

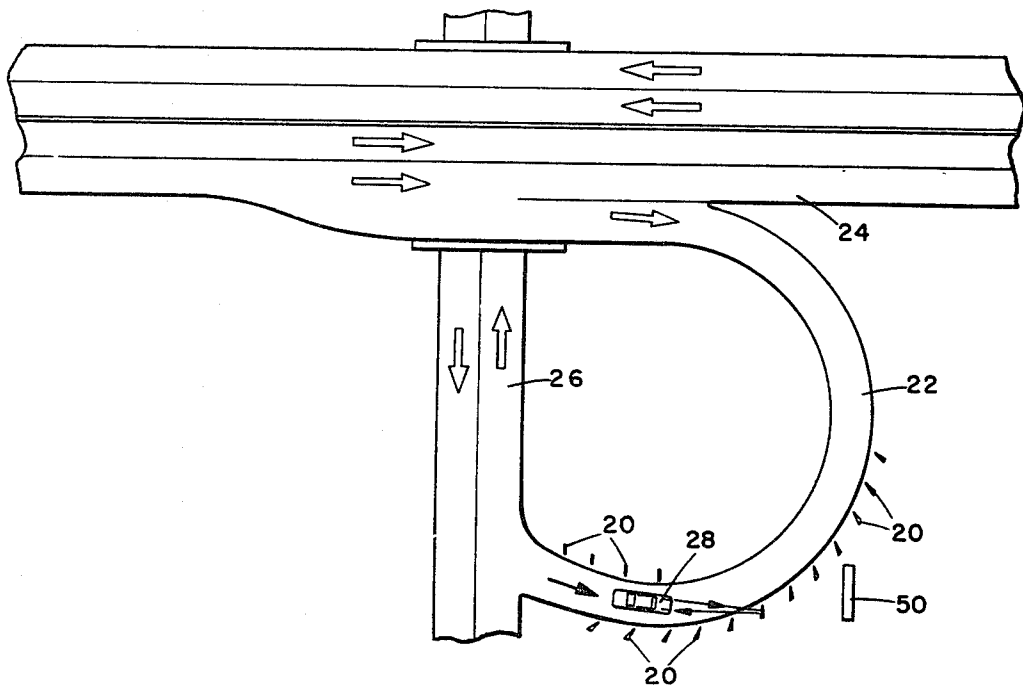
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 [21] Appl. No. **805,637**
 [22] Filed **Mar. 10, 1969**
 [45] Patented **Feb. 2, 1971**

[56] **References Cited**
UNITED STATES PATENTS
 2,996,137 8/1961 Chu et al. 343/7(ED)X
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[54] **WRONG WAY TRAFFIC CONTROL SYSTEM**
 6 Claims, 7 Drawing Figs.

[52] U.S. Cl. 180/98;
 340/32, 340/53, 343/7
 [51] Int. Cl. B60t 7/12,
 G01s 9/02, B60k 77/08
 [50] Field of Search 180/98;
 340/32, 53; 343/7ED

ABSTRACT: The system is adaptable to vehicles having radiant energy proximity detecting or automatic spacing apparatus. A series of fixed radiant energy reflectors is placed along the side of a one-way traffic lane to reflect signals back to a wrong way vehicle and warn or stop the vehicle. A simple addition to the basic proximity detecting apparatus locks the brakes until the vehicle is reversed.



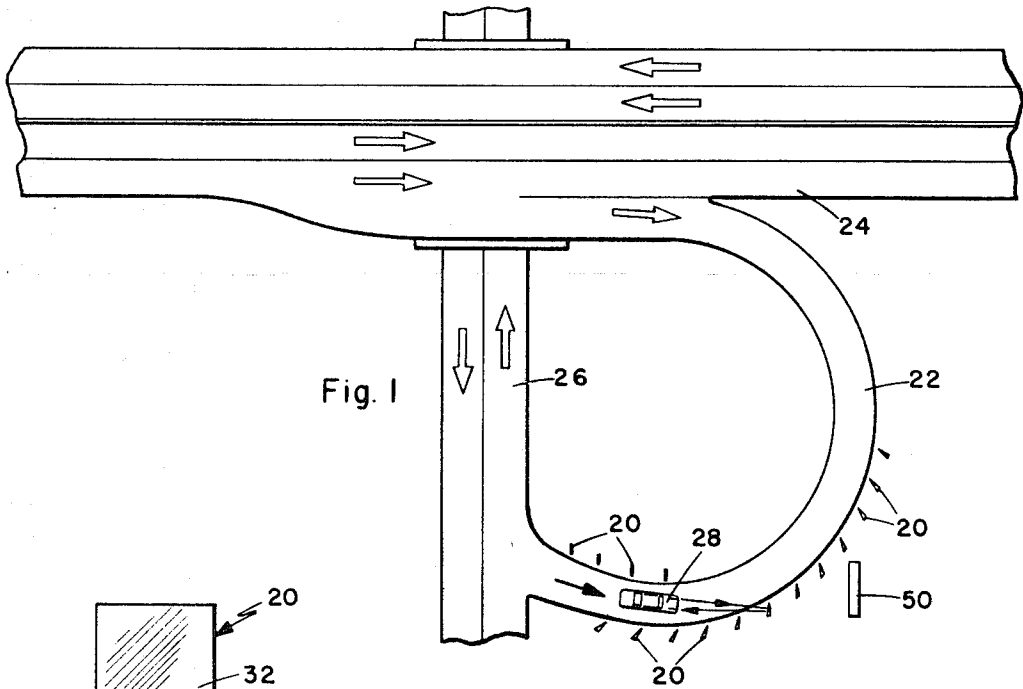


Fig. 1

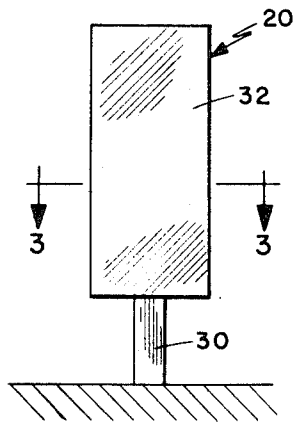


Fig. 2

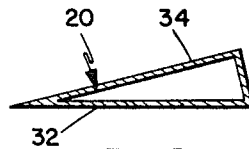


Fig. 3

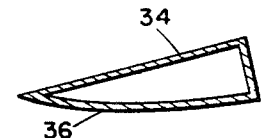


Fig. 4

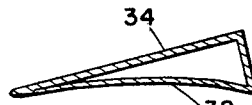


Fig. 5

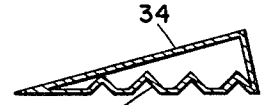


Fig. 6

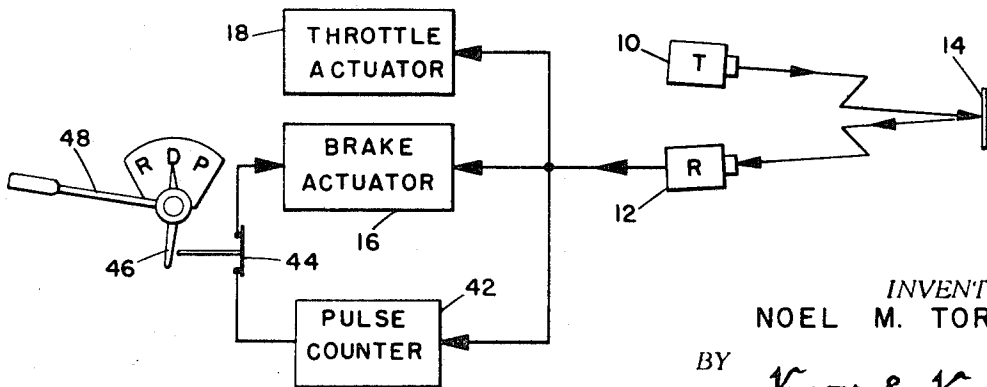


Fig. 7

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WRONG WAY TRAFFIC CONTROL SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates to traffic control and specifically to a wrong way traffic control system.

Due to increasing traffic density and the complexities of highways wrong way driving is becoming more frequent and is extremely dangerous. Various means have been proposed to prevent wrong way driving, in addition to the usual signs, but all have some disadvantages. The simple types, such as spikes, blades, physical barriers and the like, usually disable the wrong way vehicle and leave it blocking the traffic lane, and this can be dangerous to right way traffic.

SUMMARY OF THE INVENTION

The system described herein is for use with vehicles having radiant energy proximity detecting or automatic spacing apparatus. Various types of such apparatus have been proposed and tested and will almost certainly come into common use as a primary safety feature for high speed travel in heavy traffic. With this type of apparatus a beam of radiant energy is transmitted ahead and is reflected from the preceding vehicle, the range being automatically computed and control means actuated to inform the driver or to actually control the vehicle, so that spacing is adjusted to a safe distance in relation to speed.

The wrong way indicating part of the system comprises fixed radiant energy reflectors spaced along a one way traffic lane to reflect strong signals to a wrong way vehicle and cause a warning or actual stopping of the vehicle by its own means. The cost of the reflector installation is low and very little maintenance is required. A simple addition to the basic proximity detection apparatus is actuated by repetitive pulses from successive spaced reflectors, to hold the vehicle brakes on until the vehicle is reversed, so preventing further travel in the wrong direction.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram of a typical highway interchange with the reflectors installed;

FIG. 2 is a front elevation view of a typical reflector;

FIG. 3 is an enlarged sectional view taken on line 3-3 of FIG. 2;

FIGS. 4-6 are sectional views similar to FIG. 3, showing alternative reflector configurations; and

FIG. 7 is a schematic diagram of the modified proximity detection apparatus used in the vehicle.

DESCRIPTION THE PREFERRED EMBODIMENTS

Since many accidents on busy highways are compounded because vehicles are too closely spaced and unable to stop in time, it has been recognized that efficient control of vehicle spacing is an essential factor in improving traffic safety. Various systems have been proposed, and some tested, which control vehicles automatically by equipment in the vehicles, or in the roads, or both, the road-installed systems being expensive. The most feasible type utilizes a radiant energy transmitter and receiver in the vehicle to measure the distance to the preceding vehicle, and either indicate the same to the driver or actually control the vehicle to maintain safe spacing in accordance with speed. Such apparatus can use radar, laser, infrared, or other radiant energy means, and the system described herein is adaptable to all types. For reference purposes, U.S. Pats. No. 2,804,160 and 3,011,580 show radar and infrared systems, respectively, of the type described.

A typical proximity detecting system is shown in very simple form in FIG. 7, in which a transmitter 10 transmits a beam of radiant energy and a receiver 12 picks up returned energy from a reflective object 14. If the distance to the reflector is less than a predetermined safe minimum, the receiver causes a brake actuator 16 to operate the vehicle's brakes and, if necessary, adjusts speed by means of a throttle actuator 18. It is as-

sumed that the apparatus will incorporate a minimum signal threshold to prevent constant reaction to spurious reflections from roadside obstacles and the like.

In the arrangement shown in FIG. 1, a plurality of reflectors 20 are spaced along the outside edge of an off ramp 22 curving from a primary divided highway 24 to a secondary road 26. Correct traffic flow is indicated by outlined arrows and the direction of a wrong way vehicle 28 by a solid arrow.

Each reflector 20 is supported on a post 30, or other suitable means and has a highly reflective front face 32, which is shown as being rectangular and elongated vertically to allow for variations in the height of the radiant energy beam. The face 32 need not be highly polished, merely a good reflector for infrared and laser light. Making the reflector of metal will ensure a good return for radar.

It will be seen that the radiant energy beam from vehicle 28 will sweep around the outside of off ramp 22, and the reflectors are oriented so that their faces 32 will be at the optimum angle to reflect a strong signal back to the vehicle. To avoid operation of the proximity detection of a right way vehicle, it is important that a minimum area of the reflector is presented to the direction of right way travel. In some road configurations a simple flat plate reflector may suffice if the orientation is such that the edge of the plate is presented to right way traffic. To accommodate different road curvatures and arrangements, the reflector 20 may be made generally wedge shaped in cross section, as in FIG. 2, and oriented with the point of the wedge toward right way traffic. This will present a minimum target area to radar and the rear face 34 may be treated to minimize optical reflectivity in any suitable manner. In any event, in the arrangement shown, and in most other instances, the orientation of the rear face 34 is such that the radiant energy beam from a right way orientation vehicle will be deflected to the side.

A set of reflectors 20 is also installed along the inside edge of off ramp 22 adjacent road 26, to provide reflections to a vehicle turning right from the right-hand lane of the secondary road. These may cause the vehicle to be stopped immediately on entering the off ramp and need not extend very far along the ramp, since the radiant energy beam will be directed to the outside of the curve once the vehicle is on the ramp.

In its basic form in FIG. 2, the reflector has a flat reflective face 32. Since some of the radiant energy systems are necessarily narrow beam, it may be desirable to vary the direction of reflection over a certain area to ensure pickup by the receiver. This is easily accomplished by making the reflective face nonplanar. As examples, FIG. 4 shows a convex curved reflective face 36, FIG. 5 shows the concave face 38 in one facet of a multifaceted reflector and FIG. 6 a ribbed face 40. Other configurations could be used for specific road layouts.

As the vehicle proceeds in the wrong direction, as in FIG. 1, the radiant energy will be reflected to the receiver as a series of pulses. The proximity of the reflectors will cause the detection apparatus to slow the vehicle and make the driver aware of impending danger. However, by making an addition to the basic proximity detection apparatus, the pulsed reflections resulting from the spaced reflectors can be utilized to stop the vehicle.

In FIG. 7, such an addition includes a pulse counter 42 connected between the receiver 12 and brake actuator 16, in addition to the existing connection, to cause the brakes to be applied after receiving a predetermined number of rapidly successive signal pulses. Pulse-counting switches of this type are well known in industrial applications, such as automatic processing or material handling, and can be set for many different pulse number and timing situations. Operation of the brakes through the pulse counting part of the system would override the speed control provided by the basic system in response to substantially continuous small fluctuations of the reflected signal.

To allow the vehicle to be moved after being stopped by the pulsed signals, a normally closed resetting switch 44 is installed at a convenient position in the circuit, such as between

the pulse counter and brake acuator. Switch 44 is opened by an arm 46, or comparable actuating means, on the gear shift lever 48, only when the lever is moved to the reverse position. Thus the vehicle is stopped and held by the brakes until shifted into reverse and backed out of the off ramp 22. Any attempt to resume wrong way forward motion after reversing will result in the vehicle being stopped again by the pulsed signals.

In a complete installation a sign 50, or several signs, would be placed at the outside of the off ramp to warn and instruct a wrong way driver. The sign could be illuminated, either permanently or triggered by approach of a wrong way vehicle. Certain of the reflectors could also incorporate visual warning means to suit specific road arrangements.

I claim:

1. Wrong way traffic control means for a vehicle having a gear shift, brake-actuating means, and radiant energy means for detecting the proximity of a reflective object ahead and controlling the progress of the vehicle in response thereto, including operation of the vehicle brakes, the traffic control means comprising: a plurality of radiant energy reflectors

spaced along a one way traffic lane with reflective front surfaces oriented to reflect radiant energy to a wrong way vehicle

2. Means according to claim 1, wherein said reflectors have substantially nonreflective rear surfaces.

3. Means according to claim 1, wherein said reflective front surfaces are nonplanar.

4. Means according to claim 1, wherein said reflectors are substantially wedge shaped in cross section, with a minimum surface area presented to right way traffic.

5. Means according to claim 1, wherein said reflectors are spaced to reflect the radiant energy in rapidly successive pulses as the vehicle advances; said traffic control means including pulse-counting means on said vehicle coupled to said radiant energy means to operate said brake actuating means after a predetermined number of pulses of reflected energy.

6. Means according to claim 5, and including resetting means coupled to said pulse-counting means and being operable by said gear shift to release the brakes upon reversing the vehicle.

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