United States Patent [19]

Coffman

[11] E **Re. 30,355**

[45] Reissued **Jul. 29, 1980**

[54] **TRAFFIC FLOW CONTROL SYSTEM**

[76] Inventor: **Moody L. Coffman,** 1832 NW. 17th St., Oklahoma City, Okla. 73106

[21] Appl. No.: **294,882**

[22] Filed: **Oct. 4, 1972**

Related U.S. Patent Documents

Reissue of:

[64] Patent No.: **3,533,062**
Issued: **Oct. 6, 1970**
Appl. No.: **606,828**
Filed: **Jan. 3, 1967**

[51] **Int. Cl.**[2] **G08G 1/07;** G08G 1/095

[52] **U.S. Cl.** **340/40;** 340/43; 340/104; 404/20

[58] **Field of Search** 340/43, 35, 40, 104; 404/20

[56] **References Cited**

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2,133,157	10/1938	Turner	340/43
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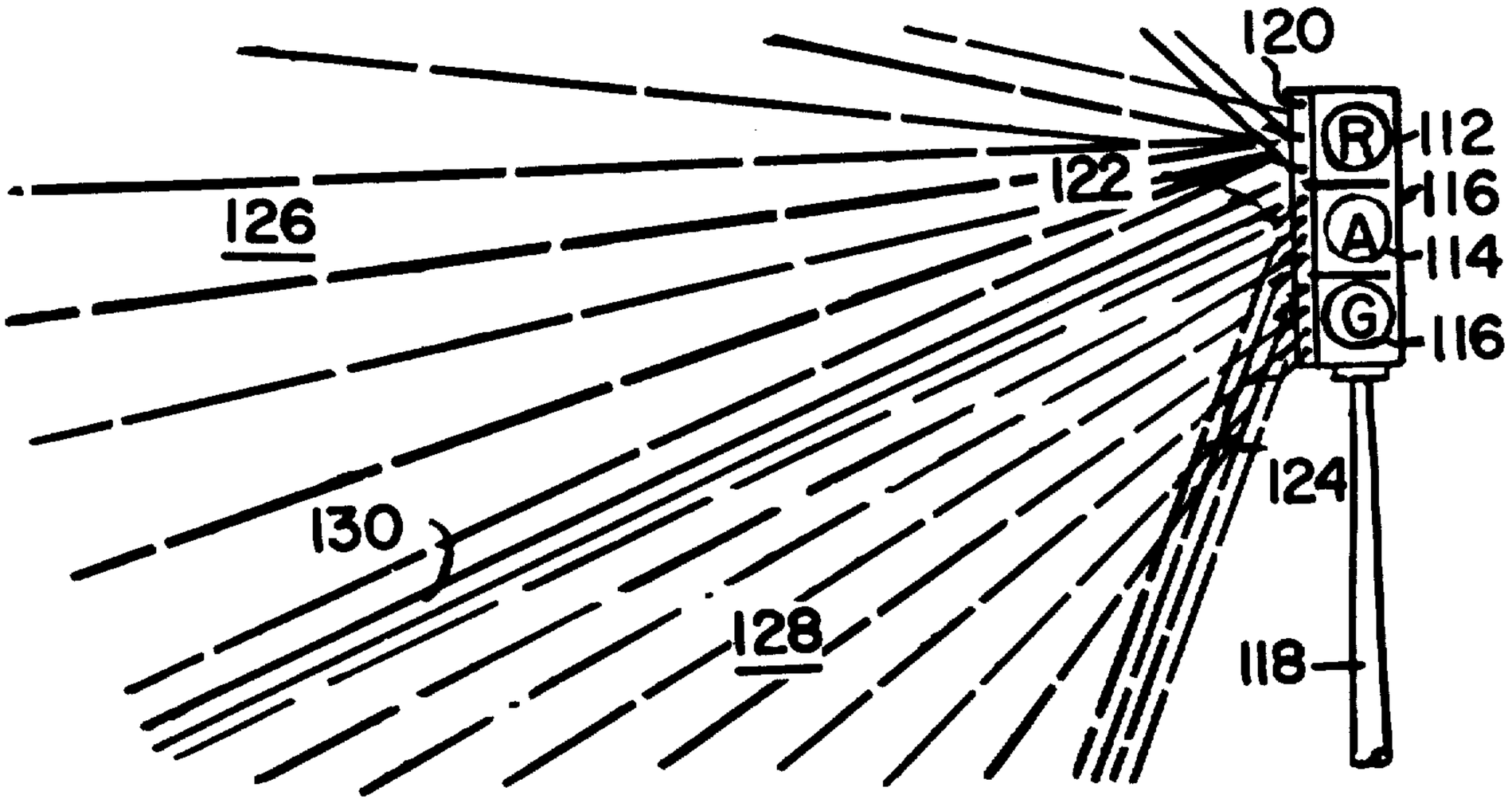
Primary Examiner—John W. Caldwell, Sr.
Assistant Examiner—James J. Groody
Attorney, Agent, or Firm—William R. Laney

[57] **ABSTRACT**

A traffic intersection and flow control system which includes a hexagonally shaped, multilane roadway having radiating, multilane roadways extending outwardly from each corner of the hexagonal roadway. Traffic dividing island means are provided in the hexagonal roadway between each corner of the hexagon and are also provided in the several radiating multilane roadways. The islands and traffic lanes are arranged so that all traffic in the innermost lane (relative to the space enclosed by the hexagon) moves at all times in the same direction which is opposite the direction of movement at all times of traffic in the outermost lane. The islands and lanes are also positioned so that traffic moving in any lane will at no time cross in front of traffic moving in any other lane. Traffic control signals are provided adjacent each corner of the hexagonal multilane roadway for controlling the flow of traffic in three directions through the intersection of the hexagonal roadway with the several radiating roadways.

The traffic control signals preferably used include at least two lamps for producing light of different colors, a louver system associated with each lamp, and cam means for moving each louver system synchronously to direct the light from each lamp in controlled, contiguous sectors.

19 Claims, 11 Drawing Figures



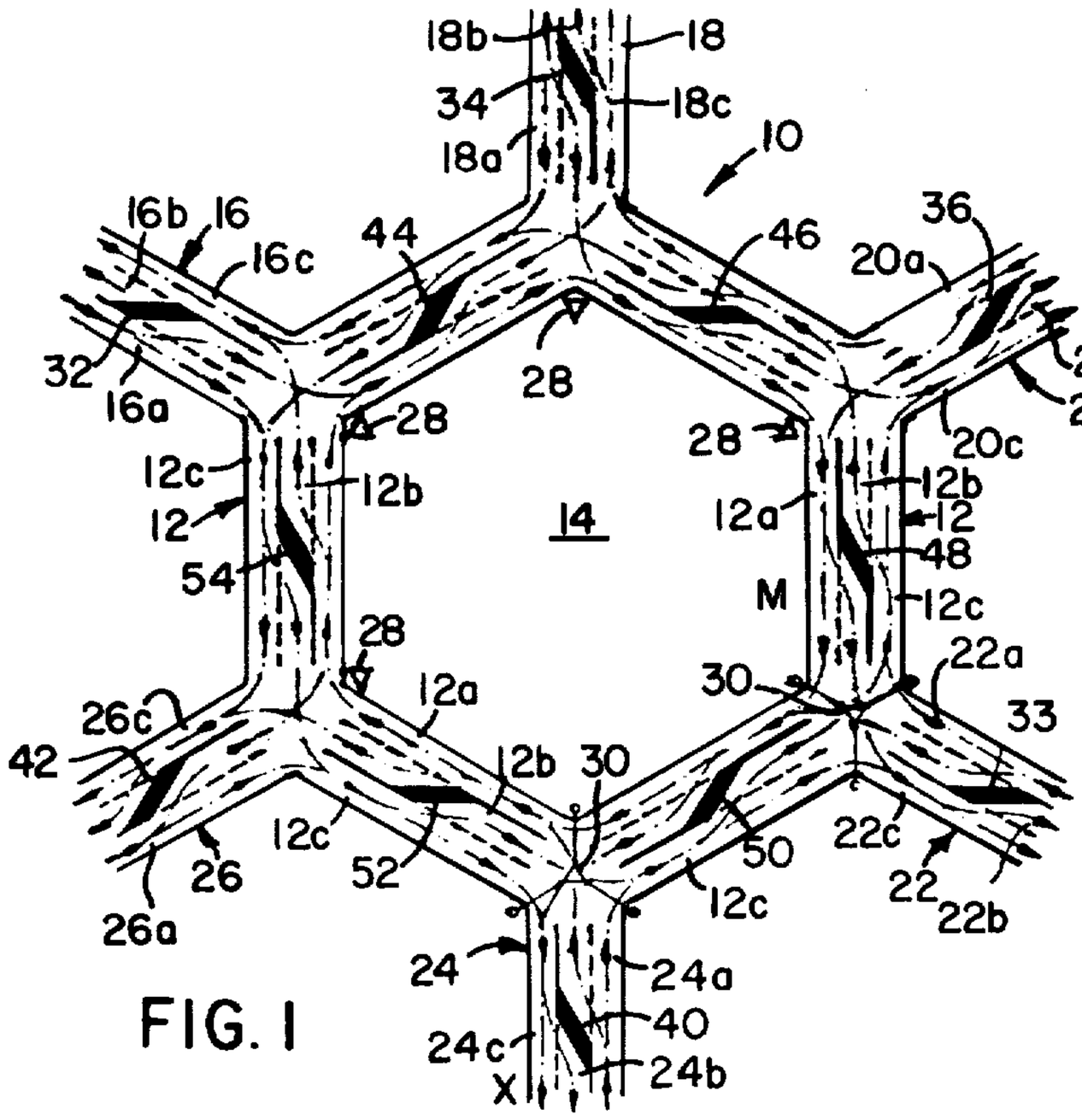


FIG. 1

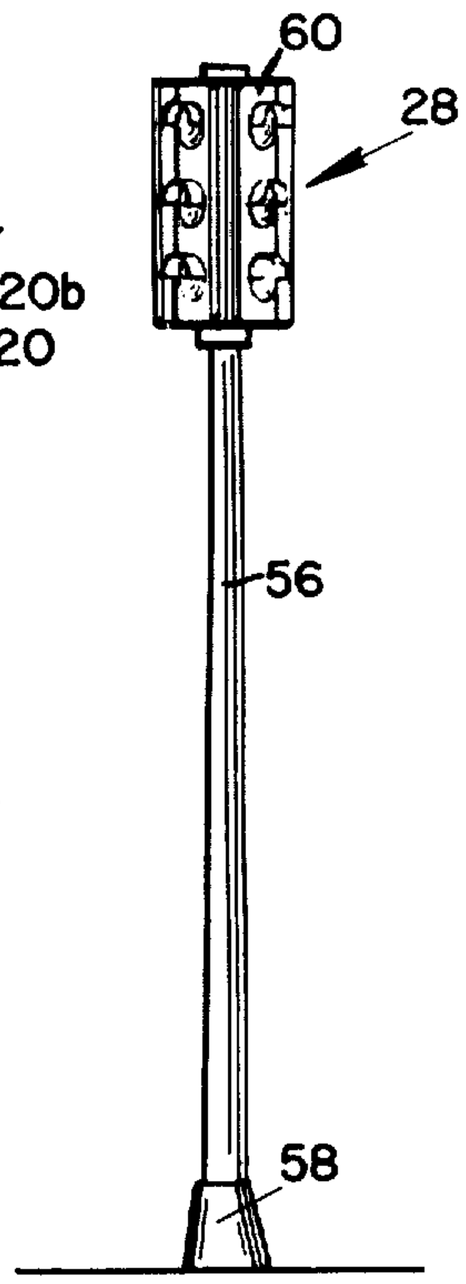


FIG. 3

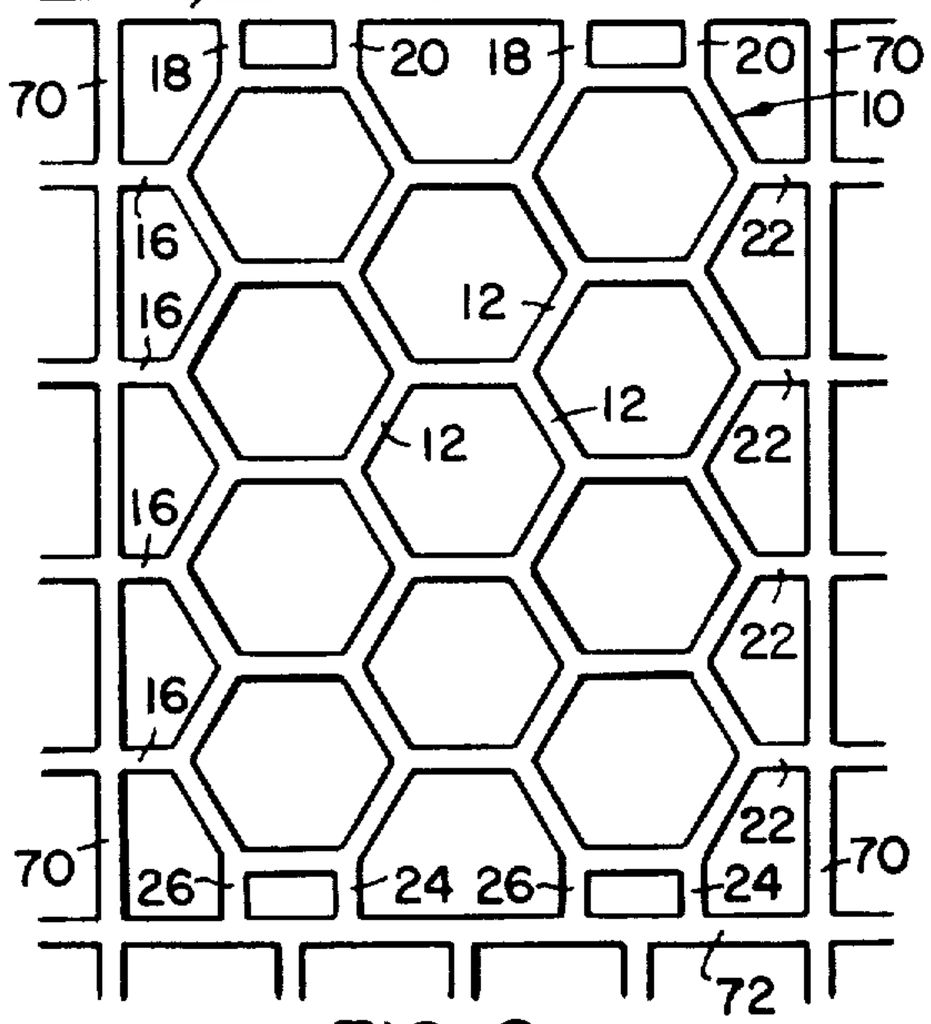


FIG. 2

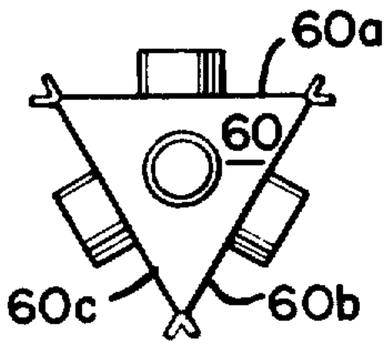


FIG. 4

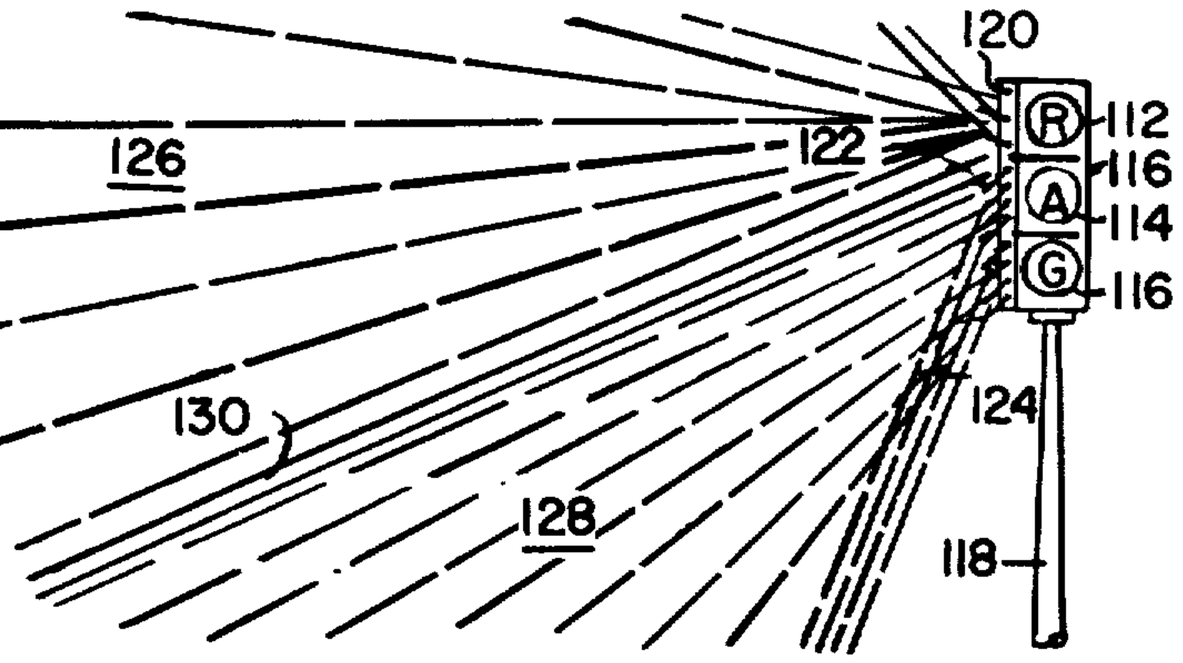


FIG. 5

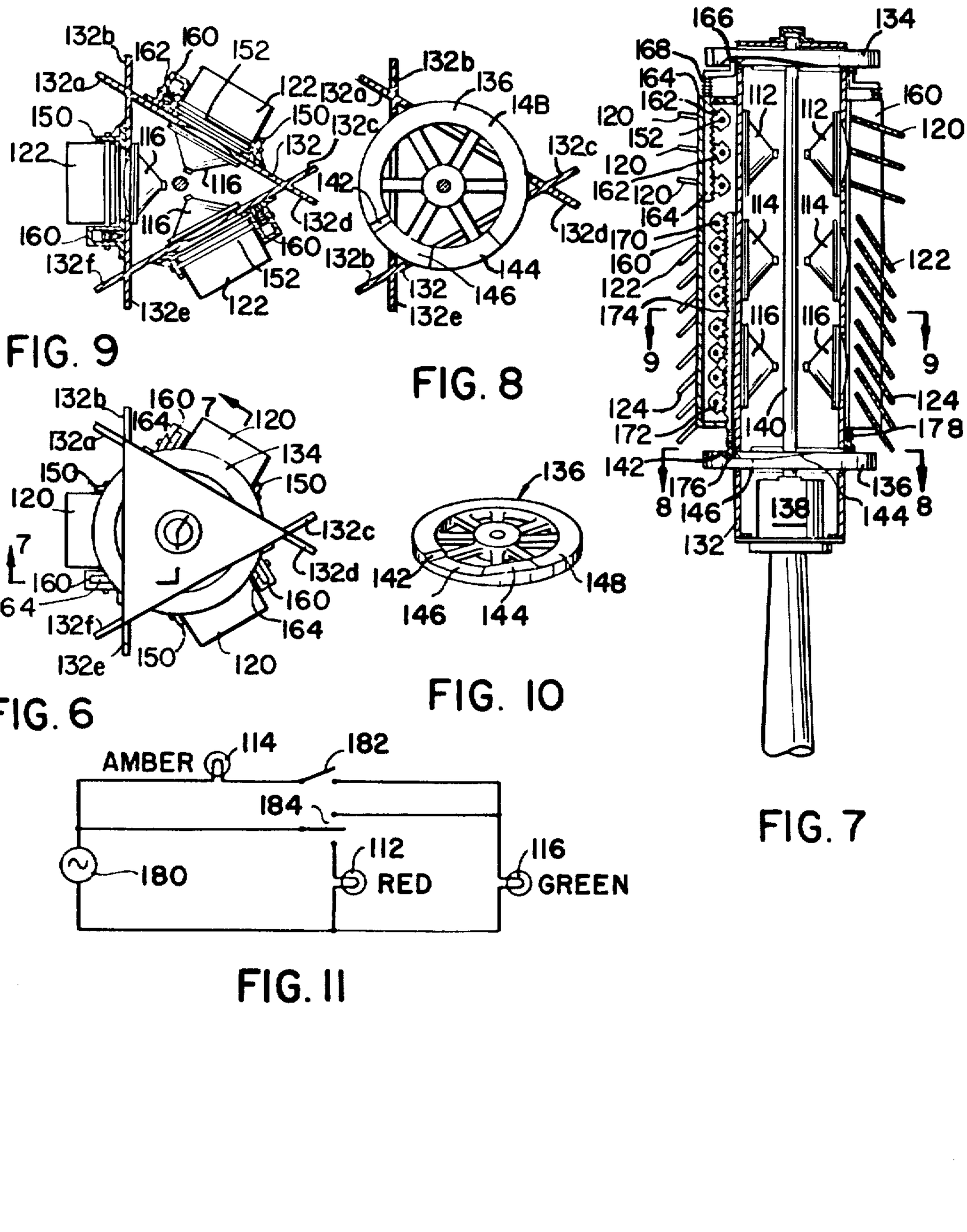


FIG. 9

FIG. 8

FIG. 6

FIG. 10

FIG. 11

FIG. 7

TRAFFIC FLOW CONTROL SYSTEM

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

This invention relates to a traffic flow control system which provides for the movement of vehicular traffic through a densely populated area with minimum congestion and maximum safe speed. More specifically, the present invention relates to a method and system for more efficiently moving large numbers of automobiles through a downtown or industrial district while providing an optimum arrangement for the location of industrial or commercial buildings and adequate parking facilities for high volume vehicular traffic.

There is currently widespread concern in many urban areas about the problem of more efficiently accommodating the flow of great numbers of automobiles through downtown or industrial areas. Concurrently, it has been widely recognized that many municipalities have grown up in a hodgepodge fashion without making adequate provision for traffic flow in densely populated areas, and without providing adequate parking facilities for the accommodation of the large numbers of automobiles which preferably should be parked and located in relatively close proximity to businesses, industries and high density downtown residential areas where the drivers of the automobiles live and work.

A number of traffic intersection and traffic flow arrangements have heretofore been proposed in an effort to more efficiently move the heavy traffic through densely populated urban areas. Among the most recent proposals of this type are those which are set out in U.S. Pats. 2,941,454 and 2,949,067, both issued to A. O. Cedeno. The Cedeno traffic intersection proposals generally employ multilevel structures in which traffic lanes are made to cross at different levels so that no interference occurs between the traffic flow in several lanes. Elaborate provision is also made for pedestrian routes through the maze of traffic lanes provided in the Cedeno systems for permitting free movement of pedestrian traffic without impeding the flow of vehicular traffic through the multilane intersections. The Cedeno systems, while indeed able to accommodate high volumes of vehicular traffic, are somewhat complicated in their arrangement, and require a considerable amount of skill or prior knowledge on the part of drivers utilizing the systems to avoid entering the wrong lanes, and in order to utilize the system with maximum efficiency in moving from one place to another. Also, due to the multilevel character of the Cedeno systems, many of the traffic lanes provided are underground or at least are located below several other lanes positioned at higher levels with the requirement that artificial lighting must be provided to assure effective and safe visibility for the operators of vehicles using the systems.

The present invention proposes a relatively simple and economical, yet highly efficient traffic intersection and flow control system which can be employed for moving traffic through densely populated urban areas in a minimum time and with minimum congestion. The traffic system of the present invention is ideally adapted for inclusion in existing traffic grid patterns of conventional character so that, in situations where it is proposed to undertake the renewal of large urban areas

while permitting other parts of the urban community to remain unchanged, the traffic flow system of the present invention can be very conveniently and effectively integrated with the unrenewed portion of the metropolitan area without the necessity to reroute or change existing traffic arteries in those portions of the municipality where no structural renewal is to be effected.

Broadly described, the traffic intersection and flow control system of the invention comprises a generally hexagonal, multilane roadway having radiating, multilane roadways extending outwardly from each corner of the hexagonal multilane roadway somewhat similarly to the plan depicted on page 154 of the publication. "The American City," November, 1929, issue. The hexagonal appearance of the intersecting multilane roadways is also generally similar when viewed in plan to that which is depicted in Cedeno U.S. Pat. 2,941,454. In the present invention, however, the lanes of each of the multilane roadways are located in a single level.

Traffic dividing island means are provided in the hexagonal multilane roadway between each corner of the hexagon, and also in each of the radiating multilane roadways. These traffic dividing islands are strategically placed for permitting traffic moving in a single lane to diverge for movement in a plurality of lanes. The islands and traffic lanes of the system are arranged or positioned so that all traffic in the innermost lane of the hexagonal roadway which is nearest the hexagonal space enclosed by this roadway moves at all times in the same direction, and all traffic in the outermost lane of the hexagonal roadway moves at all times in a direction opposite to the direction of movement of traffic in the innermost lane. The traffic dividing islands and lanes of the roadways are also positioned so that traffic moving in any of the lanes will at no time cross in front of traffic moving in any other lane. Finally, traffic control signals are provided adjacent each corner of the hexagonal multilane roadway for controlling the flow of traffic in three directions through the intersection of the hexagonal multilane roadway with the several radiating multilane roadways.

With the described traffic flow control system, traffic can be moved expeditiously across a densely populated urban area, since traffic congestion is minimized, and little opportunity is afforded for traffic moving in any lane to cross in front of, or obstruct, traffic moving in other lanes. The system is characterized in having great flexibility in that every radiating multilane roadway which extends from any of the corners of the hexagonal roadway is accessible from substantially any point within the hexagonal enclosure, and vehicle operators can, with a minimum of difficulty, maneuver their automobiles to move outwardly on any one of the radiating roadways, or to remain on the hexagonal roadway, depending upon their ultimate destination. The system is economical to construct since all lanes of the several roadways are provided in a single level, and since a minimum number of traffic control signals are required for governing the total flow of traffic in the system. Two-way traffic flow is provided over every portion of each of the roadways so that all locations on any of the roadways are accessible from any part of the system.

Although any number of lanes can be provided in the hexagonal roadway and in the radiating roadways, an odd number of lanes in each is preferred, and a very economical yet highly efficient preferred system contemplates the provision of three lanes in both the hexagonal roadway and in each of the radiating roadways.

Since the entire system can be located at ground level, no requirement exists for artificial lighting and easy access can be had to any of the lanes of any of the roadways from ground level access streets.

From the foregoing description of the invention, it will be apparent that the present invention provides an improved traffic flow control system which can be economically constructed, but which can be used to efficiently and expeditiously move heavy traffic through a densely populated area with maximum safety.

An additional object of the invention is to provide a traffic intersection and flow control system in which traffic is always either aligned or diverging, and is never converging so as to present risks of collisions between vehicles.

Another object of the invention is to provide a traffic intersection in which traffic enters and passes through the intersection from a single direction only at any given time.

An additional object of the invention is to provide a traffic intersection and flow control system in which threeway traffic control signals or lights are employed to permit traffic entering the intersections from three different directions at different times to turn to the right or to the left from the intersecting streets.

An additional object of the invention is to provide a traffic intersection and flow control system in which automobiles experience no need to turn through an angle of more than 60° at any time during the use of the system.

An additional object of the invention is to provide a traffic intersection and flow control system in which drivers preparing to proceed through the intersection are prevented from anticipating changes in the traffic control signals employed by positioning the traffic control signal apparatus so that signals to other drivers at the intersection are totally outside the field of view of the first-mentioned drivers.

Another object of the invention is to provide a traffic intersection and flow control system involving a hexagonal grid of roadways which can be easily adapted or accommodated to existing streets and traffic arteries in situations where it is desired to renew a large, centrally located, urban section, and concurrently with such renewal, incorporate the control system of the present invention in the renewed area.

Another object is to provide a traffic intersection and flow control system in which a better and less obstructed view of traffic entering the intersection is provided than in conventional 90° intersections due to the arrangement of the traffic intersections of the present invention such that all roadways entering the intersection extend at an angle of at least 120° to each other.

Another object of the invention is to provide a traffic intersection and flow control system in which vehicle parking areas and business buildings may be compatibly accommodated to the traffic flow system of the invention to provide for easy access to parking areas and business buildings from the roadways included in the system.

An additional object of the invention is to provide a traffic intersection and flow control system which requires fewer traffic control signals or lights than in the case of a conventional rectangular, four-lane intersection traffic grid system.

Another object of the invention is to provide an improved signal light for use in the control of traffic flow, which signal light is operative to permit a vehicle operator approaching an intersection to correlate his braking of the vehicle with the speed of the vehicle and the time at which a stop signal will positively indicate that he should not enter the intersection.

In addition to the foregoing described objects and advantages, additional objects and advantages will become apparent as the following detailed description is read in conjunction with the accompanying drawings which illustrate embodiments of the invention.

In the drawings:

FIG. **1** is a plan view of a traffic intersection and flow control system constructed in accordance with one embodiment of the invention, and illustrating one of the hexagonal traffic interchange units making up the basic unit in the traffic flow control grid of the invention.

FIG. **2** is a schematic illustration of the manner in which the traffic intersection and flow control system of the invention can be incorporated in a conventional urban street arrangement in which the streets intersect at right angles.

FIG. **3** is a view in elevation of one type of traffic control signal which can be used in the present invention.

FIG. **4** is a plan view of the traffic control signal depicted in FIG. **3**.

FIG. **5** is a schematic illustration of a novel traffic control signal apparatus which can be usefully employed in the traffic control system of the present invention, this view illustrating schematically the manner in which two moving sectors of light are developed by the traffic control signal apparatus.

FIG. **6** is a plan view of the novel traffic control signal apparatus.

FIG. **7** is a sectional view taken on line **7—7** of FIG. **6**.

FIG. **8** is a sectional view taken on line **8—8** of FIG. **7**.

FIG. **9** is a sectional view taken on line **9—9** of FIG. **7**.

FIG. **10** is a perspective view of one of two identical annular, cam plates used in the traffic control signal apparatus depicted in FIGS. **7–9**.

FIG. **11** is an electrical circuit diagram illustrating electrical circuitry employed in the traffic signal control apparatus.

Referring now to the drawings in detail, and initially to FIG. **1**, a traffic intersection and flow control system constructed in accordance with the invention is designated generally by reference numeral **10** and includes a generally hexagonal, multilane roadway **12** which encloses a large hexagonal open space **14**. The hexagonal, multilane roadway **12** is intersected at its corners by a plurality of radiating, outwardly extending roadways **16, 18, 20, 22, 24** and **26**. The size of the enclosed hexagonal space **14** may be varied over a wide range, but in most instances, will preferably be from about 150 to about 350 feet in width, and will be used for the accomodation of business or industrial buildings, or for the provision of a large automobile parking area, or for both buildings and parking.

In the arrangement depicted in FIG. **1**, two types of mounting of traffic control signals have been depicted for purposes of illustration or example. Thus, a traffic light mounted atop a suitable upright member or pole is designated by reference numeral **28** while a signal light which is suspended over the center of an intersection on cables or other suitable members is designated by reference numeral **30**. Both types of traffic signal support

structures are well understood in the art and will not be discussed further herein except in the incidental relationship of such support structures to the specific type of three-way traffic signals or lights which are provided as hereinafter described.

The generally hexagonal, multilane roadway **12** which is utilized in the embodiment of the invention depicted in FIG. **1** is divided into three traffic lanes which have been indicated in the drawing by reference numerals **12a, 12b** and **12c**. The lane **12a** is the innermost lane and adjoins, or is contiguous with, the large hexagonal space **14** enclosed by the hexagonal roadway. The lane **12b** is the central lane, while the lane **12c** is outermost in the hexagonal roadway. Each of the radiating outwardly extending roadways **16–26** is also characterized in being divided into three lanes with such lanes being designated by the letters a, b, and c as in the case of the three lanes of the hexagonal roadway **12**. The flow of traffic in the lanes of the several roadways as it moves in accordance with the control provided by the present invention is indicated by arrows and broken lines.

Final elements of the traffic intersection and flow control system of the invention are traffic dividing islands. These islands are provided in each of the radiating, outwardly extending roadways **16–26**, and also at points spaced around the hexagonal roadway **12** between the several corners thereof. Thus, a traffic dividing island **32** is provided in the radiating, outwardly extending roadway **16**, an island **34** in the roadway **18**, an island **36** in the radiating roadway **20**, an island **38** in the radiating roadway **22**, an island **40** in the roadway **24**, and an island **42** in the roadway **26**. The islands positioned in the hexagonal roadway between the six corners thereof are designated by reference numerals **44–54**, and are also positioned diagonally with respect to the direction of traffic flow for a purpose hereinafter explained.

The traffic signals **28** and **30** which are utilized in the traffic intersection and flow control system of the invention are, in each case, preferably three-way lights of a novel construction hereinafter described in detail. These signals control the flow of traffic from three directions through each of the intersections of the hexagonal roadway **12** with the several radiating roadways **16–26**. A typical general construction of such traffic signals is depicted in FIGS. **3** and **4** and includes a supporting pole **56** which is secured to the ground by a suitable base **58**, and which supports at its upper end, a triangular housing **60** having three sides **60a, 60b**, and **60c** extending at an angle of 60° to each other so that the housing **60** has a cross-section conforming to the geometry of an equilateral triangle. Each of the sides **60a—60c** of the housing **60** carries the conventional red, yellow and green lights to indicate to motorists whether their lane of traffic is to go, to exercise caution, or to stop.

Instead of being supported on the pole **56**, the housing **60** can also, and perhaps to better advantage, be supported by suitable cables or other suspension members over the center of the intersection as indicated by reference numerals **30** in FIG. **1**. In either event, the purpose of the triangular construction of the housing **60** and the positioning of the control lights in the manner described is to permit vehicular traffic entering the intersections at each corner of the hexagonal roadway to have an unobstructed view of the traffic signals, and to be apprised of the time at which traffic moving in a particular lane adjacent the intersection can proceed safely through the intersection without encountering traffic from other lanes.

OPERATION

For the purpose of explaining the operation of the traffic intersection and flow control system of the invention, let it initially be assumed that an automobile is moving in lane **16a** of the radial roadway **16**, and is approaching the intersection of this radial roadway with the hexagonal roadway **12**. As the line of traffic moving in lane **16a** approaches the intersection, some of the cars may diverge and move into the central lane **16b** once the line of traffic has moved even with and slightly past the traffic island **32**. Whether a given automobile moves into the central traffic lane **16b** after passing the island **32** in approaching the intersection will depend on whether the automobile wishes to turn to the left or to the right in entering the hexagonal roadway **12**.

Assuming that an automobile moving in the lane **16a** desires to proceed to a point X which is located at the side of the radial, outwardly extending roadway **24**, the automobile will, in this event, remain in the traffic lane **16a** until the intersection of the radial roadway **16** with the hexagonal roadway **12** is reached. Then, depending upon the status of the traffic signal **28** at this intersection, the automobile will be stopped or will be driven into the intersection. In any event, when the automobile is free to enter the intersection, the driver will turn to the right through an angle of about 60° and enter the lane **12c**. Stated differently, as viewed in FIG. **1**, the automobile will enter lane **12c** and will move in a counterclockwise direction around the hexagonal roadway **12**. When the automobile has been driven to a point abreast of the traffic island **54**, the operator will move to his left into the central lane **12b** and will then continue in this lane until the intersection of the hexagonal roadway **12** with the radial roadway **26** is reached. Here, when the three-way traffic signal **28** has indicated that the operator of the vehicle can proceed through the intersection, the automobile is driven through the intersection and into lane **12c** in that portion of the hexagonal roadway between the intersections of this roadway with the radial roadways **26** and **24**. The driver continues in lane **12c** until he reaches the intersection of the roadway **12** with the radial roadway **24**. When the automobiles in the three lanes **12a**, b, and c are permitted by the traffic signal **30** to move through the intersection of the radial roadway **24** with the hexagonal roadway **12**, the operator of the automobile in question turns through the intersection and into the lane **24c** in the roadway **24**. Though they are not illustrated, the radial roadways **16–26**, as well as the hexagonal roadway **12**, are provided with feeder or access streets at spaced intervals therealong to permit traffic to enter and exit from the peripheral or side lanes along these roadways. Thus, when the operator of the automobile in question approaches the access road or exit which is nearest his point of destination X, the automobile is driven off of the roadway **24** from lane **24c** and is parked in a suitable location near the destination.

Let it now be assumed that a person working in a building M located within the hexagonal space **14**, and parking his automobile in or near such building desires to leave the building and proceed to his residence which may be assumed to lie at some distance out on the radial roadway **18**. He will initially drive his automobile into the lane **12a** of the hexagonal roadway **12** and will pro-

ceed to move clockwise around the hexagonal roadway in the inside lane **12a** until he comes to the traffic island **44**. In proceeding around the hexagonal roadway **12**, the vehicle operator will, of course, proceed through the several intersections in accordance with signals indicated on the several traffic signals **30** and **28**. When the vehicle operator comes abreast of the traffic island **44**, he will drive the automobile into the central land **12b** on that side of the island **44** which is most nearly adjacent the intersection of the hexagonal roadway **12** with the radial roadway **18**. Then, after passing through the intersection upon the proper traffic signal, the operator of the vehicle will move first into the lane **18c**, and will then either continue in this traffic lane or will move to the left into the lane **18b** and proceed in one of these lanes toward his residence or ultimate destination.

The traffic signals **28** and **30** are operated so that, at any given time, traffic moves from any one of the three roadway branches entering an intersection into either of the other two branches, depending upon the destination and choice of the vehicle operators. At no time are vehicles entering any intersection simultaneously from two different directions. It will also be noted that there is no opportunity provided with the described system for traffic to converge or cross so that some automobiles are crossing in front of others.

The hexagonal interchange provided by the traffic control system of the invention permits large buildings to be erected in the hexagonal space **14** in the center of the hexagonal roadway **12**, or for this space to be devoted to automobile parking, or for both uses to be made of the space. Pedestrians may move across the several roadways by any one of several routes, such as by tunnels provided underneath the roadways and linking the hexagonal space **14** with the spaces located on the outside of the hexagonal roadway **12**. A preferred crossing arrangement, however, uses the traffic islands in conjunction with overhead walkways which permit pedestrians to cross over the inner and outer lanes of the three lane roadways to the islands at will. It should also be pointed out that the traffic signals **28** and **30** located at the several intersections can be arranged to provide a stop signal for vehicular traffic to permit pedestrians to walk through the intersection in any direction, if such an arrangement should be preferred. This arrangement, however, has the disadvantage of delaying vehicular traffic and increasing the time required for traffic to move across a given area of the city in which the system is utilized.

An especially desirable feature of the traffic intersection and flow control system of the invention is the manner in which it lends itself to incorporation in an existing conventional rectangular street grid or network as it is most often presently used in urban areas. Such integration of the system of this invention with an existing rectangular street network is depicted in FIG. **2**. Here the traffic intersection and flow control system **10** of the present invention is shown as it is incorporated in a large area in which, for example, urban renewal has been effected without disturbance or change in the outlying portions of the metropolitan area. Thus, in such outlying area, regular north-south east-west streets, designated by reference numerals **70** and **72**, respectively, have been interconnected by the radial roadways of the system of the present invention, and a series of contiguous hexagonal roadways **12** are provided in the center of the renewed area.

A novel traffic control signal light which can be very usefully employed in the traffic intersection and flow control system of the invention is depicted in FIGS. **5–9**. The manner in which the signal light functions can be best described by referring to the somewhat schematic portrayal of the light in FIG. **5**. As shown here, the signal light **110** is provided with the usual red, amber and green lamps **112**, **114** and **116**, respectively, and is supported on a suitable light pole **118**. A group of movable vanes or louvers **120** is provided for directing the light emanating from the red lamp **112**, and these louvers each have a light reflecting upper surface and a light absorbing lower surface. Groups of movable louvers or vanes **122** and **124** are also provided for directing the light emanating from the amber and green lamps, respectively. The louvers **122** and **124** each have a light reflecting lower surface and a light absorbing upper surface. The louvers **120**, **122** and **124** are so positioned relative to each other, and are so actuated by a hereinafter described pivoting mechanism, that during one period in the cycle of operation of the lamps, all three of the lamps are lit or burning, and their light is directed to produce a totally red sector **126** which is substantially contiguous to a sector **128** in which both the green and amber lights are visible to a motorist in this sector (**[see]** *See* FIG. **5**). The louvers **120**, **122** and **124** are pivoted in synchronism so that the red sector **126** is enlarged, the green-amber sector **128** is reduced in size, and the interface or boundary plane **130** between the sectors **126** and **128** is moved continuously toward the intersection at which the signal light is located.

The structure used to accomplish this distribution of light, and this movement of the illuminated sectors is most clearly illustrated in FIGS. **6–10**. The signal light **110** includes a housing **132** which is of triangular cross section and has its three sides projected to form light shields designated **132a–132f** in FIGS. **6** and **8**. The housing **132** is slotted near its top and its bottom to accommodate an upper annular cam plate **134** and a lower annular cam plate **136** so that the outer peripheral portions of these cam plates **134** and **136** project outside the housing (**[see]** *See* FIG. **8**). A motor **138** is mounted in the lower portion of the housing **132** and drives a shaft **140** which is keyed to the cam plates **134** and **136** for driving them in rotation. Each of the cam plates **134** and **136** has a slotted surface which includes an abrupt shoulder **142**, a gradually tapered shoulder **144**, and a lower flat **146** and an upper flat **148** all positioned contiguously in circular array as shown in FIGS. **7** and **10**. The upper cam plate **134** is mounted with its slotted surface facing downwardly, and the lower cam plate **136** is mounted with its slotted surface facing upwardly.

Mounted within the housing **132** between the upper and lower cam plates **134** and **136** are nine electric lamps, these lamps being arranged in three sets of three vertically aligned lamps, with the red lamp **112** being the uppermost lamp in each set, the amber lamp **114** being the central lamp, and the green lamp **116** being the lowermost of the three lamps in each set. The lamps are oriented at angles of 60° with respect to each other so that they face outwardly through openings formed in the three side walls of the housing **132** as best depicted in FIGS. **7** and **9**.

Positioned adjacent the lamp apertures in the walls of the housing **132** and secured in a vertically extending position on the respective walls of the housing **132** are a plurality of vane or louver rod brackets **150** (**[see]** *See*

FIG. 9). The brackets **150** journal one end of each of a plurality of vertically spaced louver rods **152** which are welded or otherwise suitably secured to the louvers **120, 122** and **124**. Each of the louvers **120, 122** and **124** is formed as a substantially rectangular plate having light absorbing and light reflecting surfaces as hereinbefore explained. At their ends which are opposite their ends journaled in the louver rod brackets **150**, the louver rods extend into U-shaped gear housings **160**. The three gear housings **160** are secured to each of the three walls of the housing **132**, and extend vertically on the opposite sides of the lamp apertures from the sides thereof on which the respective rod brackets **150** are located. A small toothed gear sector **162** is secured to the end of each of the louver rods **152** with the gear sectors being positioned in and protected by, the gear housing **160** (see FIG. 7). A rack or toothed rod **164** having two right angle bends therein to provide an offset extends downwardly through the top of each of the gear housings **160** and is positioned so that the teeth carried by the rack **164** engage the teeth on the toothed gear sectors **162** which are located in the respective gear housing. The upper end of each of the racks **164** is provided with a small roller or cam follower **166** which is positioned to roll upon the downwardly facing slotted surface of the upper cam plate **134**, and to follow the contour thereof as this cam plate is rotated. A spring **168** is disposed between a suitable stop pin carried by each rack **164**, and the top of the respective gear housing **160** so that the roller **166** at the top of the rack **164** is constantly resiliently biased into contact with the slotted surface of the upper cam **134**.

In a manner similar to the arrangement of the toothed gear sectors **162** on the louver rods **152** which carry the louvers **120** associated with the red lamp **112**, the louver rods **152** to which are secured the louvers **122** and **124** associated with the amber and green lights, respectively, also carry toothed gear sectors at their ends inside the gear housings **160**, these gear sectors each being designated *by* reference numeral **170** in the case of those louver rods carrying the louvers **122**, and **172** in the case of the louver rods carrying the louvers **124**. A rack or toothed bar **174** extends upwardly through the bottom of each of the gear housings **160** and is positioned so that its teeth engage the several gear sectors **170** and **172**. Each of the three racks **174** carries at its lower end a small cam follower or roller **176** which bears against the slotted surface of the lower cam plate **136** and follows the contour thereof during rotation of this cam plate. The roller **176** carried at the lower end of each of the racks **174** is continuously biased into contact with the slotted surface of the lower cam plate **136** by a spring **178** which is extended between an appropriate stop pin on the respective rack and the lower end of the respective gear housing **160**.

The orientation and construction of the several vanes or louvers **120, 122** and **124** are of substantial importance to the proper functioning of the novel and improved signal light of the invention. Thus, it will be noted that the louvers **122** and **124** associated with the amber and green lamps **114** and **116**, respectively, are inclined downwardly and extend substantially parallel to each other. The louvers **120** associated with the red lamp **112**, however, extend upwardly in one of their positions, and these louvers are also oriented in parallelism with each other. The upper surface of each of the louvers **120** is coated or covered with a light reflecting material so that red light emanating from the red lamp **112** is not only directed outwardly through the space between these louvers, but is reflected upwardly so as to provide a relatively large and far extending sector of red light during operation of the signal light as hereinafter described.

In the case of the louvers **122** and **124** associated with the amber and green lamps **114** and **116**, respectively, these louvers carry a light reflecting material on the lower surface of each of the louvers. Light from the amber and green lamps **114** and **116**, respectively, is thus reflected downwardly at a relatively steep angle so that the sector **128** in which the amber and green light is visible to a motorist moving along the roadways extends to a point relatively close to the intersection or to the location of the traffic control light **110**. The effect of this orientation and construction of the several louvers will become more clearly apparent as the operation of the signal light is hereinafter explained.

Electrical circuitry which is provided for use in controlling the timing sequence of the red, amber and green lamps **112, 114** and **116**, respectively, is depicted in FIG. **11** of the drawings. An A.C. generator **180** or other suitable source of electrical power is connected to a circuit which includes the amber lamp **114**, the green lamp **116** and a normally closed switch **182**. Circuitry is also provided which includes a two-position switch **184** for alternately connecting either the red lamp **112** or the green lamp **116** across the source of power **180**. The two switches **182** and **184** used to energize the lamps **112, 114** and **116** at different times during the operation of the traffic control light **110** may be located at several different locations so as to be alternately open and closed, or shifted from a first to a second position by contact with the switches of moving mechanical portions of the apparatus. This will be better understood as the sequencing of the mechanical movements and electrical switching of the apparatus is hereinafter explained.

Let it be assumed that a driver is approaching an intersection at which the novel traffic control signal light **110** is located. Let it further be assumed that the approach is being made at a time when the green lamp **116** in the bank or set of lamps facing the driver is lighted, and the louvers **120, 122** and **124** are positioned substantially as shown in FIG. **5**, or as shown [in] *on* the left side of the sectional view of the housing **132** in FIG. **7**. The status of the electrical circuitry at this time can be assumed to be that the switch **182** is open so that the amber lamp **114** is unlighted, and that the switch **184** is thrown to a position such that the red lamp **112** is unlighted and the green lamp **116** is lighted. At the same time that this status of the electrical circuit exists, the rollers **166** and **176** carried at the lower end of the racks **162** and **174**, respectively, are riding on the flats **146** of the upper and lower cam plates **134** and **136**, respectively. This relationship is best illustrated in FIG. **7**. These positions of the rollers **166** and **176** and their associated racks **164** and **174** assure that the louvers **120, 122** and **124** are located in the positions depicted in FIG. **5** and on the left side of FIG. **7**.

The energization of the green lamp **116** by operation of the switch **184** at this time can be conveniently effected by placing appropriate switch contacting protuberances on the inner peripheral surface of the annular cam plates **134** [ad] *and* **136**, or by placing the switch at a preselected point along the racks **164** and **174**, or in a position to be actuated by movement of the louvers **120, 122** and **124**. It is only necessary that synchronism

be effected between the operation of switch **184** to form an electrical circuit through the green lamp **116**, and the movement of the louvers **120**, **122** and **124** to the described [position] *positioned* by rotation of the cam plates **134** and **136**.

As the cam plates **134** and **136** continue to rotate in a clockwise direction as viewed in FIG. **8** of the drawings, the rollers **166** and **176** continue to bear against the flat **146** of the slotted cam plate surface for a preselected period of time and, during this time, the green lamp **116** continues to burn. Continued rotation of the cam plates **134** and **136** ultimately brings the rollers **166** and **176** onto the gradually tapered shoulder **144** so that the rack **164** begins to move slowly downwardly, and the rack **174** commences to move slowly upwardly. The effect of these movements of the racks **164** and **174** is to cause a gradual pivotation of the louvers **120**, **122** and **124** about their respective louver rods **152**.

Simultaneously with the movement of the rollers **166** and **176** onto the respective gradually tapered shoulders **144** of the respective slotted cam plate surfaces, the switch **184** is thrown to its alternate position to light the red lamp **112**, and the switch **182** is closed to provide simultaneous illumination of the amber lamp **114** and the green lamp **116**. Thus, at the time that the rollers **166** and **176** commence to move on the gradually tapered shoulders **144** of the cam plates **134** and **136**, all three of the lamps are lit. As the louvers **120**, **122** and **124** are gradually pivoted downwardly about their louver rods **152**, the effect of this movement is to gradually diminish the size of the sector **128** in which both the amber and green lights are visible to a motorist, to gradually enlarge the size of the sector **126** in which only the red light is visible to the motorist, and to simultaneously cause the interface or [plans] *plane* of division **130** between these sectors to move inwardly toward the intersection.

The rate of pivotation of the louvers **120**, **122** and **124** is preferably adjusted so that the interface or plane of division **130** between the sectors **126** and **128** sweeps along the roadway toward the intersection at a rate which is equivalent to the legal speed limit on the roadway approaching the intersection. Thus, at this time, the motorist approaching the intersection may find himself either in that sector **126** in which only the red lamp **112** is visible, or he may be located in the sector **128** where both the amber and the green lamps are visible. As the size of the sectors **126** and **128** change, and the interface **130** between them sweeps inwardly toward the intersection where the traffic signal light **110** is located, a motorist who is driving too slowly may find himself overtaken by the red sector and will be clearly advised well in advance of reaching the intersection that he should commence to apply the brakes. On the other hand, a motorist who is initially in the red sector will know that he must stop at the intersection unless he violates the law by speeding up to a speed exceeding the legal limit in order to overtake the green-amber sector **128**. A significant aid is thus provided by the described arrangement to witnesses and to motorists alike in evaluating the fault of motorists involved in any accidents which may occur at or adjacent the intersection since it will be possible to testify whether the motorist overtook the moving boundary **130** between the amber-green sector **128** and the red danger sector **126**.

After the rollers **166** and **176** complete their travel up the gradually tapered shoulder **144** of the upper and lower cam plates **134** and **136**, respectively, the louvers will be in the lowered position shown at the right of FIG. **7**. Thus, the louvers **122** and **124** associated with the amber and green lights **114** and **116**, respectively, will be slanted downwardly at a steep angle, and the effect will be that essentially no light emanating from either of these lamps will be visible to motorists approaching the intersection. On the other hand, the louvers **120** associated with the red lamp **112** are not inclined downwardly at such steep angle, and the position of these louvers, coupled with their characteristic of having light reflecting upper surfaces, is such that a red sector will extend from far down the roadway approaching the intersection to a point at the base of the pole **118** or at least to within the intersection at which the traffic signal **110** is located. This broad coverage of the red sector at this time is accomplished by the transmission of direct rays through the slots or openings existing between the [louver] *louvers* **120**, and also by the reflection of red light from the reflective upper surfaces of each of the louvers **120**.

At the time that the rollers **166** and **176** move onto the flat **148** of the upper and lower cam plates **134** and **136**, respectively, to move the louvers **120**, **122** and **124** to the position shown at the right of FIG. **7**, though the amber and green lamps **114** and **116** are obscured by their substantially closed louvers **122** and **124**, these lamps may further be extinguished by opening the electrical circuits to them. This may be accomplished by opening the switch **182** at this time by contact with one of the louvers **122** and **124** when it has moved to the downwardly extending position illustrated, or by contact with a suitable protuberance carried upon one of the cam plates **134** or **136**, or in any other suitable manner.

It will be noted in referring to FIGS. **7** and **8** that the slotted surface of each of the cam plates **134** and **136** permits three louver actuating sequences to be effected in the case of each of the three vertically aligned sets of red, green and amber lamps **112**, **114** and **116**, respectively, during each rotation of each cam plate. Thus, the two cam plates **134** and **136** may be used to operate each of the three vertically arranged sets of lamps in proper sequence at each intersection, and while the green lamp **116** alone is burning and the rollers **166** and **176** are moving on the flat **146** in the case of a single set of louvers and lamps facing in one direction, the red lamps **112** in the other two sets are illuminated, and the rollers **166** and **176** carried by the racks **164** and **174** associated with each of the other two sets of louvers are moving on the flats **148** of the two cam plates.

From the foregoing description of the invention, it will be apparent that the invention provides an improved traffic intersection and flow control system for rapidly moving traffic from one location to another in a densely populated metropolitan area with minimum danger of collision and obstruction. Moreover, the system can be easily adapted for inclusion in existing rectangular traffic patterns, and is well adapted to the inclusion within the roadway network provided by the system of business and commercial buildings, as well as large areas for vehicular parking, parks or the like.

Although preferred embodiments of the invention have been herein described in order to provide an example of the manner in which the invention should be practiced, it will be understood that various modifications and changes can be made in the invention without departure from the general principles which underlie the invention. *All such changes and modifications are*

therefore deemed to be circumscribed by the spirit and scope of the invention except as the same may be necessarily limited by the appended claims or reasonable equivalents thereof.

What is claimed is:

1. A traffic intersection and flow control system comprising:

a generally hexagonal, multilane roadway having radiating, multilane roadways extending outwardly from each corner of the hexagonal multilane roadway, the lanes of each of said multilane roadways being located in a single level;

traffic dividing island means in said hexagonal multilane roadway between each corner thereof and in each of said radiating multilane roadways for allowing traffic moving in a single lane to diverge and move in a plurality of lanes, said islands and lanes being positioned so that all traffic in that innermost lane of the hexagonal roadway which is nearest the enclosed hexagonal space moves at all times in one direction, and all traffic in the outermost lane of the hexagonal roadway moves at all times in the opposite direction to the direction of movement of traffic in said innermost lane, and being further positioned so that traffic moving in any of said lanes need at no time cross in front of traffic moving in the other lane; and

traffic control signals adjacent each corner of said hexagonal multilane roadway for controlling the flow of traffic in three directions through the intersection of said hexagonal multilane roadway with the several radiating multilane roadways.

2. A traffic intersection and flow control system as defined in claim 1 wherein each of said roadways has an odd number of lanes therein.

3. A traffic intersection and flow control system as claimed in claim 1 wherein each of said roadways has three lanes, and said traffic dividing island means includes:

a traffic island in the center lane of each of said radiating, outwardly extending roadways; and

traffic islands located in the center lane of said hexagonal, multilane roadway on the opposite side of each intersection of said hexagonal roadway with said radiating, outwardly extending roadways.

4. A traffic intersection and flow control system as defined in claim 3 wherein said traffic islands each extend diagonally across the respective center lanes in which they are located, and extend parallel to the direction in which automobiles will necessarily move when moving from an adjacent outside lane into said center lanes when the traffic in said outside lanes moves in opposite directions.

5. A traffic intersection and flow control system as defined in claim 1 wherein each of said traffic control signals comprises a triangular housing having three sides extending at 60° to each other, and having traffic signal lights in each of said sides.

6. A traffic intersection and flow control system as defined in claim 1 wherein said radiating, outwardly extending roadways each form a portion of other hexagonally shaped roadways contiguous with said first mentioned hexagonal roadway and having a side in common with said first mentioned hexagonal roadway in honeycomb fashion.

7. A traffic intersection and flow control system as defined in claim 5 and wherein each of said control signals is further characterized in having three sets of vertically aligned signal lamps in said housing with the lamps in each of said sets facing at an angle of 120° with respect to the direction in which the lamps in adjacent sets face to direct light through the three respective sides of said housing, each set of lamps containing a top lamp, a central lamp and a bottom lamp, the top lamp, central lamp and bottom lamp in each set producing lights of different colors from each other;

and wherein said control signal further includes louvers pivotally mounted on said housing in alignment with each of said lamps for directing light emanating from said lamps, said louvers being oriented relative to each other so that a first sector of light projected from said top lamp is clearly delineated from an adjacent second sector of light projected from both said central and bottom lamps; and

means for synchronously pivoting said louvers to enlarge said first sector, diminish said second sector, and maintain each of said first and second sectors well defined with respect to each other while moving the boundary therebetween toward said traffic control signal.

8. A traffic control signal light comprising:

a housing having a plurality of apertures therethrough;

a first lamp for producing light of a first color positioned in said housing for directing said first color light through at least one of said apertures;

a second lamp for producing light of a second color positioned in said housing below said first lamp for directing said second color light through at least one of said apertures other than those through which said first color light is directed;

a first set of louvers pivotally mounted on said housing and aligned with said first lamp for directing light from said first lamp in a first sector extending from said signal light;

a second set of louvers pivotally mounted in said housing and aligned with said second lamp for directing light from [said] said second lamp in a second sector adjacent, but distinct from, said first sector with both of said first and second sectors intersecting[,] a plane extending normal to a vertical line extending through said housing;

means for [synchonously] *synchronously* moving said louvers in pivotal movement to simultaneously enlarge said first sector and diminish said second sector while concurrently moving the boundary between the two sectors.

9. A traffic control signal light as defined in claim 8 and further characterized to include:

a third lamp producing light of a third color positioned between said first and second lamps and aligned with at least one aperture in said housing other than the apertures through which said first color light is directed;

a third set of louvers pivotally mounted in said housing and aligned with said third lamp for directing said light of a third color into said second sector with said second color light; and

means for synchronously moving said second and third set of louvers to maintain both said second and third color light in said second sector.

10. A traffic control signal light as defined in claim 8 wherein said first set of louvers includes a plurality of first plates extending in spaced parallel planes with each of said first plates being mounted for pivotation about a

horizontal axis, each of said first plates having a light reflecting upper surface;

and wherein said second set of louvers includes a plurality of second plates extending in spaced, parallel planes with each of said second plates being mounted for pivotation about a horizontal axis which extends parallel to the horizontal pivotal axes of said first plates, each of said second plates having a light reflecting lower surface.

11. A traffic control signal light as defined in claim **10** wherein said means for synchronously moving said louvers comprises:

rods extending along the pivotal axes of each of said plates and secured to said plates;

gear means secured to each of said rods;

rack means drivingly engaging said gear means for driving said rods in rotation about their longitudinal axes; and

cam means engaging said rack means and moving said rack means to effect synchronous movement of said plates in a predetermined pattern of movement.

12. A traffic control signal light comprising:

a first lamp for producing light of a first color;

a second lamp spaced from said first lamp for producing light of a second color;

louver support means adjacent said first and second lamps;

a first set of louvers pivotally mounted on said louver support means and aligned with said first lamp for directing light from said first lamp in a first sector extending from said signal light;

a second set of louvers pivotally mounted on said louver support means and aligned with said second lamp for directing light from said second lamp in a second sector adjacent, but distinct from, said first sector; and

means for synchronously moving said louvers in pivoted movement to simultaneously enlarge said first sector and diminish said second sector while concurrently moving the boundary between the two sectors.

13. A traffic intersection and flow control system comprising:

a generally [polygonal] *hexagonal*, multilane roadway having radiating, multilane roadways extending outwardly from each corner of the [polygonal] *hexagonal* multilane roadway, the lanes of each of said multilane roadways being located in a single level;

traffic dividing island means in said [polygonal] *hexagonal*, multilane roadway between each corner thereof and in each of said radiating multilane roadways for allowing traffic moving in a single lane to diverge and move in a plurality of lanes, said traffic dividing island means and lanes being positioned so that traffic moving in any of said lanes need at no time cross in front of traffic moving in any other lane; and

traffic control signals adjacent each corner of said [polygonal] *hexagonal*, multilane roadway for controlling the flow of traffic in three directions through the intersection of said [polygonal,] *hexagonal* multilane roadway with the several radiating multilane [roadyays] *roadways*.

14. A method for controlling traffic approaching a traffic intersection from a traffic control signal source positioned proximate to the traffic intersection comprising the steps of:

displaying at the traffic control signal source a "go" signal indication visible to traffic in a first sector, the traffic in the first sector being at a sufficiently short distance from the traffic intersection that passage thereof through the traffic intersection at a predetermined traffic control speed is permitted; and

simultaneously displaying at the traffic control signal source a "stop" signal indication visible to traffic following said first sector in a second sector, the second sector being at a greater distance from the traffic intersection than the first sector in the line of travel of traffic toward said intersection.

15. The method for controlling traffic approaching a traffic intersection as defined in claim 14 characterized further to include the additional step of:

simultaneously displaying at the traffic control signal source a "caution" signal indication visible to traffic in the first sector.

16. The method for controlling traffic approaching a traffic intersection as defined in claim 14 characterized in including the further steps of

moving the first sector in which the "go" signal indication is visible in a direction approaching the traffic intersection at a speed directly related to the predetermined traffic control speed; and

moving the second sector in which the "stop" signal indication is visible in a direction approaching the traffic intersection at a speed directly related to the predetermined traffic control speed.

17. The method of controlling stop-and-go traffic in a control zone from a traffic signal adjacent said zone comprising displaying at said traffic signal a "go" indication to traffic at sufficiently short distances from said traffic signal to permit safe transit through said zone at normal zone speed, while simultaneously displaying at said traffic signal, a "stop" indication to traffic at greater distances.

18. Apparatus for controlling traffic approaching a traffic intersection comprising:

a first source of light of one color;

a second source of light of a second and different color;

means for directing light of said one color into a first sector along a roadway passing under said first and second light sources; and

means for directing light of said second and different color into a second sector contiguous to said first sector and at a different distance along said roadway from said first and second sources than said first sector; and

means for simultaneously and continuously shifting the location of both said first and said second sectors toward said first and second sources of lights while maintaining said sectors contiguous to each other.

19. Method of controlling stop-and-go traffic in a control zone from a traffic signal adjacent said zone and having a view lens, comprising displaying at said lens a "go" indication to traffic at sufficiently short distances from said signal to permit safe transit through said zone at normal zone speed, while simultaneously displaying at said lens, a "stop" indication to traffic at greater distances.

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