

[54] **ELECTRICAL SWITCHES AND TURN SIGNAL SWITCHING SYSTEMS UTILIZING THE SAME**

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[52] U.S. Cl. **200/11, 200/61.27, 340/81 F**

[51] Int. Cl. **H01h 21/74, B60q 1/38**

[58] Field of Search **200/61.27, 61.3, 61.34-61.38, 200/11 R, 11 A, 11 C, 11 J, 166 BE; 340/55, 67, 73, 81**

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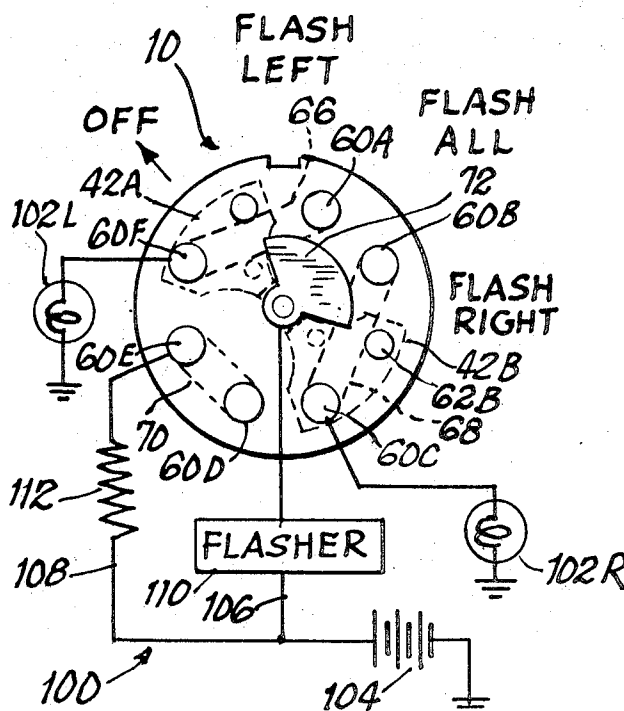
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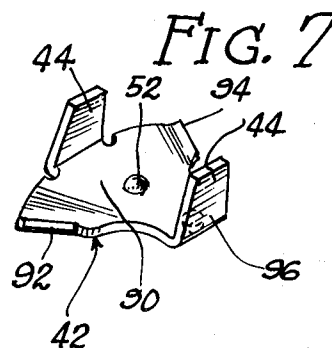
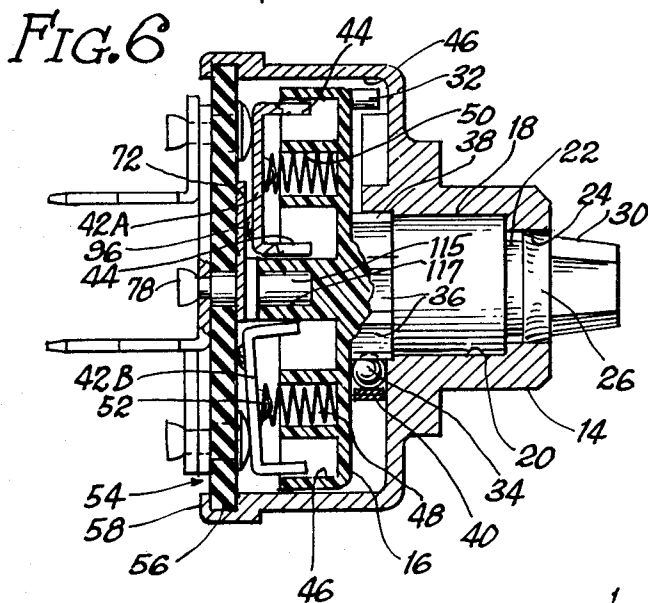
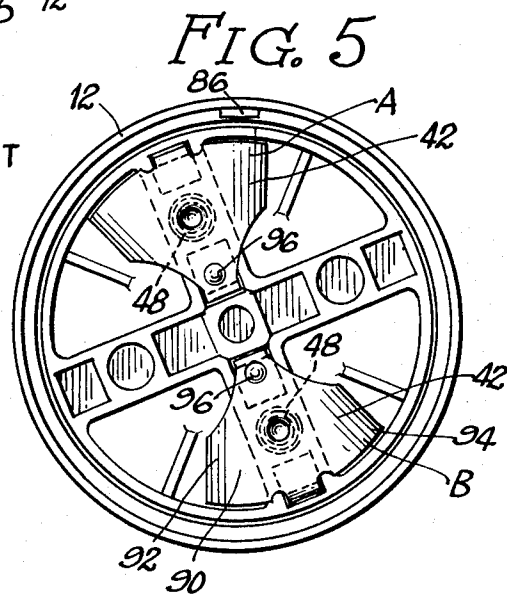
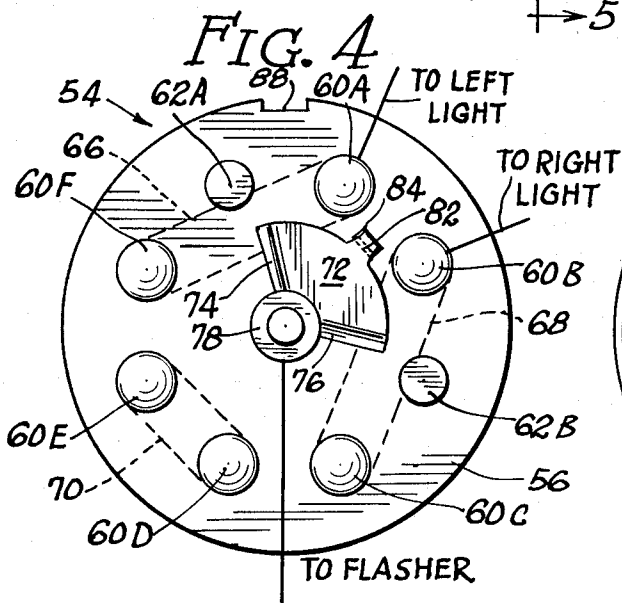
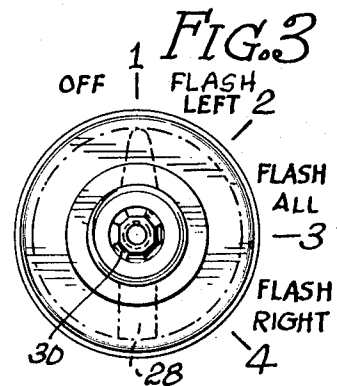
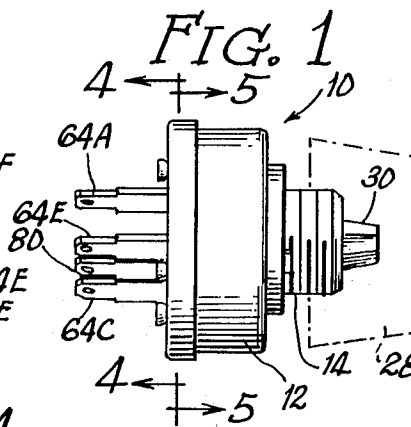
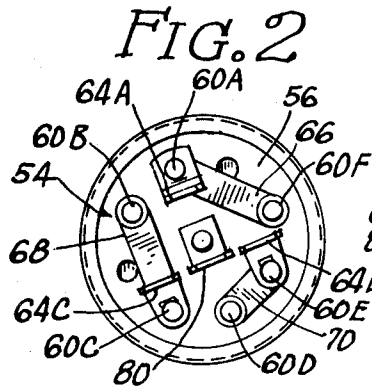
Primary Examiner—Kenneth N. Leimer
Attorney—Burmeister, Palmatier & Hamby

[57] **ABSTRACT**

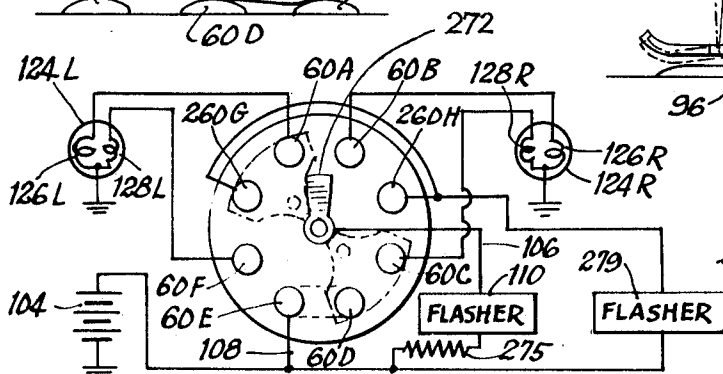
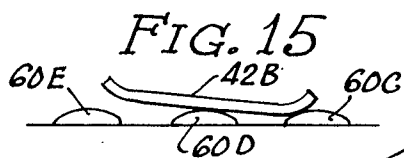
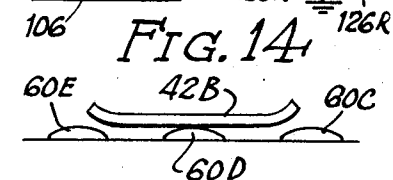
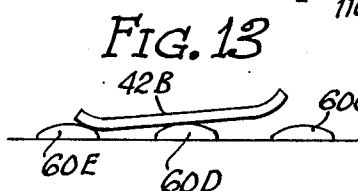
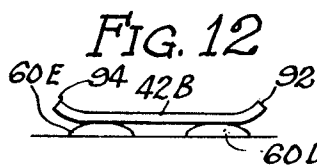
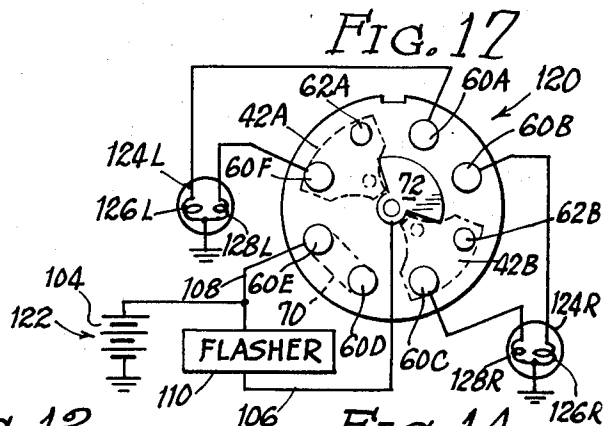
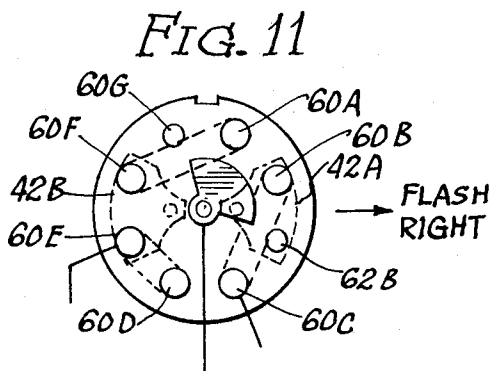
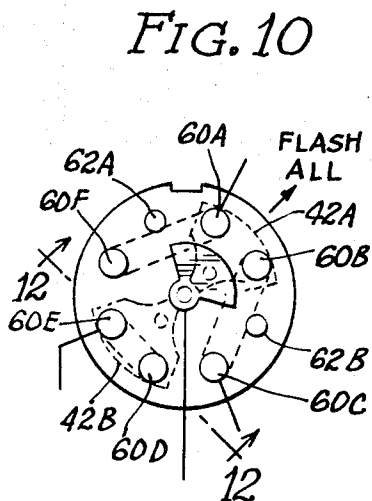
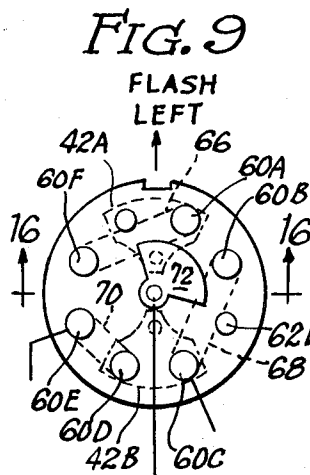
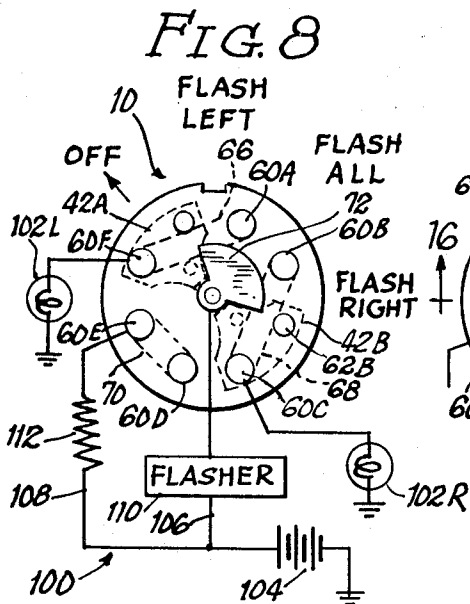
The electrical switch comprises a rotatable carriage having two contractors for engaging a series of contact points. Each contractor comprises a sector-shaped portion for engaging the contact points, and a point portion spaced inwardly from the sector-shaped portion. In the case of one contractor, the point portion is engageable with a contact sector on the insulating board which carries the contact points. In the case of the other contractor, the point portion rides along the insulating board. The switch may be employed in a turn signal switching system comprising left and right-hand signal lamps. A first battery feed wire is connected to the stationary contact sector through a flasher. The contractors are movable to four positions, comprising an off position, a flash left position, a flash all position and a flash right position. The first contractor establishes the connections between the contact sector and the contact points for flashing the left signal lamps, all signal lamps, and the right signal lamps. A second battery feed wire is connected to a pair of contact points through a dimming resistor. These contact points are engageable by the second contractor, which establishes connections for lighting the right lamp dimly when the left lamp is flashing, while lighting the left lamp dimly when the right lamp is flashing. Other modified switches and turn signal switching systems are also disclosed.

2 Claims, 18 Drawing Figures





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ELECTRICAL SWITCHES AND TURN SIGNAL SWITCHING SYSTEMS UTILIZING THE SAME

This invention relates to electrical switches, and also turn signal switching systems which may utilize such switches. It will be understood that the present invention is applicable particularly to automotive-type switches and switching systems, but the invention will find many other applications.

The switches and switching systems of the present invention are adapted to operate left- and right-hand signal lamps, particularly as used on farm tractors or other agricultural vehicles which are likely to be driven occasionally along highways. Such vehicles do not require signal lamps, or even tail lights for their normal agricultural uses. However, when such vehicles are driven along highways, it is very desirable, in the interest of safety, to provide signal lamps which are visible to oncoming drivers from the rear, and also preferably from the front. It is desirable to flash all of the signal lamps at a steady rate when the farm vehicle is traveling straight ahead. Such flashing lamps will indicate to oncoming vehicles that a slow moving vehicle is on the highway.

When the farm vehicle is to be turned to the left, it is desirable to flash the left marker lamps while lighting the right lamps continuously but at less brilliance than the left lamps. Likewise, when the farm vehicle is to be turned to the right, it is desirable to flash the right signal lamps while continuously lighting the left lamps at less brilliance.

To achieve these desirable results, the present invention utilizes a switch which preferably comprises two contactors, mounted on a rotary carriage. Each contactor comprises a sector-shaped portion for engaging various contact points projecting from an insulating board. Each contactor also has a point portion, preferably spaced inwardly from the sector-shaped portion. In the case of one contactor, the point portion is engageable with a contact sector on the insulating board. An "Off" position is preferably provided in which the point portion is disengaged from the contact sector. In its three operating positions, the contactor is effective to energize the flash left contact point, the flash right contact point and both contact points, at an intermediate position. The second contactor is effective to establish the connections whereby the lamps are lighted dimly when they are not being flashed. In this way, the unflashed lamps continue to serve as marker lamps. The point portion of the second contactor is adapted to ride along the insulating board. The sector portion is adapted to form a bridge between the battery feed contact points and the left- and right-hand lamp contact points.

The dimming of the unflashed lamps may be brought about by inserting a resistor in series with the second battery feed wire. In another arrangement, each of the signal lamps has a major filament and a minor filament. The major filaments are flashed for turn signals and the straight ahead signal. A second contactor is arranged to energize the minor filaments on the side which is not being flashed.

In still another arrangement, the major filaments are flashed less brightly for the straight ahead signal, than they are for the turn signals. This is brought about by providing a second flasher and a third battery feed

wire. A dimming resistor is connected in series with the second flasher. Additional contact points are provided on the switch so that there can be three battery feed connections.

Further objects, advantages and features of the present invention will appear from the following description, taken with the accompanying drawings, in which:

FIG. 1 is a side elevational view of a switch constituting one illustrative embodiment of the present invention.

FIGS. 2 and 3 are rear and front elevations of the switch.

FIG. 4 is an enlarged elevational view, taken generally along the line 4—4 in FIG. 1, to show the front or inner side of the terminal head.

FIG. 5 is an enlarged view showing the rear side of the switch with the terminal head removed, generally as indicated by line 5—5 in FIG. 1.

FIG. 6 is a central longitudinal section taken through the switch.

FIG. 7 is an enlarged perspective view of one of the contactors for the switch.

FIG. 8 is a diagrammatic view showing the contactors in their Off position, the switch being shown in connection with a turn signal switching system.

FIGS. 9, 10 and 11 are views similar to FIG. 8, but showing the switch in its flash left, flash all, and flash right positions, respectively.

FIG. 12 is an edge view of one of the contactors showing the manner in which it engages the contact points, the view being taken generally along the line 12—12 in FIG. 10.

FIGS. 13, 14 and 15 are views similar to FIG. 12 but showing the manner in which the contactor rocks as it is moved by the contact points.

FIG. 16 is a different edge view of one of the contactors taken generally along the line 16—16 in FIG. 9.

FIG. 17 is a view similar to FIG. 8, but showing a modified switch and a modified turn signal switching signal.

FIG. 18 is still another view similar to FIG. 8, but showing another modified switch and another modified turn signal switching system.

It will be seen that FIGS. 1—6 illustrate an electrical switch 10 comprising a casing 12 which is made of metal, as shown, but may be made of various plastics or other materials. The casing 12 has a forwardly projecting stem or bushing 14 which is threaded so that it may be used to mount the switch upon a panel or bracket.

As shown in FIGS. 5 and 6, a carriage 16 is rotatably mounted within the casing 12. The illustrated carriage 16 has an axial shaft extension 18 which is journaled within a cylindrical opening or bearing 20 formed in the bushing 14. The shaft extension 18 has a reduced front portion 22 which extends out of casing 12 through an axial opening 24. A sealing ring 26 is preferably mounted between the reduced portion 22 and the opening 24 to exclude dust and moisture from the inside of the casing 12.

Preferably, a knob 28 is mounted on the front end of the reduced portion 22. In this case, the reduced portion 22 has a tapering hexagonal front portion 30 to receive the knob 28.

As indicated in FIG. 3, the carriage 16 is rotatable to four angularly spaced positions, designated Off, Flash Left, Flash All, and Flash Right. A stop lug 32 is provided on the carriage to limit the rotation of the carriage. The stop lug 32 is engageable with one or more abutments (not shown) on the casing 12.

Suitable detent means are preferably provided to establish the four positions of the switch. As indicated in FIG. 6, such detent means may comprise a ball 34 which is engageable with a series of notches or recesses 36 in the hub portion 38 of the carriage 16. A leaf spring 40 is provided to press the ball 34 into the notches 36. In this case, there is an interval of 45° between the adjacent detent positions. However, this interval may be changed to suit various conditions.

It will be seen from FIGS. 5 and 6 that two contactors 42 are mounted on the rear side of the carriage 16. The illustrated contactors 42 are the same in construction, but in some cases they will be designated A and B, in order to distinguish between them.

The illustrated contactors 42 are formed with tabs 44 which project into slots 46 formed in the carriage 16. Thus, the contactors are slidable, relative to the carriage 16, from front to rear. It will be seen that the tabs 44 are tapered in width, so as to provide for limited rocking movement of the contactors.

Biasing springs 48 are mounted between the carriage 16 and the contactors 42. As shown, the springs 48 are in the form of compression coil springs, located in sockets 50 which are formed in the carriage 16. To locate the springs 48 relative to the contactors 42, each contactor is formed with a projection 52, adapted to be received in the rear end of the corresponding spring 48.

To the rear of the contactors 42, the casing 12 is fitted with a terminal head 54 which encloses the rear side of the casing. The illustrated terminal head 54 comprises an insulating board 56, upon which various contact elements are mounted. The insulating board 56 is suitably retained on the casing 12, as by means of the illustrated turned flange 58.

The illustrated insulating board 56 is fitted with six contact points 60A-F. In this case, the contactor 42A is engageable with the contact points 60A and B, while the contactor 42B is engageable with the contact points 60C-F. As shown in FIG. 6, each of the contact points may be in the form of the spherically rounded head of a rivet.

It will be seen from FIG. 4 that the terminal head 54 is also formed with two insulating bosses or dummy contact points 62A and B. These insulating bosses preferably take the form of semi-perforations, punched or otherwise formed from the insulating board 56, so as to project forwardly therefrom. It will be seen that the boss 62A is between the contact points 60A and 60F, while the boss 62B is between contact points 60B and 60C.

From FIG. 2, it will be apparent that the terminals are connected to certain of the contact points 60A-F. Specifically, terminals 64A, 64C, and 64E are connected to the corresponding contact points 60A, 60C and 60E.

Some of the contact points are connected together by suitable means, preferably in the form of straps on the terminal head 54. As shown in FIG. 2, a strap 66 is connected between the contact points 60A and 60F.

Another strap 68 is connected between the contact points 60B and 60C. A third strap 70 is connected between the contact points 60D and 60E.

It will be evident that the contact points 60A-F are spaced apart in a circular pattern on the insulating board 56. The insulating bosses 62A and 62B are part of the same circular pattern. The interval between the adjacent contact points or insulating bosses is approximately 45°, but this angle may be varied to suit various conditions.

In addition to the contact points 60A-F, the terminal head 54 is provided with a contact sector 72, adapted to be engaged by at least one of the contactors 42. As shown, the contact sector is disposed inwardly from the circular pattern of the contact points. It will be understood that the angular extent of the contact sector 72 may be varied to suit different requirements, but the illustrated sector has an angular extent somewhat greater than 90°. As shown, the sector 72 is in the form of a plate having beveled edges 74 and 76, as will be evident from FIGS. 4 and 16.

Various means may be employed to secure the contact sector to the insulating board 56. As shown, this is accomplished by means of a rivet 78, located in line with the rotary axis of the carriage 16. As shown in FIG. 2, a terminal 80 is secured to the rear side of the insulating board 56 by means of the rivet 78. To prevent any possible turning movement of the sector 72, a tab 82 is formed on the sector and is arranged to project through a slot or opening 84 in the insulating board 56.

To insure that the terminal head 54 will be accurately located, a key 86 is preferably formed on the casing 12. The insulating board 56 is formed with a key slot 88 adapted to receive the key 86. The insulating board 56 may be made of various insulating materials, such as suitable plastics.

The contactors 42 are adapted to ride over the contact points 60A-F. In addition, the first contactor 42A is adapted to ride up and over the contact sector 72.

To engage the contact points 60A-F, each contactor 42 is formed with a sector-shaped portion 90, which is in the form of a flat conductive plate, with sloping edge portions 92 and 94. As will be seen from FIGS. 12-15, the sloping edge portions 92 and 94 make it possible for the contactor to move smoothly and easily over the contact points 60A-F.

Each contactor 42 is also formed with a point portion 96, preferably spaced inwardly toward the axis of the carriage 16 from the sector-shaped portion 90.

The contactors 42 are preferably made of sheet copper, or some other highly conductive material. The point portions 96 may be struck or punched from the inner extremity of the sector-shaped portion 90. It will be seen from FIG. 16 that the illustrated point portion 96 is spherically rounded.

The point portion 96 of the first contactor 42A is adapted to engage the contact sector 72. On the other hand, the point portion 96 of the second contactor 42 rides along the front surface of the insulating board 56.

The angular extent of the sector-shaped portion 90 is sufficient to engage two of the contact points simultaneously. Thus, the angular extent is somewhat greater than 45°.

FIG. 8 illustrates a turn signal switching system 100 which utilizes the switch 10. The switching system 100 is adapted to control the lighting of left and right-hand signal lamps 102L and R. While only one lamp is shown in each case, it will be understood that any number of additional lamps may be connected in parallel with the illustrated lamps 102 L and R. Thus, in many cases, four lamps will be employed, two at rear of the vehicle and two more in front. It will be seen that the left lamp 102L is connected to the contact points 60A and F, while the right lamp 102R is connected to the contact points 60B and C.

The switching system 100 is adapted to be energized from the vehicle battery 104, which is normally on the vehicle for other purposes. One side of the battery is grounded to the frame of the vehicle, while the other side is connected to two battery feed wires 106 and 108. A flasher 110 is connected into the feed wire 106, which then is connected to the contact sector 72. A light dimming resistor 112 is connected into the second feed wire 108 which then is connected to the contact points 60D and E.

FIG. 8 represents the Off position of the switch, in which the lamps 102L and R are not lighted. It will be seen that the first contactor 42A does not engage the contact sector 72. It engages the contact point 60F and the insulating boss 62A, so that no circuit is established. The second contactor 42B engages the contact point 60C and the insulating boss 62B, so that no circuit is established.

In FIG. 9, the contactors 42A and B have been advanced clockwise through 45°. The point portion 96 of the first contactor 42A now engages the contact sector 72. The sector-shaped portion 90 of the first contactor 42A engages the contact point 60A and the insulating boss 62A. Thus, the circuit is established between the contact sector 72 and the contact point 60A, so that the left lamp 102L is flashed. Accordingly, this is called the Flash Left position of the switch. In this position, the second contactor 42B encases the contact points 60C and D, so that the right lamp 102R is energized through the dimming resistor 112. Accordingly, the right lamp 102R is lighted with a steady but dim glow. In this way, the right lamp functions as a marker light, while the flashing left lamp provides a left turn signal.

In FIG. 10, the contactors 42 have been advanced through an additional interval of 45°. The contactor 42A engages the contact sector 72 and the contact points 60A and B. Accordingly, both lamps 102L and R are flashed. Since there normally are four or more lamps, this is called the Flash All position. The second contactor is engaged in the contacts 60D and E, which are already connected together by the strap 70. Thus, no circuit is established to the second battery feed wire 108. The switch is used in this position when the tractor or other farm vehicle is traveling straight ahead on the highway. The flashing lamps on both sides of the vehicle indicate to oncoming drivers that a slow vehicle is being operated on the highway.

In FIG. 11, the contactors 42 have been stepped through another 45° to the final position of the switch. The first contactor 42A engages the contact sector 72, the contact point 60B, and the insulating boss 62B. Accordingly, the right lamp 102R is flashed. The second contactor engages the contact points 60E and F, so that

the left lamp is energized through the dimming resistor 112. Accordingly, the left lamp is lighted steadily but dimly.

FIGS. 12-15 illustrate the manner in which the contactors 42 are rocked as they travel over the contact points 60A-F. Specifically, FIG. 12 shows the second contactor 42B in its engagement with the contact points 60D and E. FIGS. 13, 14 and 15 illustrate successive stages of the movement of the contactor into engagement with the contact points 60C and D. It will be seen that the contactor rocks counterclockwise as it leaves the contact point 60E, and then clockwise as it moves over the contact point 60D to the contact point 60C. It will be evident that the contactor again rocks counterclockwise to a level position as it rides up the contact point 60C. This rocking action is highly advantageous, because the contact points are wiped clean over a considerable area as the contactor is moved over the points. The rocking action prolongs the life of the switch and insures that good contact will be established between the contact points and the contactors.

It will be evident from FIG. 19 that the point portion 96 of the first contactor is adapted to ride up and down the beveled edges 74 and 76 as the point portion is moved over the contact sector 72. The beveled edges make it possible for the point portion to travel smoothly and easily over the contact sector.

It will be evident that the provision of the point portion 96 on each contactor 42 makes it easy for the contactor to rock, in the manner shown in FIGS. 12-15. The point portion 96 acts as a rocker element at the inner extremity of each contactor.

It will be seen from FIG. 6 that the central rivet 78 has a forwardly projecting pin portion 115 which acts as a rear bearing for the carriage 16. An axial bore or opening 117 is formed in the carriage 16 to receive the pin 115.

FIG. 17 illustrates a modified switch 120, connected into a modified turn signal switching system 122. The switch 120 is only slightly modified, in that the straps 66 and 68 are not used. It will be understood that additional terminals are connected to the contact points 60B and 60F. FIG. 17 is a diagrammatic view in which the terminals are not shown.

The single filament lamps 102L and R are replaced by double filament lamps 124L and R. The lamp 124L is provided with a major filament 126L and a minor filament 128L. Similarly, the right lamp 124R is provided with major and minor filaments 126R and 128R. The minor filaments are adapted to provide a low level of illumination, while the major filaments are capable of providing a high level.

The first battery feed wire 106 and the flasher 110 are connected to the contact sector 72, the same as before. However, the dimming resistor 112 is omitted, so that the second battery feed wire 108 is connected directly to the contact points 60D and E. The major filaments 126 L and R are connected to the contact points 60A and B. It will be seen that the minor filaments 128L and R are connected to the contact points 60F and 60C, respectively.

In FIG. 17, the modified switch is shown in its Off position in which no circuit is established. In the flash left position, the major filament 126L is flashed, while the minor filament 128R is lighted steadily through the

circuit established by the second contactor 42B between the contact points 60C and 60D.

In the Flash All position, both of the major filaments 126L and R are flashed through the circuit established by the first contactor 42A. No circuit is established by the second contactor 42B.

In the Flash Right position, the major filament 126R is flashed, while the minor filament 128L is lighted steadily. Thus, the minor filament acts as a marker light, while the flashing major filament provides a turn signal.

FIG. 18 illustrates another modified switch 220 and another modified switching system 222. The switch 220 is more extensively modified in that the insulating bosses 62A and B are replaced by additional contact points 260G and H. The contact sector 72 is replaced by a much narrower sector 272.

The switching system 222 of FIG. 18 employs the double filament lamps 124L and R, the same as in FIG. 17. Moreover, the connection of the major and minor filaments is the same as before.

The switching system 222 utilizes a dimming resistor 275 in series with the first battery feed wire 106, which still includes the flasher 110. The second battery feed wire 108 is connected the same as in FIG. 17, to the contact points 60D and E.

The switching system 222 utilizes a third battery feed wire 277 which includes a second flasher 279. The third battery feed wire 277 is connected to the newly added contact points 260G and H.

The switch 220 has only three positions, rather than four, which may be designated Flash Left, Flash All, and Flash Right. The switch is shown in its Flash Left position, in which the first contactor 42A completes a circuit between the contact points 60A and 260G. Thus, the major filament 126L is flashed by the second flasher 279.

The second contactor establishes a circuit between the contact points 60C and D, so that the minor filament 128R is lighted steadily. The relatively dim minor filament 128 provides a marker lamp, while the bright major filament 126L provides a left turn signal. In the Flash All position of the switch, the contactor 42A engages the contact sector 272 and the contact points 60A and B. Thus, the major filaments 126L and R are flashed through the flasher 110 and the dimming resistor 275. This arrangement provides a straight ahead signal in which the major filaments 126L and R are flashed at less than full brilliance. Accordingly, it is easier for oncoming drivers to distinguish between the straight ahead signal and the turn signals.

In the Flash Right position, the contactor 42A engages the contact points 60B and 260H. In this way, the major filament 126R is flashed by the flasher 279. The second contactor 42B engages the contact points 60E and F so that the minor filament 128L is lighted steadily.

To make it still easier for oncoming drivers to distinguish between the straight ahead signal and the turn signals, the flashers 110 and 279 may be arranged to flash the lights at different rates. With this arrangement, there is a change of the flashing rate when the switch is removed from its Flash All position to either the Flash Left or the Flash Right position.

It will be evident that the illustrated switches utilize two contactors to provide two independent switching circuits. However, it is possible to provide modified switches utilizing three or four contactors, so that there will be three or four independent switching circuits. It is also possible to produce switches utilizing only one contactor.

We claim:

1. An electrical switch

comprising a casing,

a carriage rotatably mounted in said casing for movement through a limited range to a plurality of positions,

means for rotating said carriage about a predetermined axis,

an insulating board mounted on said casing behind said carriage,

a plurality of contact points projecting forwardly from said insulating board and spaced at angular intervals around a first circular pattern,

all of said contact points being at the same radial distance from said axis,

a plurality of identical contactors mounted on said carriage at angularly spaced positions and at the same radial distance from said axis,

spring means biasing said contactors toward said insulating board,

each of said contactors comprising a sector-shaped portion engageable with some of said contact points,

the width of each sector-shaped portion being such as to span two adjacent contact points,

each of said contactors comprising a contactor point portion spaced from said sector-shaped portion and projecting rearwardly from said contactor for movement along said insulating board around a second circular pattern concentric with said first circular pattern,

and a contact sector mounted on said insulating board and engageable by said point portion of one of said contactors,

said last-mentioned point portion being movable out of engagement with said contact sector in one position of said carriage,

said contact sector being of limited angular extent whereby the point portion of the other contactor is engageable with said insulating board throughout the range of movement of said carriage.

2. An electrical switch

comprising a casing,

a carriage rotatably mounted in said casing for movement through a limited range to a plurality of positions,

means for rotating said carriage about a predetermined axis,

an insulating board mounted on said casing behind said carriage,

a plurality of contact points projecting forwardly from said insulating board and spaced at angular intervals around a first circular pattern,

all of said contact points being at the same radial distance from said axis,

a plurality of identical contactors mounted on said carriage at angularly spaced positions and at the same radial distance from said axis, Spring means

biasing said contactors toward said insulating board,
each of said contactors comprising a sector-shaped portion engageable with some of said contact points,
the width of each sector-shaped portion being such as to span two adjacent contact points,
each of said contactors comprising a contactor point portion spaced from said sector-shaped portion and projecting rearwardly from said contactor for movement along said insulating board around a second circular pattern concentric with said first circular pattern,
and a contact sector mounted on said insulating

board and engageable by said point portion of one of said contactors,
said last-mentioned point portion being movable out of engagement with said contact sector in one position of said carriage,
said contact sector being of limited angular extent whereby the point portion of the other contactor is engageable with said insulating board throughout the range of movement of said carriage,
at least one of said contact points being engageable by both of said contactors in different positions of said carriage.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,686,449 Dated August 22, 1972

Inventor(s) Charles E. Black and William J. Schaad

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the front page, after the names and addresses

of the inventors, insert the following

--[73] Assignee: Indak Manufacturing Corp.,

Northbrook, Ill.--

Signed and sealed this 30th day of January 1973.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,686,449 Dated August 22, 1972

Inventor(s) Charles E. Black and William J. Schaad

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the front page, after the names and addresses
of the inventors, insert the following
--[73] Assignee: Indak Manufacturing Corp.,
Northbrook, Ill.--

Signed and sealed this 30th day of January 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents