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[21] Appl. No. **704,033**
[22] Filed **Feb. 8, 1968**
[45] Patented **Aug. 31, 1971**
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[32] Priority **Feb. 14, 1967**
[33] **Japan**
[31] **42/9472**

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[54] **TRAFFIC SIGNAL CONTROL SYSTEM**
11 Claims, 2 Drawing Figs.

[52] U.S. Cl. **340/31,**
340/36
[51] Int. Cl. **G08g 1/08**
[50] Field of Search **340/31, 31**
A, 36, 37, 41

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ABSTRACT: A system for providing smooth traffic control at an intersection of two or more streets includes a detecting means for each street which comprises a combination of detectors and a signal generator which produce a first signal when a platoon has been detected on the street and a second signal which denotes the traffic volume on the street. The first and second signals from the detecting means are coupled to a logic means which also has inputs from the traffic signal green indicators for each street and a priority command signal. The logic means include a component circuit for each street. If a platoon is detected on one of the streets and the signal indication to that street is red, the corresponding component circuit applies a control signal to a controller to change the state of the traffic signal. If platoons coincide on at least two streets, a third circuit including a comparing means having the second signals coupled thereto inhibits the production of a control signal by the corresponding component circuit of the street having the lesser traffic volume. However, a fourth circuit always gives priority to one of the streets when a priority command signal is present, by inhibiting the production of the control signal by the corresponding component circuit of the street which does not have priority.

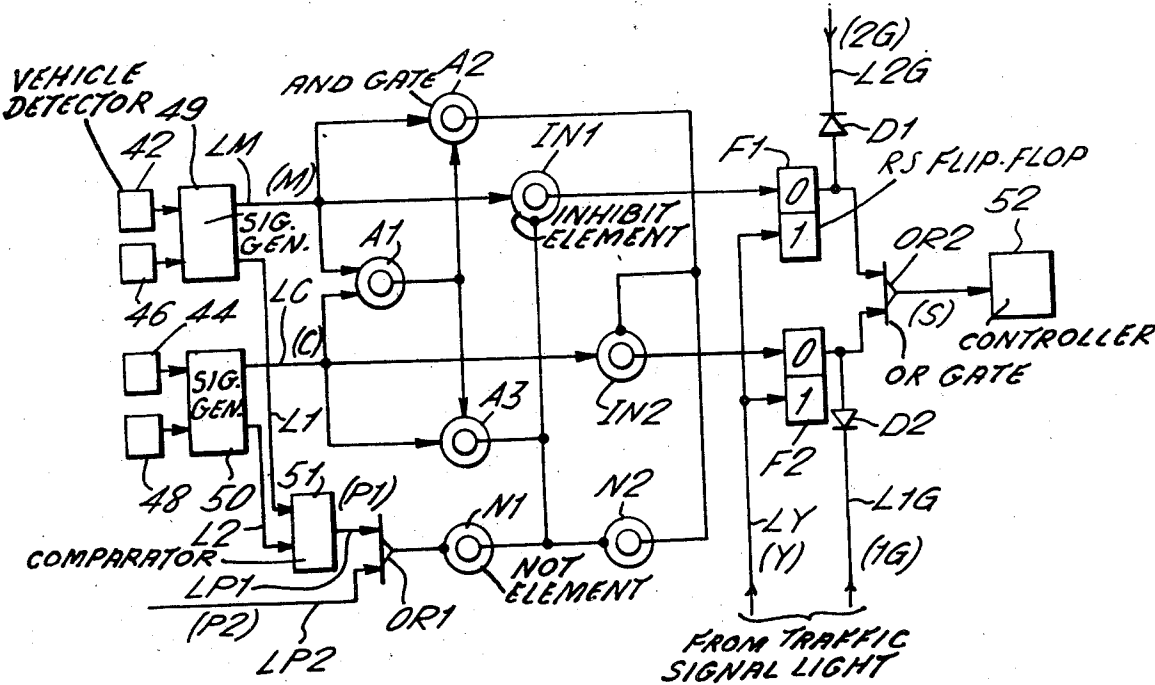


Fig. 1.

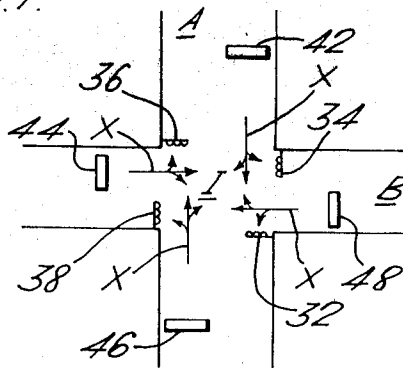
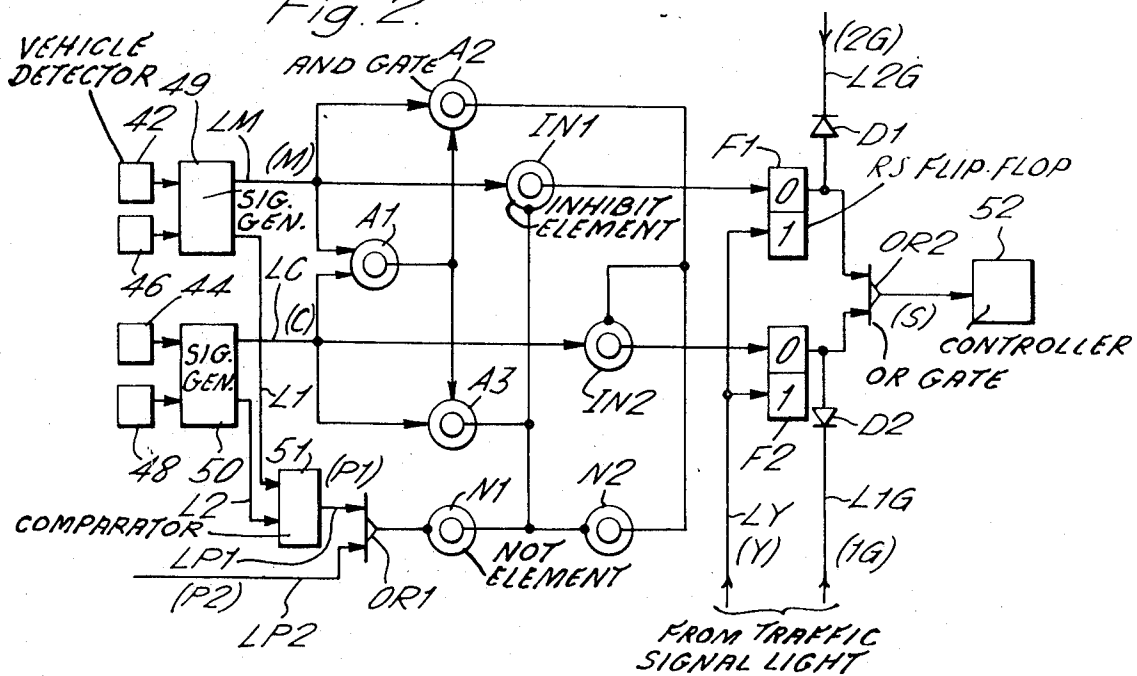


Fig. 2.



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TRAFFIC SIGNAL CONTROL SYSTEM

This invention provides a traffic control system which enables a smooth and efficient control of traffic flow through a street intersection.

For a smooth traffic control at a street intersection, the traffic signals at the intersection may be controlled in accordance with the volume of traffic approaching the intersection on each of the intersecting streets. This type of control system is well known as the traffic-actuated control system and is in wide use. In accordance with this system, the number of vehicles passing a street intersection for a predetermined period of time from the street to which a green signal is being displayed is detected so that the standard period of time of duration of the green signal indication is accordingly lengthened or shortened. The street to which a green signal is being displayed will hereinafter be called the green signal street, and the street to which a red signal is being displayed, the red signal street.

In the above stated type of control system, however, if traffic on a green signal street is so heavy that the green signal period is increased to a maximum limit, vehicles on the red signal street intersecting the green signal street must wait longer in front of the intersection, with resulting increase in the traffic density on the red signal street. Consequently, it may well happen that when this red signal street has its signal turned green, all the vehicles that have been waiting for the change of signal on the street cannot pass through the intersection during the green signal period given to the street. This will finally result in a serious traffic delay or stagnation around the intersection.

Accordingly, the primary object of the invention is to provide a traffic control system which is capable of a smooth and efficient traffic control at a street intersection which control depends upon the traffic volume not only on the green signal street but also on the red signal street.

Another object of the invention is to provide a traffic control system which is capable of a smooth and efficient traffic control at a street intersection by detecting a "platoon" on both the green and red signal streets.

The term "platoon" will often be used in the specification and is defined as follows: When the number of vehicles that will enter a street intersection during a predetermined relatively short period of time has exceeded a predetermined number, that group of vehicles is conceived as a "platoon."

To detect a platoon, that is, the number of vehicles that will enter a street intersection during a predetermined relatively short period of time, a vehicle detector may be provided, which is designed to produce one pulse upon detection of one vehicle, so that the pulses produced during the period of sampling time may be counted to know the number of vehicles.

The terms "major street" will also be often used in the specification. The major street is that one of intersecting streets on which the vehicles can be accorded priority to pass the intersection over the vehicles on the other street, which is the minor street. Such priority is accorded to the major street by means of a "major street priority command."

In accordance with the system of the invention, when a platoon has occurred on only one of two intersecting streets which is a red signal street, that street is changed to a green signal street and at the same time the other street that has until then been a green signal street is changed to a red signal street. When the red signal street has been changed to a green signal street, the vehicles thereon can pass the intersection so that the platoon will soon disappear. However, when a platoon has appeared on a green signal street alone, the street is not changed to a red signal street but remains as it is for removal of the platoon therefrom.

Sometimes a platoon appears on both the major and minor streets at the same time. In this case, if the traffic volume on the major street is greater than that on the minor street, or if the major street priority command is given, the platoon on the major street is first removed. To this end, if the major street is at that time a red signal street, it is changed to a green signal

street. On the contrary, if the traffic volume on the major street is smaller than that on the minor street and if the major street priority command is not given, then the platoon on the minor street is first removed by controlling the traffic signals at the intersection accordingly.

The electrical control network of the system of the invention comprises the following four component circuits: The first and second components circuits are for the purpose of changing the red signal street to a green signal street when a platoon has been produced on that red signal street only. The first component circuit works when the red signal street is the major street of a street intersection, while the second component circuit works when the red signal street is the minor street of the intersection. The first component circuit is such that it produces an output when a signal M caused by the appearance of a platoon on the major street coincides with a signal 2G produced when the minor street is a green signal street and consequently the major street is a red signal street. When the output has been produced by the first component circuit, the red signal displayed to the major street is changed to green. The second component circuit is such that it produces an output when a signal C caused by the production of a platoon on the minor street coincides with a signal 1G produced when the major street is a green signal street and consequently the minor street is red signal street. When the output has been produced by the second component circuit, the red signal minor street is changed to a green signal street.

The third and fourth component circuits are for the purpose of controlling the first and second component circuits, respectively, by a signal P produced when the traffic volume on the major street is greater than that on the minor street or when the major street priority command is given. The third component circuit is such that it prevents the production of an output by the first component circuit when the signals M and C coexist in the absence of the signal P. In other words, when a platoon has come into existence on both the major and minor streets at the same time, the major street which is a red signal street remains as it is if the traffic volume on that street is smaller than that on the minor street and if the major street priority command is not given. As a result, the platoon on the minor street is first removed. The fourth component circuit is such that it prevent the production of an output by the second component circuit when the signals M, C and P coexist. In other words, when a platoon exists on both the major and minor streets at the same time, the major street which is a green signal street is kept as it is if the traffic volume on the major street is greater than that on the minor street or if the major street priority command is given. In this case, the platoon on the major street is first removed.

The invention will be better understood from the following detailed description of a preferred embodiment thereof with reference to the accompanying drawings, wherein:

FIG. 1 schematically shows a street intersection to which the control system of the invention is applied; and

FIG. 2 is a block diagram of the control system of the invention.

The illustration embodiment is arranged for a two-phase control, but a multiphase control system is of course possible and will be apparent to those who have read the following description.

In FIG. 1 there are shown two streets A and B which meet at an intersection I. Vehicles on each street are supposed to keep left and advance in the direction of an arrow X into the intersection, in front of which they are regulated by four signaling devices 32, 34, 36 and 38, respectively. Each signaling device has a green, a yellow and a red lamp arranged from left to right as viewed in front of them and in the order mentioned.

Let it be assumed that the street A is a major street and the street B, a minor street. In the first phase, the right of way is given to traffic on the major street and in the second phase, it is given to traffic on the minor street.

A vehicle detector is placed in each street a suitable distance from the intersection at the opposite sides thereof, as

indicated at 42, 44, 46 and 48. Each detector is designed to produce one pulse for every one vehicle it has detected. The number of pulses produced by the detectors 42 and 46 for a predetermined relatively long period of time, for example, one minute expresses the traffic volume on the major street, while the number of pulses produced by the detectors 44 and 48 for the period of time expresses the traffic volume on the minor street. When the number of pulses produced by the detector 42 or 46, or 44 or 48 for a predetermined relatively short period of time, say, 10 seconds has exceeded a predetermined number, a platoon has been detected as occurring on the street A or B.

As shown in FIG. 2, signal generators 49 and 50 each including a pulse counter, not shown, are provided for detecting the traffic volume and/or platoons on the streets A and B, respectively. The generator 49 receives and counts the pulses from the vehicle detectors 42 and 46 and produces on a line L1 a signal corresponding to the traffic volume on the major street. The generator 49 also produces a signal M on a line LM when it as counted a predetermined number of pulses indicating the occurrence of a platoon on the major street. Similarly, the generator 50 receives and counts the pulses from the vehicle detectors 44 and 48 and produces on a line L2 a signal corresponding to the traffic volume on the minor street. The generator 50 also produces a signal C on a line LC when it has counted a predetermined number of pulses indicating the occurrence of a platoon on the minor street. The signals on the lines L1 and L2 are compared by a comparing circuit 51. When the signal on the line L1 expressing the traffic volume on the major street is greater than the signal on the line L2 expressing the traffic volume on the minor street, the circuit 51 produces a signal P1 on a line LP1. When the major street priority command is given, a signal P2 is produced on a line LP2 by a suitable device, not shown.

In this specification, when an electrical signal is produced or exists on a line, the condition will be referred to as a signal "1" being produced on the line or the signal on the line becoming "1," while when no signal exists on a line or the signal "1" existing on a line has disappeared, the condition will be referred to as a signal "0" being produced or existing on the line, or the signal "1" on the line becoming "0." The signal "1" on a line may for example be the condition under which a voltage of -12 volts is applied on the line and the signal "0," the condition under which the line is grounded to zero voltage.

In the various parts of the circuit of FIG. 2 there are shown symbols Y, 1G and 2G adjacent lines LY, L1G and L2G, respectively. These express an electrical signal on the lines, which is "1" or "0" depending upon whether the signal lamps in the signalling devices are illuminated or not. To put it in more detail, the signal Y on the line LY becomes "1" when the yellow lamps are illuminated in the signaling devices 32, 36 and 34, 38. The signal 1G on the line L1G becomes "1" when the major street A becomes a green signal street, that is, when the green lamps of the devices 32 and 36 are illuminated to the major street and the red lamps of the devices 34 and 38 are illuminated to the minor street. The signal 2G on the line L2G becomes "1" when the minor street becomes a green signal street, that is, the green signal indication of the devices 34 and 38 is displayed to the minor street and the red signal indication of the devices 32 and 36, to the major street.

Under the conditions to be described hereinafter, the circuit of FIG. 2 produces an output signal S "1," which actuates a controller 52 for controlling the interrelated sequential illumination of the signal lamps. When the controller 52 is actuated by the signal S "1," the red signal indication is changed to green and the green indication, to red through yellow. This change of traffic signal may be effected the instant the signal S "1" is produced or a short period of time thereafter by means of, say, a suitable delay means inserted between the OR element OR2 and the controller 52, or upon termination of the initial portion of the green signal to the street the traffic signal being displayed to which is green when a platoon has been detected. The change of traffic signal may also be eventually ef-

ected by shortening the unit extension, that is, the minimum unit period of time of green signal indication to be added for every one vehicle detected to the initial portion of the green signal indication to the street to which the traffic signal indication is green when the change of traffic signal is required.

In the circuit of FIG. 2, various static logic elements are used as circuit components, such as AND, INHIBIT, NOT, OR and MEMORY (flip-flop) elements, which bear symbols A, IN, N, OR, and F, respectively, accompanied by reference numerals. These logic elements are composed of diodes and/or transistors combined in well known manners, with a common grounding line. For example, a NOT element comprises a transistor having an emitter connected to the 0-volt grounding line and a collector connected to a positive voltage line. While an input signal "0" is applied to the base of the transistor, an output signal "1" is produced at the collector. However, when the input signal to the base becomes "1," the transistor becomes conductive so that the signal "1" at the collector becomes "0."

The system of FIG. 2 may be divided into four component circuits. The first comprises an INHIBIT element IN1, a flip-flop F1 and a diode D1. The signaling M "1" that has been caused by the occurrence of a platoon on the major street is applied as a set input signal "1" to the flip-flop F1 through the INHIBIT element IN1 provided that the inhibit input thereto be "0." The set output signal "1" from the flip-flop F1 is applied to an OR element OR2 if the signal 2G on the line L2G is "1," so that the output S from the OR element OR2 becomes "1." In the following description, the signal from a logic element will sometimes be indicated by the same reference symbol indicating that logic element and, as previously mentioned, accompanied by "1" or "0" depending upon the presence or absence of the signal. For example, the set output signal F1 "1" means the set output signal "1" produced by the flip-flop F1 while the set output signal F1 "0" means the set output signal "0" from the flip-flop F1, that is, the condition under which no set output is produced by the flip-flop F1.

If the signal 2G is "0" in the above case, the set output signal F1 "1" is grounded through the diode D1, so that the output signal S from the OR element OR2 remains "0." If the inhibit input to the element IN1 is "1," its output signal remains "0" despite the input signal M thereto being "1," so that the output signal S remains "0."

The second component circuit comprises an INHIBIT element IN2, a flip-flop F2 and a diode D2. The arrangement and operation are similar to those of the first component circuit described just above. When the signal C is rendered "1" by the occurrence of a platoon on the minor street, the output signal S from the OR element OR2 becomes "1" provided that the signal 1G be "1." If the signal 1G is "0," the signal S remains "0" and if the inhibit input to the element N2 is "1," the signal S remains "0" no matter whether the signal 1G is "1" or "0."

The third component circuit comprises two AND and eighth A1 and A3, a NOT element N1 and an OR element OR1. When the street M and C are rendered "1" by the occurrence of platoons on the major and minor streets, the output signal A1 becomes "1" so that the output signal A3 also becomes "1." If the output signal from the OR element OR1 is "0," the signal N1 is "1." When the signal A3 "1" coincides with the signal N1 "1," neither of the two elements A3 and N1 are grounded, so that the inhibit input to the element IN1 is "1." As a result, the signal S remains "0" despite the signal M "1" in the second component circuit.

The fourth component circuit comprises two AND elements A1 and A2 and a NOT element N2. When the signals M and C are rendered "1" by the simultaneous occurrence of a platoon on both the major and minor streets, the signal A1 and consequently the signal A2 becomes "1." Suppose that the signal OR1 be "1." Then the signal N1 is "0" so that the signal N2 is "1." The signals A2 "1" and N2 "1" are not grounded, so that the inhibit input to the INHIBIT element IN2 becomes "1." This prevents the element IN2 from producing an output

signal "1" despite the signal C "1" being applied to the input of the element IN2. As a result, the flip-flop F2 remains reset, with its set output signal and consequently the signal S remaining "0."

Now will be the time to explain the control operation of the system with reference to FIG. 2.

1. Suppose that a platoon has occurred only on the major street A that is now a green signal street. Then, the signal M is "1" the signal C, "0"; the signal 1G, "1"; and the signal 2G, "0." Because the signals M and C are "1" and "0," respectively, the signal A1 is "0," so that the signals A2 and A3 are also "0." Because the signal A3 is "0," no inhibit input is applied to the INHIBIT element IN1, so that its output is "1" due to the signal M "1." This output IN1 "1" sets the flip-flop F1 to produce a set output "1." Because the signal 2G is "0," the set output F1 "1" is not applied to the OR element OR2, so that the signal S remains "0." As a result, the signal lamps remain unchanged, that is, the existing illuminating condition of the signal lamps remains unchanged. In other words, the major street remains to be a green signal street, the vehicles on which can pass through the intersection.

2. Suppose that a platoon has been detected only on the minor street B that is now a green signal street. In this case, the signals M, C, 1G and 2G are "0," "1," "0" and "1," respectively. Consequently, the signal A1 is "0"; the signal A2 is "0"; and the signal A3 is "0." The signal C "1" is applied as an input to the INHIBIT element IN2. Since the inhibit input to the element IN2, that is, the signal A2 is "0," the element IN2 produce an output "1" to be applied as a set input to the flip-flop F2, whereupon its set output becomes "1." However, since the signal 1G is "0," the signal F2 "1" cannot be applied to the OR element OR2, so that the signal S remains "0." This means that the illuminating condition of the signal lamps remain unchanged and the minor street remains to be a green signal street, the vehicles on which can pass through the intersection.

3. Suppose that a platoon has occurred only on the major street A that is now a red signal street. In this case, the signals M, C 1G and 2G are "1," "0," "0" and "1," respectively. As a result, the signal F1 becomes "1," as in the above stated case (1). At this time, since the signal 2G is "1," the signal S is rendered "1" due to the signal F1 "1." The signal S "1" operates the control 52, which changes the red signal indication displayed to the major street to a green indication, so that the vehicles on the major street can pass through the intersection.

4. Suppose that a platoon has occurred only on the minor street 13 that is now a red signal street. In this case, the signal M, C, 1G and 2G are "0," "1," "1" and "0," respectively, so that the signal F2 becomes "1" as in the case (2). Since the signal 1G is "1" at this time, the signal S becomes "1." This signal S "1" operates the control 52, which changes the minor street from a red to a green signal street, so that the vehicles thereon can freely pass through the intersection, just as in the case (3).

5. Suppose that a platoon has occurred on both the major and minor streets under the condition that the traffic volume on the major street is smaller than that on the minor street and that the major street priority command is not given. In this case, the signals M, C, P1 and P2 are "1," "1," "0" and "0," respectively. Because the signals M and C are both "1," the signal A1 is "1," so that the signals A2 and A3 both become "1." On the other hand, since the signals P1 and P2 are both "0," the signal OR1 is "0," so that the signal N1 is "1" and consequently the signal N2 is "0."

Since the signals A3 and N1 are both "1," the INHIBIT element IN1 receives an inhibit input "1" and consequently the signal F1 remains "0." On the other hand, since the signal N2 is "0," the signal A2 "1" is grounded, so that the inhibit input to the element IN2 is "0." This causes the signal C "1" to pass through the element IN2 to set the flip-flop F2. Under the condition, if the major street A is now a green signal street, the signal 1G is "1." Consequently, the set output "1" from the

flip-flop F2 is applied to the OR element OR2, the output signal S "1" from which actuates the control 52 so that the signal displayed to the major street is changed from green to red and at the same time the signal to the minor street, from red to green for removal of the platoon from the latter street first.

On the contrary, if the major street A is a red signal street the signal 1G is "0," so that the signal F2 "1" is grounded through the diode D2 so as not to be applied as an input to the OR element OR2, the output S from which remains "0." This means that the major street remains a red street and minor street, a green street for removal of the platoon from the latter street first.

6. Suppose that a platoon has been detected on both the major and minor streets under the condition that the traffic volume is greater on the major street than on the minor street, or that the major street priority command is given. In this case, the signals M, C and P1 or P2 are "1," "1" and "1," respectively. Consequently, just as in case (5), the signals A1, A2 and A3 are all becomes "1." On the other hand, since the signals P1 or P2 is "1," the signal OR1 is "1," so that the signal N1 is "0" and consequently the signal N2 is "1." Since the signals A2 and N2 are both "1," the inhibit input to the element IN2 is "1," so that its output IN2 is "0." Consequently, the set output from the flip-flop F2 remains "0." On the other hand, since the signal N1 is "0," the signal A3 "1" is grounded, so that no inhibit input is applied to the element IN1.

As a result, the set output from the flip-flop F1 becomes "1." If the traffic signal displayed to the minor street at this time is green, the signal 2G is "1," so that the signal F1 "1" is applied to the OR element OR2 and consequently the signal S becomes "1." This actuates the control 52 so that the signal displayed to the minor street is changed from green to red and the signal to the major street, from red to green for removal of the platoon from the major street first.

On the contrary, if the traffic signal being displayed to the minor street at that time is red, the signal 2G is "0," so that the set output "1" is grounded through the diode D1. This means that the signal being displayed to the major street continues to be green for removal of the platoon therefrom first.

In the above six cases (1.) to (6.), while the traffic signal displayed to one of the streets is changed from green to red through yellow, the signal Y becomes "1," which is applied as a reset input to the flip-flops F1 and F2, whereupon the signal S is restored to "0."

Having illustrated and described a preferred embodiment of the invention, it is understood that the invention is not limited thereto but that there are any other embodiments within the scope of the invention as defined in the appended claims.

What we claim is:

1. A system for controlling a traffic signal at an intersection of a plurality of streets, comprising:

- a. a plurality of traffic sensing means, each of said means being responsive to the traffic on one street of said intersection and comprising at least one vehicle detector for said street, means responsive to said vehicle detector for providing a first signal when a platoon has occurred on said street by passage of a predetermined number of vehicles by said detector within a relatively short time interval, and means responsive to said vehicle detector for providing a second signal related to the traffic volume on said street,
- b. means providing a plurality of third signals indicating the state of the traffic signal displayed to each of the said streets,
- c. means having coupled thereto said plurality of first, second, and third signals and operable in response thereto to produce an output signal when a platoon has been detected on at least two of said streets and when the traffic signal being displayed on one of said streets which has a greater traffic volume than the others is in a red state to block entrance of traffic from said one street into the intersection, and

- d. controller means operable in response to said output signal to change the state of the traffic signal being displayed to said one street to a green state permitting entry from said one street into the intersection
2. A system for controlling a traffic signal at an intersection of a plurality of streets comprising:
- a plurality of traffic sensing means, each of said means being responsive to the traffic on one street of said intersection and including at least one vehicle detector for said street and means responsive to said vehicle detector for providing a first signal when a platoon has occurred on said street by passage of a predetermined number of vehicles by said vehicle detector within a relatively short time interval,
 - means producing a priority command signal determining which of said streets has priority in the intersection,
 - means having coupled thereto said plurality of first signals and said priority command signal and being operable to produce an output signal when a platoon has been detected on at least two of said streets at the same time and when the traffic signal which is being displayed to that one of said streets which is accorded priority over the remaining streets is in a red state to block entrance of traffic from said priority street into the intersection, and
 - controller means operable in response to said output signal to change the state of the traffic signal being displayed to said priority street to a red indication permitting entrance from said street into the intersection.
3. A system for controlling a traffic signal at an intersection of a plurality of streets, comprising:
- a first traffic sensing means including at least one vehicle detector for one of said streets of said intersection, and means responsive to said vehicle detector for providing a first signal when a platoon has been detected on said street by passage of a predetermined number of vehicles by said vehicle detector within a relatively short time interval,
 - means producing a second signal when the state of the traffic signal displayed to that street is red to block entrance from the street into the intersection,
 - means producing a third signal upon the occurrences of said first and said second signals, and
 - controller means changing the state of the traffic signal in response to said third signal.
4. A system as recited in claim 3 further comprising:
- a second vehicle sensing means including at least one vehicle detector for a second street of said intersection, and means responsive to said second vehicle detector for providing a fourth signal when a platoon has been detected on said second street by passage of a predetermined number of vehicles by said second vehicle detector within a relatively short time interval,
 - means for producing a fifth signal when the state of the traffic signal displayed to the second street is red to block entrance from the second street into the intersection,
 - means producing a sixth signal upon the occurrence of said fourth and fifth signals, and
 - means coupling said third and said sixth signals to said controller means so that said controller means changes the state of the traffic signal in response to either of said signals.
5. The system of claim 4:
- wherein said first and second traffic sensing means also include means responsive to said vehicle detectors for providing seventh and eighth signals denoting the traffic volume on the first and second streets, respectively,
 - further including means comparing said seventh and eighth signals and providing a priority command signal when the traffic volume on the first street exceeds that on the second street, and
 - means responsive to the priority command signal for inhibiting production of said sixth signal.

6. A system as recited in claim 5, further comprising:
- means providing a priority command signal when the traffic on the first street is to have priority over the traffic on the second street, and
 - means responsive to said priority command signal for inhibiting production of said sixth signal.
7. The system of claim 6:
- wherein said first and second traffic sensing means also include means responsive to said vehicle detectors for providing seventh and eighth signals denoting the traffic volume on the first and second streets, respectively,
 - further including means comparing said seventh and said eighth signals and providing a second priority command signal when the traffic volume on the first street exceeds that on the second street, and
 - means coupling said first and said second priority command signals to said inhibiting means so that said inhibiting means acts in response to either signal.
8. The system of claim 7, further comprising:
- means for providing a ninth signal upon the concurrence of said first and said fourth signals, and
 - a second means inhibiting the production of said third signal upon the occurrence of said ninth signal and the absence of both said priority command signals.
9. A system for controlling a traffic signal at an intersection of a plurality of streets comprising:
- a plurality of platoon detecting means, each of said means being responsive to the traffic on one street of said intersection and including at least one vehicle detector per said street, and means responsive to said vehicle detector for providing a first signal when a predetermined number of vehicles have passed said vehicle detector within a relatively short time interval,
 - means providing a plurality of second signals indicating the state of the traffic signal displayed to each of said streets,
 - means having coupled thereto said first signals from said plurality of platoon detecting means and said plurality of second signals and producing therefrom a third signal upon the coincidence of any of said first signals and its corresponding second signal when a platoon occurs on a street for which the traffic signal is in a red state, and
 - controller means operable in response to said third signal to change the traffic signal being displayed to said street to a green state.
10. A system for controlling a traffic signal at an intersection of two streets, comprising: means for detecting a platoon on one of said streets to produce a first signal; means for detecting a platoon on the other of said streets to produce a second signal; means for detecting the traffic volume on said two streets to produce a third signal when said traffic volume is greater on said one street than on said other street; means for producing a fourth signal when said traffic signal being displayed to said other street inhibits entrance of traffic on said other street into said intersection; means for producing a fifth signal when the traffic signal being displayed to said one street inhibits entrance of traffic on said one street into said intersection; means for producing a sixth signal when said first and fifth signals only coincide; means for producing a seventh signal when said second and fourth signals coincide; means for preventing the production of said sixth signal when said first and second signals coexist in the absence of said third signal; means for preventing the production of said seventh signal when said first, second and third signals coexist; and means operable in response to said sixth and seventh signals alternatively to change said traffic signal to an indication to permit entrance of traffic on each said street into said intersection.
11. The system of claim 10, wherein said third signal producing means further including means for producing a eighth signal when traffic on said one street is accorded priority to pass said intersection over traffic on said other street, said eighth signal functioning in place of said third signal.