April 30, 1935. B. V. NAGASHEV 1,999,661

SIGNAL CONTROLLING APPARATUS

Original Filed Dec. 12, 1929

Fig. 1

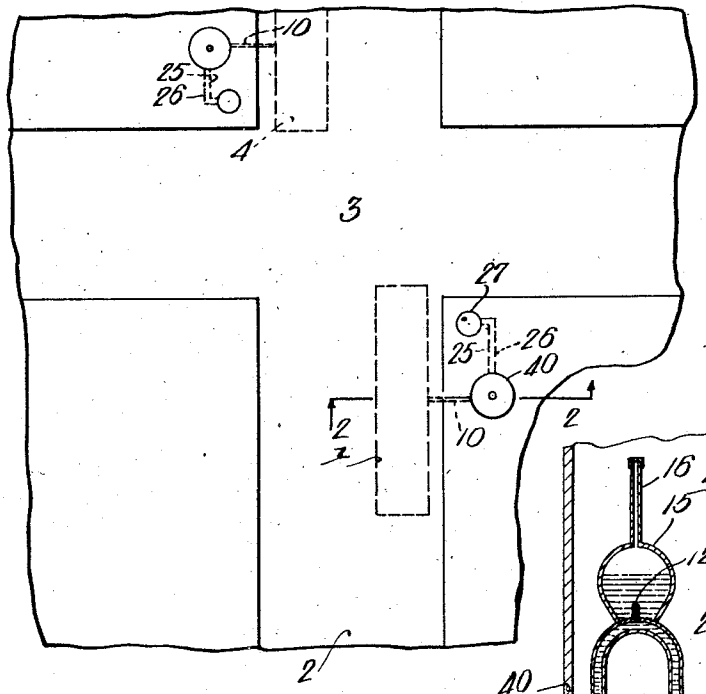


Fig. 3

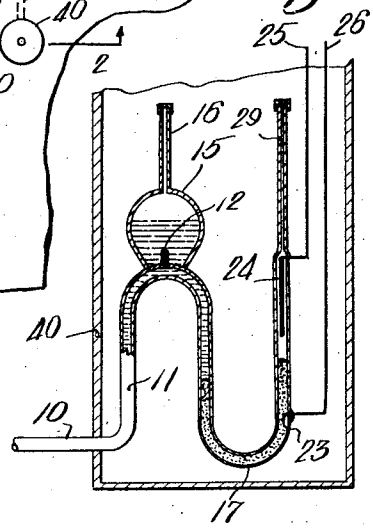
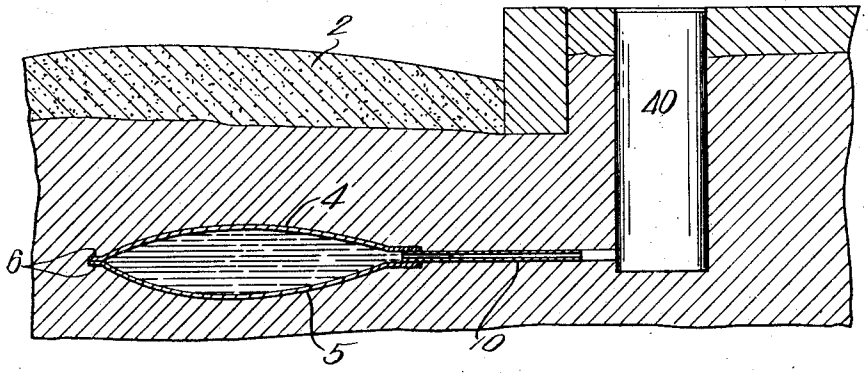


Fig. 2



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SIGNAL CONTROLLING APPARATUS

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7 Claims. (Cl. 177—329)

This invention relates to improved signal actuating devices and more particularly to arrangements for operating traffic signals.

It has heretofore been proposed to arrange to operate automatic traffic signals by means of movable elements located in the roadways at a distance from an intersection, each of these elements being depressible by a vehicle passing over the same, to close a switch which forms part of a system for energizing the traffic lights. An arrangement of this character ordinarily has necessitated the provision of some factor for effecting the continued energization of the light as the vehicle passes between the movable actuating element and the intersection. Furthermore the depressible elements disposed in the roadway have been unsatisfactory and undependable due to the possibility of material such as dust or mud lodging upon or between the moving parts and preventing the normal operation thereof, as well as due to the effect of surface moisture, snow or the like and also due to the likelihood of the conventional street cleaning appliances detrimentally affecting mechanism of this character.

The present invention affords means which may be arranged below the surface of the roadway and which may be self-contained or fully enclosed; accordingly the system need not be subjected to the adverse variant conditions of moisture, dust, and mechanical attrition of all sorts which occurs at the surface of the roadway. Furthermore, the controlling factor for this device may be elongate and disposed longitudinally of a roadway, thus affording means that may continually be actuated by a vehicle until it reaches the intersection and thereby permitting the continued energization of a signal light or the like without necessity for a special delay factor, secondary relays or timing mechanisms or the like.

In order to accomplish this result, I preferably arrange a pressure sensitve receptacle at a suitable depth below the surface of the roadway, having found that the weight of an ordinary vehicle will cause an appreciable increase in pressure at a distance below the surface of the roadway or pavement. In accordance with this invention, the roadway is in the form of a pavement having a surface layer providing a continuous unbroken surface, such as for example is afforded by a conventional concrete or macadam pavement. Such a layer thereof affords the same character of continuous surface over the device as in other parts of the roadway, there being no definite breaks in the surface to correspond to the location of the device beneath its surface. Accordingly operation of this device depends upon transmission of pressure through the continuous surface layer rather than involving the provision of a separate independently movable strip in the roadway. Accordingly, I preferably arrange an elongate metal receptacle beneath the surface of the right-hand portion of a roadway adjoining an intersection, the thickness of the wall of the receptacle being so determined in relation to its depth in the roadway and its width that it may be susceptible to pressure resulting from the movement of vehicles over the same in such a manner that such increases in pressure will be effective to decrease the volumetric capacity of the receptacle or to increase the pressure of liquid or fluid contained therein. Preferably such fluid is relatively non-compressible and extends through a suitable duct to a current closing device so that the increase in pressure applied to the receptacle will close a circuit to energize the signal light at the vehicular intersection. Preferably this device may comprise a trap connected to the liquid containing receptacle and containing a current-conductive liquid such as mercury, so that upon the application of pressure to the receptacle, the mercury rises in one leg of the trap to permit current to pass between suitable immersed contacts, thus closing the circuit which includes the appropriate signal light. Preferably I also provide means for permitting the device automatically to compensate for gradual changes in temperature and/or pressure, although these changes are not likely to be great, when the liquid containing receptacle is located below the surface of the roadway.

In the accompanying drawing:

Fig. 1 is a somewhat diagrammatic view of a vehicular intersection showing my improved signal controlling devices arranged in relation thereto;

Fig. 2 is a sectional view somewhat diagrammatic in character indicated by line 2—2 of Fig. 1; and

Fig. 3 is a sectional detail of the current-closing device or switch.

In accordance with this invention, a suitable receptacle 1 may be disposed beneath the surface of the roadway 2 at any desired point, as for example adjoining an intersection 3. The receptacle may comprise transversely curved upper and lower sheet members 4 and 5 respectively that have flanges 6 welded or otherwise secured to each other to provide a fluid-tight construction. Preferably, as shown in Fig. 1, the recep-

tacle is elongate, being longitudinally disposed in relation to the roadway and extending from a point spaced from the intersection substantially to the intersection, and the thickness of its walls is so determined in relation to the depth of installation and the character of pavement and sub-soil that it will be slightly distorted by the weight of a vehicle passing over it.

A tube 10 of small diameter may be connected to the receptacle and have an upward continuation 11 which communicates through a minute opening 12 with a reservoir 15. A suitable breather tube 16 permits the surface of the liquid, such as oil, in reservoir 15 to be subject to atmospheric pressure. A downwardly extending portion of the tube 10 forms one leg of a trap 17 which normally contains an electrically conductive liquid such as mercury.

Preferably the opposite leg of this trap is provided with a pair of conductors 23 and 24 which are connected by leads 25 and 26 to a suitable signal appliance, which in the accompanying drawing for the purposes of illustration is illustrated as a simple warning or signaling light 27, but which obviously may be any suitable system of electro-magnets, relays or the like, as desired. A breather 29 also permits the leg of trap 17 which contains the contacts to communicate with the atmosphere; thus the pressure at opposite sides of the trap may be equalized.

It is evident that a vehicle passing over the roadway 2 will cause a sufficient increase in the pressure applied to the top of receptacle 1 slightly to flatten the same with a consequent decrease in its volumetric capacity, thus forcing fluid through tube 10 and causing the mercury in trap 17 to rise so that both of the conductors are immersed therein and thereby closing the circuit between leads 25 and 26. Since orifice 12 is of very restricted diameter, such a relatively sudden surge of the liquid through tube 10 will not cause enough flow through orifice 12 to result in an appreciable rise in the liquid level in reservoir 15, nor will such flow occur during the length of time normally required by a vehicle to pass over receptacle 1.

Obviously as soon as the vehicle leaves the receptacle, the latter tends to return to its normal shape and the mercury will return to the position illustrated in Fig. 2, wherein it has a substantially equal height in each of the legs of trap 17.

If there is a permanent change in the pressure applied to the receptacle or a change in its temperature results in a tendency of the liquid in receptacle 1 permanently to expand or contract, opening 12 will permit gradual extrusion of liquid to compensate for such a change, thus permitting the mercury in trap 17 to retain its normal position except when displaced by the weight of a passing vehicle. As shown, receptacle 1 may be permanently installed in the earth beneath the roadway and accordingly ordinarily will not involve any necessity for frequent attention adjustment or care. The receptacle 12 and the trap 17 may be conveniently located in a suitable container 40 that may be disposed at any desired point, but which may be arranged to permit convenient access to these parts should the same be necessary and to permit the convenient exposure of the surfaces of the liquids in chamber 12 and trap 17 to atmospheric pressure.

While for convenience of illustration I have shown a typical example of my signal operating means as connected to a single signal or warning light it is evident that it may be arranged to operate any desired type of mechanism through the medium of an electrical controlling apparatus or the like. If desired, a plurality of round or circular receptacles may be substituted for the single elongate receptacle illustrated herein. Each of the same being connected in parallel to the same elongate circuit so that a vehicle passing toward the intersection continues to actuate the signalling device by successfully increasing the pressure to which the receptacles are subjected; it is further evident that in the case of a wide roadway it may be preferable to arrange two or more of the receptacles side by side in order to permit the energization of the signal device by a vehicle which is disposed over any part of the right-hand side of the roadway adjoining the intersection.

I claim:

1. In a combination including a roadway having a continuous unbroken surface and a device operable in response to the passage of a vehicle over the roadway, an actuating mechanism comprising means disposed entirely beneath the continuous surface of said roadway for effecting the actuation of said device, said means being operable in response to deflection of said surface by a vehicle passing over the roadway above said means.

2. In a combination including a roadway having a continuous unbroken surface and a device operable in response to the passage of a vehicle over the roadway, an actuating mechanism comprising a distortable body disposed entirely beneath the continuous surface of said roadway, and means operable in response to distortion of said body by a vehicle passing over the roadway adjacent to that part containing said body for effecting the actuation of said device.

3. In a combination including a roadway having a continuous unbroken surface and a device operable in response to the passage of a vehicle over the roadway, an actuating mechanism comprising an elongate compressible body disposed longitudinally in relation to the extent of the roadway and entirely beneath its continuous surface, said body being compressed by the weight of a vehicle passing over the roadway adjacent to that part beneath which it is disposed, and means responsive to compression of said body for actuating said device.

4. In a combination including a roadway having a continuous unbroken surface and a device operable in response to the passage of a vehicle over the roadway, an actuating mechanism comprising an elongate liquid-containing receptacle disposed longitudinally in relation to the extent of the roadway and entirely beneath its continuous surface, said receptacle being distortable by a vehicle passing over the roadway adjacent to that part beneath which it is disposed, a duct connected to the receptable, and means operable in response to the flow of liquid through said duct for effecting the actuation of said device.

5. In a combination including a roadway having a continuous unbroken surface and a device operable in response to the passage of a vehicle over the roadway, an actuating mechanism comprising a fluid-containing receptacle disposed entirely beneath the continuous surface of the roadway and distortable by the weight of a vehicle passing over the roadway adjacent to that part containing the receptacle, a duct connected to the receptacle, and means operable in response

to the flow of fluid through said duct for actuating said device.

6. In a combination including a roadway having a continuous unbroken surface and a device operable in response to the passage of a vehicle over the roadway, an actuating mechanism comprising a fluid-containing receptacle disposed entirely beneath the continuous surface of the roadway and distortable by the weight of a vehicle passing over the roadway adjacent to that part containing the receptacle, a duct connected to the receptacle, and means operable in response to the flow of fluid through said duct for actuating said device, and compensating means for preventing a gradual change in pressure from causing a fluid flow in said duct sufficient to actuate said device.

7. In a combination including a roadway having a continuous unbroken surface and a device operable in response to the passage of a vehicle over the roadway, an actuating mechanism comprising a fluid-containing receptacle disposed entirely beneath the continuous surface of the roadway and distortable by the weight of a vehicle passing over the roadway adjacent to that part containing the receptacle, a duct connected to the receptacle, and means operable in response to the flow of fluid through said duct for actuating said device, and compensating means comprising a reservoir connected to said duct by a passage of restricted size, whereby a gradual change in pressure or long continued application of pressure is prevented from causing an accidental or continued operation of said device.

BORIS V. NAGASHEV.