

Sept. 24, 1963

P. D. SCHWARZ

3,105,221

TRAFFIC COUNTING APPARATUS

Filed June 1, 1959

3 Sheets-Sheet 1

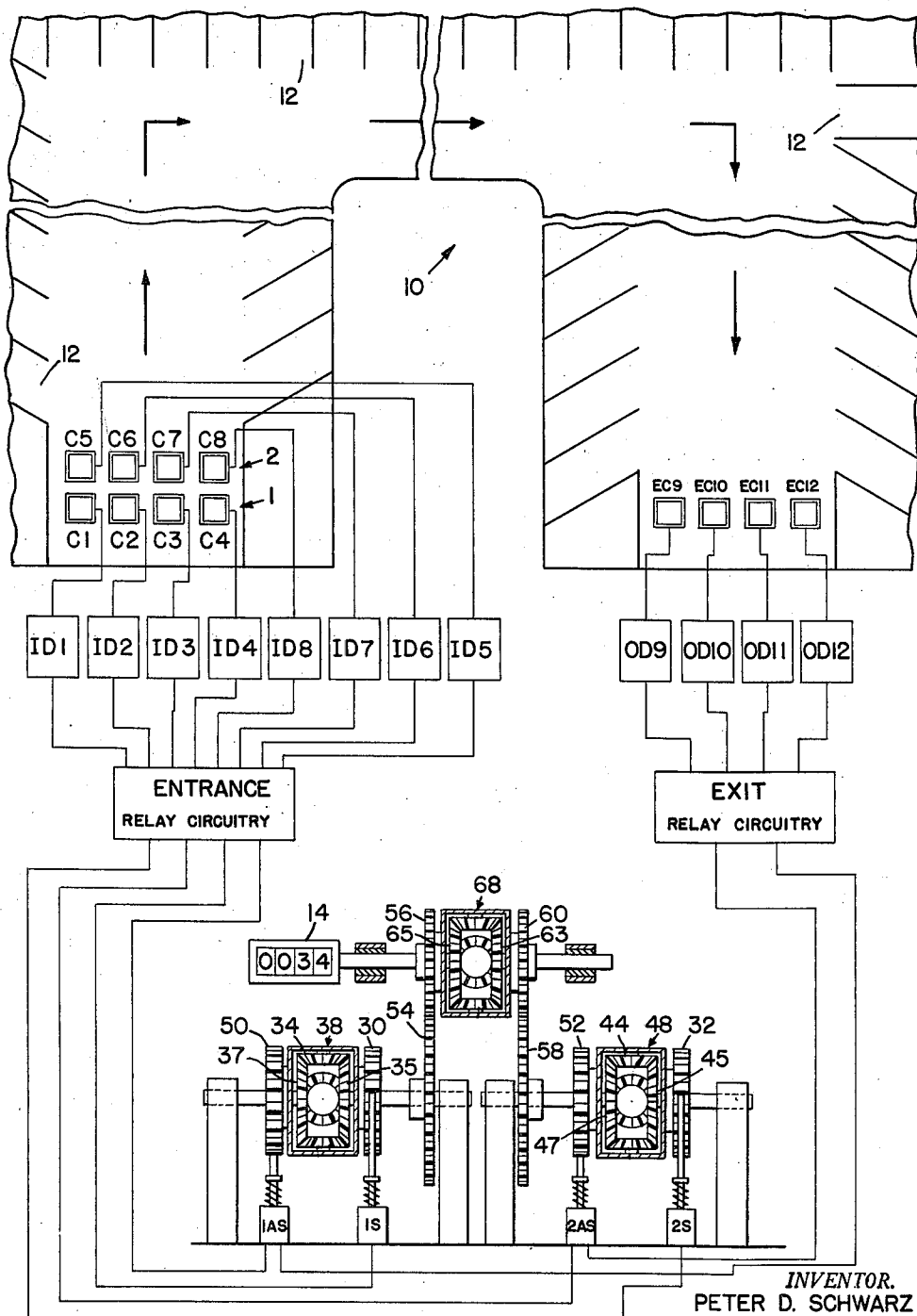


FIG. 1

INVENTOR.
PETER D. SCHWARZ

BY

P. J. Shilling
Attorney

Sept. 24, 1963

P. D. SCHWARZ

3,105,221

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3 Sheets-Sheet 2

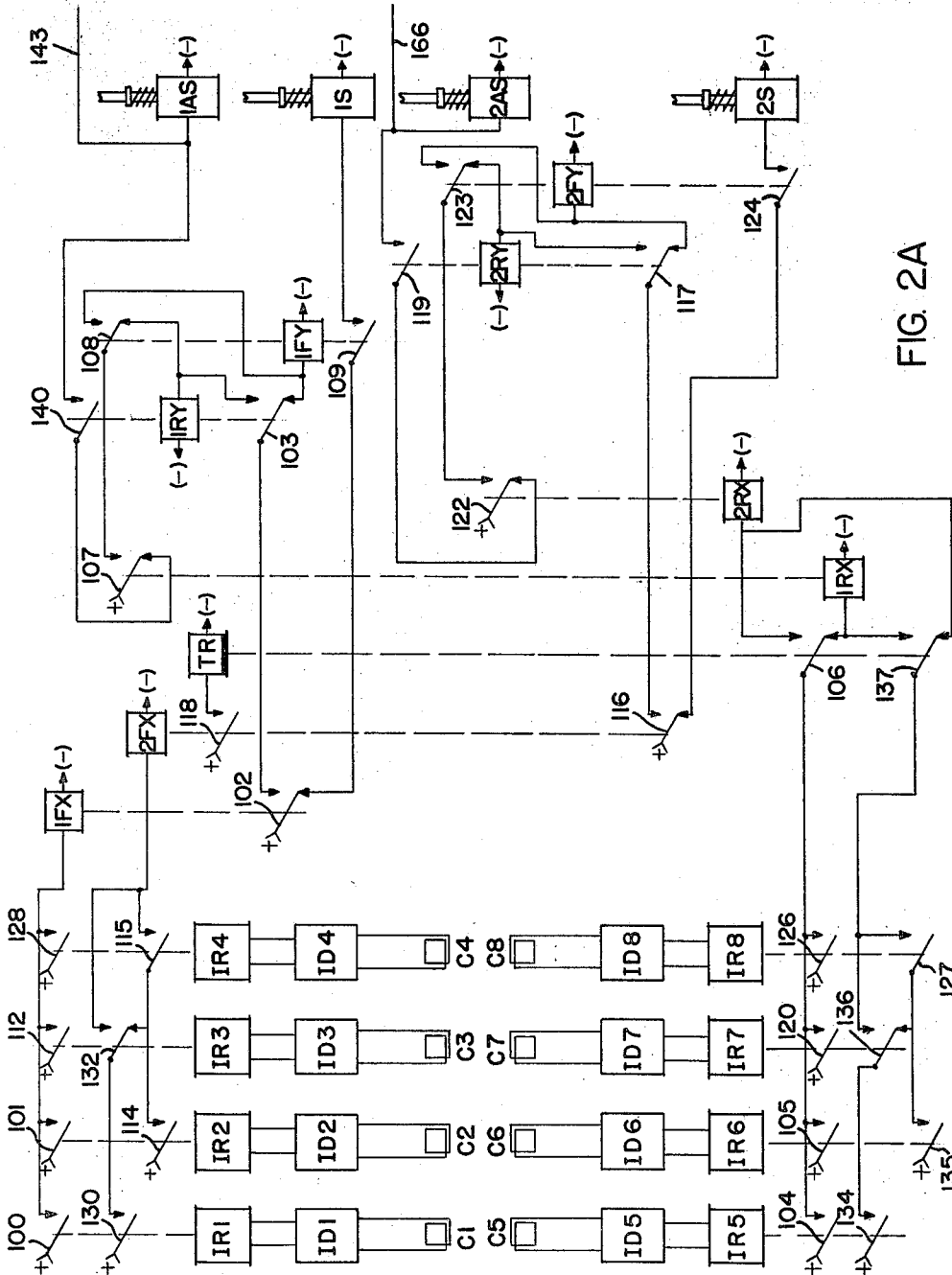


FIG. 2A

INVENTOR.
PETER D. SCHWARZ

BY

P. D. Schwarz
Attorney

Sept. 24, 1963

P. D. SCHWARZ
TRAFFIC COUNTING APPARATUS

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3 Sheets-Sheet 3

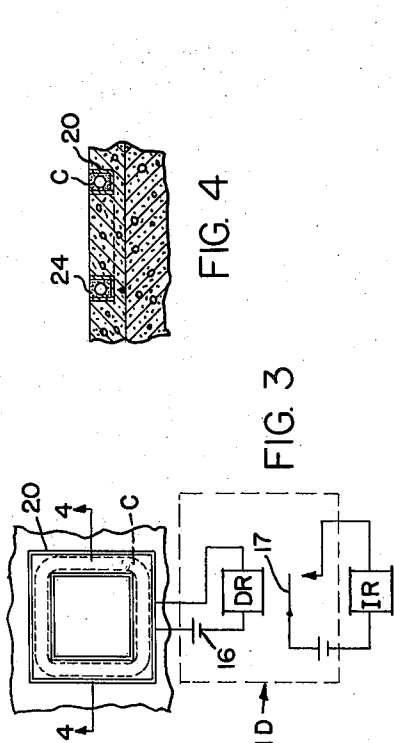


FIG. 4

FIG. 3

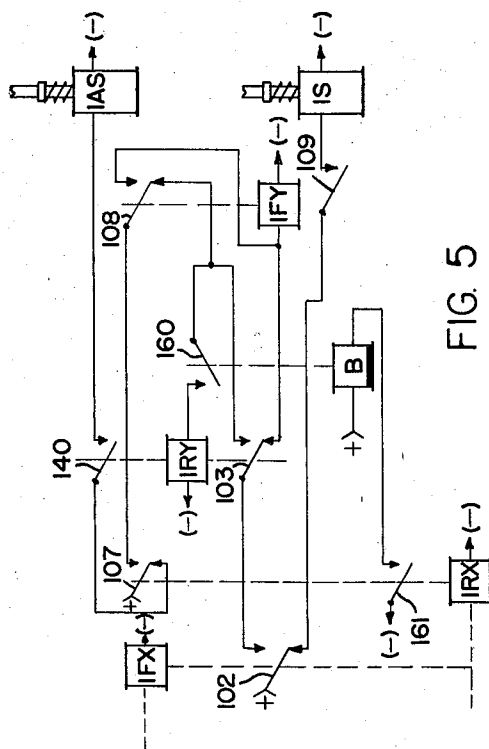


FIG. 5

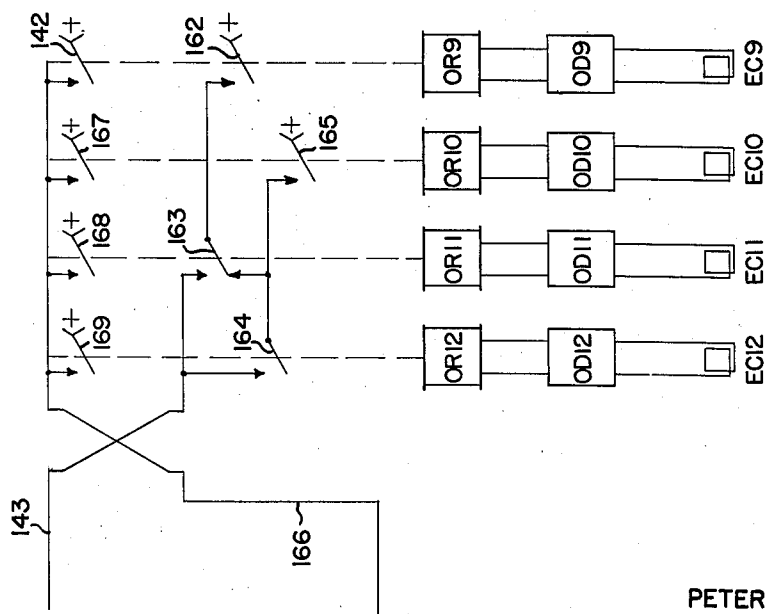


FIG. 2B

INVENTOR.
PETER D. SCHWARZ
BY *P. D. Schwarz*
Attorney

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3,105,221

TRAFFIC COUNTING APPARATUS
Peter D. Schwarz, 61 Woodcrest Drive,
Rochester 10, N.Y.

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21 Claims. (Cl. 340—51)

The present invention relates to traffic counting apparatus, and more particularly to an improved system of traffic counting for determining the number of spaces available in a parking area.

At the present time, parking garages which have many levels for parking are in operation. These modern parking garages may have separate entrances or have a multi-lane roadway leading into the garage which serves as both an entrance and an exit. In order to attract vehicles and make it easy for the automobiles to enter such a garage there must be wide entrances and exits, and wide ramps with a large turning radius leading to the various levels. Also in order to provide for uniform and efficient flow of traffic entering and leaving the garage, and to prevent vehicles from entering the garage when there is no parking space available therein, it is desirable that such a garage have apparatus for informing the driver prior to entering the area if there is a parking space available in the structure, and for then directing him to the nearest area or level where parking space is available. It is evident that vehicles entering and leaving such garages present problems for such a traffic counting system. For example, a vehicle may occupy more than one lane when entering the parking garage, a plurality of vehicles may enter the garage abreast or simultaneously, small vehicles may enter the garage occupying a small portion of only one lane or straddling both lanes, vehicles may enter and stop, stop and then roll back while waiting for a car in front of them, and then go forward again, or vehicles already in the garage may actuate the detection apparatus in a reverse direction in turning or attempting to occupy a parking space.

Such non-uniformity of traffic patterns, stopping, backing up, and the like creates problems which do not exist in the counting of traffic on highways or streets for signal control or survey purposes. If a small percentage of error exists in counting apparatus used on highways or streets caused by an occasional non-uniform traffic movement, it does not affect the overall efficiency of the system. However, a one or two percent error in traffic count in a parking garage or lot can result in an error of from fifty to one hundred percent of the indicated total available parking spaces over a given short period of time. For example, in an eight level ramp which holds sixty-five vehicles on each level and has an approximate turnover of six vehicles per space during a twenty-four hour period, the total number of cars which occupy such a garage during such a period is approximately three thousand. Thus, if the detector is in error even two percent, for example, the counter will be in error approximately sixty vehicles during the twenty-four hours, which is almost the total capacity of one level in the garage.

One of the objects of the present invention is to provide an apparatus for detecting and counting vehicles entering and leaving a parking garage so that the available parking spaces will be accurately registered at all times.

Another object of this invention is to provide a system of the character described that will accurately register a single vehicle entering or leaving through either lane of a multi-lane roadway.

Another object of this invention is to provide a system of the character described which will accurately register a single vehicle straddling more than one lane of a multi-lane roadway.

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Another object of this invention is to provide an improved system of the character described which will accurately register several vehicles traveling abreast or in an over-lapping fashion when entering or leaving a parking garage.

A further object of this invention is to provide a system of the character described which will accurately register a plurality of vehicles simultaneously entering and leaving a parking area.

A further object of this invention is to provide a system of the character described wherein the accuracy of the system is not affected by vehicles occupying the detection portion of the apparatus and then going in a reverse direction prior to entering the parking garage.

A still further object of this invention is to provide a vehicular detecting system for a parking garage wherein the accuracy of the system will not be affected by a car backing into the detection area from an adjacent parking space in the garage before leaving the garage.

A further object of this invention is to provide a system of the character described which will accurately register cars of all known sizes presently manufactured and regardless of the traffic pattern they assume when entering the parking area.

A still further object of this invention is to provide a system of the character described which will add or subtract the number of available spaces in the parking area in accordance with the direction in which a vehicle travels relative to the detecting portion of the apparatus.

A still further object of this invention is to provide an apparatus for registering traffic and indicating the spaces available in a parking area, which may be installed in any parking area or garage regardless of the entrance and exit facilities available.

A still further object of this invention is to provide a system of the character described for registering available spaces in a parking area which is dependable and simple in its operation and may be easily installed in any existing parking installation.

Other objects of this invention will become apparent from the drawings, the specification, and the appended claims.

In the drawings:

FIG. 1 is a diagrammatic view of a typical parking area, in which a system made according to one embodiment of this invention is employed, showing the position of the entrance and exit detectors in the roadways of the area and also showing in block form the circuitry for operating a counter operatively connected in the circuit;

FIG. 2A is a diagrammatic view showing in detail the circuitry for registering vehicles passing over the detection apparatus in either direction in the entrance roadway to the parking area;

FIG. 2B is a diagrammatic view showing in detail the circuitry for registering vehicles passing over the detection apparatus when leaving the parking area;

FIG. 3 is a plan view of a coil such as may be in the system of the invention and installed in a section of roadway and adapted to be used for detecting the presence of a vehicle, and showing a typical detection circuit in simplified form;

FIG. 4 is a sectional view showing the detecting coil mounted in the roadway; and

FIG. 5 is a diagrammatic view showing a modified circuit for preventing under certain circumstances the system from inaccurately registering when a vehicle backs into the entrance from an adjacent parking area;

Referring to FIG. 1, this embodiment of the invention is shown as being installed in the entrance and exit level of a parking garage generally denoted at 10. In the instance illustrated, this level has a dual lane entrance roadway and a separate dual lane exit roadway. Within the

garage are a plurality of parking spaces denoted as 12. Located in the entrance roadway of the parking garage are a plurality of detecting coils referred to as C1 through C8 and in the exit roadway of the garage are a plurality of detecting coils referred to as EC9 through EC12. In the system of the present invention passage of a vehicle over the coils C or EC operates, respectively, the entrance circuitry or the exit circuitry which will be described in detail later, to indicate on a suitable indicator, such as 14, located in the office of the garage, the subtraction from or addition to the number of spaces available in the garage. The indicator may be also operatively connected to various warning signs located at the entrance to the garage for indicating when the garage is fully occupied.

The coils C1 through C4 are spaced across the entrance roadway so that at least one of the coils and not more than two of the coils will be influenced by a car entering the roadway. The coils C1 through C4 form the first row of coils. These coils first detect the presence of a vehicle or vehicles entering the parking area. The coils C5 through C8 are aligned behind and adjacent to the respective coils C1 through C4 and constitute the second row of coils that are influenced by a vehicle entering the parking area after the vehicle has influenced an adjacent coil or coils in the first row. Similarly, the coils EC9 through EC12 are spaced across the exit roadway of the parking area so that a vehicle leaving the parking area will affect at least one, and not more than two, of adjacent coils EC9 through EC12.

The coils C1 through C8 and EC9 through EC12 may be installed in the roadway as shown in FIGS. 3 and 4. Each of the coils C1 through C8 and EC9 through EC12 is positioned in a rectangular channel 20 (FIGS. 3 and 4) that is embedded in the roadway; and the coil is then covered with an epoxy resin 24 to protect it from the wheels of passing vehicles.

Associated with each coil C1 through C8 is a detector ID1 through ID8 (FIG. 1), respectively, and associated with each coil EC9 through EC12 is a detector OD9 through OD12, respectively. In FIG. 3, an example of a typical detector ID, or OD in simplified form is shown diagrammatically. Each coil is connected in a circuit to a respective detector ID or OD which includes the coil, a battery 16 or other source of energy, and the winding of a relay DR. When a vehicle passes over a coil C or EC, it magnetically unbalances the current in the detector circuit for deenergizing a relay winding such as DR. Thus each coil C and EC may have a permanent magnet core so that as the vehicle goes over the coil, the air gap is replaced by the metal of the vehicle thus increasing the flux-density of the coil which increases the resistance in the coil. The increased resistance causes decrease in current in the relay winding DR thus causing the contact 17 of the relay to drop away. The dropping away of the contact 17 closes a circuit for energizing a relay, such as IR, which is included in the entrance and exit relay circuitry as will be described in detail hereinafter.

The detectors ID1 through ID8, and OD9 through OD12 are connected in the entrance and exit relay circuits, as will be described in detail hereinafter, to energize, successively or simultaneously as the case may be, one or more of the solenoids 1S, 2S, 1AS, and 2AS. These solenoids when energized operate the indicator 14 through differential gearing. There are two solenoids 1S and 2S for actuating the counter to subtract from the number of spaces indicated to be available in the parking area. There are two solenoids 1AS and 2AS for actuating the counter to add to the number of parking spaces indicated to be available.

The solenoids 1S and 2S, when energized, operate, through conventional pawls, ratchet wheels 30 and 32, respectively, to advance each ratchet wheel one step at a time in one direction. The solenoids 1AS and 2AS

operate also through conventional pawls to advance step-by-step ratchet wheels, but these ratchet wheels 50 and 52, respectively, are advanced in a direction opposite to that of the ratchet wheels 30 and 32. The ratchet wheels 30 and 50 are differentially connected by a bevel gear differential 38 comprising the pinions 34 and side gears 35 and 37. The ratchet wheels 32 and 52 are differentially connected by a bevel gear differential 48 comprising the pinions 44 and side gears 45 and 47. The differential 38 is connected to operate a gear 54 which is in mesh with a gear 56. The differential 48 is similarly connected to a gear 58 which is in mesh with gear 60. The gears 56 and 60 are rigidly connected to the side gears 65 and 63, respectively, of a bevel gear differential 68 which comprises these side gears and pinions 62. Differential 68 operates the indicating mechanism 14. Thus the energizing of the solenoid 1S moves the ratchet wheel 30 in one direction to drive the counter 14 in a direction to denote one less available parking space in the garage. The simultaneous energizing of solenoids 1S and 2S operates the ratchet wheels 30 and 50 to move the indicator two steps in this same direction to indicate two less available parking spaces in the garage. The solenoid 1AS operates the ratchet wheel 50 in the other direction to operate the counter to indicate an additional parking space; and simultaneous energizing of relays 1AS and 2AS causes the indicator 14 to move sufficiently to indicate two more available parking spaces in the garage. The simultaneous energizing of relays 1S and 1AS or the simultaneous energizing of relays 2S and 2AS through the differential gearing, causes the gears 54 and 58, respectively, to remain stationary, thus no change is indicated in the number of available parking spaces.

In FIGS. 2A, 2B and 5, the relays of the entrance and exit circuitry are shown in their normal positions as when no vehicles are influencing any of the coils C or EC to activate their associated detectors ID or OD respectively. When a relay winding is deenergized, all of its associated contacts are in their dropped away position, and when the winding of a relay is energized, its associated contacts assume a picked up position to close a front contact. In some instances, back contacts are provided to be closed when a respective relay winding is deenergized. The symbols (+) denote a suitable connection to the positive terminal of a battery or other source of energy, and the symbols (—) denote a connection to a negative terminal or ground connection of a suitable source of energy.

The entrance and exit circuitry will now be described. Referring to FIGS. 2A and 2B, each of the detector units ID1 through ID8 is connected to an associated relay IR. There are eight of these relays IR1 through IR8. Each such relay is energized in response to the activation of its associated detector. Similarly, each detector OD9 through OD12 is connected to a relay OR9 through OR12. Each such relay is energized in response to the activation of its associated detector. The energizing of each relay IR1, IR2, IR3, IR4, IR5, IR6, IR7, IR8, OR9, OR10, OR11, and OR12 causes a pair of contacts, 100 and 130, 101 and 114, 112 and 132, 128 and 115, 104 and 134, 105 and 135, 120 and 136, 126 and 127, 142 and 162, 165 and 167, 163 and 168, and 164 and 169, respectively, which are associated with the respective relays to pick up.

Relay 1FX is provided to be energized in response to the picking up of any one of the relays IR1 through IR4 which occurs when a single vehicle occupies the entrance roadway to the parking garage in either one of the entrance lanes or straddling of the lanes. Relay 2FX is provided to be energized by the picking up of any two non-adjacent relays such as IR1 and IR3, IR2 and IR4, or IR1 and IR4. This condition exists when more than one vehicle is in the entrance section of roadway influencing two or more coils C1 through C4 of which at least two of the influenced coils are non-adjacent. The energizing of the winding of relay 1FX causes its contact

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102 to shift from back to front. The energizing of relay 2FX causes its contact 116 to shift from back to front.

Relay 1RX is provided to be energized by the picking up of any one of the relays IR5 through IR8 which occurs when a single vehicle passes over any one of the second row of coils C5 through C8. Relay 2RX is energized by the picking up of any two non-adjacent relays of group IR5 through IR8, such as relays IR5 and IR7, IR6 and IR8, or IR5 and IR8 which would be caused by the presence of two vehicles occupying the roadway in such a way as to influence the second row of coils C5 through C8 in a manner similar to the influence to the first row of coils C1 through C4 by the presence of more than one vehicle in the detecting section of the roadway. The energizing of the winding of relay 1RX causes its contact 107 to shift from back to front. The energizing of the winding of relay 2RX causes its contact 122 to shift from back to front.

Transfer relay TR, which is a slow drop-away relay, is energized whenever relay 2FX is picked up. Ordinarily relay 1RX would be energized when the first of two vehicles which occupied the first row of coils C1 through C4 continued on to the second row of coils C5 through C8. However, relay TR causes relay 2RX to be picked up first when a single vehicle passes over any one of the second row of coils C5 through C8 while relay 2FX is picked up. Also relay TR when energized causes the relay 1RX to drop away before relay 2RX when the first of two adjacent or overlapping vehicles clears the second row of coils C5 through C8. The energizing of the winding of relay TR causes both its contacts 106 and 137 to shift from back to front.

Relays 1FY and 2FY are energized when coils C1 through C4 are influenced by a vehicle, and coils C5 through C8 have not yet been influenced by a vehicle. These FY relays condition the entrance circuitry so that a solenoid 1S or 2S respectively, is energized when a vehicle entering the parking area uncovers the first row of coils C1 through C4. The energizing of the winding of relay 1FY causes its contacts 108 and 109 to shift from back to front. The energizing of relay 2FY causes its contacts 123 and 124 to shift from back to front.

Relays 1RY and 2RY condition the entrance circuitry so that a solenoid 1AS or 2AS, respectively, will be energized when a vehicle traveling in a reverse direction in the entrance roadway clears the second row of coils C5 through C8. The energizing of relay 1RY causes its contacts 103 and 140 to shift from back to front; and the energizing of relay 2RY causes its contacts 117 and 119 to shift from back to front.

A more detailed description of the function of the circuitry and the various relays will be given in connection with the description of the operation of the system under typical operating conditions.

Assuming a vehicle enters the parking area to first cover both coils C1 and C2, the associated detectors ID1 and ID2 are activated which causes the energizing of relays IR1 and IR2. In response to the picking up of either IR1 or IR2, relay 1FX is energized by a circuit which extends from (+) and includes front contact 100 of relay IR1 or front contact 101 of relay IR2, and the winding of relay 1FX to (-). In response to the picking up of relay 1FX, relay 1FY is energized by a circuit which extends from (+) and includes front contact 102 of relay 1FX, back contact 103 of relay 1RY, and the winding of relay 1FY to (-). The vehicle then proceeds across coils C5 and C6 before leaving coils C1 and C2, thus picking up relays IR5 and IR6. In response to the picking up of relays IR5 and IR6 relay 1RX is energized by a circuit which extends from (+) and includes either front contact 104 of relay IR5 or front contact 105 of relay IR6, back contact 106 of relay TR, and the winding of relay 1RX to (-). The picking up of relay 1RX provides a stick or hold-in circuit for holding relay 1FY picked up, which circuit extends from (+) and includes

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front contact 107 of relay 1RX, front contact 108 of relay 1FY and the winding of relay 1FY to (-).

When the vehicle leaves the coils C1 and C2 relays IR1 and IR2 are deenergized to open the pick up circuit for relay 1FX. The dropping away of relay 1FX closes its back contact 102 which completes a circuit for energizing solenoid 1S, which circuit extends from (+) and includes back contact 102 of relay 1FX, front contact 109 of relay 1FY, and the winding of solenoid 1S to (-).

The energizing of the solenoid 1S operates the ratchet wheel 30 to move the counter 14 back one digit thus indicating that there is one less available space in the parking area. As the car proceeds into the parking area it uncovers coils C5 and C6 which results in the dropping away of relays IR5 and IR6 thus deenergizing relay 1RX. The dropping away of relay 1RX breaks the previously described stick or hold-in circuit for relay 1FY at front contact 107 of relay 1RX thus causing relay 1FY to drop away which deenergizes the solenoid 1S by opening its previously described pick-up circuit.

For another example, assume that two vehicles enter the parking area abreast, the first vehicle straddling both lanes of the roadway so that it activates the detectors associated with coils C2 and C3 of the first row and the second vehicle entering so that it activates the detector associated with coil C4. In response to the activation of detectors ID2, ID3 and ID4, relays IR2, IR3 and IR4 are energized. In response to the picking up of IR2 or IR3, whichever is first, relay 1FX is energized by a circuit which includes either contact 101 of relay IR2 or contact 112 of relay IR3. The picking up of relay IR4 when two cars are covering the first row of coils causes the picking up of relay 2FX by a circuit which extends from (+) and includes front contact 114 of relay IR2, front contact 115 of relay IR4 and the winding of relay 2FX to (-). The picking up of relay 1FX energizes the relay 1FY through its previously described pick-up circuit. The picking up of relay 2FX energizes relay 2FY by a circuit which extends from (+) and includes front contact 116 of relay 2FX, back contact 117 of relay 2RY and the winding of relay 2FY to (-). Simultaneously with the picking up of relay 2FX relay TR is energized by an obvious circuit which extends from (+) and includes front contact 118 of relay 2FX.

Assuming that the second vehicle stops and covers coil C4 without proceeding forward while the first vehicle proceeds to cover coils C6 and C7, relays IR6 and IR7 are energized in the manner previously described which causes the picking up of relay 2RX by a circuit which extends from (+) and includes either contact 105 of relay IR6 or contact 120 of relay IR7, front contact 106 of relay TR and the winding of relay 2RX to (-). It should be noted that the presence of two vehicles over coils in the first row resulted in the picking up of the relay TR which caused the relay 2RX to be energized instead of relay 1RX when the first vehicle covered a coil or coils of the second row before it uncovered the coils of the first row. In response to the picking up of relay 2RX a stick or hold-in circuit is provided for relay 2FY which extends from (+) and includes front contact 122 of relay 2RX, front contact 123 of relay 2FY and the winding of relay 2FY to (-). Relay 2FY is now being held in its picked-up condition by relay 2RX, thus as the first vehicle leaves the first row of coils, relay 2FX is deenergized by the opening of front contact 114 of relay IR2 which causes the pick-up circuit for relay TR to be broken at front contact 118.

The dropping away of relay 2FX closes a circuit for energizing the solenoid 2S which extends from (+) and includes back contact 116 of relay 2FX, front contact 124 of relay 2FY and the winding of solenoid 2S to (-). It should be noted that the relay TR has a delayed drop-away action after its pick-up circuit is broken so that the relay 2RX will not become deenergized through the opening of front contact 106 of relay TR before relay

2FX has an opportunity to establish the pick-up circuit for the solenoid 2S.

The relay 2RX must be maintained energized so as to maintain the stick or hold-in circuit for the relay 2FY so that its front contact 124 will remain closed. When relay TR drops away, relay 2RX is deenergized by opening its previously described pick-up circuit thus causing the dropping away of relay 2FY which causes the deenergizing of the solenoid 2S. The closing of back contact 106 of relay TR causes relay 1RX to pick up by a circuit which extends from (+) and includes either front contact 105 of relay IR6 or front contact 120 of relay IR7 in the previously described pick-up circuit for the relay 2RX.

Assuming that the first vehicle passes beyond the second row of coils before the second vehicle occupies a coil in the second row, relays IR6 and relays IR7 are deenergized which causes relay 1RX to drop away. As the second vehicle moves forward, it covers coil C8 of second row of coils thus picking up relay IR8 which energizes relay 1RX by a circuit which extends from (+) and includes front contact 126 of relay IR8, back contact 106 of relay TR and the winding of relay 1RX to (-).

The picking up of relay 1RX causes the previously described stick or hold-in circuit for relay 1FY to be reestablished. As the second vehicle leaves coil C4 relay 1FX is deenergized. The dropping away of relay 1FX energizes the solenoid 1S through its previously described pick up circuit. As the second vehicle leaves coil C8 relay IR8 is deenergized which causes the dropping away of relay 1RX which breaks the previously described stick or hold-in circuit for 1FY thus deenergizing the solenoid 1S.

Now assume that a vehicle enters the parking area to first cover coil C1, relay IR1 is deenergized which picks up relay 1FX through the front contact 100 of relay IR1. This causes the energizing of relay 1FY as previously described. The further proceeding of this vehicle over coil C5 results in the picking up of relay 1RX that provides the stick or hold-in circuit for relay 1FY. Now assuming that another vehicle enters the parking area to first cover coils C3 and C4 relays, IR3 and IR4 are picked up which causes the picking up of relay 2FX by a circuit which extends from (+) and includes front contact 130 of relay IR1, front contact 132 of relay IR3 and winding of relay 2FX to (-). The picking up of relay 2FX causes the picking up of relay TR as previously described which results in the deenergizing of relay 1RX by the opening of back contact 106 of relay TR. The closing of front contact 106 causes relay 2RX to pick up. Since the first vehicle is still influencing coil C4 relay 1FY is not affected by this dropping away of relay 1RX. The picking up of relay 2RX establishes the previously described stick or hold-in circuit for relay 2FY. The second vehicle then covers coils C7 and C8 which causes the picking up of relays IR7 and IR8 thus energizing relay 1RX by a circuit which extends from (+) and includes front contact 134 of relay IR5, front contact 136 of relay IR7, front contact 137 of relay TR and the winding of relay 1RX to (-). The picking up of relay 1RX reestablishes the stick or hold-in circuit for relay 1FY. At this point both vehicles are covering coils in both rows simultaneously.

Assuming that one vehicle first uncovers coil C1 in the first row, relay IR1 is dropped away which breaks the pick-up circuit for 2FX. The dropping away of relay 2FX opens the pick-up circuit for relay TR and closes the pick-up circuit for solenoid 2S as previously described which causes the indicator 14 to subtract an available space from the total it shows. When the contacts 106 and 137 of the relay TR shift from front to back relays 1RX and 2RX are momentarily dropped away. Since both vehicles are still occupying the second row of coils however, these relays 1RX and 2RX are picked up again. Since only one vehicle is occupying the first row of coils,

the dropping away of relay 2RX causes relay 2FY to become deenergized by breaking its previously described stick or hold-in circuit which opens its front contact 124 thus deenergizing the solenoid 2S. The presence of the other vehicle over the first row of coils maintains relay 1FY energized even though the relay 1RX momentarily is dropped away.

Now assuming that the other vehicle leaves the first row of coils, relay 1FX is deenergized which energizes the solenoid 1S to cause the indicator to subtract another available space from the total shown. Since relay 2RX was reenergized after its momentary dropping away the closing of its front contact 122 picks up relay 2RY which has no effect on the circuit under these conditions. When the one vehicle leaves the second row of coils relay 2RX is deenergized thus causing relay 2RY to drop away. As the other vehicle leaves coil row 2 relay 1RX is dropped away which causes the dropping away of relay 1FY thus deenergizing the solenoid 1S.

Assuming that a vehicle backs out of a parking space 12 to cover coil C5, relay IR5 is picked up which energizes relay 1RX through its previously described pick-up circuit. The picking up of relay 1RX closes the pick-up circuit for energizing relay 1RY which extends from (+) and includes front contact 107 of relay 1RX, back contact 108 of relay 1FY and the winding of relay 1RY to (-). If this vehicle continues to back up, it then covers coil C1 of coil row 1, which causes the picking up of relay IR1, thus energizing relay 1FX. The picking up of relay 1FX provides a stick or hold-in circuit for relay 1RY, which extends from (+) and includes front contact 102 of relay 1FX, front contact 103 of relay 1RY and the winding of relay 1RY to (-). At this point if the vehicle reverses its direction and goes forward into the garage to leave by way of the normal exit roadway, coil C1 is uncovered which causes relay IR1 to drop away thus deenergizing relay 1FX. Since the vehicle is still occupying coil row 2 the relay 1RY is held in its picked up position. Since the vehicle next uncovers coil row 2, relay IR5 is dropped away which deenergizes relay 1RX. The dropping away of relay 1RX breaks the pick-up circuit for relay 1RY thus restoring the system to normal. In the preceding example neither the solenoid 1S nor the solenoid 1AS was energized.

In the event that the vehicle merely covered coil row 2 and then proceeded in a forward direction, the relay 1RX would cause the picking up of relay 1RY, and as the vehicle then proceeded forward the relay 1RX and 1RY would drop away without adversely affecting the circuit to erroneously actuate the indicator 14.

However, if, instead of reversing and then going forward as described above, the vehicle should continue to go in a reverse direction it will pass over and uncover coil row 2 thus deenergizing relay IR5 which causes the dropping away of relay 1RX. This closes a circuit for energizing the solenoid 1AS which actuates the indicator 14 to denote an additional available space in the parking area. The circuit for energizing solenoid 1AS extends from (+) and includes back contact 107 of relay 1RX, front contact 140 of relay 1RY and the winding of solenoid 1AS to (-). As this vehicle clears coil row 1, relay 1FX is deenergized which causes the dropping away of relay 1RY.

It is apparent that if two vehicles should simultaneously travel in a reverse direction over the coils that a circuit would be established to energize the solenoids 1AS and 2AS as described previously for the traveling of two vehicles abreast in a forward direction.

Assuming that a vehicle leaves the parking garage in an ordinary fashion and as it is driven out forwardly through the exit covers one of coils EC9 through EC12, say, for instance, coil EC9, the detector unit OD9 associated with this coil is activated which energizes the relay OR9 thus energizing the solenoid 2AS by a circuit which extends from (+) and includes front contact 142 (FIG.

2B) of relay OR9, wire 166 (FIGS. 2B and 2A) and the winding of solenoid 2AS to (—). After this vehicle clears the row of coils at the exit, relay OR9 drops away thus deenergizing the solenoid 1AS. It is apparent at the exit end of the garage that one or more vehicles may leave simultaneously or in overlapping fashion to energize both solenoids 1AS and 2AS as described for the simultaneous energizing of the solenoids 1S and 2S thus causing the indicator 14 to denote two additional parking spaces in the garage. For example, if a second vehicle should cover coil EC12 while coil EC9 is covered solenoid 2AS is energized by a circuit which extends from (+) and includes front contact 162 of relay OR9, back contact 163 of relay OR11, front contact 164 of relay OR12, wire 143 (FIGS. 2A and 2B), and the winding of solenoid 1AS to (—).

Referring to FIG. 5, the entrance circuitry may be modified to include a slow drop-away relay B having a front contact 160 in the pick-up circuit for the relay 1RY. This may be included in an installation if it is desirable to have additional back-up protection in the embodiment shown in FIGS. 2A and 2B as, for instance, where the first and second row of coils may be so spaced or located that cars from adjacent parking spaces may back into the second row of coils, then back into the first row of coils and then while still parking uncover the second row before proceeding forward to the exit. In this event, the vehicle, when backing into the second row of coils, would cause relay 1RX to pick up, which would energize relay B by an obvious circuit which includes front contact 161 of relay 1RX. The picking up of relay B closes the front contact 160 in the pick-up circuit for relay 1RY. This circuit extends from (+) and includes the front contact 107 of relay 1RX, the back contact 108 of relay 1FY, the front contact 160 of relay B and the winding of relay 1RY to (—). As the vehicle backs into the first row of coils relay 1FX is picked up which provides a stick or hold-in circuit for relay 1RY which extends from (+) and includes the front contact 102 of relay 1FX, front contact 103 of relay 1RY, and the front contact 160 of relay B and the winding of relay 1RY to (—).

When the vehicle uncovers the second coil row, relay 1RX drops away, thus energizing the solenoid 1AS to denote an additional available parking space in the garage by a circuit which extends from (+) and includes the front contact 107 of relay 1RX, the front contact 140 of relay 1RY and the winding of solenoid 1AS to (—). The dropping away of relay 1RX also opens the pick-up circuit for the relay B which causes its contact 160 to open thus breaking the stick circuit for relay 1RY permitting it to drop away. Since relay 1FX is in its picked up condition, relay 1FY is energized when relay 1RY drops away by a circuit which extends from (+) and includes the front contact 102 of relay 1FX, back contact 103 of relay 1RY and the winding of relay 1FY to (—).

Now when the vehicle proceeds in a forward direction to again cover the second coil row, relay 1RX is again picked up which provides a stick or hold-in circuit for relay 1FY through its front contact 107. As the vehicle proceeds forward and uncovers coil row 1, relay 1FX drops away which energizes the solenoid 1S by a circuit which extends from (+) and includes the back contact 102 of relay 1FX, front contact 109 of relay 1FY and the winding of the solenoid 1S to (—). This causes the indicator 14 to subtract an additional available space from the total shown. It is evident that as the car proceeds forward relay 1RX drops away which breaks the stick or hold-in circuit for relay 1FY thus deenergizing the solenoid 1S.

It is obvious that the embodiments of the invention herein disclosed may be expanded so as to be installed in a parking area where the entrance or exit roadway is of sufficient width to accommodate three or more vehicles. It is also contemplated that instead of using coils in the

floor as detectors, other means of detection may be used in connection with this invention such as vertical beams of visible light using photoelectric cells, infra red, ultrasonic, or other types of presence detectors, either overhead or embedded in the roadway; or the coils themselves may be located above the vehicles instead of in the floor as long as they operate the circuitry in the manner previously described.

While the invention has been described in connection with a specific embodiment thereof, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains and as may be applied to the essential features hereinbefore set forth, and as fall within the scope of the invention or the limits of the appended claims.

Having thus described my invention, what I claim is:

1. A system for counting the number of vehicles passing over a section of roadway of a parking garage or the like, comprising first and second vehicle detectors, one of said detectors being ahead of the other in the direction of movement of traffic so that said detectors are activated successively by a single vehicle during passage of the vehicle over said section of roadway, a counter for indicating the number of vehicles in said parking garage or the like, means responsive to the activation of said first detector followed by the activation of said second detector and the subsequent inactivation of said first detector for causing said counter to indicate a single vehicle change in the total number of vehicles in said parking garage, and means responsive to the activation of said first detector followed by the activation of said second detector and the subsequent inactivation of said second detector and reactivation of said first detector, as caused by a vehicle reversing its direction of travel after activating both said first and second detectors, for preventing said counter from indicating a change in the total number of vehicles in said garage.

2. A system for counting the number of vehicles traveling in either direction over a section of roadway leading into a parking garage, comprising a counter for indicating the number of vehicles in said garage, a first electromagnetic means operative when energized to operate said counter to indicate one additional vehicle in said garage, a second electromagnetic means operative when energized to operate said counter to indicate one less vehicle in said garage, a first detector for indicating the presence of a vehicle in said roadway, a second detector for indicating the presence of a vehicle in said roadway, said first and second detector being disposed in the direction of travel relative to one another so that both of said detectors are successively activated by said vehicle but in opposite order, respectively, during travel of the vehicles in opposite directions, respectively, a forward control relay for partially controlling the operation of said first electromagnetic means, a reverse control relay for partially controlling the operation of said second electromagnetic means, a first circuit means responsive to the activation of said first detector when said second detector is in an inactive condition for energizing said forward control relay, a second circuit means responsive to the activation of said second detector when said first detector is in an inactive condition for energizing said reverse control relay, a third circuit means including a front contact of said forward control relay for holding said forward control relay picked up while a vehicle is activating said second detection means regardless of activation of said first detection means, a fourth circuit means responsive to the deactivation of said first detection means and the picked-up condition of said forward control relay for energizing said first electromagnetic means to indicate addition of a single vehicle to the number in said garage,

a fifth circuit means including a front contact of said reverse control relay and the activated condition of said first detection means for holding said reverse control relay in a picked-up condition regardless of activation of said second detection means, and a sixth circuit means responsive to the deactivated condition of said second detector and the picked-up condition of said reverse control relay for energizing said second electromagnetic means to indicate subtraction of a single vehicle from the number in said garage.

3. A system according to claim 9 comprising a seventh circuit means responsive to the deactivation of said second detector for deenergizing said first electromagnetic means and an eighth circuit means responsive to the deactivation of said first detector for deenergizing said second electromagnetic means.

4. A system for counting vehicles traveling over a section of roadway leading into a parking area, comprising a counter for indicating the number of vehicles in said parking area, an electromagnetic means operative when activated to operate said counter to indicate a single vehicle change in the number of vehicles in said parking area, a first vehicle detector and a second vehicle detector, said first and second detectors being spaced in the direction of travel for activation of both said detectors by a single vehicle during its travel, a single relay for partially controlling the energizing of said electromagnetic means, a first circuit means responsive to the activation of said first detector for energizing said single relay, a second circuit means responsive to the activation of said second detector and including a contact of said single relay in its energized position for holding said single relay in its energized position, and a third circuit means connected to said first circuit means to be operated upon deactivation of said first detector when said second detector is activated and including a contact of said single relay in its energized position for energizing said electromagnetic means to operate said indicator.

5. A system for counting the number of vehicles passing over a section of roadway leading into a parking garage or the like, comprising a counter for indicating the number of vehicles in the parking garage, a first plurality of detectors spaced from one another laterally across the roadway a distance less than the width of a vehicle, a second plurality of detectors spaced from one another laterally across the roadway a distance less than the width of a vehicle, said first and second plurality of detectors being spaced from each other in the direction of travel a distance less than the length of a vehicle, means operated by a vehicle passing at least one of said first plurality of detectors and then at least one of said second plurality of detectors and subsequently clearing said first plurality of detectors for operating said counter to indicate a single additional vehicle in said parking garage, means operated by a second vehicle first passing said first plurality of detectors and then said second plurality of detectors and subsequently clearing said first plurality when a first vehicle is activating said first plurality of detectors for causing said counter to indicate another additional vehicle in said parking garage, and means operated by a vehicle first passing one of said second plurality of detectors and then said first plurality of detectors and subsequently clearing said second plurality of detectors for operating the counter to indicate a single less vehicle in the garage, and means operated by a vehicle first passing said second plurality of detectors and then said first detector and subsequently clearing said second detector when another vehicle is occupying said second detectors and traveling in the same direction to indicate another less additional vehicle in said garage.

6. A system for counting vehicles traveling over a section of roadway leading into a parking area, comprising a counter for indicating the number of vehicles in said parking area, an electromagnetic means operable when activated to cause said counter to indicate a change in

the number of vehicles in said parking area, a first vehicle detector and a second vehicle detector, said detectors being so disposed relative to one another that a vehicle entering said parking area first activates said first detector and then subsequently activates said second detector which is followed by the inactivation of said first detector and the subsequent inactivation of said second detector, a first circuit means responsive to the activation of said first detector followed by the activation of said second detector and the subsequent inactivation of said first detector for energizing said electromagnetic means to cause said counter to indicate the presence of an additional vehicle in said parking area, and a second circuit means responsive to the activation of said second detector followed by the activation of said first detector and the subsequent inactivation of said first detector followed by the inactivation of said second detector preventing the activation of said electromagnetic means whereby a vehicle traveling out of said parking area and then back into said parking area will not cause said counter to indicate a change in the number of vehicles in said area.

7. A system for counting vehicles entering and leaving a parking area, said parking area having a first section of roadway for vehicles entering said parking area and a second section of roadway for vehicles leaving said parking area, each of said sections of roadway being of sufficient width to accommodate at least two vehicles abreast, said system comprising a counter for indicating the number of vehicles in said parking area, a first electromagnetic means operative when activated to operate said counter to indicate a single vehicle entering said parking area and a second electromagnetic means operative when activated to operate said counter to indicate an additional single vehicle entering said parking area, said first and second electromagnetic means operative when activated simultaneously to cause said counter to indicate two vehicles entering said parking area, a third electromagnetic means and a fourth electromagnetic means, said third electromagnetic means being operative when activated to operate said counter to indicate a single vehicle leaving said parking area, and said fourth electromagnetic means operative when activated to operate said counter to indicate an additional single vehicle leaving said parking area, said third and fourth electromagnetic means operative when activated simultaneously to cause said counter to indicate two vehicles leaving said parking area, a first plurality of vehicle detectors activated by the presence of vehicles entering said parking area over said first section of roadway, a second plurality of vehicle detectors activated by the presence of vehicles traveling over said second section of roadway leaving said parking area, said first plurality of detectors being so laterally disposed relative to one another that the presence of a single vehicle in the first section of roadway activates at least one of said first plurality of detectors and not more than said one detector and another adjacent detector, and the presence of two laterally-spaced vehicles in said first section of roadway activates a third of said first plurality of detectors, said second plurality of detectors being so laterally disposed relative to one another that the presence of a single vehicle in said second section of roadway activates at least one of said second plurality of detectors and the presence of two laterally-spaced vehicles in said second section of roadway activates a third of said second plurality of detectors, both of said third detectors being non-adjacent to at least one of the first-named activated detectors, a first circuit means responsive to the activation by a first vehicle of one of said first plurality of detectors to energize said first electromagnetic means, a second circuit means responsive to the activated condition of said first plurality of detectors caused by a second vehicle in said first section of roadway and the presence of said first vehicle for energizing said second electromagnetic means, a third circuit means responsive

to the activation by a first exiting vehicle of said second plurality of detectors to activate said third electromagnetic means, and a fourth circuit means responsive to the activation of said second plurality of detectors caused by the presence of a second exiting vehicle and the presence of said first exiting vehicle in said second section of roadway for energizing said fourth electromagnetic means, whereby said counter can accurately indicate more than one vehicle entering and more than one vehicle leaving said parking area simultaneously.

8. A system for counting the number of vehicles passing over a section of roadway leading into a parking garage or the like, comprising first and second vehicle detectors, said first detector being spaced ahead of said second in the direction of movement of traffic, a counter for indicating the number of vehicles in said parking garage or the like, a first means responsive to the completing of a first electric circuit for causing said counter to move in one direction to indicate a single additional vehicle in said garage, a second means responsive to the completing of a second electric circuit for causing said counter to move in the other direction to indicate a single less vehicle in said garage, means responsive to the activation of said second detector by the presence of a vehicle for partially completing said second circuit, means responsive to the activation of said second detector and then the activation of said first detector by the presence of said vehicle followed by the inactivation of said second detector when said vehicle clears said second detector when traveling in a direction out of the parking garage for completing said second electric circuit, and means responsive to the activation of said second detector and then the activation of said first detector while said second detector is in a state of activation, followed by the subsequent inactivation of said first detector when said vehicle reverses its direction of travel from exiting to entering said parking garage for preventing said counter from registering a vehicle change, said first electric circuit being completed by activation of said first detector followed by the simultaneous activation of said second detector, and the subsequent inactivation of said first detector and said second electric circuit being completed by activation of said second detector followed by the simultaneous activation of said first detector, and the subsequent inactivation of said second detector.

9. A system for counting the number of vehicles passing over a section of roadway leading into a parking garage or the like, comprising first and second vehicle detectors, one of said detectors being spaced ahead of the other in the direction of movement of traffic a distance less than the length of a vehicle, a counter for indicating the number of vehicles in said parking garage or the like, a first means responsive to the completing of a first electric circuit for causing said counter to move in one direction to indicate a single additional vehicle in said garage, a second means responsive to the completing of a second electric circuit for causing said counter to move in the other direction to indicate a single less vehicle in said garage, means responsive to the activation of said second detector by the presence of a vehicle for partially completing said second circuit, means responsive to the activation of said second detector and then the activation of said first detector followed by the inactivation of said second detector when said vehicle clears said second detector when traveling in a direction out of the parking garage for completing said second electric circuit, time delay means responsive to activation of the second detector for partially completing said first electric circuit and responsive to said activation of said second detector during the activation of said first detector followed by the subsequent inactivation of said second detector to register no count upon the counter so as to provide a back up protection, subsequent entry of the vehicle into said parking area causing said first electric circuit to be completed by activation of said first detec-

tor followed by the simultaneous activation of said second detector and the subsequent inactivation of said first detector.

10. A system for counting the number of vehicles passing over a section of roadway of a parking garage or the like, said section of roadway being of sufficient width to accommodate at least two vehicles abreast, said system comprising a plurality of detectors laterally spaced across the roadway, each adapted to be actuated by registry therewith of a vehicle, said detectors having an effective lateral spacing from one another less than the width of a vehicle, a counter for indicating the number of vehicles in the parking garage, and means connecting said detectors to said counter to actuate said counter, said connecting means being operative to cause said counter to count only once when two adjacent detectors are actuated simultaneously.

11. A system for counting vehicles entering and leaving a parking area, said parking area having a first section of roadway for vehicles entering said parking area and a second section of roadway for vehicles leaving said parking area, each of said sections of roadway being of sufficient width to accommodate at least two vehicles abreast, said system comprising a counter for indicating the number of vehicles in said parking area, a plurality of vehicle entrance detectors, a plurality of vehicle exit detectors, said plurality of vehicle entrance detectors being so disposed laterally relative to one another that the presence of a single entering vehicle in the first section of roadway activates at least one of said entrance detectors and not more than said one detector and an adjacent entrance detector, and the presence of a second entering vehicle in said first section of roadway and laterally spaced from the first-named single vehicle activates a third of said entrance detectors, said plurality of vehicle exit detectors being so disposed relative to one another that the presence of a single exiting vehicle in the second section of roadway activates at least one of said exit detectors and not more than said one detector and an adjacent exit detector, and the presence of a second exiting vehicle in said second section of roadway and laterally spaced from the last-named single exiting vehicle activates a third of said exit detectors, said third detectors being non-adjacent to at least one of the first-named activated detectors of said entrance detectors and said exit detectors, two differentials, each of said differentials having three elements, means connecting said entrance detectors to a first element of one differential to advance said first element in one direction upon registry of a vehicle with one and not more than two adjacent entrance detectors, said connecting means being operative to advance a first element of the second differential in said one direction upon entry of two vehicles simultaneously, a second means connecting said exit detectors to a second element of one differential to advance said second element in the other direction upon registry of a vehicle with one and not more than two adjacent exit detectors, said second connecting means being operative to advance a second element of the second differential in said other direction upon the leaving of two vehicles simultaneously, a third differential having three elements, means connecting the third elements of the first two differentials, respectively, to two different elements respectively of the third differential, and means connecting the third element of the third differential to the counter to actuate said counter upon actuation of any element of the first two differentials.

12. A system for counting the number of vehicles passing over a section of roadway of a parking garage or the like, said section of roadway being of sufficient width to accommodate at least two vehicles abreast, said system comprising a plurality of detectors, each adapted to be actuated by the registry therewith of a vehicle, said detectors having an effective lateral spacing from one an-

other less than the width of a vehicle, a counter for indicating the number of vehicles in the parking garage, and means connecting said detectors to said counter to actuate said counter, said connecting means being operative to cause said counter to count only once when two laterally adjacent detectors are actuated simultaneously and being further operative to cause said counter to count twice when two laterally non-adjacent detectors are actuated simultaneously.

13. A system for counting the number of vehicles passing over a section of roadway of a parking garage or the like, said section of roadway being of sufficient width to accommodate two vehicles abreast, comprising a plurality of pairs of vehicle detectors spaced from one another transversely of the direction of vehicle travel, each pair consisting of first and second vehicle detectors spaced from one another in the direction of vehicle travel, so that they are activated successively by a vehicle traveling over said section of roadway, said pairs of detectors being so laterally disposed relative to one another that the travel of a single vehicle over said section of roadway activates the detectors of one pair and not more than said one pair of detectors and another adjacent pair of detectors, and travel of a second vehicle over said section of roadway in laterally-spaced relation to the first vehicle activates a third pair of detectors, said third pair of detectors being non-adjacent to at least one of said first two pairs, a counter for indicating the number of vehicles in said garage, means responsive to the activation of the first detector of any one of said pairs for partially completing a first electric circuit, means responsive to the activation of the second detector of any one of said pairs followed by inactivation of the first detector of any one of said pairs when either of said vehicles clears the previously-activated first detector for completing said first circuit, and means responsive to the activation of another of said second detectors followed by the inactivation of another one of said previously-activated first detectors for completing another electric circuit, means responsive to the completing of a first of said electrical circuits for causing said counter to indicate a single change in the number of vehicles in said parking garage, and means responsive to the completing of a second of said electrical circuits for causing said counter to indicate a second single change in the number of vehicles in said parking garage.

14. A system for counting the number of vehicles traveling over a section of roadway leading into a parking garage or the like, said roadway being of sufficient width to accommodate at least two vehicles abreast, comprising a counter for indicating the number of vehicles, a plurality of vehicle detection means arranged in first and second rows, said rows being perpendicular to the direction of vehicle travel and spaced from one another along the direction of vehicle travel a distance sufficient for activation of at least one detection means in each row by a single vehicle during a portion of its path of travel, said detection means being so positioned laterally with respect to one another in each row that at least two non-adjacent detection means in each row are activated in response to the presence of two vehicles traveling abreast of one another in said section of roadway, and a detection means of one row being aligned with a detection means of the other row in the direction of vehicle travel, means responsive to the activation of one of said detection means of said first row followed by activation of the aligned detection means of said second row, and the subsequent inactivation of said one detection means of said first row for completing a first electric circuit to actuate said counter to indicate a single change in the number of vehicles in said garage or the like, and means responsive to the activation of one of the non-adjacent detection means in said first row caused by the presence of an additional laterally-spaced vehicle and to the activation of said one of said first row detection means and

to the activation of said aligned detection means of said second row, and to activation of the non-adjacent detection means in the second row, which is aligned with the first-named non-adjacent detection means, followed by the inactivation of said non-adjacent detection means of said first row for completing a second electric circuit, to actuate said counter to indicate an additional vehicle change simultaneously with the indication of the vehicle change in response to said first circuit means.

15. A system for counting vehicle traveling over a section of roadway leading into a parking area, said section of roadway being of sufficient width to accommodate at least two vehicles abreast, comprising a counter for indicating the number of vehicles in said parking area, first means operative to operate said counter to indicate a single vehicle change in the number of vehicles in said parking area, a second means operative to indicate an additional single vehicle change in the number of vehicles in said parking area, a plurality of vehicle detectors arranged in first and second rows and activated by the presence of vehicles traveling in said roadway, said rows being spaced from one another in direction of vehicle travel, said detectors being so disposed laterally that travel of a single vehicle in said section of roadway activates at least one of said detectors in both rows and not more than one adjacent detector in each row, and the presence of two laterally-spaced vehicles in said roadway activates at least a third of said plurality of detectors in each row, said third detector in each row being non-adjacent to at least one of the detectors activated by the first vehicle, a relay associated with each of said detectors, means connecting each of said relays to its associated detector to energize said relay when said associated detector is activated by the presence of a vehicle, means responsive to the energizing of any one of the relays associated with said first row detectors for partially completing an electric circuit, means including two relays associated with non-adjacent detectors for partially completing a second electric circuit, means responsive to the energizing of any one of the second row relays and responsive to the deactivation of all of said first row relays for completing the first circuit to activate said first means, and means responsive to the activation of the relay associated with the third detector of the second row of detectors and to the partial completion of said first circuit and to the deactivation of the relay associated with the third detector of the first row of detectors for completing said second circuit to actuate said counter to indicate an additional vehicle change.

16. A system for counting vehicles passing along an access roadway of a parking garage or the like comprising two vehicle detectors spaced along the roadway for activation in a forward sequence by a vehicle passing along the roadway to enter the garage and in a reverse sequence by a vehicle passing along the roadway to leave the garage, a counter for indicating the cumulative algebraic total number of vehicles passing along the roadway, and means responsive to said detectors for actuating said counter to add one unit to the total in response to activation of said detectors in one of said sequences and to subtract one unit in response to activation of said detectors in the other one of said sequences, said detector responsive means being inoperative to actuate said counter in response to a successive actuation of said detectors followed by deactivation of the second activated one thereof during the continued activation of the first activated one thereof and the subsequent deactivation of the first activated one, whereby no count is made for a vehicle which enters the roadway, stops while both detectors are activated by it, and then leaves the roadway in the direction from which it came.

17. A system for counting vehicles passing along an access roadway of a parking garage or the like comprising two vehicle detectors spaced along the roadway for successive activation by a vehicle passing along the road-

way in a selected direction, the spacing between said detectors being such that both detectors are activated for a common interval during the passage thereby in said selected direction of each vehicle to be counted yet such that they may be separately activated by respective successive vehicles, a counter, and means responsive to said detectors for actuating said counter including electrical circuit means for actuating said counter twice in response to the passage along the roadway of two successive vehicles spaced so closely that for an interval one of the vehicles activates one of said detectors while the other vehicle activates the other detector.

18. A system for counting vehicles passing along an access roadway of a parking garage or the like comprising two vehicle detectors spaced along the roadway for activation in a predetermined sequence by a vehicle passing along the roadway in a selected direction, the spacing between said detectors being such that both said detectors are activated for a common interval during the passage thereby of each vehicle to be counted yet such that said detectors may be separately activated by respective successive vehicles, a counter, means responsive to activation of said detectors in said predetermined sequence followed by the deactivation of the first activated one of said detectors for actuating said counter, and means operatively connecting said detector responsive means to said counter to render said counter operative to make a succeeding count even though said first activated detector is reactivated by a succeeding vehicle during the time the first vehicle continues to activate said second actuated detector.

19. A system for counting vehicles passing along an entrance roadway of a parking garage or the like comprising first and second vehicle detectors spaced along the roadway for successive activation by a vehicle passing along the roadway in a selected direction, the spacing between said detectors being such that both detectors are activated for a common interval during the passage thereby of each vehicle to be counted yet such that they may be separately activated by respective successive vehicles, a counter, and means responsive to actuation of said detectors by vehicles moving in said selected direction for actuating said counter twice upon (a) activation of said first detector by a first vehicle, (b) activation of said second detector by said first vehicle as it moves on in said selected direction, (c) deactivation of said first detector as said first vehicle passes beyond said first detector, (d) reactivation of said first detector by a second vehicle moving in said selected direction, (e) deactivation of said second detector by said first vehicle passing beyond said second detector, (f) reactivation of said second detector by said second vehicle moving on in selected direction and (g) deactivation of said first detector by said second vehicle passing beyond said second detector.

20. A system for counting vehicles passing over an access roadway of a parking garage or the like, the roadway being sufficiently wide to accommodate at least two vehicles abreast, said system comprising a plurality of vehicle detectors arranged in two longitudinally spaced, laterally extending rows adjacent to the roadway for detecting vehicles passing therealong, the lateral spacing between said detectors being less than the width of a

vehicle to be counted, the number of detectors in each row being greater than the number of vehicles the roadway will accommodate abreast, the longitudinal spacing between said rows being such that at least one of said detectors of each row is activated for a common interval during the passage thereby of each vehicle to be counted yet such that corresponding detectors of the different rows may be activated for a common interval by different vehicles, a counter, and means responsive to said detectors for actuating said counter, said detector responsive means being operative to actuate said counter to indicate only a single count in response to a predetermined sequence of activation and deactivation of said detectors when only two adjacent detectors of each row are sequentially activated and deactivated, and being operative to actuate said counter to indicate a double count when two non-adjacent detectors of each row are activated and deactivated in said predetermined sequence.

21. A system for counting vehicles passing over an access roadway of a parking garage or the like, the roadway being sufficiently wide to accommodate at least two vehicles abreast, said system comprising a plurality of vehicle detectors arranged in two longitudinally spaced, laterally extending rows adjacent to the roadway for detecting vehicles passing therealong, the lateral spacing between said detectors being less than the width of a vehicle to be counted, the number of detectors in each row being greater than the number of vehicles the roadway will accommodate abreast, the longitudinal spacing between said rows being such that at least one of said detectors of each row is activated for a common interval during the passage thereby of each vehicle to be counted yet such that corresponding detectors of the different rows may be activated for a common interval by different vehicles, a counter, and means responsive to said detectors for actuating said counter, said detector responsive means being operative to actuate said counter to indicate only a single count in response to a predetermined sequence of activation and deactivation of said detectors when only two adjacent detectors of each row are sequentially activated and deactivated, and being operative to actuate said counter to indicate a double count when two non-adjacent detectors of each row are activated and deactivated in said predetermined sequence, said detector responsive means being further operative while one of said detectors remains continuously activated and also while one of said detectors in one row and a corresponding detector in the other row remain continuously activated to actuate said counter in response to activation and deactivation in said predetermined sequence of one of said detectors non-adjacent to said one detector and of one of said detectors non-adjacent to said corresponding detector, whereby said system continues to count vehicles passing along a clear lane of the roadway while another vehicle remains parked blocking a lane.

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