

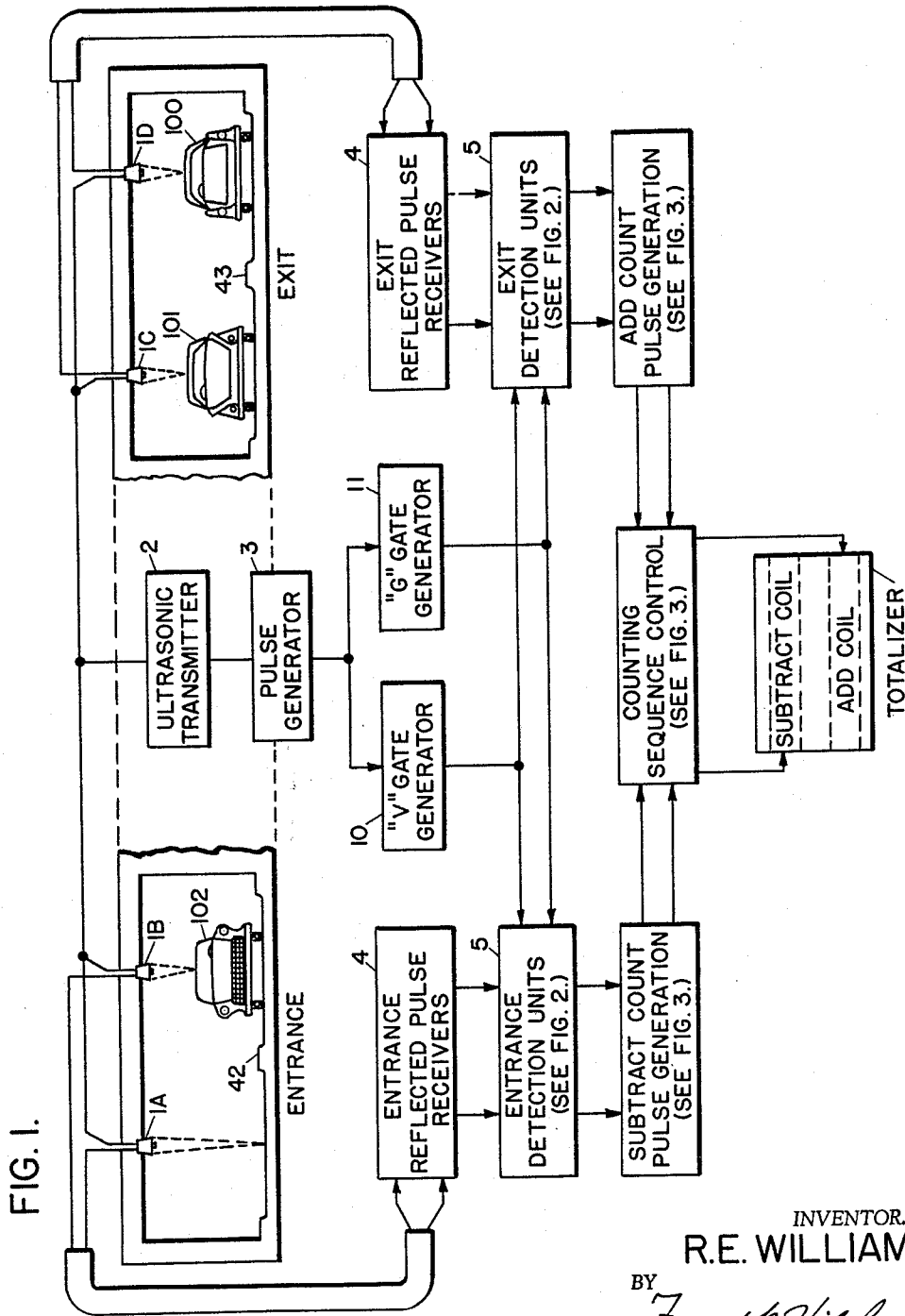
July 9, 1963

R. E. WILLIAMS  
TRAFFIC COUNTING SYSTEM

3,097,295

Filed June 8, 1961

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

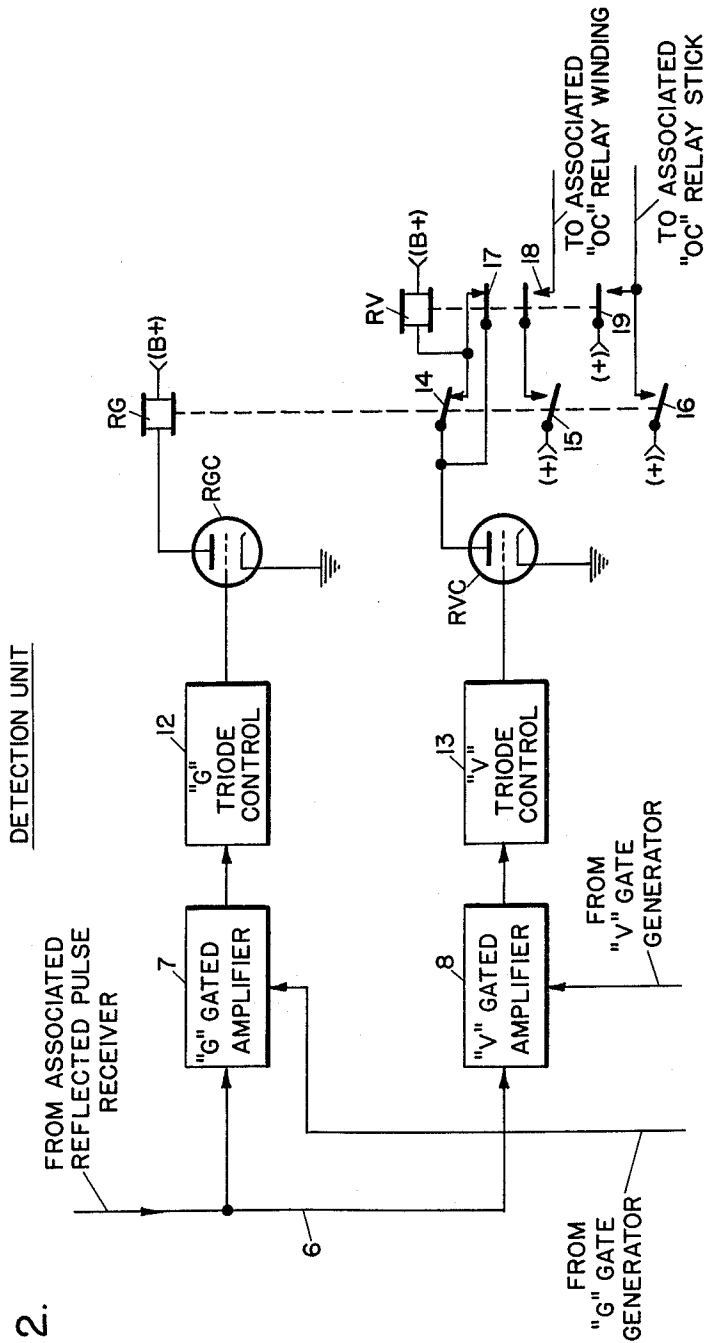


FIG. 2.

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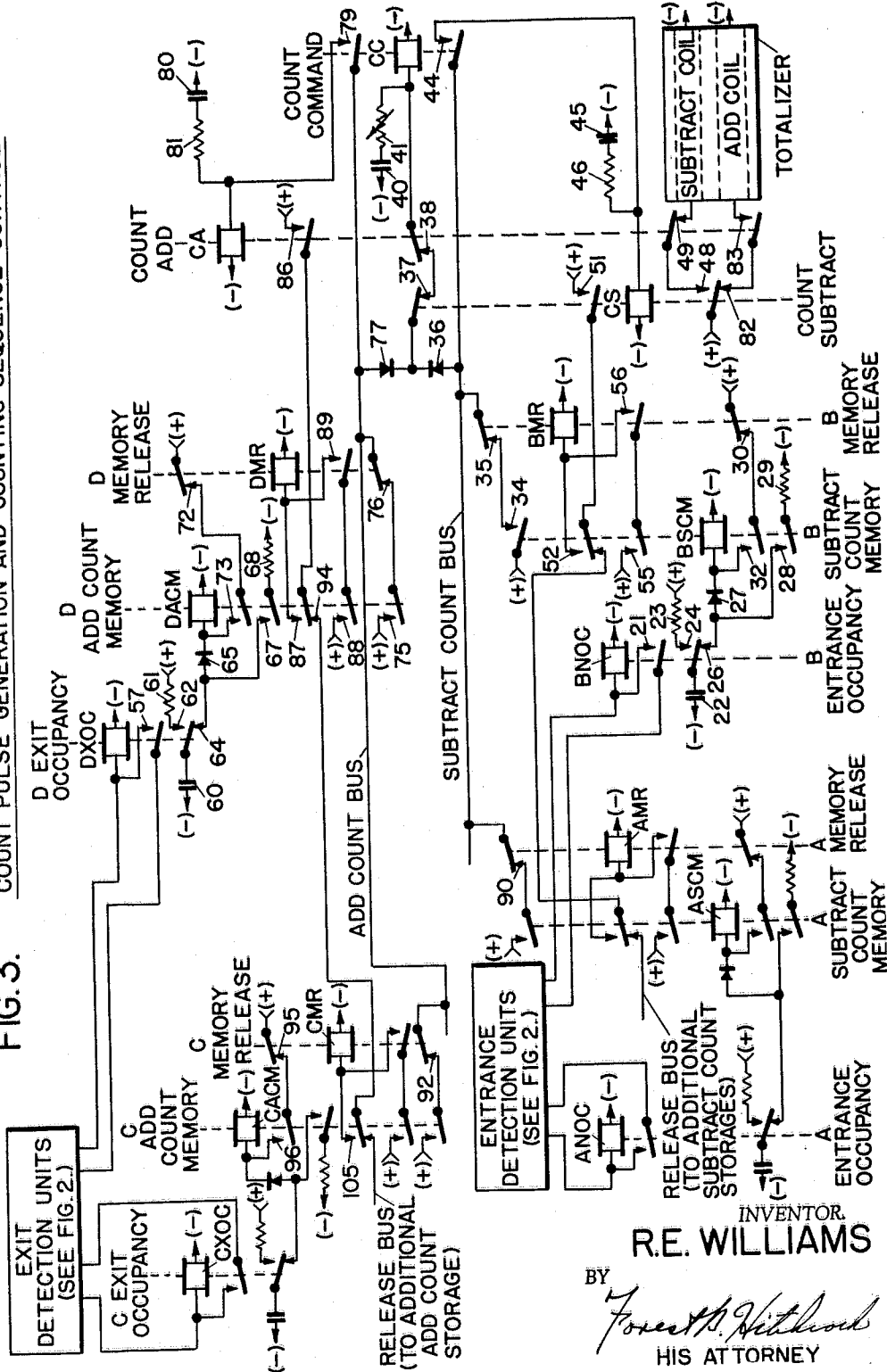
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FIG. 3. COUNT PULSE GENERATION AND COUNTING SEQUENCE CONTROL



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3,097,295

## TRAFFIC COUNTING SYSTEM

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Filed June 8, 1961, Ser. No. 115,788  
1 Claim. (Cl. 235—92)

This invention relates to a traffic counting system, and more particularly, pertains to such a system for counting vehicles entering and exiting a designated area by means of separate passage ways where such entering and exiting may occur at spaced time intervals or simultaneously.

The efficient handling of large traffic loads in metropolitan areas requires, as a requisite, the maintenance of accurate running totals of the spaces available in a designated parking area. Moreover, such running totals should be accurately maintained irrespective of the rapidity with which vehicles enter into and exit from such designated parking area.

It is considered necessary with the presently utilized vehicle detection and counting methods using treadles, light beams etc. to either count vehicles which enter into and exit from a designated parking area at different times or to provide a storage of vehicle counts representative of the entering and/or exiting vehicles which at some later time are effective to operate an available space totalizer in sequence. It is apparent that these utilized methods of vehicle detection and counting into and out of a designated parking area are adequate for normal traffic flow conditions, but under heavy traffic flow conditions, the counting of vehicles and effective control of the available space totalizer does not occur with the most efficient and favorable results.

It is proposed in this invention to employ a detection system of the ultrasonic type such as that disclosed by Kendall et al. in their pending application Serial No. 808,736, filed on April 24, 1959, now Patent No. 3,042,303, issued July 3, 1962. With such a detecting system, many of the inaccuracies inherent with the presently used detection systems are overcome to the extent that only vehicles are detected thereby and not extraneous objects such as people, animals, and the like. This ultrasonic detection system in combination with the present traffic counting system disclosed herein affords a versatile counting system which can maintain an accurate count of the spaces available within a designated parking area without impeding the maximum flow of traffic into and out of the area.

In the present invention each vehicle entering a designated parking area subtracts a count from a space totalizer. Each exiting vehicle adds a count to the totalizer. It is proposed in this invention to provide a system for expediting the totalizing of available spaces on the space totalizer by effecting a count cancelling operation when concurrently both an entering and an exiting vehicle are detected.

The present invention provides several advantages over the prior art with respect to counting vehicular traffic into and out of a parking area. One advantage of this invention is the provision of a counting system which is highly efficient under conditions of a normal traffic flow into and out of a designated parking area as well as under conditions of heavy traffic flow therein. Another advantage of this invention is the provision of a system which will accurately maintain a running count of spaces available within a designated parking area at any given time irrespective of the variability of traffic flow conditions.

Thus, one object of this invention is to provide a system for accurately counting vehicles entering and exiting a designated area so as to maintain an accurate and corresponding running count of the spaces available within the parking area at any given time.

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Another object of this invention is to provide a system for maintaining a single accurate total of "add" and "subtract" counting pulses where such pulses occur simultaneously and at different times.

5 Another object of this invention is to provide a system for maintaining a single accurate space total of available spaces within a designated parking area irrespective of the traffic flow conditions into and out of such parking area.

10 Another object of this invention is to provide a system for maintaining a single accurate space total of available spaces in a designated parking area where counting pulses for entering and exiting vehicles which occur at least substantially simultaneously provide a cancelling control in the system.

15 Other objects, purposes and characteristic features of the present invention will be in part obvious from the accompanying drawings, and in part pointed out as the description of the invention progresses.

20 For the purpose of simplifying the illustration and facilitating in the explanation, the various parts and circuits constituting the embodiment of the invention have been shown diagrammatically and certain elements have been left in block form, the drawings have been made more with the purpose of making it easy to understand the principles and mode of operation than with the ideas of illustrating the specific construction and arrangement of parts that would be employed in practice. Thus, the various relays and their contacts are illustrated in a conventional manner, and the symbols (+) and (—) are employed to indicate the positive and negative terminals respectively of suitable batteries, or other sources of direct current; the circuits with which these symbols (+) and (—) are used always have current flowing in the same direction.

25 In describing the invention in detail reference will be made to the accompanying drawings, in which like reference characters designate corresponding parts throughout the several views and in which:

30 FIG. 1 is a block diagram of the entire circuit of one embodiment of this invention;

35 FIG. 2 illustrates in combination block and schematic diagram one single detection unit of the type employed in multiple form as referred to in FIG. 1; and

40 FIG. 3 illustrates in schematic form the Count Pulse Generation and Counting Sequence Control circuits referred to in FIG. 1.

45 In the embodiment illustrated in FIG. 1, it is assumed that the invention herein is being utilized to monitor a parking area having a double lane entrance and a double lane exit. The following detailed description of the circuits which make up the various components of this illustrated embodiment shall be divided into two distinct parts, namely, Detection and Count Pulse Generation and Counting Sequence Control. While each of these parts is integral to the invention herein, each can be understood without extensive reference to the other parts, and for this reason, it is felt that this method will facilitate in disclosing the invention.

### Detection

50 The type of ultrasonic detection system suggested by FIG. 1 utilizes transducers 1 suffixed A through D which suffixed correspond to the detection zones defining the entrance and exit of a designated parking area as determined by the width of the beam of ultrasonic energy transmitted by each transducer 1A, 1B, 1C and 1D. Transducers 1A and 1B are considered to be sufficient to monitor the double entrance lane, while transducers 1C and 1D are considered to be sufficient to monitor the double exit lane.

55 A single Ultrasonic Transmitter drives each transducer

1, causing each transducer 1 to transmit a series of intermittent, short pulses of ultrasonic energy. The pulse repetition rate of this transmitted signal is controlled by Pulse Generator 3 and is selected so that the time between each transmitted pulse is sufficient to allow for the receipt of pulses reflected from the floor of the respective passageway back to transducers 1.

Each transducer 1 is connected to its own particular Reflected Pulse Receiver 4 which is adapted to amplify, filter and rectify the reflected pulses of ultrasonic energy received by each respective transducer 1. The filtered and rectified reflected pulses are then fed to respective Detection Units 5.

Referring to FIG. 2, reflected pulses fed to each Detection Unit 5 over line 6 are fed to Gated Amplifiers 7 and 8 which are gated, respectively, by a "G" gate and a "V" gate. Gate Generators 10 and 11 (see FIG. 1) are triggered by pulse Generator 3 which also triggers the common Ultrasonic Transmitter 2, as mentioned above. The gates are chosen so that only pulses reflected from the floor of the passageway will be passed through "G" Gated Amplifier 7, while any pulses reflected from the surface of vehicles passing through the respective detection zones will be gated through "V" Gated Amplifier 8.

R-C time constant circuits represented in block form as "g" Triode Control 12 and "v" Triode Control 13 cause the build-up of cut-off bias on the grids of Relay Control Triodes RGC and RVC in accordance with the reception of reflected pulses passed by Gated Amplifiers 7 and 8. Thus, when a steady succession of pulses is passed by one of the Gated Amplifiers, its corresponding Relay Control Triode is cut-off. Since a steady train of pulses is normally reflected from the floor of the passageway when no vehicle is present within the detection zone, and since these pulses arrive during the "on" portion of the "G" gate, triode RGC is normally cut-off. At the same time, when vehicles are not present within a particular detection zone, no pulses are being received during the "on" portion of the "V" gate, and the triode RVC is normally conducting.

Conversely, the presence of a vehicle within the detection zone cuts off the normally present stream of pulses reflected from the floor of the passageway, and, instead, pulses are reflected from the surface of the passing vehicle and are received during the "on" portion of the "V" gate. As the result of this, triode RGC begins to conduct, while triode RVC becomes cut off.

When triode RGC is conducting, a circuit is closed from (B+) through the winding of relay RG, through the triode RGC from plate to cathode through the grid thereof, to ground which causes relay RG to pick up. However, since reflections are normally being received from the floor of the passageway, triode RGC is normally cut-off thus opening the circuit to the winding of the relay RG which causes such relay RG to be normally dropped away, as shown, thus closing back contact 14 and opening front contacts 15 and 16 thereof.

It should also be obvious that as long as triode RVC is normally conducting and triode RGC is cut-off, a circuit is closed from (B+), through the winding of relay RV, through back contact 14 of relay RG, through triode RVC from plate to cathode through the grid thereof, to ground which causes relay RV to remain picked up. The stick circuit for relay RV provided through a front contact 17 thereof assures that relay RV will remain picked up as long as no signal is received during the "V" gate. Thus, even though a person or animal walking through the detection zone may cut off the chain of pulses normally reflected from the floor of the passageway which causes relay RG to pick up temporarily, no reflections are received during the "V" gate (the transmitted pulses of ultrasonic energy being absorbed by the person or animal and not reflected), and the stick circuit maintains relay in its picked up position. In this way, the presence of a person or animal within the detection zone may cause

the closing of front contacts 15 and 16 of relay RG, but the detection zone occupancy circuits including front contacts 15 and 16 of relay RG and back contacts 18 and 19 of relay RV remain open.

On the other hand, whenever a vehicle appears within the detection zone associated with a particular detection unit, relay RG picks up and relay RV drops away closing front contacts 15 and 16 of relay RG and back contacts 18 and 19 of relay RV. This completes the detection zone occupancy circuit and causes the picking up and sticking of an occupancy ("OC") relay associated with that particular detection zone.

It should be noted that if the vehicle passing through a particular detection is a convertible, the fabric top of which will absorb rather than reflect the beamed pulses of ultrasonic energy, the temporary loss of reflections from the surface of the passing convertible will not cause the triode RVC to conduct as might be expected inasmuch as the plate circuit of triode RVC remains open at the open back contact 14 of relay RG as long as no pulses are being reflected from the floor of the passageway due to the presence of the vehicle. Obviously, front contact 17 of relay RV is open at this time since relay RV has been dropped away due to the cutting off of triode RVC in response to the reception of pulses reflected from the hood of the convertible during the "on" portion of the "V" gate.

As a vehicle completes its passage through its detection zone, pulses are once again received from the floor of the passageway and arrive during the "on" portion of the "G" gate, and relays RG and RV drop away and pick up once again, respectively, as described above. This opens the detection zone occupancy circuit at front contacts 15 and 16 of relay RG and back contacts 18 and 19 of relay RV thus allowing the associated occupancy ("OC") relay to drop away once more.

Thus, it can be seen that the detection units corresponding to each detection zone cause an associated occupancy relay to pick up and stick during the time the vehicle is present in that particular detection zone.

Hereinafter, the chain of events which has just been described will not be referred to again. In view thereof, it will be merely assumed that a particular occupancy relay is operated to its picked up position whenever a vehicle is present within the detection zone corresponding to that particular relay.

#### Count Pulse Generation and Counting Sequence Control

Each vehicle entering the parking area defined by the entrance way and exit way illustrated in FIG. 1 represents one less available vehicle space within such area, while each vehicle leaving such area represents one additional available parking space. With a totalizer originally set to indicate the total number of spaces available within the parking area, a running count of the number of spaces available at any given time can be maintained by subtracting one unit from the totalizer for each vehicle entering the area and adding one unit for each vehicle exiting from the area where such entering and exiting occurs at different times. When one vehicle is detected as entering the area at least substantially simultaneously with the detection of another vehicle exiting from the area, a cancelling circuit control becomes effective which prevents operation of the totalizer, but yet maintains an accurate count of the spaces available in the parking area.

FIG. 3 shows the Count Pulse Generation and Counting Sequence Control circuits for vehicles entering the parking area and for vehicles exiting from the parking area with a totalizer being controlled according to the effectiveness of the cancel circuit control.

In general, the Count Pulse Generation circuit of FIG. 3 comprises two occupancy relays corresponding to the detection zones 1A and 1B of the entrance way and two occupancy relays corresponding to the detection zones 1C and 1D of the exit way. It is noted in FIG. 1 that

the detection zones 1A and 1B of the entrance way are separated by an intervening barrier 42 which causes vehicle travelling therein to remain within the respective detection zones 1A and 1B. Similarly, a barrier 43 is included between the detection zones 1C and 1D for the exit way, thus requiring the vehicles travelling in such detection zones 1C and 1D to remain therein. However, the use of such barriers is by no means essential to the practice of this invention since, as shown in the copending application of Norman A. Bolton, Serial No. 82,903, filed January 16, 1961, it is possible to separately register a plurality of vehicles passing simultaneously through a multilane passageway even when there are no lane restrictions such as may be provided by barriers.

The occupancy relays corresponding to detection zones 1A and 1B are designated ANOC and BNOC, while the occupancy relays corresponding to detection zones 1C and 1D are designated CXOC and DXOC. Each occupancy relay is individually energized when a vehicle is detected as having entered the respective detection zone and is maintained picked up so long as such vehicle is present within the detection zone. A stick or holding circuit is provided for each occupancy relay which insures the continued energization of an occupancy relay when either relay RV is dropped away or relay RG is picked up. The operation of these occupancy relays will be explained in more detail hereinafter for a typical operation. For the present, it is only necessary that it be understood that relays ANOC and BNOC each generate a subtract pulse upon the entrance of a vehicle through the respective detection zones 1A and 1B, while the relays CXOC and DXOC generate an add pulse upon the exit of a vehicle through respective detection zones 1C and 1D.

As shown in FIG. 3, the respective generated add pulses and subtract pulses are supplied to Counting Sequence Control circuits which, respectively, are effective to temporarily store such pulses and to transfer them to the totalizer when such pulses occur in sequence. When such pulses occur simultaneously or substantially simultaneously, a cancelling circuit control becomes effective to prevent operation of the totalizer. The totalizer thus maintains a running count of the spaces available within the designated area monitored by this invention.

The add coil pulses generated by occupancy relays ANOC and BNOC are stored by respective memory relays ASCM and BSCM, while the add pulse generated by occupancy relays CXOC and DXOC are stored by memory relays CACM and DACM. Count add relay CA and count subtract relay CS, in conjunction with count command relay CC, send control pulses to the totalizer when such relays CA and CS are picked up in sequence, but no such control pulses are sent to the totalizer when the relays CA and CS are picked up concurrently as will be explained more fully hereinafter. Release relays AMR, BMR, CMR and DMR are employed to clear their respective memory relays after the count pulses stored thereon have been either transposed to the totalizer or cancelled according to the cancel circuit control.

The cancel circuit control is comprised of contacts of the relays CA and CS which are connected in a manner for supplying pulses to the totalizer only when relays CA and CS are energized at different times. More particularly, in order to energize the subtract coil of the totalizer when a vehicle enters the designated parking area, energy is supplied through a front contact of the relay CS and a back contact of the relay CA. Similarly, to energize the add coil of the totalizer when a vehicle leaves the parking area, energy is supplied through a back contact of relay CS and a front contact of relay CA. With these contacts interconnected in this manner, the simultaneous energization of relays CA and CS permits these contacts to effect a cancelling control which prohibits the energization of either the subtract coil or

add coil of the totalizer, as will be explained more fully hereinafter.

Assuming a vehicle is entering the parking area through the entranceway and detector zone 1B, it is detected in the manner described above with Entrance Occupancy relay BNOC being controlled to a picked up condition. Relay BNOC is held in its picked up condition by a stick or holding circuit as partially described above (FIG. 2) and including its front contact 21. This stick circuit is maintained complete until the reversal of operation for relays RG and RV as described above which drops relay BNOC in a period of time.

In the picked up condition of relay BNOC, capacitor 22 is charged by a circuit extending from (+) through a resistor 23, through front contact 24 of relay BNOC, through the capacitor 22, to (-). When relay BNOC is dropped away (representative of the assumed vehicle's passing out of the detection zone 1B), the charge on capacitor 22 energizes Subtract Count Memory relay BSCM by a circuit extending from the positive (+) side of capacitor 22, through back contact 26 of relay BNOC, through diode 27, through the winding of relay BSCM, to (-). When relay BSCM picks up, a discharge path for capacitor 22 is completed through front contact 28 of relay BSCM, resistor 29, to (-) to insure complete discharge thereof. Relay BSCM is maintained in a picked up condition by a stick circuit extending from (+), through back contact 30 of Memory Release Relay BMR, through front contact 32 of relay BSCM, through the winding of relay BSCM, to (-).

In the picked up condition of relay BSCM, Count command Relay CC is energized by a circuit extending from (+), through front contact 34, through back contact 35 of relay BMR, through diode 36, through back contact 37 of Count Subtract Relay CS, through back contact 38 of Count Add Relay CA, through the winding of relay CC, to (-). This circuit, in addition, charges capacitor 40 through resistor 41 connected in shunt with relay CC and provided for controlling the drop away time of such relay CC.

The picking up of relay CC completes a circuit for relay CS which extends from (+), through front contact 34 of relay BSCM, through back contact 35 of relay BMR, through front contact 44 of relay CC, through the winding of relay CS, to (-). This circuit, in addition, charges capacitor 45 through a resistor 46 connected in shunt with relay CS and provided for controlling the drop away time of such relay CS. In the picked up condition of relay CS, a circuit is completed to the subtract coil of the totalizer which extends from (+), through front contact 48 of relay CS, through back contact 49 of relay CA, through the subtract coil winding, to (-). The totalizer thus displays one less available space which is indicative of an entered vehicle.

The picking up of relay CS also interrupts the energizing circuit for relay CC which circuit includes back contact 37 of relay CS as described above. The relay CC is then dropped away in a period of time dependent upon the discharge of capacitor 40 therethrough. Before such relay CC is dropped away and after relay CS is picked up, a circuit is completed for energizing relay BMR which extends from (+), through front contact 51 of relay CS, through front contact 52 of relay BSCM, through the winding of relay BMR, to (-). The picking up of relay BMR interrupts the energizing circuit for relay CS through the back contact 35 of relay BMR as described above. Relay CS is then dropped away after a time dependent upon the time constant for the discharge of capacitor 45 through resistor 46 and the winding of relay CS. The picking up of relay BMR also opens the stick circuit for relay BSCM thus dropping such relay BSCM. Relay BMR has its energizing circuit interrupted at front contact 51 of relay CS upon the dropping of relay CS and is dropped away. A stick circuit for relay BMR extending from (+), through front

contact 55 of BSCM, through front contact 56 of relay BMR, and through the winding of relay BMR is provided to prevent pulsing of relay BMR. Thus, the relays CC, CS, BSCM and BMR are once again dropped away and positioned in readiness for another count as received by relay BNOC.

Assuming now a vehicle exits from the vehicle parking area through the exit way and detection zone 1D and is detected in the manner described above. The Exit Occupancy Relay DXOC would be controlled to a picked up condition and would be maintained in such picked up condition by a stick circuit including its front contact 57. In the picked up condition of relay DXOC, a capacitor 60 is charged from (+), through a resistor 61, through front contact 62 of relay DXOC, through resistor 60, to (-).

When relay DXOC drops away (representative of the assumed vehicle passing out of the detection zone 1D), the Add Count Memory Relay DACM is energized by the circuit extending from the positive (+) side of capacitor 60, through back contact 64 of relay DXOC, through diode 65, through the winding of relay DACM, to (-). When relay DACM picks up, a discharge path for capacitor 60 is completed through back contact 64 of relay DXOC, through front contact 67 of relay DACM, through resistor 68, to (-). Also, a stick or holding circuit extends from (+), through back contact 72 of Memory Release Relay DMR, through front contact 73 of relay DACM, through the winding of relay DACM, to (-).

The Count Command Relay CC is controlled to a picked up condition once again by a circuit extending from (+), through front contact 75 of relay DACM, through back contact 76 of relay DMR, through a diode 77, through back contact 37 of relay CS, through back contact 38 of relay CA, through the winding of relay CC, to (-). Capacitor 40 is once again charged through resistor 41 and affects the drop away time of relay CC.

In the picked up condition of relay CC, relay CA is energized by a circuit extending from (+), through front contact 75 of relay DACM, through back contact 76 of relay DMR, through front contact 79 of relay CC, through the winding of relay CA, to (-). Capacitor 80 is charged through such circuit and through a resistor 81 and is provided for controlling the drop away time of relay CA.

In the picked up condition of relay CA, a circuit is completed to the add coil included with the totalizer which extends from (+), through back contact 82 of relay CS, through front contact 83 of relay CA, through the add coil winding, to (-). Thus, a count is added to the available space total displayed by the totalizer which is indicative of an additional parking space available.

The picking up of relay CA also interrupts the energizing circuit for relay CC which circuit includes back contact 38 of relay CA as described above. The relay CC is then dropped away in a period of time dependent upon the discharge of capacitor 40 therethrough. Before such relay CC is dropped away and after relay CA is picked up, a circuit is completed for energizing relay CMR which extends from (+), through front contact 86 of relay CA, through front contact 87 of relay DACM, through the winding of relay DMR, to (-). The picking up of relay DMR interrupts the energizing circuit for relay CA through back contact 76 of relay DMR as described above. Relay CA is then dropped away after a time dependent upon the time required for capacitor 80 to discharge through resistor 81 and the winding of relay CA. The picking up of relay DMR also opens the stick circuit for relay DACM thus dropping such relay DACM. Relay DMR has its energizing circuit interrupted at front contact 86 of relay CA upon the dropping of relay CA and is dropped away. A stick circuit for relay DMR extending from (+), through front contact 88 of relay DACM, through front contact 89 of relay DMR, through the

winding of relay DMR, to (-), is provided to prevent pulsing of relay DMR. Thus, the relays CC, CA, DACM and DMR are once again dropped away and positioned in readiness for another count as received by relay DXOC.

If it is alternatively assumed that a vehicle enters the parking area by way of detection zone 1A, the relays ANOC, ASCM, CC, CS and AMR would be controlled similarly to that described above for the relays of the detection zone 1B. In this respect, a Subtract Count Bus extends from the heel of contact 35 for relay BMR to the heel of a contact 90 of relay AMR and is indicated as being extended therebeyond for the inclusion of other detection zones. It is apparent from FIG. 3 that the relays CC and CS would be controlled in the manner described above for causing the subtract coil of the totalizer to be pulsed once for subtracting a count therefrom.

If it is assumed that a vehicle is exiting from the designated parking area through detection zone 1C, the relays CXOC, CACM, CMR, CC and CA are controlled similarly to that described above for the detection zone 1D. In this respect, it is noted that an Add Count Bus extends from the heel of contact 76 for relay DMR to the heel of a contact 92 of relay CMR therebeyond for connection to additional exit detection zone circuits. Relays CC and CA are controlled similar to that described above for detection zone 1D for causing pulsing energy to be supplied to the add coil of the totalizer. Thus, an add count is registered on the totalizer which is indicative of another vehicle exiting from the designated parking area.

It should now be obvious, if it is assumed that a vehicle is detected as passing out of either of the entrance detection zones 1A or 1B and a vehicle is detected as passing out of either of the exit detection zones 1C or 1D concurrently, that relays CA and CS would be controlled to picked up conditions in the manner described above and according thereto. It is obvious in FIG. 3 that with both relays CS and CA picked up, the circuit for controlling the subtract coil and the circuit for controlling the add coil included with the totalizer are interrupted thus effecting a cancelling control of the vehicle counts. This concurrent detection of two entering and existing vehicles causes the totalizer to remain inoperative to thus maintain the existing count thereon. In this way, the available spaces within the parking area will be maintained at an accurate count by the totalizer with an increased efficiency being obtained under varying traffic flow conditions.

It is apparent from the drawings that two vehicles may be exiting or entering the assumed parking area through the respective detection zones 1C—1D and 1A—1B either simultaneously or substantially simultaneously. In this connection, the counting sequence control circuits of FIG. 3 must be effective to recognize this time sequence.

If it is assumed that two vehicles 100 and 101 are exiting through detection zones 1C and 1D simultaneously while another vehicle 102 is entering through detection zone 1B (as shown in FIG. 1), an understanding can be had of the applicability of this invention to provide adequate counting control thereof.

For the two exiting vehicles 100 and 101, the occupancy relays CXOC and DXOC are controlled as described above while the respective count memory relays CACM and DACM would be additionally controlled as described. It is apparent from FIG. 3, however, that the relay DACM would be effective to control the relays CC and CA in view of the fact that the relay CMR has its energizing circuit completed through a back contact 94 of relay DACM. Thus, the relay CACM would be maintained stuck up by a circuit extending from (+), through back contact 95 of relay CMR, through front contact 96 of relay CACM, through the winding of relay CACM, to (-).

Since it is assumed vehicle 102 is also entering through detection zone 1B simultaneously with the exiting of two vehicles through detection zones 1C and 1D, the relays BNOC and BSCM are controlled for subsequently con-

trolling the relays CC and CS. With the relays CA and CS being energized simultaneously, pulsing energy remains disconnected from the add and subtract coils of the totalizer.

When the relay DACM becomes deenergized in the manner described above, the energizing circuit for relay CMR including back contact 94 of relay DACM and front contact 105 relay CACM is completed and relays CC and CA can then both be energized once more, this time through the respective contacts of relays CACM and CMR which control the energization of the Add Count Bus. A pulse of energy is then supplied to the add coil of the totalizer by a circuit extending from (+), through back contact 82 of relay CS, through front contact 83 of relay CA, through the add coil of the totalizer, to (-).

If the conditions were reversed, i.e., two vehicles were assumed to be entering simultaneously through the Entrance defined by detection zones 1A and 1B while one vehicle was exiting from the Exit defined by either detection zone 1C or 1D, the subtract coil of the totalizer would be pulsed once. If it was assumed that two vehicles were entering through detection zones 1A and 1B while two vehicles were exiting through detection zones 1C and 1D, the subtract and add coils of the totalizer would remain deenergized even though counts were stored by the respective relays CACM and ASCM for a period of time. In order that the counting of vehicles be more effective for substantially and simultaneously appearing vehicles the control of relay CC has been made variable through an adjustable resistor 41 which controls the release time through the discharge of capacitor 49. Also, it is noted that the relays AMR, BMR, CMR and DMR are assumed to be fast pick up type relays with respect to the other relays mentioned herein in order that the time required for control energy to be supplied through a front contact of each respective count memory relay be as brief as possible.

Having described a traffic counting system as one specific embodiment of the present invention, it is to be understood that this form is selected to facilitate in the disclosure of the invention rather than to limit the number of forms which it may assume: and, it is to be further understood that various modifications, adaptations, and alterations may be applied to the specific form shown to meet the requirements of practice without in any manner departing from the spirit or scope of the present invention.

What I claim is:

In a system for registering the number of vehicles en-

tering into and exiting from a parking area having at least one entrance passageway and at least one exit passageway, the combination comprising, vehicle detection means for each passageway producing an output signal upon the passage of a vehicle through the respective passageway, first and second storage means each registering the number of output signals produced by the plurality of vehicle detector means associated respectively with the entrance and exit passageways, an add-subtract counter having two input terminals and operating a single step in one counting direction upon the application of a control manifestation to one of its input terminals and operating a single step in the opposite counting direction upon the application of a control manifestation to the other of its input terminals, means responsive to the registration by said first storage means of one of said output signals for applying a control manifestation to said one terminal of said counting means and being responsive to the registration by said second storage means of one of said output signals for applying a control manifestation to said other of said terminals, means operable upon the operation of said counter by a single step to remove a single count from whichever of said storage means provided the last operation of said counter, said responsive means being also responsive to the concurrent registration by both said storage means of at least one count for removing from both said storage means a single count registered thereon without operating said counter, said responsive means completing an energization circuit to said one terminal of said counter when a count is registered by said first storage means but concurrently opening any energization circuit to said other said terminal, and said responsive means also completing an energization circuit to said other terminal of said counter when a count is registered by said second storage means but concurrently opening any energization circuit to said one terminal of said counter.

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