March 2, 1954 E. J. SCHULENBURG 2,671,148

ELECTRIC SWITCH

Filed June 1, 1951

2 Sheets-Sheet 1

Fig. 1.

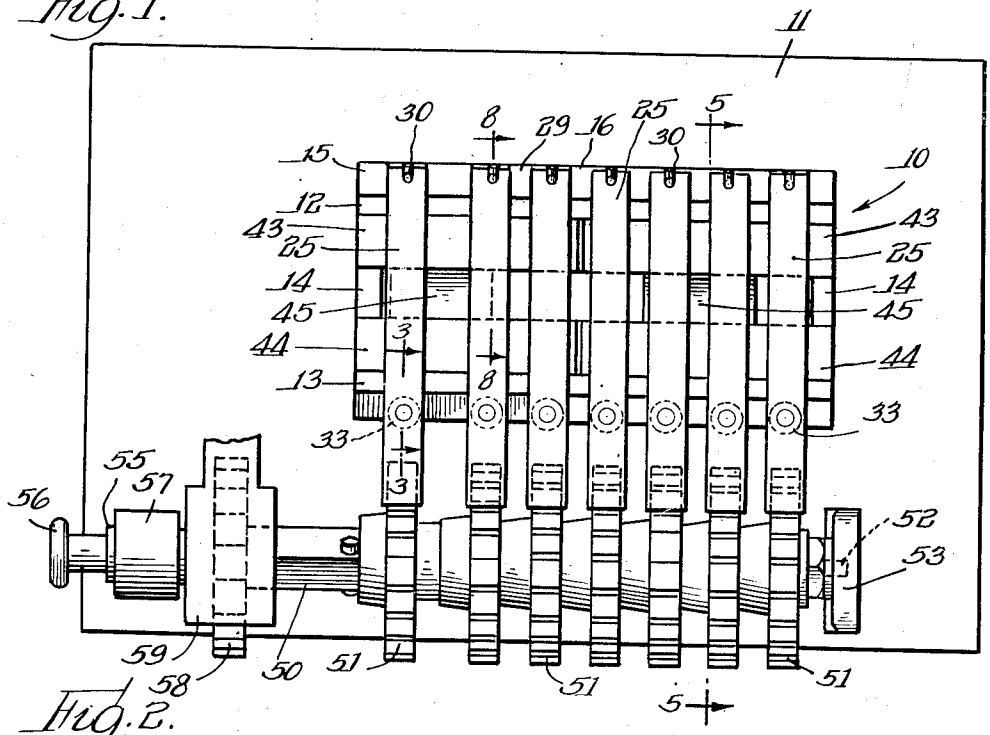


Fig. 2.

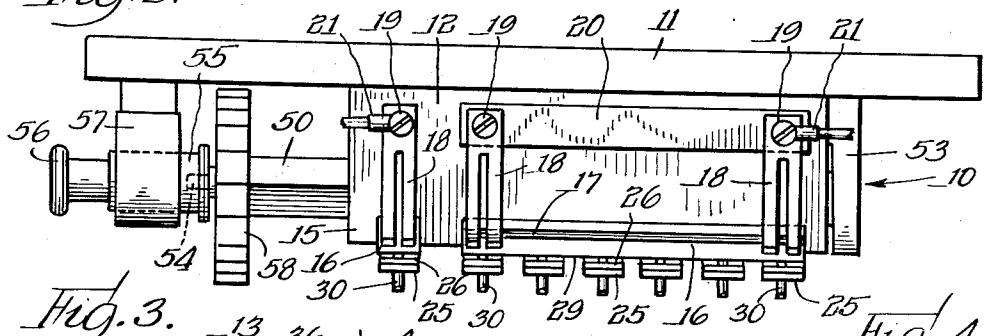


Fig. 3.

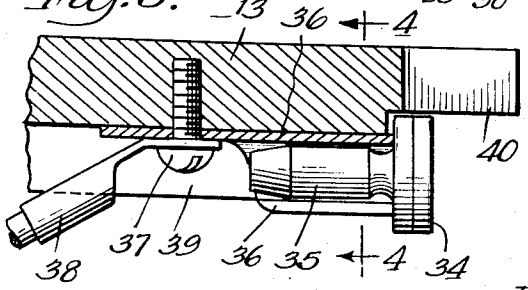
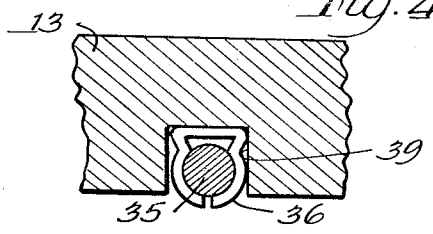


Fig. 4.



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Fig. 5.

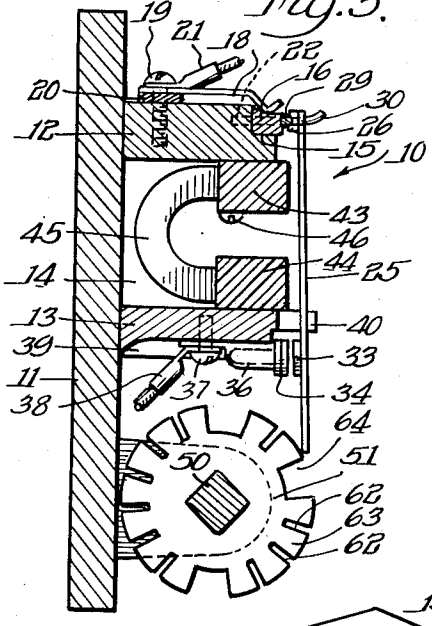


Fig. 6.

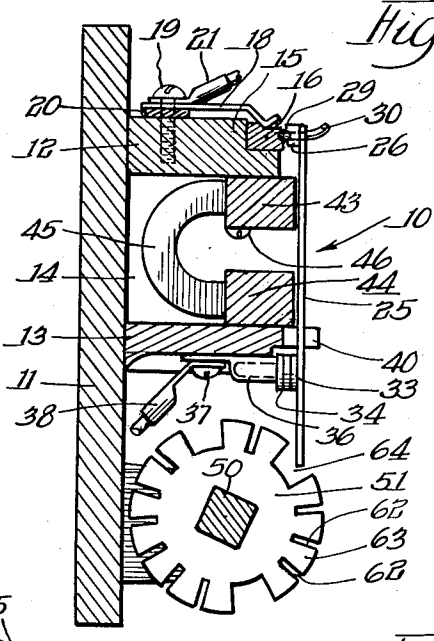
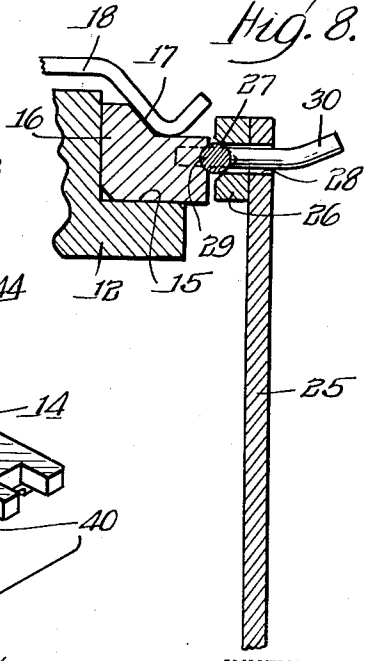


Fig. 8.



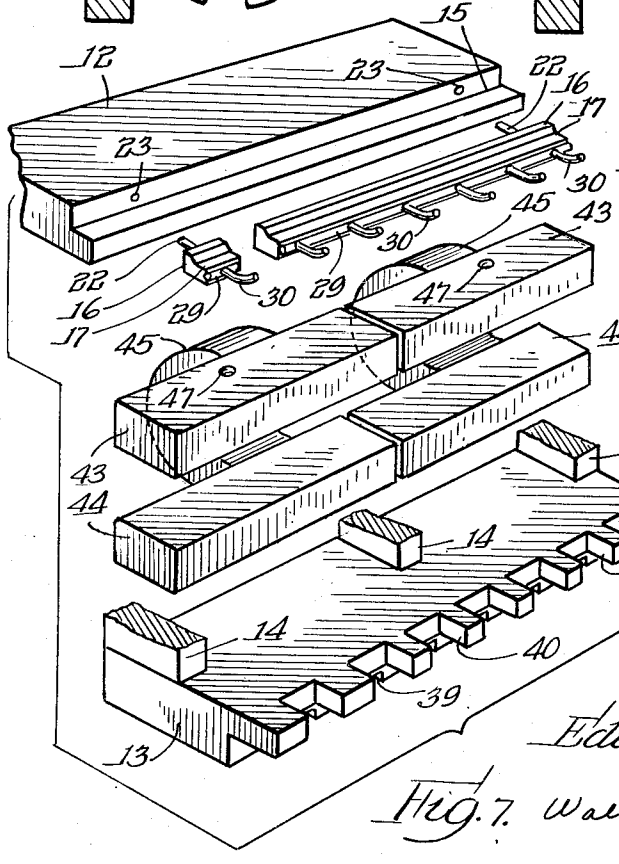


Fig. 7.

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ELECTRIC SWITCH

Edward J. Schulenburg, Danville, Ill.

Application June 1, 1951, Serial No. 229,412

13 Claims. (Cl. 200—153)

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This invention relates to an electric switch and more particularly to an electric switch for producing switching operations in a desired sequence.

The principal object of this invention is to provide an improved electric switch of this type which is simple in construction, inexpensive to manufacture and foolproof in operation, which eliminates the necessity for springs and the like heretofore conventionally used, which may be readily disassembled and assembled without the use of tools, which provides for simple interchangeability of parts, which may be readily adjusted, and which needs substantially no servicing in use. While the electric switch of this invention is of general utility, it is particularly adaptable for use in traffic control systems, such as disclosed in my copending application Serial No. 229,413, filed June 1, 1951, such systems operating continuously over extended periods of time and under all types of adverse weather conditions with a minimum of care.

The electric switch of this invention preferably includes a plurality of magnetic switch blades and means for pivotally mounting the magnetic switch blades in parallel relation. A magnet is located transversely of the plurality of magnetic switch blades for attracting the same in one direction about their pivotal mounting. Means are also provided for individually moving the magnetic switch blades in the opposite direction about their pivotal mounting against the attracting force of the magnet. The magnetic switch blades each operate a switch means.

The pivotal mounting means for each magnetic switch blade is extremely simple in construction and may include a stationary transverse shoulder engageable in a transverse recess in one side of the switch blade. The magnet in addition to moving the magnetic switch blade in one direction about its pivotal mounting also operates to maintain the transverse recess of the switch blade in engagement with the stationary transverse shoulder. The stationary transverse shoulder may also be provided with a pin extending through a hole in the magnetic switch blade to facilitate assembly and to assure positive location of the magnetic switch blade. The stationary shoulder may be carried by a block which is releasably secured to the switch supporting frame by a spring clip.

The switch means operated by each magnetic switch blade may include a contact carried by the magnetic switch blade and a stationary contact. The stationary contact may be releasably secured to the switch supporting frame and in this

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connection the stationary contact may have a post releasably secured in a spring clip which in turn is carried by the switch supporting frame.

The means for individually moving the magnetic switch blades about their pivotal mounting against the attracting force of the magnet may include a rotatable cam shaft located transverse to the magnetic switch blades and having a cam for each switch blade. The cams may be in the form of frangible discs having a plurality of radial slots so that circumferential portions between the radial slots may be readily removed to produce the desired camming action or sequence. The cam shaft may also be releasably mounted for rotation so that it may be readily removed if desired.

Further objects of this invention reside in the details of construction of the electric switch and the cooperative relationship between the component parts thereof.

Other objects and advantages of this invention will become apparent to those skilled in the art upon reference to the accompanying specification, claims, and drawings, in which:

Fig. 1 is a front elevational view of the electric switch of this invention;

Fig. 2 is a top plan view thereof;

Fig. 3 is an enlarged vertical sectional view taken substantially along the line 3—3 of Fig. 1 and illustrating the detachable stationary contact;

Fig. 4 is a sectional view taken substantially along the line 4—4 of Fig. 3;

Fig. 5 is a vertical sectional view taken substantially along the line 5—5 of Fig. 1, illustrating the magnetic switch blade in open circuit position;

Fig. 6 is a view similar to Fig. 5 but illustrating the magnetic switch blade in circuit closing position;

Fig. 7 is an exploded perspective view of various parts of the electric switch;

Fig. 8 is an enlarged vertical sectional view taken substantially along the line 8—8 of Fig. 1 and illustrating in more detail the pivotal mounting for the magnetic switch blade.

The electric switch of this invention is generally designated at 10. It includes a base 11 to which is suitably secured a supporting frame of insulating material having a pair of transverse spaced apart members 12 and 13 connected together by webs 14.

The transverse member 12 is provided with a shouldered recess 15 for receiving one or more metallic blocks 16. These metallic blocks 16

are each provided with a cam surface 17 which in turn is engaged by a spring clip 18 secured to the transverse member 12 by means of screws 19. The spring clips 18 are secured against a conducting washer or bar 20 and electrical connection is made to the spring clips 18 by means of terminals 21 which are also held in place by the screws 19. In this way the spring clips 18 detachably secure the metallic blocks 16 in place on the transverse member 12 and also provide electrical connections to the metallic blocks. Positively to locate the metallic blocks 16 they are provided with dowel pins 22 which are received in holes 23 formed in the transverse member 12.

The electric switch also includes a plurality of magnetic switch blades 25. The upper end of each of these magnetic switch blades has an ear 26 secured thereto as by welding and this ear is provided with a transverse recess 27. The ear 26 and the magnetic switch blade 25 are provided with a hole 28 therethrough which communicates with the transverse recess 27. The metallic blocks 16 are provided with a transverse shoulder 29 which may take the form of a rod secured in place on the block as by welding. Projecting from the shoulders 29 and extending through the holes 28 in the magnetic switch member 25 are pins 30. The transverse recesses 27 in the magnetic switch blades engage the stationary shoulders 29 for pivotally mounting the magnetic switch blades 25 on the metallic blocks 16. As will be pointed out more fully hereinafter, the transverse recesses are maintained in engagement with the transverse shoulders by magnetic attraction so that the transverse recesses 27 and the transverse shoulders 29 form means for pivotally mounting the magnetic switch blades 25. The pins 30 cooperating with the holes 28 operate to facilitate application of the magnetic switch blades 25 to the metallic blocks 16 and also assure that the magnetic switch blades 25 are maintained in proper position.

Each magnetic switch blade 25 is provided with a switch contact 33, the contact being secured thereto in any suitable manner as by welding. The switch blade contacts 33 engage and disengage stationary contacts 34 which in turn are releasably carried by the transverse member 13 of the supporting frame. In this connection, as shown more particularly in Figs. 3 and 4, each stationary contact 34 is provided with a post 35 which is received in a spring clip 36 secured to the transverse member 13 by means of a screw 37. Electrical contact is made with the stationary contacts 34 by means of terminals 38 held in place by the screws 37. The transverse member 13 is provided with a plurality of recesses 39 for receiving the spring clips 36 and the stationary contacts 34 and the edge of the transverse member 13 is provided with a plurality of slots 40 to assist in guiding the movement of the magnetic switch blades 25.

A magnet is located between and carried by the transverse members 12 and 13 of the supporting frame. This magnet includes a plurality of transverse bars 43 and 44 underlying all of the magnetic switch blades 25. Suitably secured to the bars 43 and 44 as by welding are permanent magnets 45. The magnet is held in place in the supporting frame by means of screws 46 extending through holes 47 in the bars 43 and into the transverse member 12. The magnet operates to attract the magnetic switch blades 25 to move the switch blade contacts 33 into engagement with the stationary contacts 34 and to maintain the transverse recesses 27 in the magnetic switch blades 25 in engagement with the shoulders 29. The attractive force on the magnetic switch blades 25 is at all times present to hold the same in proper position for pivotal movement.

Means are provided for individually moving the magnetic switch blades 25 against the magnetic force of the magnet for the purpose of individually separating the switch blade contacts 33 from the stationary contacts 34. This means includes a cam shaft 50 carrying a plurality of cams 51, one cam for each magnetic switch blade. One end of the cam shaft 50 is provided with a bearing extension 52 received in a hole in a journal member 53 suitably secured to the base 11. The other end of the cam shaft 50 is also provided with a bearing extension 54 received in a journal member 55 which is slidably mounted in a bracket 57 also suitably secured to the base 11. The journal member 55 is spring pressed inwardly so that the cam shaft is journaled at each end for rotative movement. The journal member 55 is provided with a handle 56 for pulling outwardly the journal member 55 to release the bearing extension 54 of the cam shaft 50. In this way the cam shaft may be readily removed if desired. The cam shaft 50 may be intermittently advanced in a rotative direction by means of a ratchet wheel 58 carried by the cam shaft 50. The ratchet wheel 58 may be intermittently operated by a pawl 59 on a solenoid operated armature such as disclosed in my copending application Serial No. 229,411, filed June 1, 1951.

The cams 51 may be in the form of frangible discs provided with a plurality of radial slots 62. The circumferential portions 63 of the frangible cam discs between the slots 62 form high dwells and may be removed by breaking away to form low dwells 64 on the cam surfaces. When the high dwells 63 engage the lower ends of the magnetic switch blades 25 they are moved outwardly about their pivotal mounting against the attractive force of the magnet to separate the switch blade contacts 33 from the stationary contacts 34 as illustrated in Fig. 5. When, however, the lower ends of the magnetic switch blades 25 overlie the low dwells 64 of the cam surfaces, the attractive force of the magnet moves the magnetic switch blades 25 in the opposite direction about their pivotal mounting to engage the switch blade contacts 33 with the stationary contacts 34.

Thus, it is seen that the contour of the cams may be adjusted to give any desired switching sequence by merely removing desired high dwell portions 63. The cam shaft 50 and cams 51 may be readily removed from the electric switch without the use of tools. Likewise, the magnetic switch blades 25 may be readily removed and replaced without the use of tools merely by slipping them over the extending pins 30. When in place, the magnetic switch blades 25 are held in operative position by the permanent magnet. The stationary contacts 34 may also be readily removed without the use of tools. In a like manner, the metallic blocks 16 carrying the pivotal mounting means for the metallic switch blades 25 may be removed and replaced without the use of tools. Thus, in the event that the electric switch of this invention should require servicing in the field, this can be readily and quickly done without the use of tools. The electric switch of this invention is extremely simple in construction, inexpensive to manufacture and foolproof

in operation. The usual springs and the like conventionally utilized in electric switches of this general character are entirely eliminated which, of course, eliminates the necessity for fine spring adjustments.

While for purposes of illustration one form of this invention has been disclosed, other forms thereof may become apparent to those skilled in the art, and therefore, this invention is to be limited only by the scope of the appended claims.

I claim as my invention:

1. An electric switch comprising a plurality of magnetic switch blades, means for pivotally mounting said magnetic switch blades in parallel relation, a magnet located transversely of the plurality of magnetic switch blades for at all times attracting the same in one direction about their pivotal mounting, means for individually moving the magnetic switch blades in the opposite direction only about their pivotal mounting against the attracting force of the magnet, and switch means operated by each magnetic switch blade.

2. An electric switch comprising a plurality of magnetic switch blades, means for pivotally mounting said magnetic switch blades in parallel relation, a contact carried by each switch blade, a stationary contact engageable by each switch blade contact, a magnet located transversely of the plurality of magnetic switch blades for at all times attracting the same in one direction about their pivotal mounting to engage the switch blade contacts with the stationary contacts, and means for individually moving the magnetic switch blades in the opposite direction only about their pivotal mounting against the attracting force of the magnet individually to separate the switch blade contacts from the stationary contacts.

3. An electric switch comprising a magnetic switch blade having a transverse recess on one side thereof, pivotal mounting means for the magnetic switch blade including a stationary transverse shoulder engaging in the recess of the magnetic switch blade, a magnet located adjacent the side of the magnetic switch blade having the recess for maintaining the recess in engagement with the shoulder and for attracting the magnetic switch blade in one direction about its pivotal mounting, means for moving the magnetic switch blade in the opposite direction about its pivotal mounting against the attracting force of the magnet, and switch means operated by the switch blade.

4. An electric switch comprising a magnetic switch blade having a transverse recess on one side thereof and a hole therethrough communicating with the recess, pivotal mounting means for the magnetic switch blade including a stationary transverse shoulder engaging in the recess of the magnetic switch blade and a stationary pin extending from the shoulder through the hole in the magnetic switch blade, a magnet located adjacent the side of the magnetic switch blade having the recess for maintaining the recess in engagement with the shoulder and for attracting the magnetic switch blade in one direction about its pivotal mounting, means for moving the magnetic switch blade in the opposite direction about its pivotal mounting against the attracting force of the magnet, and switch means operated by the switch blade.

5. An electric switch comprising a plurality of magnetic switch blades, each having a transverse recess on one side thereof, means for pivotally mounting said magnetic switch blade in

parallel relation including stationary transverse shoulders engaging in the recesses of the magnetic switch blades, a magnet transversely located adjacent the sides of the magnetic switch blades having the recesses for maintaining the recesses in engagement with the shoulders and for attracting the magnetic switch blades in one direction about their pivotal mounting, means for individually moving the magnetic switch blades in the opposite direction about their pivotal mounting against the attracting force of the magnet, and switch means operated by each magnetic switch blade.

6. An electric switch comprising a magnetic switch blade having a transverse recess on one side thereof, pivotal mounting means for the magnetic switch blade including a stationary transverse shoulder engaging in the recess of the magnetic switch blade, a contact carried by the side of the magnetic switch blade having the recess, a stationary contact engageable by the switch blade contact, a magnet located between the stationary shoulder and the stationary contact on the same side of the magnetic switch means for maintaining the recess in engagement with the shoulder and for attracting the magnetic switch blade in one direction about its pivotal mounting to engage the switch blade contact with the stationary contact, and means for moving the magnetic switch blade in the opposite direction about its pivotal mounting against the attracting force of the magnet to separate the switch blade contact from the stationary contact.

7. An electric switch comprising a supporting frame including a pair of spaced apart insulating members, a magnetic switch blade spanning the insulating members, pivotal mounting means for the magnetic switch blade detachably carried by one of the insulating members, a stationary contact detachably carried by the other insulating member, a contact carried by the magnetic switch blade engageable with the stationary contact, a magnet secured between the insulating members for attracting the magnetic switch blade in one direction about its pivotal mounting to engage the switch blade contact with the stationary contact, and means for moving the magnetic switch blade in the opposite direction about its pivotal mounting against the attracting force of the magnet to separate the switch blade contact from the stationary contact.

8. An electric switch comprising a supporting frame including a pair of spaced apart insulating members, a magnetic switch blade spanning the insulating members, a shouldered recess in one of the insulating members, pivotal mounting means for the magnetic switch blade including a metal block located in the shouldered recess, a spring clip carried by the insulating member for engaging the block releasably to secure the block in the shouldered recess and to complete an electrical circuit to the block, a stationary contact detachably carried by the other insulating member, a contact carried by the magnetic switch blade engageable with the stationary contact, a magnet secured between the insulating members for attracting the magnetic switch blade in one direction about its pivotal mounting to engage the switch blade contact with the stationary contact, and means for moving the magnetic switch blade in the opposite direction about its pivotal mounting against the attracting force of the magnet to separate the switch blade contact from the stationary contact.

9. An electric switch comprising a supporting frame including a pair of spaced apart insulating members, a magnetic switch blade spanning the insulating members, a shouldered recess in one of the insulating members, pivotal mounting means for the magnetic switch blade including a metal block located in the shouldered recess, a transverse shoulder on the block and a transverse recess in the switch blade engaging the transverse shoulder, a spring clip carried by the insulating member for engaging the block releasably to secure the block in the shouldered recess and to complete an electrical circuit, a stationary contact detachably carried by the other insulating member, a contact carried by the magnetic switch blade engageable with the stationary contact, a magnet secured between the insulating members for maintaining the recess of the magnetic switch blade in engagement with the shoulder of the block and for attracting the magnetic switch blade in one direction about its pivotal mounting to engage the switch blade contact with the stationary contact, and means for moving the magnetic switch blade in the opposite direction about its pivotal mounting against the attracting force of the magnet to separate the switch blade contact from the stationary contact.

10. An electric switch comprising a supporting frame including a pair of spaced apart insulating members, a magnetic switch blade spanning the insulating members, pivotal mounting means for the magnetic switch blade detachably carried by one of the insulating members, a spring clip carried by the other insulating member, a stationary contact having a post releasably secured in the spring clip, a contact carried by the magnetic switch blade engageable with the stationary contact, a magnet secured between the insulating members for attracting the magnetic switch blade in one direction about its pivotal mounting to engage the switch blade contact with the stationary contact, and means for moving the magnetic switch blade in the opposite direction about its pivotal mounting against the attracting force of the magnet to separate the switch blade contact from the stationary contact.

11. An electric switch comprising a plurality of magnetic switch blades, means for pivotally mounting said switch blades at one end in parrallel relation, a magnet located transversely of the plurality of magnetic switch blades for at all times attracting the same in one direction about their pivotal mounting, a rotatable cam shaft located transversely of the plurality of magnetic switch blades and provided with a cam for each magnetic switch blade for engaging the other ends of the switch blades individually to move the magnetic switch blades only in the opposite direction against the attracting force of the magnet, and switch means operated by each magnetic switch blade.

12. An electric switch comprising a plurality of magnetic switch blades, means for pivotally mounting said switch blades at one end in parallel relation, a magnet located transversely of the plurality of magnetic switch blades for at all times attracting the same in one direction about their pivotal mounting, a rotatable cam shaft located transversely of the plurality of magnetic switch blades and provided with a cam for each magnetic switch blade for engaging the other ends of the switch blades individually to move the magnetic switch blades only in the opposite direction against the attracting force of the magnet, and switch means operated by each magnetic switch blade, said cams each comprising a frangible disc having a plurality of radial slits to provide for ready removal of circumferential portions between the slits for producing the desired camming action.

13. An electric switch comprising a plurality of magnetic switch blades, means for pivotally mounting said switch blades at one end in parallel relation, a magnet located transversely of the plurality of magnetic switch blades for at all times attracting the same in one direction about their pivotal mounting, a rotatable cam shaft located transversely of the plurality of magnetic switch blades and provided with a cam for each magnetic switch blade for engaging the other ends of the switch blades individually to move the magnetic switch blades only in the opposite direction against the attracting force of the magnet, and switch means operated by each magnetic switch blade, and means for releasably mounting the cam shaft for rotation.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,096,485	Barnum	May 12, 1914
1,780,328	Ames	Nov. 4, 1930
1,827,102	Penn	Oct. 13, 1931
2,010,705	Stark	Aug. 6, 1935
2,170,341	Shaw	Aug. 22, 1939