POP UP TRAFFIC DIVIDER
10 Claims, 4 Drawing Figs.

ABSTRACT: A pop up traffic divider for use on a highway has a housing buried flush with the highway and containing a casing also flush with the highway and encompassing a column supported on the casing bottom and at top flush with the highway. An annular piston is disposed between the casing and the column and is moved up and down by differential pressure of fluid such as air. On the piston is a resilient, deformable tube retracted within the casing and expelled therefrom by movement of the piston. The upper end of the column and of the casing afford a rounded body or bodies over which the extended, deformable and resilient tube can be bent without injury.
In modern traffic control, particularly on multilane highways, there are various means of demarcating turning points and of marking the boundary between adjacent highway lanes. There are also ways of demarcating different lanes at different times in order to accommodate variances in the flow of traffic. Sundry devices for this purpose are manually positioned and shifted and removed. This is an expensive and sometimes dangerous operation. The marking devices offer, in some instances, hazards to driving.

It is an object of the invention to provide an improved traffic divider which is permanently installed and which is movable between a retracted position substantially concealed beneath the roadway to a projected position forming a visible and actual physical barrier above the highway.

Another object of the invention is to provide a pop up traffic divider of sufficient durability and stamina as to withstand abuse in traffic.

Another object of the invention is to provide a pop up traffic divider which is entirely safe and does not increase the traffic hazard nor interfere with emergency operation.

Another object of the invention is to provide a pop up traffic divider which is relatively inexpensive to install and maintain under adverse weather and traffic conditions.

A further object of the invention is to provide a pop up traffic divider which can readily be repaired or replaced when necessary.

Another object of the invention is to provide a pop up traffic divider having a projecting and retracting tube of special characteristics to fit it for long-continued service despite onerous conditions.

Another object of the invention is in general to provide an improved pop up traffic divider.

Other objects of the invention together with the foregoing are attained in the embodiment of the invention described in the accompanying description and illustrated in the accompanying drawings, in which:

FIG. 1 is a side elevation of an installation of a number of my traffic dividers in a highway, the highway being shown in cross-section on a vertical plane;

FIG. 2 is a cross-section, the plane of which is indicated by the line 2-2 of FIG. 1, with the scale substantially enlarged and with a portion of the figure broken away to reduce its size and other portions broken away to show the interior arrangement;

FIG. 3 is a side elevation of the tube with portions broken away to illustrate the interior arrangement; and

FIG. 4 is a cross section, in part diagrammatic, showing the interaction of a vehicle wheel with a pop up traffic divider constructed pursuant to the invention herein.

In a typically successful installation one or a number of dividers 6 and 7 are provided. If a number are installed, all of them are substantially identical and are installed, usually in a linear series, below and within the pavement 8 of a highway or the like having a traffic surface 9. A description of one device applies to all. Preferably there is provided in and below the material of the highway 8 an exterior housing 11. This is conveniently a circular cylindrical, tubular member of metal or plastic. In this instance the housing is of metal long enough to extend substantially vertically into the ground and being symmetrical about a vertical axis 12. At its upper end the housing 11 is reinforced by a reinforcing collar 13 conveniently held in place by a weld 14 and is positioned so that the upper surface of the collar 13 is substantially flush with the surface 9 of the highway. At its lower end the housing 11 is closed by a plug 16 conveniently held in place by welds 17. The plug 16 closes the bottom end of the housing against the elements so that there is afforded a segregated enclosure for the pop-pocket.

Designed to fit into the housing 11 is a casing 18, also of circular cylindrical configuration, disposed concentrically about the axis 12. The casing extends downwardly into close contact or abutment with the plug 16 and at its upper end extends toward the collar 13 to join a conical ring 19 to which it is secured by welding 20. A moderately hard but flexible annulus 21 is secured to a flanged metal disc 22 held on the ring 19 by fasteners 23, a skirt 24 being clamped as a gasket between the ring 19 and the collar 13. The ring 19 is referred to herein as substantially flush with the surface of the highway. While the drawing (FIG. 2) is approximately to scale and while in fact the ring 19 is above the highway surface, the amount the ring extends above the surface is small compared to the diameter of vehicle wheels passing nearby and is of about the same upward projection as is encountered in connection with the usual traffic lane marker buttons. This construction leaves a small annular space 25 between the housing 11 and the casing 18.

At its lower end the casing 18 is closed by a disc 26 held in place by a weld 27. The disc 26 is also held by a weld 28 to a central column 29 preferably of tubular form, the disc and column thus being virtually integral. The column is concentric with the axis 12 and at its upper end receives a cap 31 having a central boss 32 seated within the column. The boss 32 has a rounded rubber-like top 33 secured to a plate 34 held to the cap by fasteners 35. The top, although actually above the surface of the highway, is substantially flush therewith. That is, the top 33 extends above the highway about as much as the normal highway lane marking buttons. The cap 31 is of a diameter to approach closely the interior diameter of the ring 19 to leave an annular opening therebetween.

For securing the cap 31 in position and for holding the column 29 and its base 26 in removable contact with the plug 16 and to maintain the parts in assembled operating relationship, there is a rod 36 passed centrally through the column along the axis 12. The rod is preferably provided with a head 37 designed to receive any of the customary wrenches such as an Allen wrench and has threads 38 at its lower end engaged with an internally threaded boss 39 centrally disposed on the plug 16. When a wrench tightens the rod 36, the cap and column are held firmly in position so that the cap is in weight-supporting and transmitting relationship with the rest of the installation. The cap and column are strong enough to support the weight and impact of any highway vehicle. When the wrench reversely operates the rod 36, the cap may be removed and the column and casing 18 can then be removed from the housing.

Situuated in the annular space 41 between the outside of the column 29 and the inside of the casing 18 is a piston 42. The piston has a lower face 43 in the bottom position thereof adapted to abut a boss 44 on the disc 26. The piston 42 is designed to slide on the column 29 and for that reason has spaced apart interior faces 46. Likewise, the piston slides on the interior of the casing 18 and so has a cooperating face 47. The faces 46 and 47 are provided with O-rings 48 so that the slidable piston is sealed against leakage to and from the annular space 41.

Secured to the piston 42 is a special tube 51. Under some conditions the piston 42 and the tube 51 are made integrally, but for convenience under present circumstances the tube and piston are separately manufactured and are then joined together on a serrated peripheral 52 of the piston 42 by a suitable adhesive such as cement. The tube, as particularly shown in FIG. 3, is an especially manufactured annular body designed to take a great deal of flexing and to be readily deformable, although resilient so as to return after deformation substantially to its original shape and size. Practically, the tube is made of a tubular annular body of steel or other metal or other material, preferably a high quality synthetic rubber, or a similar substance. The tube is formed in a long section and is supplied with or is provided with an inner tube 53 of an elastomeric material such as synthetic rubber and with a band of fibers 54 around such inner tube 53. The fibers 54 are arranged with the axis of each fiber parallel to the central axis 56 of the tube, so that the fibers extend lengthwise or longitudinally of the tube. Around the longitudinal axis of the fibers 54 is provided a covering 57 of additional elastomeric material which in turn is surrounded by circumferentially extending fibers 58. Around this layer of fibers 58 is imposed a further layer 59 of elastomeric material itself sur-
rounded with circumferentially wound or extending fibers 61. Finally, to provide a smooth exterior, the fibers 61 are surrounded by an elastomeric layer 62. The result of this construction is a tube 51 of a carefully controlled predetermined size and smoothness as to both interior and exterior surfaces, a tube which is very nearly circular cylindrically throughout its entire length and a tube able to deform and deflect numerous times without injury, yet one which is sufficiently resilient or elastic as to return after deflection substantially to its original condition.

The tube 51 is of such height that when the piston 42 is at its bottom most location, the top or rim 63 of the tube is approximately flush with the surface of the top 33 and thus is not exposed and visible but rather is retracted and virtually unnoticeable.

While many different means may be utilized to move the piston 42 within its annular space 41, present preference is to utilize compressed air for this purpose and so to subject the piston to differential pressure. For that reason, as diagrammatically shown in FIG. 2, there is a control valve 64 governing the flow from a source of air under pressure and to a waste or sink 67 (such as the atmosphere) for air under piston re.

The valve 64 can also connect either the inlet 66 or the outlet 67 to a control pipe 68 which extends to a nipple 69 intersecting the wall of the housing 11 and communicating with the annular space 25 therein. A similar nipple 71 in an opposite location in the wall of the housing has a connection 72 (FIG. 1) to the adjacent housing in a series. If a series is not utilized, the nipple 71 can be omitted or capped. The valve 64 thus can supply air under pressure to the annular space 25, but the air cannot escape at the top because of the skirt 24 and also cannot flow improperly at the bottom because of the provision of an O-ring 73 in the pipe 26. However, there are apertures 74 through the wall of the casing 18 so that pressure air can enter the annular space 41 in the chamber 76 beneath the piston 42.

If the valve 64 is reversed, then air under pressure within the interior spaces can discharge through the outlet 67.

The valve 64 likewise can connect either the supply 66 or the discharge 67 to a line 77 having a fitting 78 joined to a tube 79 leading to another fitting 81 opening into a passageway 82 formed in the plug 16. The passageway 82 continues through the central boss 39 into the interior of the column 29. A plug 83 provides for drainage when removed. There is no flow to or from the upper end of the column 29 except through a passageway 84. The passage 84 has an outlet 87 leading into the annular space 41 above the piston 42. Leakage is prevented by a packing ring 85 and a backup ring 86.

When the valve 64 is operated in one sense there is afforded a superior air pressure beneath the piston 42, which is driven upwardly in the casing 18, lifting the tube 51 with it, until such time as the piston 42 is in abutment with the under side of the cap 31. In that relationship of parts the tube 51 extends above the highway a substantial amount as indicated in FIG. 1. The tube is normally of a bright, highly visible, light reflecting finish so that it serves as an easily observed demarcation or divider for a turning point or for adjacent traffic lanes. When the valve 64 is reversed, then the chamber 41 is supplied with air under pressure through the line 77, the tube 79, the passageway 82 and then the jet 83 when removed. There is no flow to or from the upper end of the column 29 except through a passageway 84. The passage 84 has an outlet 87 leading into the annular space 41 above the piston 42. Leakage is prevented by a packing ring 85 and a backup ring 86.

4. tube surface of adhering material.

When the tube is extended it is sometimes inadvertently hit by adjacent vehicles or in emergency is purposely run into or over. Under those conditions the tube simply yields. Following the release of the contact, the tube springs back to its initial location without any particular harm. The lower end of the tube is well anchored and held within the buried portion of the structure so that the tube is not readily dislodged from the piston and cannot come off and fly about to cause injury under such circumstances. More particularly, severe tests have shown that when a skidding or locked vehicle wheel 91 (FIG. 4) encounters the upstanding tube and slides over it the ring 21 and the top 33, the tube itself bends readily over and also deforms the rubber-like ring 21 and the top 33 and is folded flat. The upper side of the tube is held directly against the lower side of the tube, which in turn is pressed against the surface of the highway. Tests indicate that the coefficient of friction between the rapidly advancing but non-rotating vehicle tire 91 and the outside of the tube 51 is less than the coefficient of friction between the outside of the tube and the highway surface about adjacent mechanism. Thus, the tube, when in the position shown in FIG. 4, is held by the vehicle weight in close juxtaposition to the highway and is retained by the friction between the tube and the highway. The tube is not stripped off or torn out of its mounting. After the vehicle wheel slides or rolls off of it, the tube is sufficiently resilient as to spring back into its circular-cylindrical form and into its initial upright position. The ring 21 and the top 33 likewise return substantially to normal to resume their protecting and scraping functions. The tube can then be withdrawn and projected, as before.

1 claim:

1. A pop up traffic divider for use on a highway comprising a casing adapted to be disposed with the upper end thereof substantially flush with the highway surface, a column within said casing and adapted to be disposed with the upper end thereof substantially flush with the highway surface, an annular piston disposed between and slidably engaging said casing and said column, a resilient deformable tube disposed between said casing and said column and having the lower end of said tube joined to said piston, and means for subjecting said piston to differential pressure.

2. A pop up traffic divider as in claim 1 including a housing adapted to be disposed with the upper end thereof substantially flush with the highway surface and adapted to receive said casing telescopically, and means for removably securing said casing to said housing.

3. A pop up traffic divider as in claim 2 including means for establishing a pressure fluid connection between said casing and said housing.

4. A pop up traffic divider as in claim 1 in which said column is hollow and is included in a pressure fluid circuit.

5. A pop up traffic divider as in claim 1 in which said column terminates at the upper end thereof in a cap in contact with the interior of said tube.

6. A pop up traffic divider as in claim 1 in which said tube is an elastomeric body incorporating reinforcing fibers.

7. A pop up traffic divider as in claim 6 in which some of said fibers extend along said tube and some of said fibers extend along said tube.

8. A pop up traffic divider as in claim 1 in which the upper portions of said column and of said casing adjacent said tube are rounded.

9. As an article of manufacture, a tube for use in a pop up traffic divider comprising an elastomeric body having incorporated therein reinforcing fibers extending longitudinally of the tube and circumferentially of said tube.

10. A pop up traffic divider as in claim 1 in which a cap and a ring are provided in substantially edge contact relationship with the interior and exterior peripheries of said tube to serve as wipers thereof.