July 11, 1939. B. COOPER 2,165,227

SWITCH

Filed Oct. 1, 1932 2 Sheets-Sheet 1

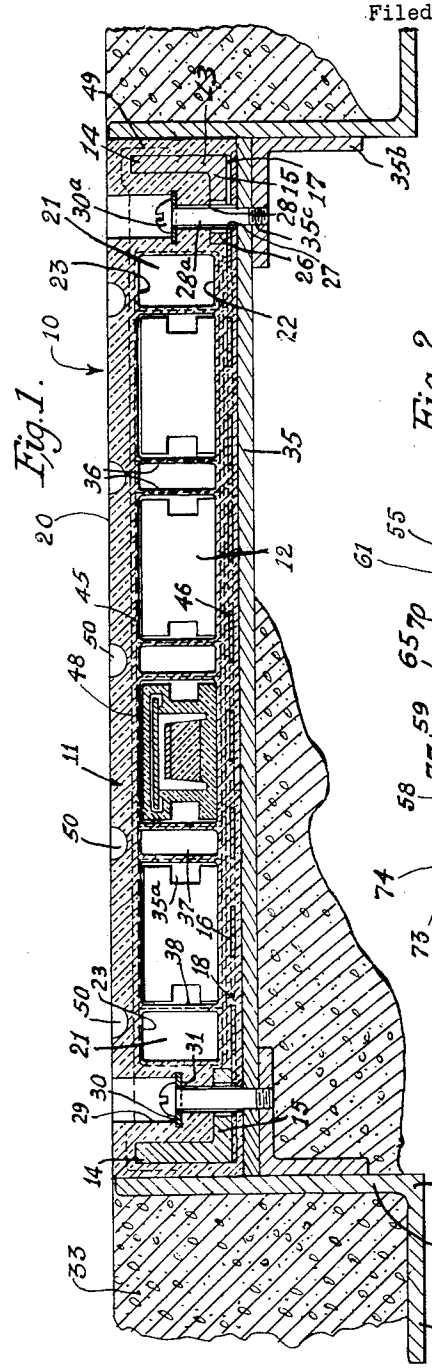


Fig. 1.

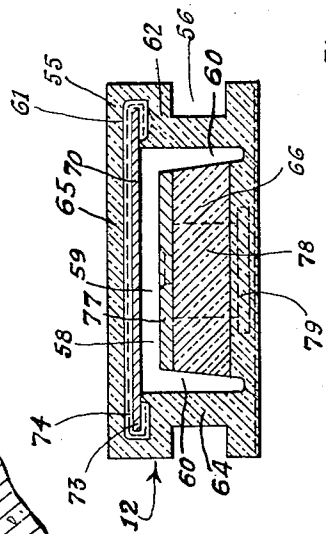


Fig. 2.

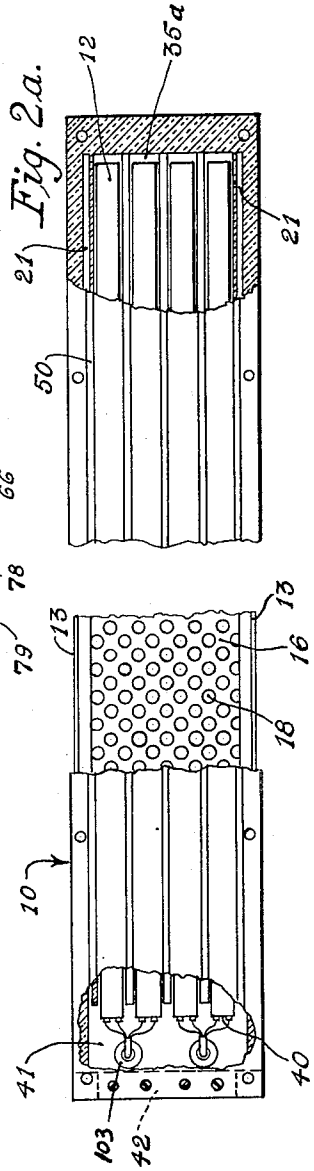


Fig. 2a.

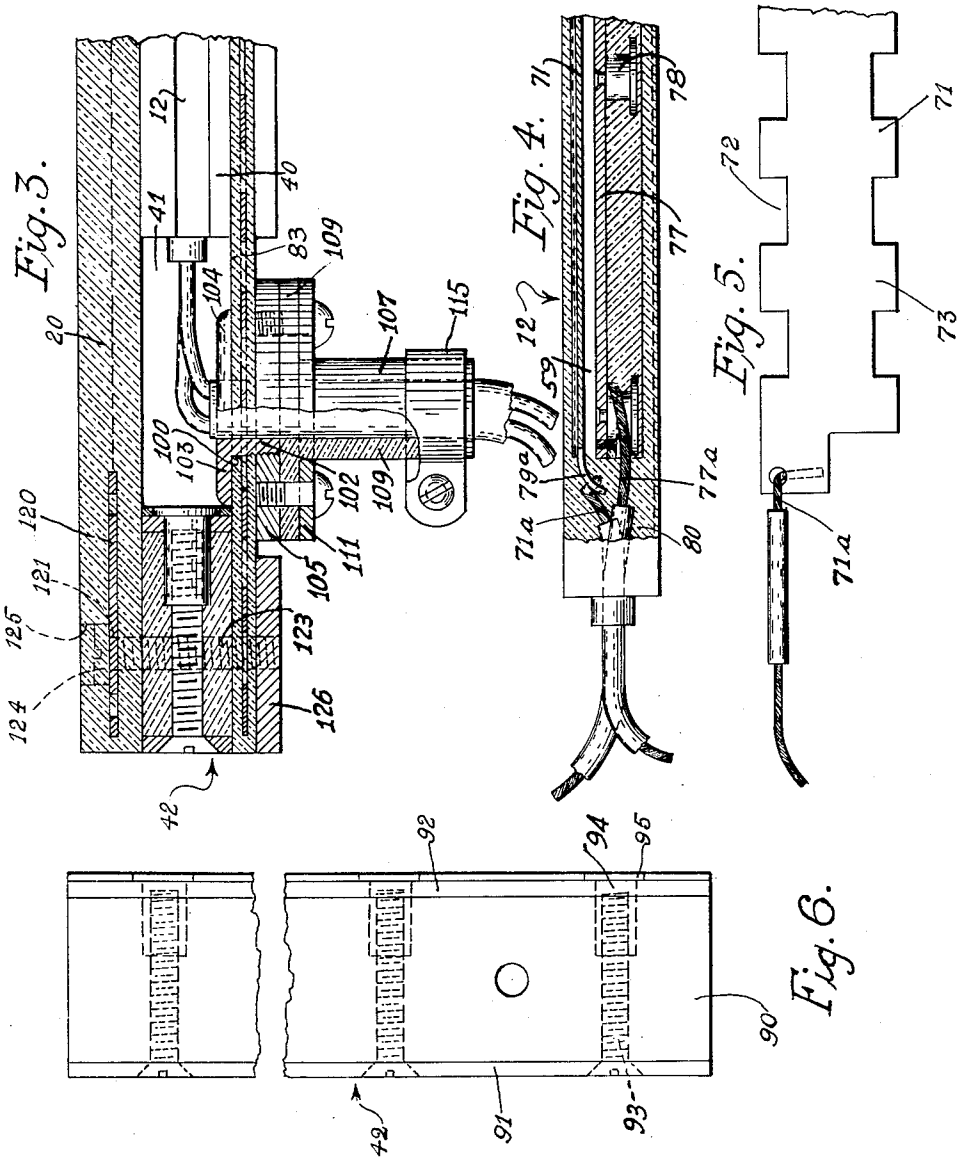
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SWITCH

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Patented July 11, 1939 2,165,227

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2,165,227

SWITCH

Benjamin Cooper, New York, N. Y.

Application October 1, 1932, Serial No. 635,727

34 Claims. (Cl. 200—86)

This invention relates to switches and is particularly directed to a multiple switch treadle forming part of an electric system, and adapted to be embedded in a roadway and actuated by the wheels of vehicles passing thereover, and the like structure.

An object of this invention is to provide a treadle of the character described comprising at least two switches so arranged that they may be simultaneously and selectively actuated, for example by the wheels of a vehicle passing over said treadle.

A further object of this invention is to provide a highly improved process for making a switch of the character described and provided with metal contact members effectively incorporated into a resilient housing.

A still further object of this invention is to provide a multiple switch treadle of the character described, which may be embedded in a roadway and actuated normally to cause a flow of current to an electrically operated member, only by vehicles passing over said treadle and not by pedestrians or by weights placed thereon.

A still further object of this invention is to provide a treadle of the character described comprising a plurality of complementary pairs of contacts, the construction being such that the first pair of contacts may be actuated first and said pair of contacts and a next adjacent pair of contacts thereafter actuated simultaneously, and said second pair of contacts and a next adjacent pair of contacts actuated thereafter simultaneously, and so on until the last two pair of adjacent contacts are actuated simultaneously and the last pair of contacts actuated thereafter alone, to cause a desired flow of electrical energy to an electrically operated member.

Still another object of this invention is to provide a neat, compact, rugged and durable multiple switch of the character described, which may be embedded in a roadway for causing operation of an electric printing counter, for example, of the type shown and described in my co-pending application, Ser. No. 603,493, filed April 6, 1932.

Yet another object of this inventon is to provide an improved multiple switch of the character described, which shall comprise comparatively few and simple parts, which shall be relatively inexpensive to manufacture, smooth and positive in operation, and yet practical and efficient to a high degree.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts which will be exemplified in the construction hereinafter described, and of which the scope of this application will be indicated in the following claims.

In the accompanying drawings, in which is shown one of the various possible illustrative embodiments of this invention,

Fig. 1 is an elevational, transverse, cross-sectional view of a multiple switch treadle embodying the invention;

Fig. 2 is an enlarged, detail, transverse, cross-sectional, elevational view of one of my improved switch units;

Fig. 2*a* is a top plan view of the treadle with parts broken away to show the interior construction;

Fig. 3 is a partial, longitudinal, elevational cross-sectional view of one end of the treadle;

Fig. 4 is a partial, elevational, longitudinal, side view of one end of the switch unit shown in Fig. 2;

Fig. 5 is a partial, top plan view of one of my improved upper contact strips; and

Fig. 6 is an elevational, enlarged, detail view of the plug for closing one end of the treadle shell.

Referring now in detail to the drawings, 10 designates a multiple switch device embodying the invention, here shown for the purpose of illustration as a switch treadle, which may be embedded or fixed in any suitable manner in the top surface of a roadway or roadbed, so that the wheels of vehicles passing thereover may cause switch units forming part of the treadle to be actuated for causing certain effects in an electric system (not shown) for operating, for example, a printing counter such as shown and described in my co-pending application, Ser. No. 603,493, filed April 6, 1932.

The treadle 10 comprises an elongated, prismatic shell 11 or housing, containing a plurality of separate switch units 12, shown in detail in Fig. 2 of the drawings. The shell 11 is in the form of a housing made of rubber or the like soft, or resilient material, in which there is embedded a metal frame comprising a pair of elongated, parallel, spaced, symmetrically disposed angle-irons 13, located adjacent the sides of the housing and each having a vertical wall 14 and an inwardly extending horizontal wall 15. Attached to said angle-irons 13 and interconnecting the same, is an elongated, flat, sheet metal member 16 preferably welded at the outer longitudinal parallel edge portions 17 thereof to the undersurfaces of said inwardly extending

walls 15. Said member 16 is preferably formed with a plurality of openings 18 to permit the rubber to pass through the opening and adhere to the plate. Said angular members 13 and the sheet member 16 preferably extend substantially the entire length of the shell 11. Said shell 11 is preferably of sufficient length to lie across a part of the road in which it is embedded so that vehicles travelling on the road will depress said shell as the wheels ride thereover. For this purpose the upper surface 20 of the shell is preferably on the level of the road surface. For embedding or attaching the treadle 10 to the roadbed or to any other suitable support, the inwardly extending walls 15 of the members 13 are each formed with a plurality of spaced openings 26 registering with openings 27 in the sheet number 16. The shell 11 is further formed with vertical openings 28 extending through said openings 26 and 27 and with enlarged openings 29 concentric with the opening 28 and extending substantially half way down the shell. A metallic washer 30 may be embedded at the bottom of each of said openings 29 resting on the shoulder 31 formed at the upper end of said opening 28.

In Fig. 1 of the drawings, the treadle 10 is shown embedded and fixed in a roadway, for example, a concrete roadway 33 recessed properly for receiving the treadle, with the top surface thereof substantially flush with the top surface of the roadway. For firmly attaching the treadle within the roadbed, there is preferably embedded in the latter, a pair of angle-shaped members 34 having vertical walls 34*a* contacting the outer sides of the shell 11 and extending a substantial distance beneath said shell. Extending from said vertical wall 34*a* are outwardly extending horizontal walls 34*b*. Contacting the undersurface of the shell 11 is a sheet metal plate 35 substantially of the same dimension as said undersurface. Welded or otherwise suitably rigidly fixed to the inner surfaces of said vertical wall portions 34*a* are the vertical walls of a pair of angle shaped members 35*b*, said members having inwardly extending horizontal wall portions contacting the underside of said metal plate 35 adjacent the outer, longitudinal, parallel edges of the latter. The plate 35 and the horizontal wall portions of the angle iron 35*b* are formed with openings 35*c* registering with the openings 28 of the shell 11. Screws 28*a* extend through said openings 28, having the bottom ends thereof screwed to the openings 35*c* in the members 35*b*; the head portions 30*a* of said screws contacting said washers 30. It will now be noted that the shell is firmly attached and supported within the roadbed. The heads 30*a*, of the attaching members, however, are disposed beneath the upper surface 20 of the shell, whereby vehicles passing thereover will not strike said heads or cause the shell to break away from its support.

Adjacent and parallel the sides thereof, said shell is provided with a pair of longitudinal, parallel, symmetrically disposed chambers 21 disposed just inwardly of the angle-shaped members 13, the bottom surfaces 22 of said chambers being disposed above the metal sheet 16, and the top surfaces 23 of said chambers being disposed below the top surface 20 of said shell. The shell 11 may be further formed with a plurality of parallel, elongated, aligned, similar ducts 35*a*, disposed between and in alignment with said elongated chambers 21. In the drawings, the shell 11 is illustrated as being provided with four spaced ducts 35*a*, it being understood, however, that any suitable number of ducts may be provided, as will appear hereinafter.

The ducts 35*a* are preferably of rectangular cross-section and wider than said chambers 21; and between each pair of ducts there are a pair of spaced, vertical webs or walls 36 forming an elongated chamber 37 between each of said pair of walls. A wall 38 separates each chamber 21 from the adjacent duct 35*a*. Within each of the ducts 35 is a contact or switch unit 12. The ducts 35*a* as well as the units 12 preferably terminate short of one end of the shell 11 whereby said shell is closed at said end. The walls 36 and 38, however, as well as the units 12 terminate short of the opposite end of said shell as at 40, to form an enlarged chamber 41 at the opposite end of said shell, said chamber being closed by a plug member 42, in the manner hereinafter appearing.

Strips of canvas 45, or the like fabric, indicated by the dotted lines in Fig. 1, may be embedded within the shell 11 to surround the chambers 21 and the ducts 35*a* said strips of canvas being disposed within the walls 36 and 38 and adjacent the top and bottom surfaces of said chambers and ducts, and also at the outer surfaces of said chambers 21.

Another flat strip or sheet of canvas 46 may be embedded within the shell 11 and is disposed between the sheet 16 and the bottom portions of the canvas strips 45. Yet another strip 48 of canvas may be embedded within the top of the shell and is disposed above the top portions of the canvas strips 45, said strip 48 having end edge portions 49 disposed around the outside of and somewhat spaced from the vertical walls 14 of the angle-shaped members 13. Said strips of canvas may be embedded within the shell during the molding process and add to the strength of the treadle whereby the same will not break down even after long use and repeated intense shocks caused by vehicles passing thereover.

The upper surface 20 of the shell or housing 11, may be formed with a plurality of parallel, elongated grooves 50 located above the chambers 21 and 37. This construction adds to the flexibility of the treadle. It will be noted that each unit 12 is disposed between a pair of grooves 50 so that each unit may be actuated separately. Thus for example, should a wheel of a vehicle pass over the treadle, when the wheel strikes a portion of the housing 11 between a pair of adjacent grooves 50 and above a unit 12, said portion of said housing would be depressed or flexed between the grooves for actuating said unit.

Each unit 12 comprises an elongated rubber casing or sheath 55 made of rubber or the like soft, flexible or resilient material, and of substantially rectangular cross-section but having a pair of elongated grooves 56 in the side walls 64 thereof. The interior of the sheath 55 is formed with an elongated chamber 58 of channel-shaped cross-section terminating short of the ends of said sheath, and having a top portion 59 and downwardly extending side portions 60. The top portion of the chamber 58 projects beyond the side portions 60, as at 61, for the purpose hereinafter appearing, and forming shoulder or ledge portions 62 within said sheath. As will be seen in Fig. 2 of the drawings, the sheath is formed with upstanding side walls 64, a top wall 65 and a central upstanding or raised bottom wall or portion 66. The portion 66 of the shell is preferably made of a substantially hard rubber, for the purpose hereinafter appearing. The re-

mainder of the sheath, however, may be made of a soft, resilient rubber to permit the top wall 65 to be readily depressed for flexing the side wall 64 when the vehicles pass over the treadle.

Disposed within the sheath 55 and contacting the underside of the top wall 65 thereof and having the edges thereof extending within the spaced portions 61 to rest upon the shoulder 62, is an upper contact member 70. Said contact member 70 comprises an elongated, flat strip 71 of metal, such as steel, and formed with a plurality of notches 72 in the opposite edges 73 thereof. Disposed about the strip 71 is a covering 74 of duck or canvas or any other suitable fabric or textile material, having the edges thereof folded about said edges 73. The surface of the canvas adjacent the metal strip is covered or coated with a material which will adhere to said canvas and set, said material extending within the notches 72. The coating adheres to the canvas and sets and hardens. The set or hardened material within the notches prevents longitudinal movement between the canvas and the metallic strip. The canvas is thus attached to the metal strip with substantially one complete surface of said strip exposed.

It will be noted that the undersurface of the contact strip 71 is exposed except at the outer edge thereof. The rubber of said sheath 55 is molded to the outer surface of the canvas strip. The second contact strip 77 comprises an elongated metal strip, and riveted to said strip at spaced points thereon, are a plurality of rivets 78 embedded within the portion 66 of the sheath and having heads 79 to firmly attach the contact strip to said sheath.

In forming said sheath 55, the portion 66 is preferably made of hard or substantially unresilient rubber so that when a vehicle passes over the treadle the top portion 65 and side wall portions 64 of the sheath will readily flex until the strip 71 contacts the strip 77. Thereafter, the hard block of rubber 66 will substantially prevent further flexing of the sheath 55. The soft rubber is thus prevented from being compressed beyond its elastic limit and the life thereof is hence prolonged. Repeated intense shocks caused, for example, by heavy vehicles passing over the treadle, will thus be effectively withstood with my improved construction.

Preferably the distance between the centers of a pair of adjacent units 12 is less than three inches so that as a vehicle passes over the treadle transversely, the first switch unit 12 is actuated first to cause contact between the strips 71 and 77; and thereafter a pair of adjacent units are simultaneously actuated. In other words, a pair of adjacent units are so close together that both may be actuated at the same time by the front wheels, for example, of an automobile.

Attached to the end portion 79*a* of each of the strips 71 and 77 as by soldering, is a wire 71*a*, said end portion being embedded in the end wall 80 of the sheath and bent downwardly to prevent the soldered connection from wearing down as vehicles pass over the treadle. A wire 77*a* is soldered to each of the strips 77, and said wires 71*a* and 77*a* pass thru said end walls 80 of the units. The wires from all of the units 12 may extend to an electrical system so arranged that each time a wheel or a pair of wheels of a vehicle passes transversely over the treadle 10, electric current will be caused to flow to an electrically operated device, for example, a counter such as shown in my aforesaid co-pending application, whereby the number of automobiles passing a certain point in a road may be counted. The electrical system may be designed to be operated by any number of units 12. Thus the treadle 10 for the purpose of illustration, is shown as provided with four units 12. When a vehicle passes thereover, the first unit is actuated first. When the front wheels pass over the second groove 50, the first and second units are simultaneously actuated. Advance of said wheels will release the first unit and cause actuation of the second and third units. Further advance of the wheels will release the second unit and cause the third and fourth units to be actuated simultaneously. A still further advance of the wheels will cause the fourth or last unit to be actuated alone, releasing the third unit. The system may be so arranged that a current for actuating a printing counter, for example, will only be caused when the contact units are actuated in the manner described above so that it will not be possible for a person standing on the treadle to actuate the printing counter. Of course, more than two units may be actuated simultaneously by larger wheels.

A dominant feature of the invention is therefore the arrangement of the units so that a wheel passing thereover may move the switch units successively as the wheel rolls onto the treadle and breaks the switch units successively, as the wheel rolls off the treadle. The system may be arranged to be operated by only a single pair of units, if desired. A single switch unit 12 may also be used in a treadle or in other suitable electrical systems.

As shown in Fig. 3 of the drawings, the units 12 terminate as at 40 to form a large chamber 41 at one end of the shell 11, and the wires 71*a* and 77*a* project into said chamber. Said wires pass from the shell 11 through the bottom wall 83 thereof. To this end, said bottom wall 83 of the shell as well as the plate member 16 are formed with registering openings 100 for receiving a tubular, externally screw-threaded portion 102 of a bushing 103, said bushing having a flat flange portion 104 contacting the bottom surface of the chamber 41. Screwed to said tubular portion 102 and contacting the underside of the shell is a metallic washer 105. The bottom wall of the shell is thus clamped between the washer and said portion 104 of the bushing. For the purpose hereinafter appearing, the washer 105 is formed with a plurality of screw threaded openings 106. Attached to said washer 105 is a flexible bushing 107 made of rubber or the like material, having a flat, circular flange 108 contacting the underside of said washer 105, and a tubular portion 109 coaxial with said tubular portion 102 and extending downwardly from the shell. Said portion 108 of the bushing 107 is provided with openings 110 registering with said screw threaded openings 106, and a metallic washer 111 contacts the underside of said flange 108 and is provided with openings 112 registering with said openings 106 and 110 for receiving screws 113 screwed to the screw threaded openings 106 and firmly clamping the flange 108 between said washers 105 and 111.

The wires 71*a* and 77*a* pass through the aligned openings in the bushings 103 and 107. A hose clamp 115 of any suitable construction, is received about the tubular portion 109 of the bushing 107 and serves to clamp the rubber bushing tightly against the wires. A water-proof connection is thus provided since no water can seep

through the bushing 107 by reason of the hose clamp 115; and no water can seep through the openings 100 in the bottom wall of the shell by reason of the clamping engagement between the washer 105 and the bushing 103. Preferably, two outlets are provided in the bottom wall of the shell, as indicated in Fig. 2a of the drawings, four wires from two units 12 passing through one of the outlets and the four wires from the other two units 12 passing through the other outlet.

The end of the chamber 41 is closed by the plug 42, shown in detail in Fig. 6 of the drawings. Said plug comprises a prismatic block of rubber 90 of the same cross-section as the chamber 41 so that said block may be fitted in within the end of the chamber to close the same. Contacting the outer and inner surfaces of said block 90 are a pair of parallel strips or plates 91 and 92 of metal. The strip 91 is provided with a plurality of countersunk openings through which there extend screws 93 extending within suitable openings in the rubber block 90. The other strip 92 is provided with openings receiving tubular members 94 to which the ends of the screws 93 are screwed, said members 94 being formed with heads 95 contacting the outer surface of the strip 92. Preferably the screws 93 are screwed so tightly as to cause the block 90 to bulge outwardly so that upon inserting the plug within the chamber the bulged sides of the rubber block will press against the inner surfaces of the shell 11 to make a waterproof seal.

For further insuring a water-proof seal in the end of the shell, there is embedded in the upper wall of the shell 11 and substantially overlying the plug 42, a flat sheet metal plate 120 formed with a plurality of openings 121 receiving therethrough vertical screws 123 having heads 124 received within countersunk openings 125 in the upper surface of the shell and extending through the shell and plug. The bottom ends of said screws 123 are screwed to a relatively heavy plate 126 underlying the shell and disposed below the plug. The plates 120 and 126 are thus pressed together by the screws 124 for increasing the pressure between the walls of the shell and the plug to prevent seepage of water into the chamber 41.

Obviously the units 12 or the treadle 10 may be used in other electrical systems and the use thereof is not limited to vehicle counting apparatus.

It will thus be seen that there is provided a device in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiments set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A multiple switch treadle comprising an elongated shell adapted to be embedded in a roadway adjacent the top surface of the latter, said shell being provided with a plurality of elongated, parallel switch units terminating short of one end of said shell and forming a wall for a chamber at said end of said shell, a plug received within said chamber for closing said end of said shell, wires extending from said switch units, and an outlet member attached to the chambered end of said shell for receiving the wires from said switch units.

2. A switch unit comprising a housing made of rubber and having a top wall, side walls, and a bottom wall, an elongated metallic strip attached to the undersurface of said top wall, and an elongated metallic strip attached to the top of said bottom wall and disposed parallel and spaced with respect to said first metallic strip, said bottom wall being raised and made of harder rubber than said side walls.

3. A switch unit comprising a housing made of rubber and having a top wall, side walls, and a bottom wall, said bottom wall being raised, an elongated metallic strip attached to the undersurface of said top wall, and an elongated metallic strip attached to the top of the raised portion of said bottom wall and disposed parallel and spaced with respect to said first metallic strip.

4. A switch unit comprising a housing made of rubber and having a top wall, side walls, and a bottom wall, one of said walls being raised, an elongated metallic strip attached to the inner surface of an opposite wall, and an elongated metallic strip attached to said raised portion and disposed parallel and spaced with respect to said first metallic strip, said raised portion being formed of a harder rubber than the other two walls of said housing.

5. In a switch, an elongated flat strip of metal, a strip of fabric having the edges thereof folded about the edges of said metal strip, the surface of the fabric adjacent to the metal strip being coated with a set adherent.

6. In a switch, an elongated flat strip of metal, a strip of fabric having the edges thereof folded about the edges of said metal strip, the surface of the fabric adjacent to the metal strip being coated with a set adherent, and rubber molded to the outer surface of said fabric strip.

7. In a switch, an elongated flat strip of metal, a strip of fabric having the edges thereof folded about the edges of said metal strip, the surface of the fabric adjacent to the metal strip being coated with a set adherent, and rubber molded to the outer surface of said fabric strip, said metal strip being formed with cut away portions and said adherent extending within said cut away portions.

8. A switch unit comprising an elongated sheath having a top wall, side walls and a bottom wall, said bottom wall being formed with a raised portion forming a chamber of substantially channel-shaped cross-section within said sheath, the top portion of said chamber extending beyond the side portions of said chamber to form shoulders within said sheath, an elongated strip of metal having the edges thereof received on said shoulders, and an elongated strip of metal attached to the upper surface of said raised portion of said sheath and disposed below and parallel to said first strip.

9. A multiple switch treadle comprising a shell, a plurality of parallel switch units disposed within said shell and terminating short of one end of said shell to form one wall of a chamber, and a plug for closing said chamber, said plug comprising a block of rubber, a pair of plates disposed on opposite ends of said block, and means for attaching said plates together.

10. A multiple switch treadle comprising an elongated housing made of compressible material

and adapted to be embedded in the top surface of a roadway for actuation by the wheels of vehicles passing thereover, a plurality of parallel, horizontally aligned switch units within said shell, each unit comprising an upper and lower contact strip, the upper surface of said shell being formed with one or more elongated grooves disposed between said contact units.

11. A multiple switch device comprising an elongated and substantially prismatic shell made of a soft compressible material, a frame for said shell and having a pair of wall portions disposed adjacent the sides of said shell, and a web portion interconnecting said pair of wall portions, said shell being formed with a plurality of elongated, aligned ducts disposed between said pair of wall portions, and switch units within said ducts.

12. In combination with a multiple switch device comprising an elongated prismatic shell made of rubber and having a plurality of parallel switch units therein, means for attaching said shell to a roadbed having a recess for receiving the shell, a pair of members embedded within said roadbed having parallel, vertical wall portions, a plate disposed beneath and contacting said shell, and a pair of angle-shaped members having vertical wall portions rigidly attached to said first mentioned vertical wall portions, and inwardly extending horizontal wall portions contacting the underside of said plate adjacent the longitudinal side edges of the latter, said shell being formed with a plurality of vertical through openings and having washers within said openings disposed below the upper surface of said shell, said plate and inwardly extending horizontal wall portions being formed with openings registering with said openings in said shell, and screws within the openings of said shell having the heads thereof contacting said washers, and the bottom ends thereof extending through said openings in said plate and inwardly extending horizontal wall portions.

13. A treadle adapted to be embedded within the top surface of a roadway, comprising a substantially prismatic shell made of rubber, a channel shaped frame for said shell having side walls at the sides of said shell and a bottom wall interconnecting said side walls at the bottom of said shell, a plurality of elongated, parallel, aligned switch units within said shell and between and parallel to said side walls, each unit comprising an upper elongated contact strip, and a lower elongated contact strip disposed beneath said upper contact strip, and said switch units being adapted to be actuated by the wheel of a vehicle passing transversely over said treadle, simultaneously and sequentially, the upper surface of said shell being formed with parallel, elongated grooves disposed between said contact units.

14. A multiple switch treadle comprising an elongated shell made of rubber, a frame for said shell having vertical wall portions disposed adjacent the sides of said shell, and a horizontal wall portion interconnecting said vertical wall portions and disposed adjacent the bottom surface of said shell, said shell being formed with a plurality of spaced, elongated, horizontally aligned ducts disposed between said vertical wall portions, and a switch unit within each of said ducts, each of said switch units comprising an elongated sheath made of rubber and having a longitudinal chamber therein, and elongated, parallel, contact strips within said chamber attached to spaced portions of said sheath and adapted to be moved into contact with one another.

15. A multiple switch treadle comprising an elongated shell made of rubber, said shell being formed with a plurality of spaced, elongated, horizontally aligned ducts, and a switch unit within each of said ducts, each of said switch units comprising an elongated sheath made of rubber and having a longitudinal chamber therein, and elongated contact strips within said chamber, attached to spaced portions of said sheath and adapted to be moved into contact with one another.

16. In combination with a multiple switch device comprising an elongated and substantially prismatic shell made of a soft compressible material, a frame for said shell having a pair of wall portions disposed adjacent the sides of said shell, and a wall portion interconnecting said pair of wall portions, a plurality of switch units disposed within said shell and between said pair of wall portions, means for attaching said device to a roadbed having a recess for receiving said shell, with the top surface of the latter substantially flush with the top surface of said roadbed, said means comprising a member underlying said shell, said shell being formed with a plurality of vertical through openings, said frame being formed with openings registering with said through openings, washers within said through openings disposed below the top surface of said shell, said member being formed with openings registering with said through openings, and attachment members within the registering openings in said shell, frame and member, said attachment members having heads contacting said washers and disposed below the top surface of said shell.

17. A multiple switch treadle comprising an elongated shell adapted to be embedded in a roadway adjacent the top surface of the latter, said shell being provided with a plurality of elongated switch units terminating short of one end of said shell and forming a wall for a chamber at said end of said shell, a plug received within said chamber for closing said end of said shell, said plug comprising a block of compressible material, plates on the inner and outer ends of said plug, and means for fastening said plates together, wires extending from said switch units into said chamber, and an outlet member attached to the chambered end of said shell for receiving the wires from said switch units.

18. A multiple switch comprising a shell made of rubber formed with a plurality of ducts terminating short of one end of said shell, said shell being formed with an enlarged chamber at said end, switch units disposed within said ducts, and a plug inserted within said chamber, said plug comprising a block of rubber, and a pair of plates on the opposite inner and outer ends of said block, and members extending through said block for attaching said plates together to bulge the side surfaces of said block against the inner surfaces of said chamber.

19. A switch unit comprising an elongated housing made of rubber having a top wall, side walls and a bottom wall, an elongated metallic strip attached to the surface of said top wall, and an elongated metallic strip attached to the top surface of said bottom wall and disposed parallel and spaced with respect to said first metallic strip, the outer surfaces of said side walls being grooved to render the same more compressible.

20. A multiple switch member comprising a shell made of rubber formed with a plurality of ducts terminating short of one end of said shell, said shell being formed with an enlarged chamber at said end, switch units disposed within said ducts, and a resilient block inserted within said chamber.

21. In a switch, an elongated flat strip of metal, a strip of fabric covering one surface of said metal strip, having the edges thereof folded about the edges of the metal strip, the surface of the fabric adjacent to the metal strip being coated with a set adherent, a rubber housing receiving said metal strip and being molded to the outer surface of said fabric strip, and a second metallic strip within said housing disposed parallel and adjacent to the uncovered surface of said first strip.

22. A switch comprising a sheath made of rubber formed with an internal elongated chamber, a contact strip attached to one surface of the chamber, and a second contact strip having a strip of fabric covering one surface thereof and being folded about the edges thereof, the surface of the fabric adjacent to said second metal strip being coated with a set adherent and the opposite surface of the chamber being molded to the outer surface of said fabric strip.

23. In a switch, an elongated flat strip of metal, a relatively hard substance covering one surface of said metallic strip and disposed about the side edges of said strip, the central portion of the opposite surface of said strip being exposed, a housing of relatively soft rubber receiving said metallic strip and being molded to said relatively hard substance, and a second metallic strip within said housing disposed parallel and adjacent to the exposed surface of said first strip.

24. A switch comprising opposed contact strips, relatively soft rubber biasing said contact strips apart, and relatively hard rubber supporting one of said contact strips.

25. A switch comprising upper and lower superimposed elongated contact strips having adjacent surfaces, a rubber housing for said strips including portions supporting the longitudinal side edges of one of said strips, leaving the central portion of said surface exposed, the other strip being aligned with said exposed portion and not wider than said exposed portion, and said housing having yielding side walls separating said contact strips and permitting said second strip to make contact throughout its width with said exposed portion upon application of pressure on said housing.

26. A switch comprising upper and lower superimposed elongated contact strips having adjacent surfaces, a rubber housing for said strips including portions supporting the longitudinal side edges of one of said strips, leaving the central portion of said surface exposed, the other strip being aligned with said exposed portion and not wider than said exposed portion, and said housing having yielding side walls separating said contact strips and permitting said second strips to make contact throughout its width with said exposed portion upon application of pressure on said housing, said housing having a raised longitudinal portion supporting said second contact strip and serving to limit compression of said yielding separating means.

27. An elongated treadle adapted to be supported on a roadbed, and disposed transversely thereof, whereby the wheels of vehicles passing along said roadbed roll transversely over said treadle, and comprising at least three elongated, co-extensive switches disposed side by side in substantially the same plane and adapted to be actuated successively by the wheel of a vehicle moving along the road, and rolling over the treadle, said switches being substantially equally spaced apart, each adjacent pair of said switches being spaced apart less than three inches, whereby adjacent switches are sufficiently close to be actuated concurrently, as said wheel rolls over the treadle.

28. A multiple switch treadle comprising an elongated casing of rubber adapted to be placed on a road and traversed by vehicles, at least three elongated, longitudinal, parallel pairs of upper and lower contact means in said casing, said pairs of contact means being adapted to be actuated successively by a wheel of a vehicle rolling transversely over said treadle, each pair of upper and lower contact means being substantially equally spaced from adjacent pairs of upper and lower contact means, the distance between each pair of upper and lower contact means and adjacent pairs of upper and lower contact means being less than three inches, whereby adjacent pairs of contact means may be actuated concurrently by said wheel as it rolls transversely over the casing, and means in said casing to bias apart the upper and lower contact means of each pair.

29. A multiple switch treadle comprising an elongated rubber member adapted to be embedded in a roadbed and contacted by wheels of vehicles rolling transversely thereover, a plurality of spaced, longitudinal, pairs of upper and lower contact means in said member adapted to be successively actuated by a wheel of a vehicle rolling transversely over said treadle, adjacent pairs of upper and lower contact means being adapted to be actuated concurrently by said wheel, said rubber member being provided with biasing means between said pairs of contact means, biasing apart the upper and lower contact means on each side thereof.

30. A multiple switch treadle comprising an elongated rubber shell adapted to be placed on a road and contacted by wheels of a vehicle rolling transversely thereover; a plurality of parallel, horizontally aligned, longitudinal, spaced, upper switch elements in said shell, lower contact means within said shell, disposed below said upper switch elements, said switch elements being adapted to be successively depressed into contact with said lower contact means when a wheel of a vehicle rolls transversely over said treadle, adjacent switch elements being adapted to be concurrently depressed by said wheel, and longitudinal rubber walls within said shell disposed between said upper switch elements and biasing apart the upper switch elements on opposite sides thereof, from said lower contact means.

31. A multiple switch treadle comprising an elongated rubber shell adapted to be placed on a road and contacted by wheels of a vehicle rolling transversely thereover, a plurality of parallel, horizontally aligned, longitudinal, spaced, upper switch elements in said shell, lower contact means within said shell, disposed below said upper switch elements, said switch elements being adapted to be successively depressed into contact with said lower contact means when a wheel of a vehicle rolls transversely over said treadle, adjacent switch elements being adapted to be concurrently depressed by said wheel, and longitudinal rubber walls within said shell disposed be-

tween said upper switch elements and biasing apart the upper switch elements on opposite sides thereof, from said lower contact means, the vertical distance between the upper switch elements and the lower contact means being less than the height of said biasing walls, whereby upon pressing the upper contact elements against the lower contact means, further compression of the biasing walls is substantially prevented.

32. A multi-switch treadle comprising an elongated rubber member, a supporting frame for said member, having a bottom wall at the bottom of the member, and side walls at the sides of said member, said member having a plurality of parallel, elongated, horizontally aligned chambers between said side walls, and above said bottom wall, and longitudinal rubber walls between said chambers, an upper longitudinal switch element in each chamber, lower contact means in said chambers, said rubber walls biasing apart the upper switch elements in the chamber on each side thereof, from the lower contact means in said chamber, said switch elements being adapted to be successively depressed into engagement with the lower contact means when a wheel of a vehicle rolls transversely over the treadle, said upper switch elements being spaced apart less than three inches, whereby adjacent pairs of switch elements may be depressed concurrently by said wheel.

33. A multiple switch treadle comprising a shell made of rubber, and formed with a plurality of elongated, parallel chambers disposed in a horizontal plane, longitudinal, rubber walls in said shell between said chambers, upper and lower normally spaced contact means in each chamber, each of said rubber walls biasing apart the upper and lower contact means in the chamber on each side thereof.

34. A multiple switch treadle comprising a shell made of rubber, and formed with a plurality of elongated, parallel chambers disposed in a horizontal plane, and provided with longitudinal, rubber walls between said chambers, upper and lower normally spaced contact means in each chamber, each of said rubber walls biasing apart the upper and lower contact means in the chamber on each side thereof, a contact means of each chamber being supported by a central raised portion, said raised portions and the contact means supported thereby, being spaced inwardly from the rubber biasing walls on each side thereof, forming elongated spaces in said chambers on opposite sides of said raised portions and strips, the vertical height of said spaces being greater than the vertical distance between said upper and lower contact means.

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