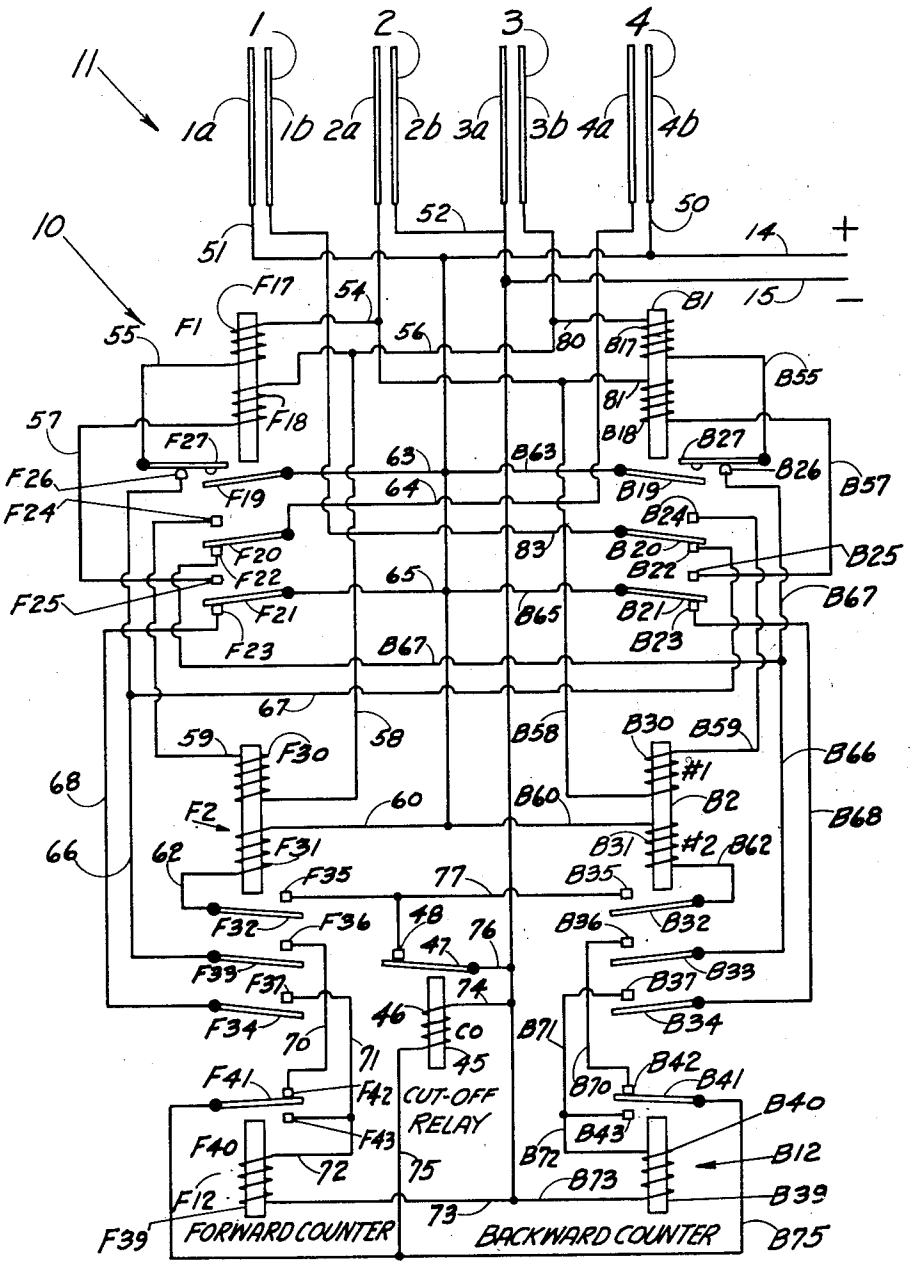
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TREADLE CIRCUIT

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TREADLE CIRCUIT

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1 Claim. (Cl. 235—92)

This invention relates to treadle circuits. It is particularly directed to a multi-switch treadle adapted to be embedded in a roadway and traversed by vehicles, and a circuit controlled by the actuation of the treadle switches by vehicle wheels rolling over the treadle, to operate counters for registering the vehicle axles.

An object of this invention is to provide a treadle circuit of the character described, having means to count axles of vehicles passing over the treadle in one direction on one counter, and to count axles of vehicles passing over the treadle in the reverse direction on another counter, the circuit being so arranged as to respond to the rolling action of the vehicle wheels.

Yet another object of this invention is to provide a circuit of the character described, so arranged as to prevent counting if crossing of the treadle is not completed in either direction, means being further provided for establishing the direction of travel by locking out the counter for one direction upon rolling of a wheel over the treadle in an opposite direction, the arrangement being such furthermore to prevent double counts by the left and right wheels on a single axle when crossing the treadle at an angle.

Still another object of this invention is to provide a circuit of the character described, which shall be relatively inexpensive to manufacture, positive in operation, and yet practical and efficient to a high degree in use.

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 application will be indicated in the following claim.

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

The single figure of the drawing is a wiring diagram of the treadle circuit embodying the invention.

Referring now in detail to the drawing, 10 designates a treadle circuit embodying the invention for a multi-switch treadle 11. The treadle 11 may be of any suitable construction, for example, as shown in my copending application, Serial No. 635,727, filed October 1, 1932. Said treadle comprises a plurality of pairs of contacts 1*a*, 1*b*, 2*a*, 2*b*, 3*a*, 3*b*, 4*a*, 4*b* each of which contacts may be a long metallic contact strip. Each pair of contacts comprises a switch. The switches being designated by numerals 1, 2, 3 and 4 in the drawing. The pairs of contacts in the treadle are disposed parallel to one another, side by side in parallel planes.

The treadle is adapted to be embedded or installed on a roadway transversely of the direction of vehicular travel, so that the vehicles move perpendicularly to the contact strips and the switches 1, 2, 3 and 4 are so spaced, that as a wheel traverses the treadle, the switches will be made in sequence in the order of switch 1 alone, switches 1 and 2 concurrently, switches 2 and 3 concurrently, switches 3 and 4 concurrently, and switch 4 alone. A wheel rolling in the opposite direction will make the switches in the reverse sequential order of switch 4 alone, switches 4 and 3 concurrently, switches 3 and 2 concurrently, switches 2 and 1 concurrently, and switch 1 alone.

The circuit is arranged to count axles of vehicles passing over the treadle in one direction on one counter F12, and to count the axles of vehicles passing over the treadle on another counter B12.

The circuit comprises two similar parts, similarly connected to the switches 1, 2, 3 and 4 and to the plus and minus leads 14 and 15, so that one part operates when the vehicle traverses the treadle in one direction, and the other part operates when the vehicle traverses the treadle in an opposite direction. To this end, the circuit comprises a pair of similar relays F1 and B1. Relay F1 has two windings, designated F17 and F18.

The relay F1 when energized, is adapted to move three switch arms F19, F20 and F21. The switch arm F19 is normally open when the relay F1 is not energized. The switch arms F20 and F21 are normally in contact with contacts F22 and F23 when relay F1 is not energized. When said relay is energized, said switch arms F20 and F21 move into engagement with contacts F24 and F25, respectively. There is further provided a fixed contact F26, normally in engagement with a switch arm F27. When relay F1 is energized, switch arm F19 is moved into engagement with switch arm F27, which is thereby moved out of engagement with respect to the contact F26. Contact between switch arms F19, F27 is made before contact between switch arms F27 and fixed contact F26 is broken.

When energized, relay B1 is adapted to move switch arms B19, B20 and B21. Switch arm B19 is normally open, but when relay B1 is energized, switch arm B19 is moved into en-

gagement with a switch arm B27, which in turn is thereafter moved out of engagement with respect to fixed contact B26. Switch arms B20 and B21 are normally in engagement with contacts B22 and B23, but when relay B1 is energized, said switch arms move into engagement with contacts B24 and B25.

Each part of the circuit has a second relay marked F2 and B2, respectively. Relay F2 has two windings, designated by numerals F30 and F31. Relay B2 likewise has two windings, designated by numerals B30 and B31.

Relay F2 controls three switch arms designated by numerals F32, F33 and F34, all normally open, but adapted to move into engagement with contacts F35, F36 and F37, when relay F2 is energized.

Relay B2 likewise controls three switch arms designated by numerals B32, B33 and B34, normally open, and adapted to be moved into engagement with fixed contacts B35, B36 and B37, when relay B2 is energized.

Counter F12 comprises a relay F39 provided with a winding F40. When energized, relay F39 is adapted to move a switch arm F41 from fixed contact F42 to fixed contact F43.

Counter B12 comprises a relay B39 provided with a single winding B40. When energized, relay B39 is adapted to move switch arm B41 from fixed contact B42 to fixed contact B43.

There is further provided a single cut-off relay 45 provided with a single winding 46. When energized, relay 45 is adapted to open switch arm 47, normally in engagement with fixed contact 48.

The plus lead 14 is connected by wires 50 and 51 to contacts 1*a* and 4*b* of switches 1 and 4, respectively. The minus lead 15 is connected by wire 52 to contacts 2*b* and 3*a*.

One side of winding F17 is connected by wire 54 to contact 2*a*. The other side of said winding is connected by wire 55 to switch arm F27. One side of winding F18 is connected by wire 56 to contact 3*b*. The other side of winding F18 is connected by wire 57 to contact F25. Winding F18 is also connected by wire 58 to one side of winding F30. The other side of winding F30 is connected by wire 59 to fixed contact F24. One side of winding F31 is connected by wire 60 to plus lead 14. The other side of winding F31 is connected by wire 62 to switch arm F32.

Switch arm F19 is connected by wire 63 to plus lead 14. Switch arm F20 is connected by wire 64 to contact 4*a*. Switch arm F21 is connected by wire 65 to plus lead 14. Switch arm F33 is connected by wire 66 to fixed contact F26, and by wire 67 to contact B22. Switch arm F34 is connected by wire 68 to fixed contact F23. Fixed contact F22 is connected by wires B66, B67 to fixed contact B26 and switch arm B33. Contact F36 is connected by wire 70 to contact F42. Contact F37 is connected by wire 71 to contact F43, and by wire 72 to one side of the winding F40. The other side of the winding F40 is connected by wire 73 to the minus lead 15. One side of the winding 46 is connected by wire 74 to the minus lead 15. The other side of winding 46 is connected by wire 75 to switch arm 41. Switch arm 47 is connected by wire 76 to minus lead 15. Fixed contact 48 is connected by wires 77 to the fixed contacts F35 and B35.

One side of the winding B17 is connected by wire 80 to contact 3*b*. The other side of winding B17 is connected by wire B55 to switch arm B27. One side of winding B18 is connected by wire 81 to contact 2*a*. The other side of winding B18 is connected by wire B57 to fixed contact B25. One side of winding B30 is connected by wire B59 to contact B24. The other side of winding B30 is connected by wire B58 to contact 2*a*. One side of winding B31 is connected by wire 60 to plus lead 14. The other side of winding B31 is connected by wire B62 to switch arm B32.

Switch arm B19 is connected by wire B63 to plus lead 14. Switch arm B20 is connected by wire 83 to contact 1*b*. Switch arm 21 is connected by wire B65 to plus lead 14. Switch arm B34 is connected by wire B68 to fixed contact B23. Fixed contacts B36 and B42 are connected by wire B70. Contact B37 is connected by wire B71 to contact B43, and by wire B72 to one side of the winding B40. The other side of the winding B40 is connected by wire B73 to minus lead 15. Switch arm B41 is connected by wire B75 to wire 75.

The operation of the circuit will now be described when a vehicle passes over the treadle from left to right:

When the first and second switches 1 and 2 are closed, relay F1 is energized through winding F17, the circuit through said winding being closed through minus lead 15, wire 52, switch 2, wire 54, winding F17, wire 55, switch arm F27, wire 67, switch arm B20, wire 83, switch 1, wire 51 and plus lead 14. As the wheel moves forward, the first switch opens, but the relay F1 is held operated through minus lead 15, wire 52, switch 2, wire 54, winding F17, wire 55, switch arms F27 and F19, wire 63 and plus lead 14. When switch member 3 closes, the holding of F1 relay is transferred to winding F18 through minus lead 15, switch 3, wire 56, winding F18, wire 57, switch F21, wire 65 and plus lead 14. Thus, when the second switch is open, the relay F1 will not release. As the last switch is closed, relay F2 operates on winding F30, through plus lead 14, switch 4, wire 64, switch arm F20, wire 59, winding F30, wire 58, switch 3 and minus lead 15. After F2 relay is energized, it holds under the control of the cut-off relay 45, the circuit passing from plus lead 14, wire 60, winding F31, wire 62, switch arm F32, wire 77, switch arm 47, wire 76, and minus lead 15. When the vehicle leaves the third switch, relay F1 releases, dropping switch arms F19, F20 and F21, and closing the circuit for actuating forward counter F39, the circuit passing through plus lead 14, wire 65, switch arm F21, wire 68, switch arm F34, wire 71, winding F40, wire 73 and minus lead 15. As soon as the counter operates and closes its contact, the cut-off relay 45 operates and opens the holding circuit for the relay F2.

The cut-off relay is energized through minus lead 15, wire 74, winding 46, wire 75, switch arm 41, wire 71, switch arm F34, wire 68, switch arm 21 and plus lead 14. Upon energizing the cut-off relay, the switch arm 47 is pulled down, away from fixed contact 48 to break the circuit through winding F31 permitting the switch arms F32, F33 and F34 to drop and breaking the circuit through the forward counter F39 and in turn the cut-off relay 45.

The function of the cut-off relay is to prevent false counts should the vehicle wheels rock back and forth on the treadle or only partially cross the treadle and then back off. For example, assume the forward motion of the wheel to be incompleted, and the wheel reversed after the fourth switch 4, has been closed, but before the third switch 3, has been broken. In this case,

the F1 and F2 relays have operated and will remain operated during the reverse motion, until the wheel closes the treadle switches normally made first. The cut-off relay 45 is then operated which causes the F2 relay to release. The F1 relay will be released, when switch 2 opens, as the wheel rolls back in the reverse direction. It will be seen that the counter has not been operated under this condition, since the F1 relay must be in released position with the F2 relay in operated condition in order for a count to be registered.

It will now be understood that the sequential operation of the switches 1, 2, 3 and 4 in the above order will cause a sequential operation of the relays F1, F2 in the order of F1 alone, then F1 and F2 concurrently, and then F2 alone. The forward counter F12 cannot be actuated except when the relays F1 and F2 are actuated in the order of the first alone, then both concurrently, and then the last alone. The same is true for the backward counter, which is only actuated when the relays B1 and B2 are actuated in the order of B1 alone, then B1 and B2 concurrently, and then B2 alone. The operation of the relays B1 and B2 in the sequence described above can only occur when the switches 4, 3, 2 and 1 are actuated in the sequence of 4 alone, then 4 and 3 concurrently, then 3 and 2 concurrently, then 2 and 1 concurrently, and then 1 alone.

When a wheel traverses the treadle from right to left, the backward counter B39 is operated in exactly the same manner as the forward counter is operated when the wheel rolled over the treadle from left to right. The counts are registered on the B39 counter in the same manner as described for forward counts, except that relays B1 and B2 function instead of the F1 and F2 relays.

It will now be understood that my improved system counts forwardly moving axles on one counter, and reversely moving axles on another counter. The counts will only respond to the rolling action of wheels. If a person steps or walks on the treadle, there will be no count, as the treadle is foot-proofed. The switches must be made in the predetermined sequence described above, otherwise, there can be no count.

Foot proofing is obtained by using more than two elongated parallel switches in the treadle. When a person steps on the treadle he may actuate a switch with the heel of his foot and another switch with the sole of his foot. By using more than two switches and spacing said switches so that the distance between them is less than the distance between the heel and sole of a shoe, a person stepping on said treadle will not actuate one of the switches. However, a wheel rolling over the treadle will actuate all of the switches successively and adjacent switches concurrently. Thus, with this type of construction a high degree of accuracy is obtained for counting vehicles because unintentional counts are not likely to be obtained by casual pedestrians walking on the treadle.

In my improved circuit, means is provided for establishing the direction of travel whereby a counter for one direction is locked out when the wheel traverses the treadle in an opposite direction. When the vehicle travels from left to right, relay F1 is energized when switches 1 and 2 are closed. When relay F1 is energized, switch arm F20 moves up from contact F22 to contact F24, and breaks the circuit through the winding B17 of the relay B1 through switches 3 and 4. When the wheel closes switches 3 and 4, relay B1 will not be energized. Since the relay B1 must be energized before B2 is energized, and since relay B2 must be energized before the backward counter B12 will operate, actuation of said backward counter is prevented when a wheel rolls forwardly over the treadle.

When a wheel rolls in the backward direction, relay B1 will be energized upon closing of switches 4 and 3 to lift the switch arm B20 and break the circuit for the winding F17 of the relay F1 through switches 2 and 1.

Since the treadle unit is adapted to be so disposed in the roadway that the switches 1, 2, 3, 4, are substantially at right angles to the normal direction of vehicular travel, any of said switches is normally contacted at substantially the same instant by all of the wheels common to one axle. If, however, a vehicle should cross at an angle which is not substantially perpendicular to the contact strips, one wheel on an axle will contact a switch of the treadle in advance of a second wheel on the same axle. The angle of crossing may be such as to cause double actuation of all the switches, in which case the second sequence of actuations caused by the retarded wheel is intermingled with the first sequence of actuations caused by the more advanced wheel.

It will furthermore now be understood that within limits, double counts due to double actuation of the switches by the wheels on one axle, is prevented when a vehicle crosses the treadle at an angle, the circuit being so arranged that when a vehicle moves forwardly over the treadle at an angle, one wheel would have to clear switch 3 before the other wheel on the same axle closes switch 1, in order to get a double count. If the second wheel closes switch 1 before the more advanced wheel clears switch 3 there is no double count.

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 embodiment above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawing 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:

In combination with a multi-switch treadle adapted to be installed on a roadway transverse of the direction of the vehicular travel, and comprising a set of more than two parallel switches disposed side by side, and adapted to be actuated sequentially when a wheel of a vehicle traverses the treadle, a forward counter and a backward counter, and a circuit connecting both counters with the above mentioned set of switches, including means to count on the forward counter, when said switches are closed sequentially in one direction, and to count on the backward counter, when the same switches are actuated sequentially in an opposite direction, and said circuit having means to make a count on one of said counters, only upon actuation of more than two of said switches, and on the other counter only upon the same switches being actuated.

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