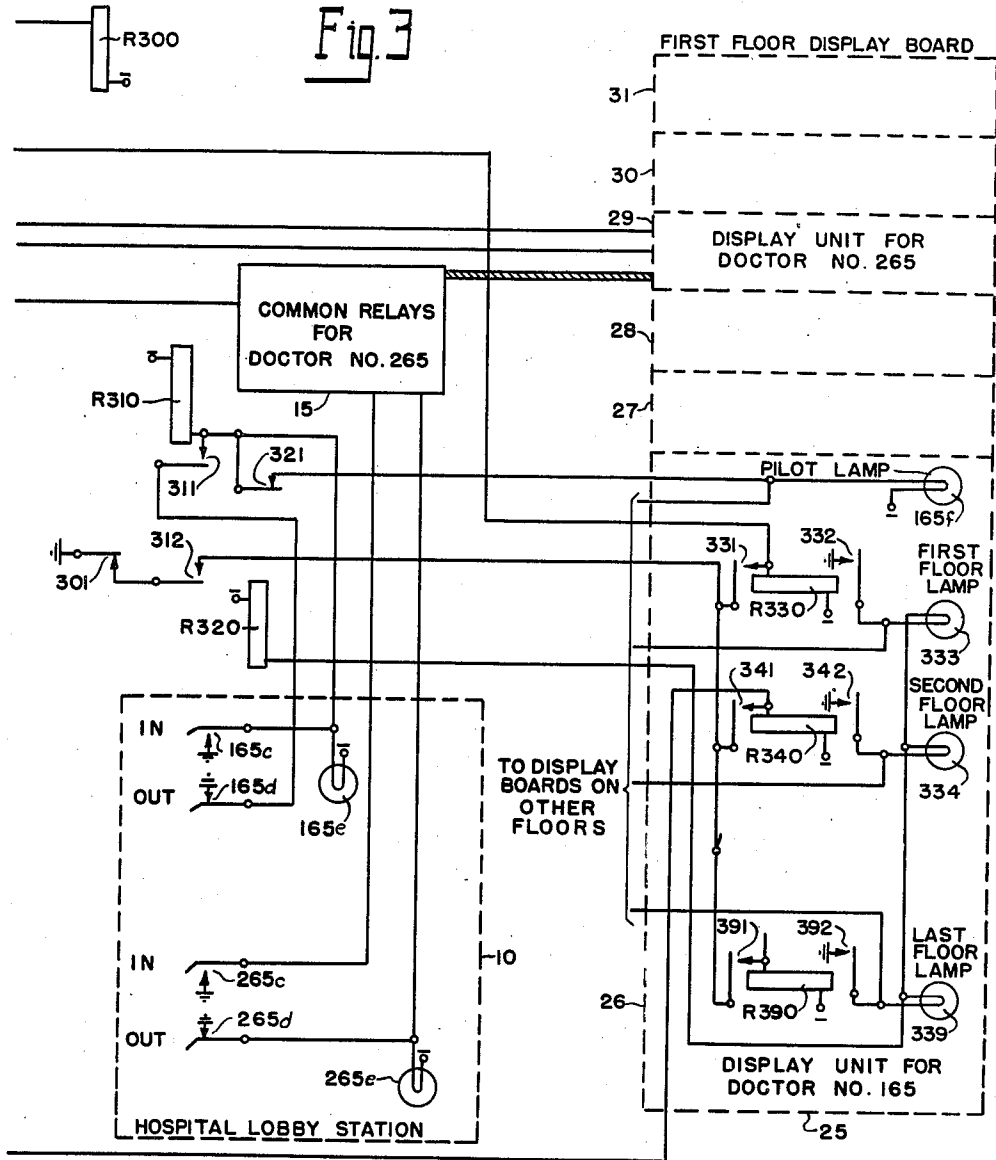
H. E. HERSHEY

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3 Sheets-Sheet 3



INVENTOR.  
HARRY E. HERSHEY

BY *Davis, Lindsey, Smith & Shonts*

ATTORNEYS

# UNITED STATES PATENT OFFICE

2,330,355

## INDICATING SYSTEM

Harry E. Hershey, Chicago, Ill., assignor to Automatic Electric Laboratories, Inc., a corporation of Delaware

Application April 26, 1941, Serial No. 390,621

10 Claims. (Cl. 177—353)

The present invention relates to systems for indicating the location of one or more persons or objects which may be located in different zones of a plural zone area, and more particularly to improvements in systems for indicating at several points the locations of a large number of doctors who may be variously occupied on the different floors or in the different wards of a large hospital.

It is an object of the present invention to provide a system of the character indicated, which is of simple and economical arrangement, is positive and reliable in operation, and may be controlled to provide accurate data as to the whereabouts of a large number of persons or objects.

Another object of the invention is to provide an improved system of the character described, wherein the display board or boards of the system may be controlled by or on behalf of any one of the persons or objects from any one of a large number of control stations which are conveniently located throughout the zoned area.

It is a further object of the invention to provide an improved system of the character described, wherein like portions of a plurality of display boards which are variously located in the zoned area, may be controlled in unison in response to control operations performed at any one of the control stations.

It is another object of the invention to provide an improved system of the character described, wherein the section of each display board which corresponds to any person or object may be selectively controlled from any control station to wipe out an existing display or to reset the section to display a new indication.

It is a still further object of the invention to provide an improved system of the character described, wherein each section of each display board may be blanked from a control station located in an entrance zone of the area.

It is still another object of the invention to provide an improved system of the character described, wherein each display board may be controlled from the entrance zone station to indicate the presence in the zoned area of each person or object posted on the display boards without indicating the particular zone in which such person or object may be located.

In the illustrated embodiment of the invention there is provided a system which includes display boards and one or more control stations on each floor of a large hospital. The entrance zone station of the hospital is located in the

lobby through which the members of the hospital staff enter the building. Each display board is equipped with a plurality of display units which individually correspond to the doctors attached to the staff of the hospital, and each of the control stations, with the exception of the lobby station, is provided with a signal transmitting device for selecting and controlling the display units of the various boards. More specifically, the display units are controlled from the control stations through automatic switches which are individual to the hospital floors and each of which has access to all of the display units. The arrangement of these switches is such that one of two signals, both designating a particular doctor, is transmitted to a switch from its associated control station, the display units corresponding to that doctor are selected, the existing display thereof, if any, is wiped out, and a new display is set up indicating the floor or zone wherein the operated control station is located. This change in display is effected concurrently at all of the display boards, so that a visual indication is given at all points as to the zone where the particular doctor may be located. The automatic switches individual to the various floors are further arranged so that if the other of the two signals designating a particular doctor is transmitted to one of the switches from an associated control station, the display units corresponding to that doctor are selected and the indications previously displayed thereby are wiped out without resetting the units to display new indications. Provisions are also made in the system whereby indications displayed by the units corresponding to a particular doctor, may also be wiped out through the selective operation of key controlled switches provided at the lobby station. This equipment also includes keys which may be operated to control the display units individual to the various doctors so that indications are posted on the boards which show that particular doctors are somewhere in the hospital, without indicating the exact floor where such doctors may be located.

The novel features believed to be characteristic of the invention are set forth with particularity in the appended claims. The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the specification taken in connection with the accompanying drawings in which Figs. 1, 2 and 3, when laid side by side in the order named, indicate a portion of the equipment provided in a

system which includes the features of the invention briefly outlined above.

Referring now more particularly to the drawings, the system there illustrated comprises a plurality of display boards which are individual to the various floors of the hospital and each of which is conveniently located for easy observation from any point in the corridor of the floor where it is provided. One such display board is indicated at 25 as being provided on the first floor of the hospital. This display board comprises a plurality of display units 26, 27, 28, 29, 30, 31, etc., which individually correspond to the doctors whose location is to be posted on the board. For example, the display unit 28 may be utilized to indicate the location of the doctor who is assigned the identification number 165, and the display unit 29 may be utilized to indicate the location of the doctor who is assigned the identification number 265. The various display boards are of identical construction and, as will be pointed out more fully below, are so arranged that each set of display units corresponding to a particular doctor are controlled in unison. The individual display units of the boards are also identical in arrangement. Briefly described, the display unit 26 comprises a pilot lamp 165f, which when energized indicates that the doctor No. 165 is somewhere in the hospital, and a plurality of individual floor lamps 333, 334, 339, etc., which individually correspond to the various floors of the hospital. Each of the latter lamps when energized indicates that the doctor No. 165 may be located on the corresponding floor. The display units common to the doctor No. 165 are controlled by a plurality of lamp control relays R330, R340, R390, etc., which are individual to the various floors and floor indicating lamps.

The relay equipment provided to control the several display boards also includes a set of common relays for each doctor posted on the boards. Thus for controlling the floor and pilot lamps of the display units individual to the doctor No. 165, the common relays R300, R310 and R320 are provided. An identical set of common relays 15, individual to the doctor No. 265, is schematically indicated in the drawings.

The control of the various display boards is effected from control stations which are conveniently located throughout the hospital. More specifically, an "in" and "out" entrance station 13 is provided in the entrance zone or lobby of the hospital, and each floor of the hospital is equipped with one or more control stations. Thus the first floor of the building is provided with three stations A, B and C, each of which includes a signal transmitting device 101, a hold key 104, and a pilot lamp 105. The hold keys 104 are of the well-known locking type. Each signal transmitting device 131 is of the dial-operated type conventionally used at the sub-stations of automatic telephone systems, and comprises a set of pulsing springs 102 and a set of off-normal springs 103. The lobby or entrance zone station 10 comprises a plurality of key controlled switches and pilot lamps individual to the doctors who are attached to the hospital staff and whose names are posted on the various display boards. More specifically, an "in" key, an "out" key, and a pilot lamp is provided for each of the doctors. Thus the lobby station control panel is equipped with an "in" key 165c, an "out" key 165d, and a pilot lamp 165e, which are for the individual use of the doctor who is assigned the identification number 165. Similarly, this control panel includes

an "in" key 265c, an "out" key 265d, and a pilot lamp 265e, which are provided for the individual use of the doctor assigned the identification number 265. The keys 165c, 165d, 265c, 265d, etc., are of the well-known non-locking type.

The selection and selective control of the relay equipment associated with the various display units of the display boards is effected through the provision of a plurality of automatic switches which are individual to the various floors and can only be controlled from the control stations provided on the corresponding floors. Thus an automatic switch 11 is provided which has access to the relay equipment and display units for all of the doctors posted on the display boards and may be controlled only from the first floor control stations A, B and C. A second switch 12 individual to the control stations of the second floor is also schematically illustrated in the drawings. These automatic switches are of identical circuit arrangement. Briefly described, the switch 11 comprises a two-motion switching mechanism of the well-known Strowger type. This mechanism is equipped with four banks of contacts, each of which includes one hundred contact points. The contacts making up this contact field are divided into ten levels of ten each, and each of the four banks has associated therewith one of the four wipers 261 to 264, inclusive for the purpose of elevating these wipers to a position opposite a desired level, and then rotating the same into engagement with a selected contact set of the selected level, rotary and vertical magnets 160 and 161 are included in the switching mechanism. The mechanism further comprises a release magnet 162, which when energized permits the wiper carriage structure to be returned to rotary and vertical normal; two sets of vertical off-normal springs 163 and 164, which are operated when the wiper carriage structure is moved to any vertical off-normal position, and a set of rotary off-normal springs 206 which are operated into engagement when the wiper carriage structure is operated one step from the rotary normal position thereof. In order to control the various magnets of the Strowger switching mechanism and the relay equipment associated with the display boards, the automatic switch 11 is equipped with a plurality of control relays and a minor switch 200 which functions as a group-select and display-wipe-out switch in the manner fully described hereinafter. Briefly described, the minor switch 200 comprises two sets of contacts having eleven contact points each, wipers 201 and 202 individually associated with the contact sets, an operating magnet 203 for driving the wipers 201 and 202 from the illustrated normal positions thereof to selected off-normal positions, a release magnet 204 for returning the enumerated wipers to normal, and a set of off-normal springs 205 which are operated into engagement when the wipers of the switch are moved off-normal. The relay equipment of the switch 11 includes a pulsing relay R110, a hold relay R120, a release relay R130, a pair of transfer relays R140 and R150, a wipe out relay R210, a cutoff relay R220, a reset relay R230, a clear out relay R240, and a switching relay R250. Of the enumerated relays, the relays R120, R130, R140 and R210 are of the well-known slow-to-release type, while the relays R220 and R230 are of the conventional slow-to-operate type.

Current for energizing the indicating lamps, the lamp control relays, the operating magnets of the Strowger switching mechanisms, and the

control relays of the automatic switches, is supplied from a common direct current source, the positive terminal of which is connected to a common bus conductor and to ground. The opposite terminal of this source is connected to a common negative bus conductor which terminates connections from the various relay, magnet and lamp terminals which are identified in the drawings by the negative polarity sign. For convenience in describing the circuits involved, the source of current, which may conventionally comprise a storage battery floated across the terminals of a charging rectifier, has not been shown.

In considering the operation of the system, it may be assumed that the doctor who is assigned the identification number 165 enters the hospital the lobby and then proceeds to the first floor where he will be occupied for a considerable period of time. Upon entering the hospital the doctor, conforming to hospital regulations, momentarily actuates the "in" key 165c, thereby to complete a circuit for energizing the common relay R310 in parallel with the filaments of the pilot lamps 165e and 165f. The relay R310, in operating, locks to ground over a path including the contacts 311 and the contacts of the "out" key 165d, and in so doing completes an obvious circuit for maintaining the pilot lamp 165e energized after the "in" key 165c is released by the doctor No. 165. In operating, the relay R310 also completes an alternative circuit for energizing the pilot lamp 165f in the display unit 26 of the first floor display board 25, this circuit extending from ground by way of the contacts of the "out" key 165d, the contacts 311 and 321, and the filament of the lamp 165f to battery. It will be noted that a branch of this circuit extends to the pilot lamps, individual to the doctor No. 165, which form a part of the display boards located on the other floors. The energization of these particular pilot lamps provides an indication at all of the display boards that doctor No. 165 is in the hospital, but is not available for consultation. The energization of the pilot lamp 165e at the lobby station 19 supplies the same information to observers who may consult the lamp panel at this station.

If the doctor No. 165, upon proceeding to the first floor of the hospital, desires to place himself on call, he may do so by actuating the transmitting device 101 at one of the first floor control stations to dial the three digits of the identification number assigned to him, i. e., 165. Assuming that the station A is selected for this purpose, the doctor, before starting the dialing operation, may actuate the key 104a to its off-normal position, thereby to complete an obvious circuit for energizing in parallel the pilot lamps 105a, 105b, 105c, etc., at the various control stations on the first floor. The energization of these lamps serves to provide an indication that the first floor switch 11 is busy. When the key 104a is actuated to its off-normal position a circuit including the series-connected pulsing springs of the transmitting devices 101 is also completed for energizing the pulsing relay R110. This relay, in operating, closes its contacts 111 to complete an obvious circuit for energizing the hold relay R120. The relay R120, upon operating, closes its contacts 121 to prepare a pulsing circuit having three branches which respectively extend to the rotary magnet 160, the vertical magnet 161 and the operating magnet 203 of the minor switch 200. At its contacts 122, the relay R120 completes an obvious circuit for energizing the release relay R130. At its contacts 122, the relay R120 also

completes a circuit for energizing the transfer relay R150, this circuit extending from ground by way of the contacts 122, the winding of R150, the wiper 201 and its engaged first contact, and the resistor 207 to battery. The relay R130, in operating, opens its contacts 132 further to interrupt the incomplete operating circuits for the relay R230 and the release magnet 204. At its contacts 131, the relay R130 opens a point in the circuit for energizing a selected one of the lamp control relays R330, R340, etc. The relay R150, upon operating, closes its contacts 153 further to prepare the circuit for transmitting pulses to the magnet 203. At its contacts 152, the relay R150 opens a point in the circuit for transmitting pulses to the vertical magnet 161. At its contacts 151, the relay R150 prepares a locking circuit for itself.

When the first digit "1" is dialed through operation of the transmitting device 101a provided at the station A, the shunt springs 103 are moved into engagement to complete a path in shunt with the engaged springs of the key 104a, and the pulsing springs 102 are opened and closed to transmit an impulse to the relay R110. This relay, upon restoring at the beginning of the open-circuit period of the impulse, opens its contacts 111 to interrupt the operating circuit for the hold relay R120, and closes its contacts 112 to complete the prepared circuit for energizing the transfer relay R140 in series with the operating magnet 203. The latter circuit extends from ground by way of the contacts 112, 121 and 163b, the winding of R140, the contacts 153 and the winding of the magnet 203 to battery. When thus energized the relay R140 operates and closes its contacts 143 to prepare an alternative pulsing circuit which bypasses the off-normal contacts 163b and includes the off-normal contacts 163a. At its contacts 142, the relay R140 opens a point in the circuit for transmitting current pulses to the rotary magnet 160 and the wipe out relay R200 in parallel. At its contacts 141, the relay R140 completes the above-mentioned locking circuit for the relay R150, this circuit extending from ground by way of the contacts 122, the winding of R150, the contacts 151, 141 and 222, and the windings of the magnet 160 and the relay R210 in parallel to battery. The relay R210 and the magnet 160 are insufficiently energized in this circuit to operate.

The magnet 203, when energized in series with the transfer relay R140, operates to advance the wipers 201 and 202 one step from the illustrated normal positions thereof. When the wiper 201 is thus moved off normal the initially traced operating circuit for the transfer relay R150 is opened at this wiper and its associated first contact. Incident to the operation of the wipers 201 and 202 to the first off-normal position, the off-normal springs 205 are moved into engagement to prepare the operating circuits for the reset relay R230 and the release magnet 204.

As indicated above, at the end of the open-circuit period of the single impulse, the contacts 102 are engaged to recomplete the circuit for energizing the pulsing relay R110. Incident to this operation the off-normal contacts 103 are disengaged, but without effect. The pulsing relay R110, upon reoperating, reCompletes the operating circuit for the hold relay R120 and opens its contacts 112 to deenergize the transfer relay R140 and the magnet 203. The magnet 203, when deenergized, retracts its operating armature to condition the associated ratchet and pawl mechanism to advance the wipers 201 and 202 a second

step. The relay R140, upon restoring, opens its contacts 141 to interrupt the above-traced locking circuit for the transfer relay R150. The relay R150 now restores and opens its contacts 151 further to interrupt this locking circuit. At its contacts 153, the relay R150 opens the above-traced circuit for transmitting current pulses to the magnet 203. At its contacts 152, the relay R150 prepares the circuit for energizing the transfer relay R140 in series with the vertical magnet 161.

When the second digit "6" of the number identifying the calling doctor is dialed through operation of the transmitting device 101a provided at the station A, the off-normal springs 103 are again moved into engagement and the pulsing springs 102 are opened and closed six times, so that six impulses are transmitted to the pulsing relay R110. At the beginning of the open-circuit period of the first impulse, the relay R110 restores to open the operating circuit for the hold relay R120 and to close the above-mentioned circuit for energizing the transfer relay R140 in series with the vertical magnet 161. The latter circuit extends from ground by way of the contacts 112, 121 and 133b, the winding of R140, the contacts 152, and the winding of the vertical magnet 161 to battery. When thus energized, the relay R140 opens its contacts 142 to prevent current pulses from being delivered to the rotary magnet 160 and the wipe out relay R210. At its contacts 143, the relay R140 prepares the path for by-passing the off-normal contacts 163b in the pulsing circuit. The vertical magnet 161, upon operating, functions to elevate the wipers 261 to 264, inclusive, one step in the vertical direction so that they are positioned opposite the first level of contacts in the associated contact field. Incident to this vertical motion of the wiper carriage structure, the off-normal springs 164 are operated into engagement to prepare the operating circuits for the reset relay R230 and the release magnet 234; the off-normal springs 163b are disengaged to interrupt the initially traced circuit for energizing the transfer relay R140 and the vertical magnet 161 in series; and the off-normal springs 163a are moved into engagement to complete the prepared path, including the contacts 143, for by-passing the contacts 163b in this circuit. Accordingly, the second and succeeding impulses of the second digit are repeated to the series-connected transfer relay R140 and vertical magnet 161 over a circuit which extends from ground by way of the contacts 112, 121, 163a and 143, the winding of R140, the contacts 152, and the winding of the magnet 161 to battery. Due to the slow-to-release characteristics thereof, the relays R120 and R140 remain operated throughout the second digit. Each time the vertical magnet 161 is energized during this digit it operates to elevate the wipers 261 to 264, inclusive, an additional step. Accordingly, at the end of the sixth and last impulse of the digit, these wipers are left standing opposite the sixth level of bank contacts in the associated contact field.

At the end of the second digit, and during the inter-digit pause between the second and third digits, the pulsing relay R110 remains operated for a sufficient time interval to permit the deenergization and release of the transfer relay R140. This relay, in restoring, opens its contacts 143 to interrupt the above-traced pulsing circuit extending through its own winding

and the winding of the vertical magnet 161. At its contacts 142, the relay R140 further prepares the circuit for energizing the rotary magnet 160 and the wipe out relay R210 in parallel.

When the third digit is dialed through operation of the transmitting device 101a provided at the station A, five impulses are transmitted to the pulsing relay R110. This relay operates to repeat the pulses to the parallel connected rotary magnet 160 and wipe out relay R210 over a circuit which extends from ground by way of the contacts 112, 121, 163a, 142 and 222, and the windings of the magnet 160 and the wipe out relay R210 to battery. When energized over this circuit at the beginning of the third digit, the relay R210 operates and opens its contacts 211 to interrupt the prepared circuit for energizing the cut-off relay R220 in parallel with a selected one of the common wipe out relays. Due to its slow-to-release characteristic, the wipe out relay R210 remains operated throughout the third train of impulses transmitted to the pulsing relay R110. Each time the rotary magnet 160 is energized over the pulsing circuit just traced, it operates to rotate the wipers 261 to 264, inclusive, one step so that at the conclusion of the third digit these wipers engage the associated fifth contacts of the sixth level in the associated contact banks. Thus the relay equipment individual to the display units for the doctor No. 165 is selected. Incident to the first rotary step of the wipers 261 to 264, inclusive, the off-normal springs 206 are moved into engagement to prepare the circuit for energizing the cut-off relay R220 in parallel with the common wipe out relay R300.

At the end of the third and final digit, the pulsing relay R110 remains operated to cause the deenergization and release of the wipe out relay R210. The relay R210, in restoring, closes its contacts 211 to complete the above-mentioned circuit for energizing the relays R220 and R300 in parallel. One branch of this circuit extends from ground by way of the contacts 211, the off-normal springs 206, and the winding of R220 to battery. The other branch of this circuit extends from ground by way of the contacts 211, the off-normal springs 206, the contacts 221 and 251, the wiper 261 and the engaged sixty-fifth contact of its associated bank, and the winding of R300 to battery. When thus energized the relay R300 opens its contacts 301 to interrupt a point in the common portion of the locking circuits for the indicator lamp control relays R330, R340, etc. In the present case, this operation is without effect, but it will be noted that had any one of the indicator lamp control relays been operated, this control relay would have been released by the relay R300 to cause the deenergization of the associated indicator lamp.

Shortly following the operation of the relay R300, the slow-to-operate cut-off relay R220 opens its contacts 221 to cause the deenergization and release of the common wipe out relay R300. The relay R300 now restores to reprepare the locking circuits for the control relays individual to the indicator lamps of the display unit 26 and to the lamps of the other display units individual to the doctor No. 165. At its contacts 222, the relay R220 opens another point in the previously traced circuit for transmitting current pulses to the rotary magnet 160 and the wipe out relay R210 in parallel. Following the operation of the cut-off relay R220 no further operation of

the apparatus occurs until the automatic switch 11 is released at the station A.

In order to release the switch 11, and incident thereto to cause the energization of the first floor indicator lamp 333 in the display unit 26 and the first floor lamps of the corresponding display units of the other boards, the doctor No. 165 must restore the key 164a to its normal position. When this key is restored to normal the pilot lamps 195a, 195b and 195c, and the pulsing relay R110 are deenergized in an obvious manner. In restoring, the relay R110 opens its contacts 111 to deenergize the hold relay R120, and closes its contacts 112 to prepare the above-mentioned operating circuits for the reset relay R230 and the release magnet 204, as well as a circuit for energizing the control relay R330 individually associated with the first floor lamp 333. The hold relay R120, upon restoring, opens its contacts 122 to deenergize the release relay R130. When the latter relay restores it closes its contacts 132 to complete the above-mentioned operating circuits for the relays R230 and R330. These circuits commonly extend from ground by way of the contacts 112 and 132, and the off-normal springs 164 and 205 in parallel, to the conductor 234 where they divide, one thereof extending through the winding of R230 to battery and the second thereof extending by way of the contacts 231, 131, 241 and 253, the wiper 262 and its engaged sixty-fifth contacts 165b of its associated contact bank, and the winding of R330 to battery. When thus energized the relay R330 locks to ground over a path including the contacts 331, 312 and 301. At its contacts 332, the relay R330 completes an obvious circuit for energizing the first floor indicator lamp 333. It will be noted that parallel branches of the last-mentioned circuit extend to the first floor indicator lamps of the display units which are provided at the other display boards to indicate the location of the doctor No. 165.

Shortly following the operation of the relay R330, the slow-to-operate reset relay R230 operates and opens its contacts 231 to interrupt the operating circuit for the relay R330. At its contacts 232, the relay R230 completes the prepared operating circuit for the release magnet 204, this circuit extending from ground by way of the contacts 112 and 132, the parallel-connected off-normal springs 164 and 205, the conductor 234, the contacts 232, and the winding of the magnet 204 to battery. At its contacts 233, the relay R230 completes an obvious circuit for energizing the release magnet 162 of the Strowger switching mechanism. The magnet 234, upon operating, attracts its associated holding pawl to permit the spring-biased wipers 201 and 202 to be returned to normal. Incident to the restoration of these wipers to their respective normal positions, the off-normal springs 205 are disengaged to interrupt one branch of the circuit over which the reset relay R230 is energized. The release magnet 162, upon operating, attracts its associated holding pawl to permit the wipers 261 to 264, inclusive, to be returned to rotary and vertical normal in the usual manner. Incident to the release of the Strowger switching mechanism, the rotary off-normal springs 206 are disengaged to deenergize the cut-off relay R220; the vertical off-normal springs 164 are disengaged to deenergize the reset relay R230; the vertical off-normal contacts 163a are disengaged; and the vertical off-normal contacts 163b are moved into engagement. Thus the Strowger switching mechanism

is fully restored to normal. Following the release of the two relays R220 and R230, the control equipment of the switch 11 is completely released and this switch is prepared to handle another call.

It will be understood from the above explanation that, following the operations just described, the first floor lamp 333 of the illustrated display board 25 and the corresponding lamps of the other display boards are energized to indicate that the doctor No. 165 may be located on the first floor of the hospital. If, after making routine calls or discharging other duties on this floor, the doctor No. 165 proceeds to the second floor, he may, by dialing his identification number at one of the second floor control stations, wipe out the indication displayed by the display unit 26 and the corresponding units of the other display boards, and reset these units to display an indication that he may now be located on the second floor of the hospital. In this regard it will be noted that, incident to the operation of the second floor switch 12 under the control of the calling second floor station, the wipers of this switch are positioned on the sixty-fifth contacts of the associated contact banks. Moreover, immediately after the third digit "5" is dialed at the calling second floor control station, the wipe out relay of the switch 12 operates to impress ground potential upon the contacts 365a for a short interval, and thus energize the common wipe out relay R200. The manner in which this is accomplished will be clearly apparent from the foregoing explanation with reference to the first floor switch 11. In operating, the wipe out relay R300 opens its contacts 301 to interrupt the locking circuit for the control relay R330. The relay R330 now restores and opens its contacts 331 further to interrupt its own locking circuit. Thus the relay R330 is prevented from reoperating in response to the release of the wipe out relay R300. In restoring, the relay R330 also opens its contacts 332 to deenergize the first floor indicator lamp 333 of the display unit 26 and the corresponding lamps of the other display boards. Thus the indications displayed by the display units individual to the doctor No. 165 are wiped out.

Upon concluding the dialing operation at the second floor control station in use, the doctor No. 165 may release the second floor switch 12 by restoring the hold key of the second floor station in use to normal. Incident to the release of the switch 12, the release relay thereof functions to impress ground potential upon the contacts 365b for a short time interval. When this contact is grounded the control relay R340 individual to the second floor indicator lamp 334 is energized in an obvious circuit. In operating, the relay R340 locks to ground over a path including the contacts 341, 312 and 301, and closes its contacts 342 to complete a circuit for energizing the second floor lamp 334 in parallel with the corresponding lamps of the other display boards. Thus a new indication is set up in each of the display units individual to the doctor No. 165, which conveys the information that this doctor may be located on the second floor of the hospital. It will be understood from the above explanation that as the doctor No. 165 proceeds from floor to floor of the hospital he may, by dialing his identification number at a control station on each floor, reset the display units provided for his use, so that accurate information is given at all times as to his location.



If the doctor No. 165 proceeds to a ward or floor where he will be occupied with duties from which he does not wish to be disturbed, he may wipe out the indications displayed by the display units provided for his use, without resetting these display units to provide a new floor indication. For example, the doctor may be occupied for a time with duties in "surgery," in which case he will not wish to be disturbed. In order to wipe out the existing indications displayed by the units provided for his use, the doctor No. 165 may dial the number "665" at any one of the control stations provided in the hospital. Assuming that this number is dialed at the first floor station A, for example, the first floor switch 11 is utilized in wiping out the existing indication. In this case the wipers 201 and 202 of the minor switch 200 are positioned to engage their associated seventh contacts at the end of the first digit of six impulses dialed at the station A. With the wiper 201 in this position, a circuit including the resistor 207 is completed for energizing the clear out relay R240. Aside from the operation of the relay R240, the manner in which the relay equipment individual to the display unit 26 and the corresponding units of the other boards is selected and the operated control relay, such, for example, as the relay R340, is released, to wipe out the display of the existing indication, is exactly the same as described above. Also, the first floor switch 11 is restored to normal in response to the release of the hold key 104a in the exact manner previously explained. In this case, however, the relay R240 is held operated until after the reset relay R230 is caused to operate, in the manner explained above. Accordingly, the previously traced circuit for energizing the first floor control relay R230 is not completed. More generally stated, the release of the switch 11 is effected without completing a circuit for energizing one of the control relays R330, R340, etc., individual to the indicator lamps of the display unit 26 and the corresponding units of the other display boards. Thus no new indications are posted in these units. It will be noted that during the release of the first floor switch 11, the clear out relay R240 is deenergized and restores incident to the release of the minor switch 200. Otherwise the release of the switch 11 is effected in the exact manner described above.

If a doctor, in attempting to change or wipe out the indications displayed by the display units provided for his use, proceeds to dial his identification number at one of the control stations without first operating the hold key provided at this station, the automatic floor switch associated with the control station in use is released at the end of each digit and the pilot lamp at the control station in use is intermittently energized as the digits are dialed. Thus if the calling device 101a at the station A is actuated before the hold key 104a is operated to its off-normal position, the shunt springs 103 are closed as the dial of the device 101a is moved off normal and are opened when this dial is returned to normal. During the period when these contact springs are closed, the pilot lamps 105a, 105b, 105c, etc., and the relays R110, R120, R130, R140 and R150 are all energized in the manner previously explained. Moreover, the wipers of the minor switch 200 may be moved off normal under the control of the magnet 203, through operation of the pulsing springs 162, during the period when the off-normal springs 163 are closed. When, however, these off-normal springs are opened, the

lamps 105a, 105b and 105c and the relays R110, R120, R130, R140 and R150 are all deenergized and restore. Incident to the release of the relay R130, the wiper 262 is connected to ground at the contacts 112 in the manner previously described, but, under the conditions stated, the wipers 261 to 264, inclusive, are at normal so that the application of ground potential to the wiper 262 is without effect. In releasing, the relay R130 also completes the operating circuit for the reset relay R230. The reset relay, upon operating, completes the prepared operating circuit for the release magnets 204 and 162. The operation of the magnet 162 is without effect. The magnet 204, upon operating, permits the wipers 201 and 202 of the minor switch 200 to be restored to normal, in the manner described above, at which time the off-normal springs 205 are disengaged to deenergize the reset relay R230. Thus the first floor switch 11 is fully released and the pilot lamps 105 are deenergized immediately after the first digit is dialed at the station A. Each time the transmitting device 101a is again actuated the operations just described are repeated, so that the pilot lamps 105 are intermittently energized. The flashing of the lamp 105a serves to inform the doctor using the control station A that the hold key 104a should be operated to its off-normal position and that the dialing operation should be started over.

Each time a doctor leaves the hospital he is expected to comply with hospital regulations by operating his assigned "out" key at the lobby station 10, for the purpose of wiping out any indications which may be displayed by the display units provided for his use on the display boards. Thus, if the control relay R390 of the display unit 26 is operated, for example, and the doctor No. 165 leaves the hospital, he is expected to actuate the "out" key 165d when he passes the lobby station 10. When this key is momentarily operated to its off-normal position the contacts 165d are opened to interrupt the locking circuit for the relay R310, the circuit for energizing the pilot lamp 165e and the circuit for energizing the parallel-connected pilot lamps 165f, etc., of the various display units individual to the doctor No. 165. The deenergization of the pilot lamps 165e, 165f, etc., indicates that the doctor No. 165 is no longer on the premises. Incident to the release of the relay R310, the contacts 311 are opened further to interrupt the circuits just considered, whereby the pilot lamps and the relay R310 are prevented from operating when the "out" key is released. At its contacts 312, the relay R310, upon restoring, interrupts the locking circuit for the operated relay R390. The relay R390 now restores to deenergize the indicator lamp 339 and the corresponding lamps of the other display boards. Thus all indications are wiped out in the display units provided for the use of the doctor No. 165.

The manner in which the other doctors attached to the staff of the hospital, and for whose use display units are provided on the display boards, may control the display units individual thereto from the lobby station 10, or any one of the control stations of the system, will readily be apparent from the preceding explanation. In this regard, however, it is pointed out that for selecting purposes the display units are divided into two groups of one hundred sets each. With this arrangement, when the wipers of the Strowger switching mechanism embodied in any of the automatic floor switches are operated to

any particular position, two sets of display units individual to two different doctors are selected. In order to determine which of the two selected sets of units is to be controlled, wiper switching relays are provided in each of the automatic floor switches. Thus the first floor switch 11 includes a switching relay R250 which is controlled in accordance with the position of the wipers of the minor switch 200 at the end of a first digit transmitted to the switch 11. With this arrangement, if the doctor No. 265, for example, operates the transmitting device 101a to transmit the three digits of his identification number to the associated floor switch 11, the wipers of the minor switch 200 are positioned to engage their associated third contacts at the end of the first digit of two impulses. Immediately the wiper 202 engages its third contact an obvious circuit is completed for energizing the switching relay R250. This relay, in operating, opens its contacts 251 and 253 to interrupt the previously described circuits over which the relays individual to the doctor No. 165 are controlled. At its contacts 252 and 254, the relay R250 prepares circuits extending through the wipers 263 and 264, over which the relays individual to the calling doctor No. 265 may be controlled in a manner clearly apparent from the preceding explanation. Aside from the operation of the switching relay R250, the wipe out of the indications displayed by the display unit 29 and the corresponding units of the other display boards and the resetting of these units to display first floor indications is effected in the exact manner described above. In this regard it will be noted that the switching relay R250 is deenergized and restores in response to the release of the minor switch 200 during the release of the automatic floor switch 11.

In the event a doctor, such, for example, as the doctor No. 265, having display units in the second group, desires to wipe out indications displayed by these units without resetting the units to display new indications, a first digit comprising seven impulses is dialed at the control station from which the wipe out is to be effected. Assuming that the station A is used by the doctor No. 265 for this purpose, the wipers 201 and 202 are operated to engage their associated eighth contacts after the first digit of seven impulses is dialed at the station A. With the wiper 201 engaging its associated eighth contact, the clear out relay R240 is operated to maintain the reset control circuits open, in the manner previously described. With the wiper 202 engaging its associated eighth contact, the wiper switching relay R250 is energized so that the circuit for energizing the common wipe out relay R300 individual to the doctor No. 165 is held open at the contacts 251, and the circuit for energizing the common wipe out relay individual to the doctor No. 265 is prepared at the contacts 252. Thus it will be apparent that with the wipers 263 and 264 engaging the contacts 265a and 265b, and the two relays R240 and R250 operated, the indications displayed by the display units individual to the doctor No. 265 will be wiped out and no new indications will be displayed thereby incident to the release of the automatic floor switch 11.

Although the invention has been explained with reference to a system for indicating the location of doctors attached to the staff of a large hospital, it will be understood that the system may also be used in industrial and other organizations to indicate the location of other objects, both animate and inanimate, in zoned

areas which are not necessarily different floors of a building. For example, the system may be utilized for indicating at one or more points the different locations of the executives and department heads of a large industrial organization having buildings disposed at random within a confined area. In such case the master or lobby station may be located at the gatehouse or entrance zone of the area. As a further example, the system may be used to indicate the location of loaded inter-departmental trucks which are used in an industrial organization and are moved from place to place to meet production or other manufacturing requirements. In order generically to designate such persons or movable objects, the locations of which are to be indicated, such persons or objects have been termed "subjects" in the following portions of the specification.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein, and it is contemplated to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In a system for indicating the location of a plurality of subjects which may be located in different zones of a plural zone area, a display board in said area including display units individually corresponding to said subjects, a control station including signal transmitting means operative to transmit signals designating different ones of said units, each of said units being designated by two different signals, automatic switching means operative to select one of said units when either of the two signals designating said one unit is transmitted thereto from said control station, a device controlled by the transmitted signal and having two settings respectively corresponding to the two signals designating said one unit, means operative to wipe out an indication previously displayed by said one unit in response to the selection of said one unit by said switching means, means operative incident to the release of said switching means for causing said one unit to display an indication of the zone wherein the subject corresponding to said one unit may be located, and means controlled by said device for preventing the operation of said last-named means when said device is operated to a predetermined one of its two settings in response to the signal transmitted to said switching means.

2. In a system for indicating the location of a plurality of subjects which may be located in different zones of a plural zone area, a display board in said area including display units individually corresponding to said subjects, a control station including signal transmitting means operative to transmit signals designating different ones of said units, each of said units being designated by two signals of different character, automatic switching means operative to select one of said units when either of the two signals designating said one unit is transmitted thereto from said station, means operative in response to the selection of said one unit by said switching means for wiping out an indication previously displayed by said one unit, means operative incident to the release of said switching means for causing said one unit to display an indication of the zone wherein the subject corresponding to said one

unit may be located, and means selectively controlled in accordance with the character of the signal transmitted to said switching means for preventing the operation of said last-named means.

3. In a system for indicating the location of a plurality of subjects which may be located in different zones of a plural zone area, a display board in said area including display units individually corresponding to said subjects, a control station including signal transmitting means operative to transmit signals designating different ones of said units, automatic switching means operative to select one of said units when the signal designating said one unit is transmitted thereto from said station, means operative in response to the selection of said one unit by said switching means for wiping out an indication previously displayed by said unit, and means operative incident to the release of said switching means for causing said one unit to display an indication of the zone wherein the subject corresponding to said one unit may be located.

4. In a system for indicating the location of a plurality of subjects which may be located in different zones of a plural zone area, display boards individual to said zones and each including display units individual to said subjects, control stations individual to said zones and each including signal transmitting means operative to transmit signals designating the different subjects, each of said subjects being designated by two signals of different character, and automatic selector switches individual to said zones and each operative to select the display units corresponding to any one of said subjects when either of the two signals designating said one subject is transmitted thereto, each of said switches including means for causing each of the selected units to wipe out any indication previously displayed thereby and to display an indication of the zone in which the associated control station is located and means selectively controlled in accordance with the character of the signal transmitted thereto for limiting the operation of said last-named means to the wipe out of indications previously displayed by the selected units.

5. In a system for indicating the location of a plurality of subjects which may be located in different zones of a plural zone area, display boards individual to said zones and each including display units individual to said subjects, control stations individual to said zones and each including signal transmitting means operative to transmit signals designating the different subjects, each of said subjects being designated by two signals of different character, automatic selector switches individual to said zones and each operative to select the display units corresponding to any one of said subjects when either of the two signals designating said one subject is transmitted thereto, means operative incident to the selection of the units corresponding to one of said subjects by one of said switches for wiping out the indications previously displayed by the selected units, means operative incident to the release of said one switch for causing the selected units to display an indication of the zone in which the control station corresponding to said one switch is located, and means selectively controlled in accordance with the character of the signal transmitted to said one switch for preventing the operation of said last-named means.

6. In a system for indicating the location of a plurality of subjects which may be located in different zones of a plural zone area, display boards individual to said zones and each including display units individual to said subjects, control stations individual to said zones, automatic selector switches individual to said zones and each controllable from the associated control station to select the display units corresponding to any one of said subjects, means operative incident to the selection of the units corresponding to one of said subjects for wiping out the indications previously displayed by the selected units, and means operative incident to the release of said one switch for causing the selected units to display an indication of the zone wherein the control station corresponding to said one switch is located.

7. In a system for indicating the location of a plurality of subjects which may be located in different zones of a plural zone area, display boards individual to said zones and each including display units individual to said subjects, control stations individual to said zones, relay networks individual to said subjects and each operative when seized from any one of said stations to wipe out the indications previously displayed by the corresponding units, means including automatic selector switches individual to said zones for seizing said relay networks from said stations, and relays individual to said switches for effecting the operation of selected units to display an indication of the location of the control station from which each selected relay network is seized.

8. In a system for indicating the location of a plurality of persons who may be located in different zones of a plural zone area and who enter said area through an entrance zone, display boards individual to at least a portion of said zones and each including display units individually corresponding to said persons, means including automatic selector switches individual to said stations and adapted to be controlled from the respective corresponding stations for selecting the units corresponding to any person and for setting the selected units to display indications of the zone wherein the person corresponding to the selected units may be located, an entrance station in said entrance zone and including control switches individually corresponding to said persons, and means individually controlled by said control switches for rendering the corresponding display units controllable from said control stations and for controlling the corresponding units to display indications that the corresponding persons are in said area.

9. In a system for indicating the location of a plurality of persons who may be located in different zones of a plural zone area and who enter said area through an entrance zone, display boards individual to at least a portion of said zones and each including display units individually corresponding to said persons, means including automatic selector switches individual to said stations and adapted to be controlled from the respective corresponding stations for selecting the units corresponding to any person and for setting the selected units to display indications of the zone wherein the person corresponding to the selected units may be located, an entrance station in said entrance zone and including control switches individually corresponding to said persons, and means individually controlled by said control switches for wiping out

indications displayed by the corresponding display units.

10. In a system for indicating the location of a plurality of persons who may be located in different zones of a plural zone area and who enter said area through an entrance zone, display boards individual to at least a portion of said zones, and each including display units individually corresponding to said persons, means including automatic selector switches individual to said stations and adapted to be controlled from the respective corresponding stations for selecting the units corresponding to any person and for setting the selected units to display indica-

5 tions of the zone wherein the person corresponding to the selected units may be located, an entrance station in said entrance zone and including "in" and "out" control switches individually corresponding to said persons, and means individually controlled by said "in" switches for rendering the corresponding units controllable from said control stations and for controlling the corresponding units to display indications that the corresponding persons are in said area, said last-named means being individually controlled by the corresponding "out" switches to wipe out indications displayed by the corresponding units.

HARRY E. HERSHEY.