SERVICE MANUAL

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No. 022 REMOTE CONTROL SWITCH

No. 022 Remote Control Switches are made for use with '0' gauge track and are generally sold in sets consisting of a right hand switch, a left hand switch and a pair of No. 022C controllers. Each switch is operated by its own controller connected to it by means of a three-conductor cable.

The mechanism of the switch, commonly called the switch 'motor', is activated by two solenoid coils assembled end to end over a common tube and plunger. The plunger is linked mechanically to the swivel rail and other parts of the switch mechanism. When either coil is energized the plunger is pulled into that coil moving the swivel rail and the rest of the switch mechanism.

The current for the switch 'motor' and for the lamps in the switch and the controllers is usually obtained from the center rail of the track through a contact spring which projects from the bottom of the switch frog rail. It is also possible, however, to obtain power directly from the transformer by using the Fixed Voltage Plug which is inserted over the booster pin of the switch. Insertion of the plug automatically separates the pin from the spring and disconnects the track power supply.

The diagram of the switch motor and controller circuit is illustrated below. The plunger and consequently the swivel rail and and the moving contact assembly have two alternate positions. In the position illustrated, the swivel rail will be set for the train to proceed along the curved branch on the rail. In this position the right spring contact connects end of coil 'A' to terminal 'A' and to the red lamp in the controller, so that current flowing from the booster pin, through coil 'A' and cable will light the red lamp. This current, however, is not large enough to operate the plunger and the switch remains undisturbed. When the lamp is shorted out by moving the controller lever a surge of current operates the plunger moving the switch mechanism and the contact assembly to the alternate position in which the swivel rail is set for the train to proceed along the straight-away and the end of coil 'B' is connected to terminal post 'B' and to the green controller lamp.

CIRCUIT DIAGRAM OF 022 SWITCH AND CONTROLLER

In order to prevent a train from running into an 'open' switch and thus derailing itself, No. 022 switches are provided with 'control' rails which automatically throw the switch to a correct position for the passage of the approaching train.

It is obvious from the circuit diagram that the two control rails, which are insulated from the rest of the track layout by means of fibre pins, are connected in parallel with the switch terminals and perform a similar function. In the illustration, if an approaching locomotive should enter on the curved control rail, its wheels would ground the control rail and thus short out the green controller lamp. This would pull the plunger to the left and set the swivel rail to correct position for the train to pass through, and at the same time lighting the red lamp in the controller.

All electrical connections between the switch 'motor' and the switch itself are made by means of pressure contacts, when the motor and the switch are assembled together. The connections between the switch 'motor' and the control rails are made by two pins riveted to the connecting straps on the under side of the switch, the ground contact is made through the spring brass ground link and the power connection is made by means of contact spring projecting from the frog rail of the switch. (See illustration of the under side of the switch)

SERVICING NO. 022 SWITCH

To test the operation of the switch, apply 12-14 volts to ends of center and outside rails, then simulate the action of the controller by shorting the center binding post to each of the outside binding posts in turn. Test the automatic operation of the non-derailing control rails by shorting each of the control rails to the opposite outside rail, simulating the shorting action of locomotive wheels. Flier handles make a convenient testing instrument for this purpose.

The swivel rail should lock securely in both positions. Failure to lock may cause train derailment and is due to improper operation of hinge lock. The hinge lock should drop into place to lock the sliding mechanism at the end of both strokes. If it does not it may be adjusted by bending the front bar slightly. Make sure the hinge bar spring is unbroken and in proper place.

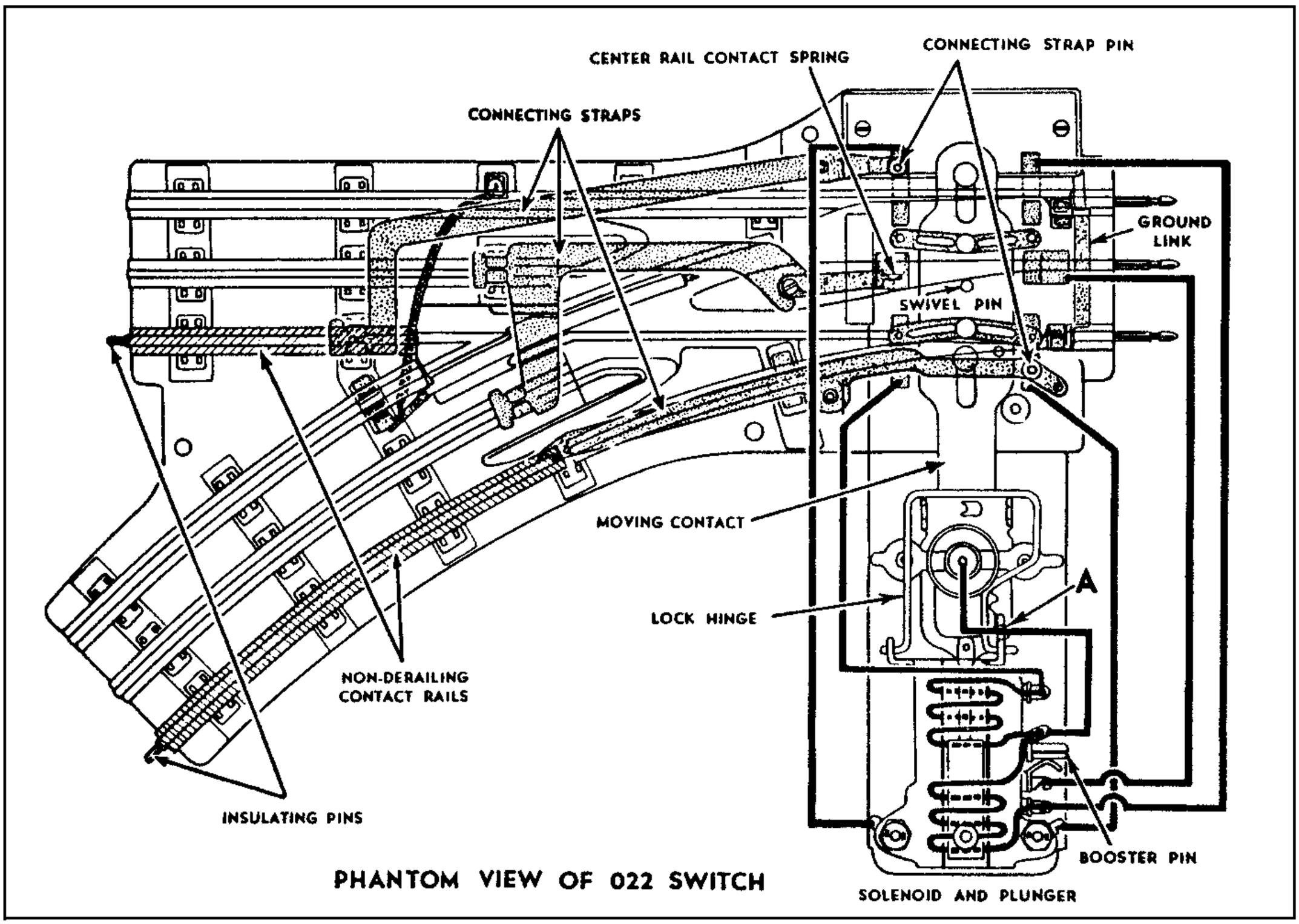
To check for possible mechanical interference operate the switch mechanism manually by rotating the lamp frame by hand. Possible sources of interference may be a bent swivel pin rubbing against the swivel rail slot, or a distorted lamp frame which might cause the lamp cover to rub against the switch cover. Interference with the action of the hinge lock might also be caused by the lamp lead unless it is properly located in the slot provided for this purpose in the coil frame (A in Figure 2).

CHECKING THE MOTOR

If the switch fails to work at all, check the continuity of the electrical circuit of the switch motor. Look for loose solder joints, broken wires, or poor contact between the spring and the booster pin. Check the continuity of the two solenoid coils. Check for possible shorts in the lamp socket or between the common center rail and the swivel rail pin. Check for loose riveting of the outer binding posts which may cause the solder lugs to turn so as to short against the coil frame supporting posts.

If the switch works irregularly or in one direction only, the trouble may lie in the sliding contact assembly. Examine the riveting of the springs to their insulating base and of the insulating base to the rest of the assembly. Loose riveting at any of these points may cause a shifting of the parts so that proper contacts are not made.

Clean the contact surfaces with alcohol or carbon tetrachloride (carbona) to remove dirt, carbon deposit, or soldering flux. Check the



PHANTOM VIEW OF 022 SWITCH

tension of the springs to see that proper contact is made at all four points of contact.

Adjustment of spring tension is a delicate operation and should be done carefully. Use an offset instrument of the type illustrated in Figure 8, Page PS 5. Too great a tension will create too much drag. Insufficient tension will result in uncertain or irregular operation and arcing at the contact points. Too great a bend in the spring may cause mechanical interference with the switch base. If the springs are too badly distorted it is advisable to replace the entire sliding assembly by removing the two retaining shoulder rivets.

CHECKING SWITCH BASE

If the switch motor is in good operating condition examine the rail connections in the switch base. Check the connecting straps to see that they are properly soldered to the control rails but do not short against the rail fingers of any of the other rails. If the control rails are shorted to ground rails, the switch will 'chatter' continuously when the power is on. Remove all rust and corrosion spots which may act as insulation and prevent the proper electrical contact. Tighten the common center rail strap screw and check the riveting of the common center rail. Loose riveting at this point will result in an uncertain electrical contact.

When reassembling the switch don't forget to insert the insulating paper between the switch base and its metal bottom plate. Bend up the soldered ends of the contacting strips on the switch motor to make sure they make proper contact with the connecting strap pins projecting from the switch base. Bend out the ground link connecting the outside rails of the switch to make sure it makes a good ground to the motor frame. Make sure that the swivel rail pin fits into the swivel rail slot before you tighten the screws holding the switch base to the switch motor. Otherwise you may fail to get proper electrical contact between the two parts of the switch.

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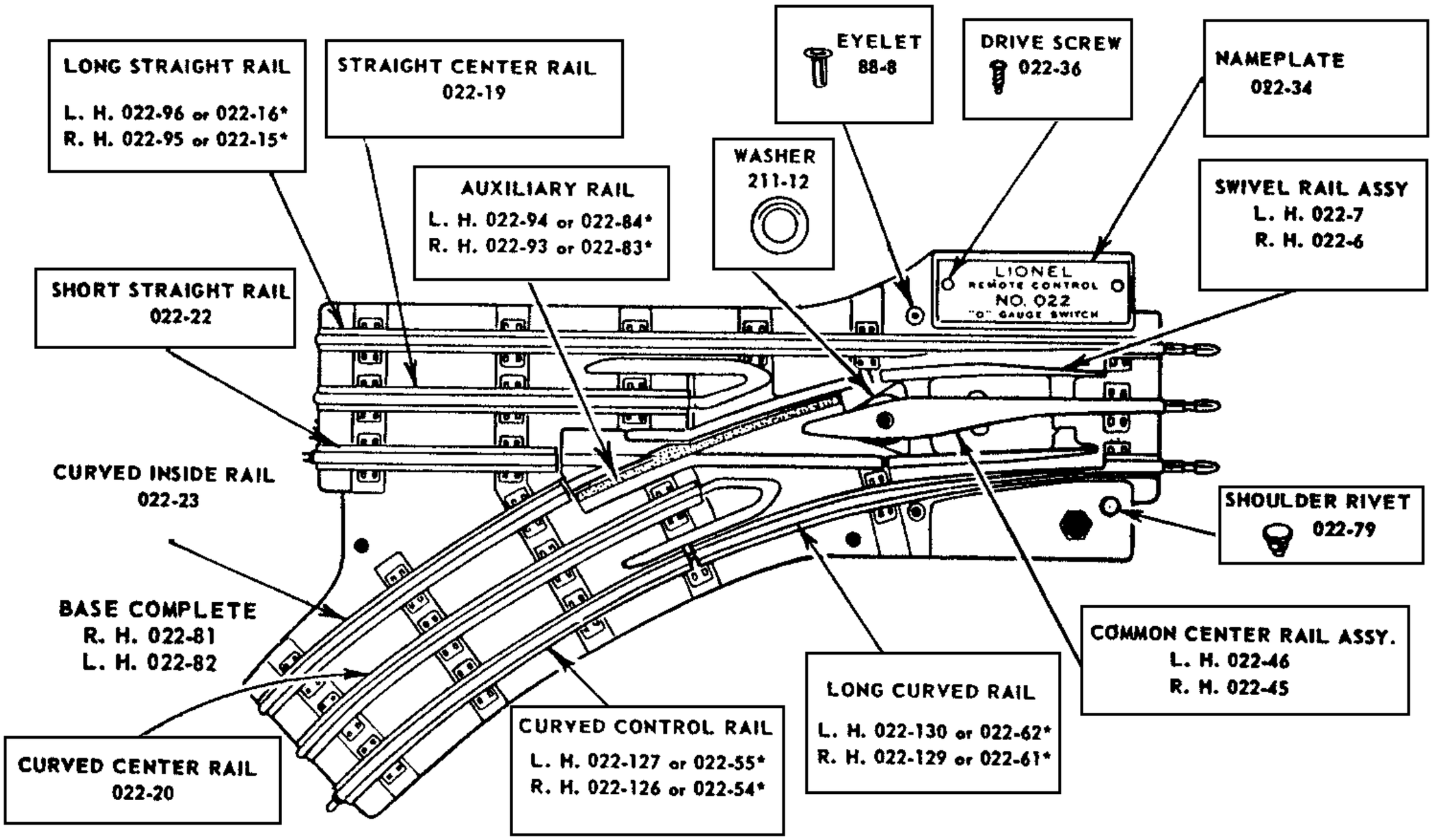
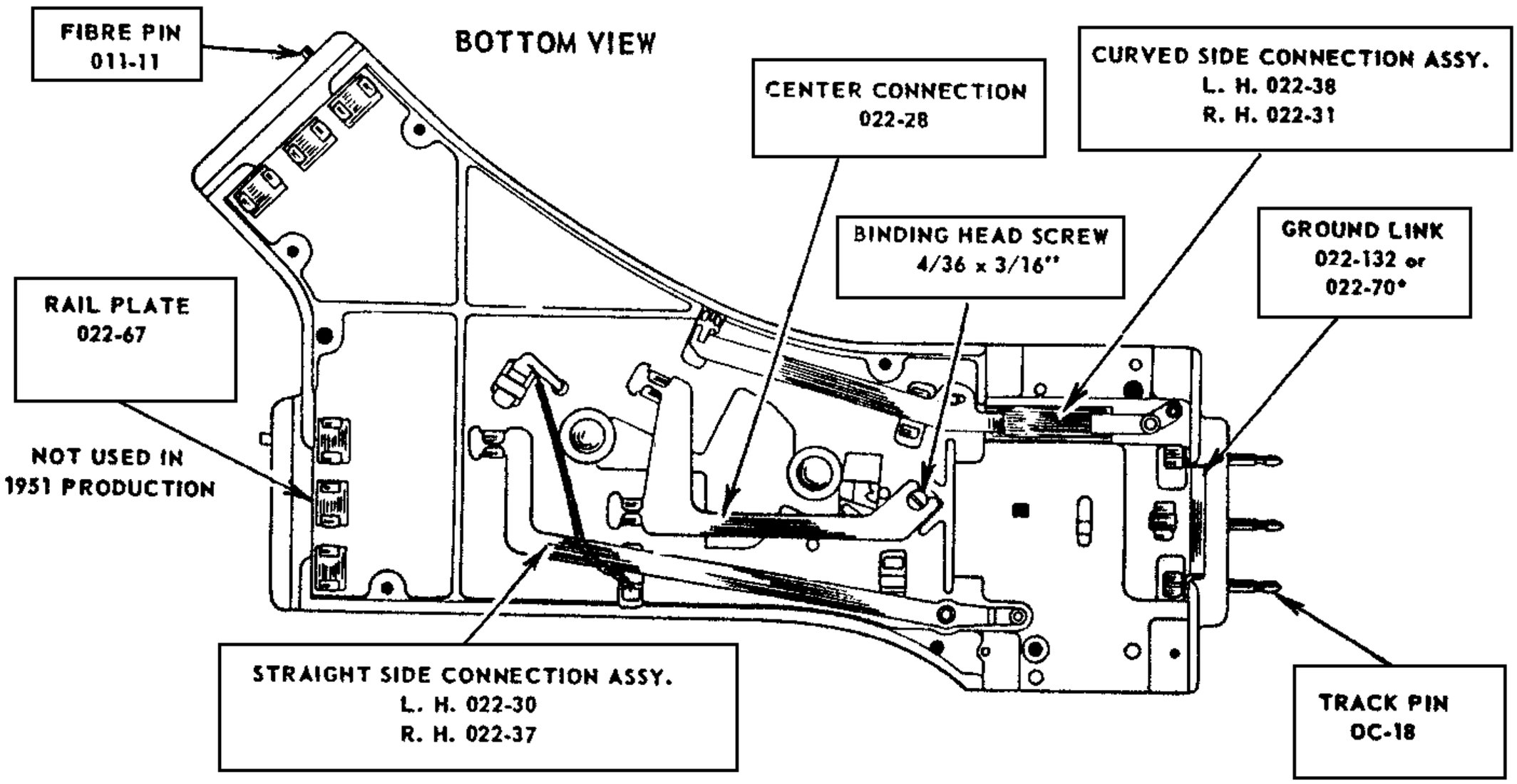
TOP VIEW



Illustrations on this page show the top and bottom views of the left-hand switch base. The companion right-hand switch base is its mirror image except for the location of the steel track pins and the section which makes contact with the switch motor. In 1950 a number of changes were made to facilitate production. However, the old parts, marked by asterisks, may be used interchangeably with the new parts except as noted.

BOTTOM VIEW



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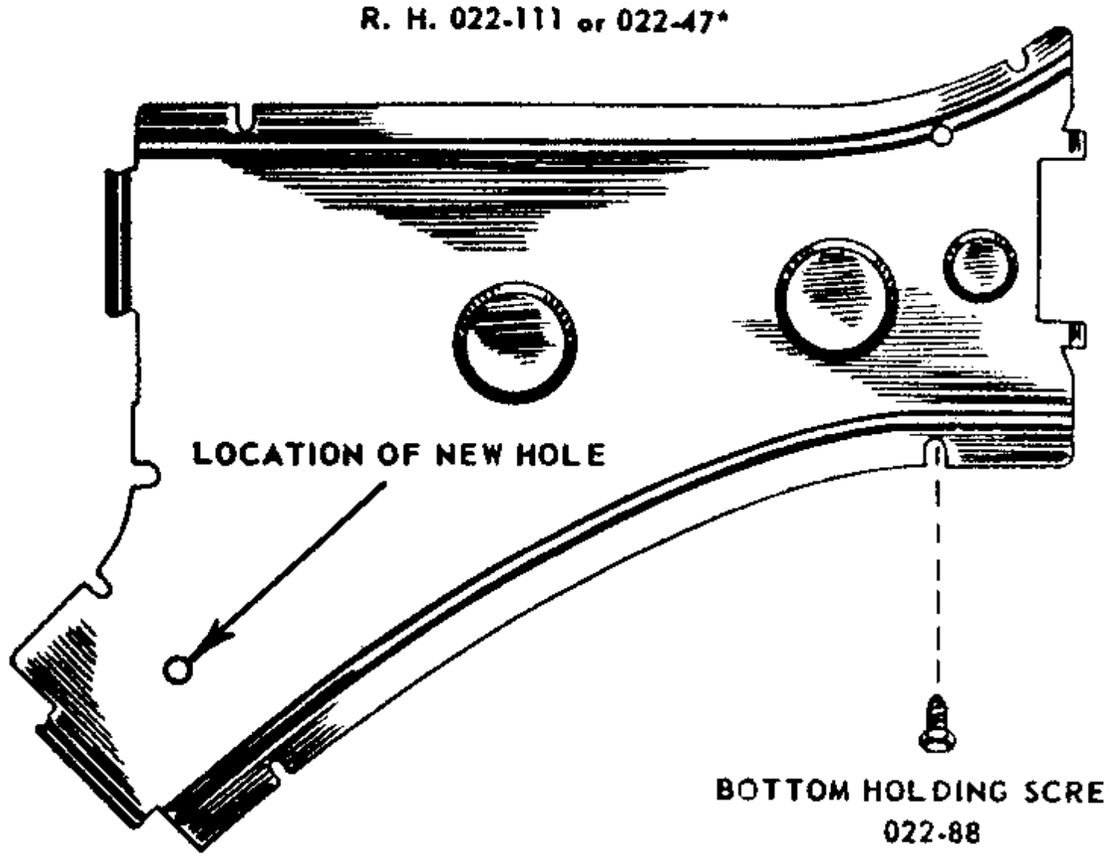
BOTTOM

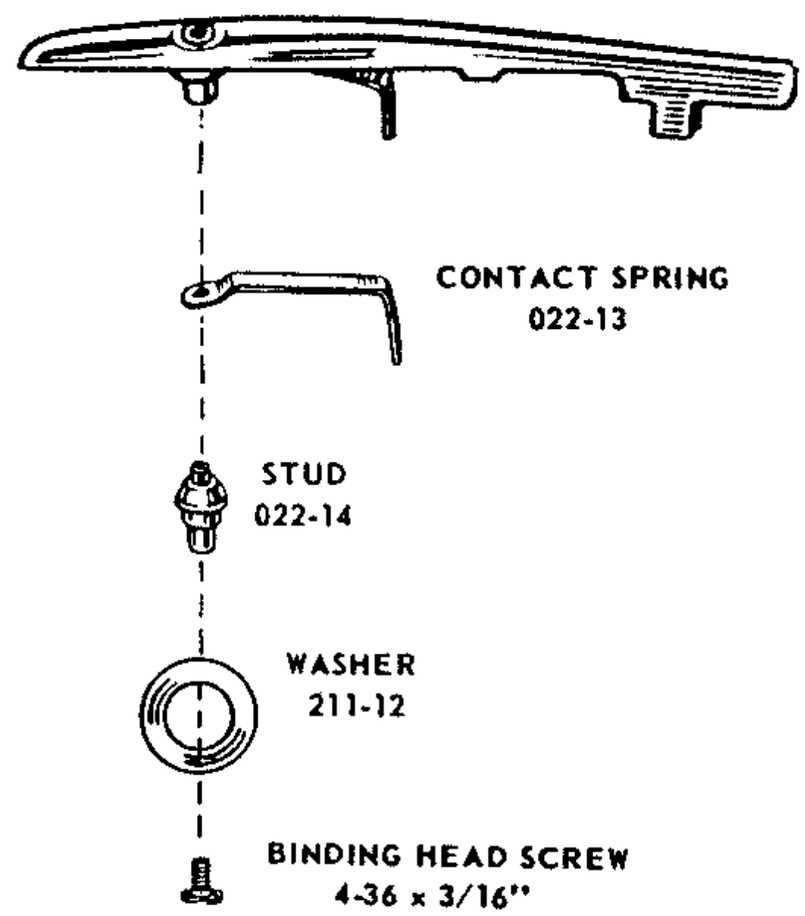
L. H. 022-112 or 022-48*
R. H. 022-111 or 022-47*



BOTTOM HOLDING SCREW
022-88

NOTE: The latest switch bottom differs from previous design in location of screw holes. The two bottoms are interchangeable provided holes are drilled in proper location.

COMMON CENTER RAIL ASSY.
L. H. 022-46
R. H. 022-45

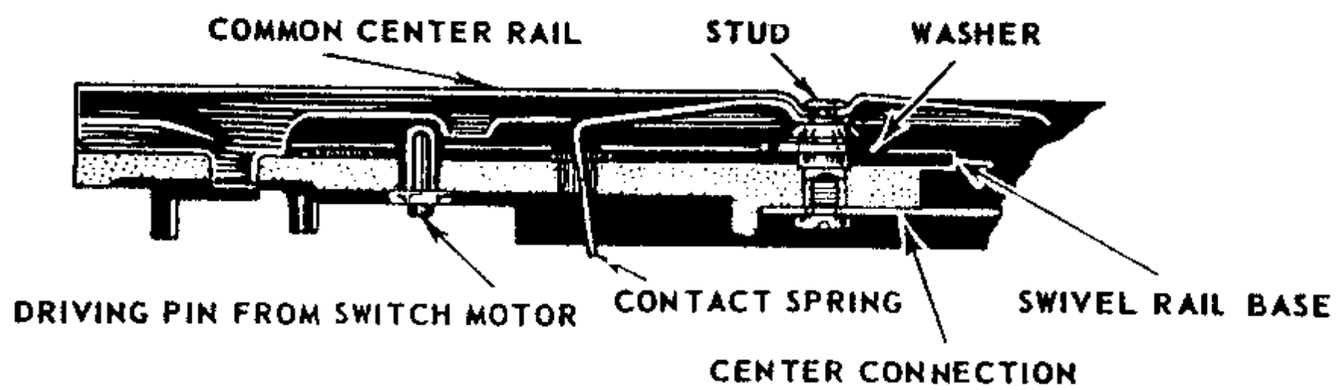


CONTACT SPRING
022-13

STUD
022-14

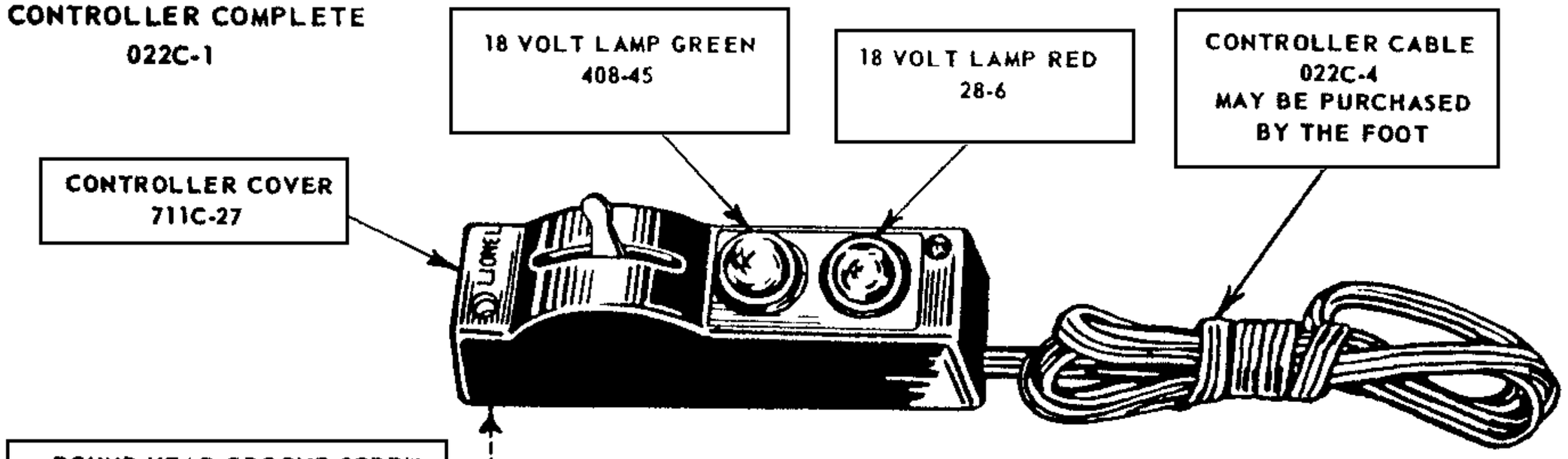
WASHER
211-12

BINDING HEAD SCREW
4-36 x 3/16"



Cross-section view showing how the common center rail is assembled to the switch base. The driving pin which is shown engaged to the swivel rail is part of the motor switch assembly not shown in the illustration.

CONTROLLER COMPLETE
022C-1



Note: Owing to material shortages, both No. 6-32 and No. 8-32 round head machine screws were used in this location at various times, instead of the specified self-tapping screw.

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BINDING POST NUT
88-2

BINDING POST
711-100

BAKELITE BUSHING
711-101
$.15

INSULATING WASHER
KL-23

SOLDER LUG
711-99

GROUND BINDING POST
259-7

LENS
RED 711-52
GREEN 711-53

LANTERN ASSY.
711-54

LOCK SPRING
711-121

LOCK HINGE
711-113

COVER
711-161

MOTOR ASSEMBLY
711-163

FIXED VOLTAGE PLUG
711-151

TERMINAL PLATE ASSY.
711-129

BINDING HEAD SCREW
4/36 x 3/16"

SWIVEL DRIVING PIN
022-40

CONTACT PLATE
711-217

FRAME & COILS
COMPLETE
711-213 or 711-191

MOUNTING SPACER
711-44

LANTERN RETAINER PIVOT
711-111

LANTERN RETAINER
711-119

RETAINING PIN
711-65

PLUNGER & ARM ASSY.
711-77

MOVING CONTACT ASSY.
711-216 or 711-170

COIL
711-202

COIL TUBE
711-45

RACK & PIN
711-150

FIXED CONTACT ASSY.
711-37

NUT
022-69

3-3/4" LAMP LEAD
711-75

LAMP
2026-58

WASHER
711-88

LAMP SPRING
R-91

RIVET
711-207

LAMP BRACKET ASSEMBLY
711-206

INSULATION
711-60

BINDING HEAD SCREW
4/36 x 1/4"

EYELET
61-14

Switches manufactured prior to 1950 were made with a screw-type lamp socket 711-147 and require lamp No. 752-9. Lamp Brackets 711-206 can be used on older switches provided that mounting holes are drilled larger to match holes in base, and Eyelet A-77 used for mounting, instead of Rivet 711-207.

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REPLACEMENT PARTS FOR NO. 022 SWITCH

Part No.	Part Name	List Price
011-11	Fibre Pin	.05
022-6	Swivel Rail Assembly R.H.	.40
022-7	Swivel Rail Assembly L.H.	.40
022-13	Contact Spring	.05
022-14	Mounting Post	.05
022-15	Long Straight Rail R.H. (Alternate)	.20
022-16	Long Straight Rail L.H. (Alternate)	.20
022-19	Straight Center Rail	.15
022-20	Curved Center Rail	.15
022-22	Short Straight Rail	.15
022-23	Curved Inside Rail	.20
022-28	Center Connection	.10
022-30	Straight Side Connection Assy. L.H.	.15
022-31	Straight Side Connection Assy. R.H.	.15
022-34	Nameplate	.15
022-36	Drive Screw	.05
022-37	Straight Side Connection Assy. R.H.	.15
022-38	Curved Side Connection Assy. L.H.	.15
022-40	Swivel Driving Pin	.02
022-45	Common Center Rail Assy. R.H.	.25
022-46	Common Center Rail Assy. L.H.	.25
022-47	Switch Bottom R.H. (Alternate)	.50
022-48	Switch Bottom L.H. (Alternate)	.50
022-54	Curved Control Rail R.H. (Alternate)	.15
022-55	Curved Control Rail L.H. (Alternate)	.15
022-61	Long Curved Rail R.H. (Alternate)	.20
022-62	Long Curved Rail L.H. (Alternate)	.20
022-67	Rail Plate	.02
022-69	Nut (Motor Mounting)	.05
022-70	Ground Link (Alternate)	.10
022-79	Shoulder Rivet	.02
022-81	Base Complete R.H.	4.00
022-82	Base Complete L.H.	4.00
022-83	Auxiliary Rail R.H. (Alternate)	.10
022-84	Auxiliary Rail L.H. (Alternate)	.10
022-88	Bottom Holding Screw	.05
022-93	Auxiliary Rail R.H.	.10
022-94	Auxiliary Rail L.H.	.10
022-95	Long Straight Rail R.H.	.20
022-96	Long Straight Rail L.H.	.20
022-111	Switch Bottom R.H.	.50
022-112	Switch Bottom L.H.	.50
022-126	Curved Control Rail R.H.	.15
022-127	Curved Control Rail L.H.	.15
022-129	Long Curved Rail R.H.	.20
022-130	Long Curved Rail L.H.	.20
022-132	Ground Link	.10
022C-1	Controller Complete	3.00
	(Pair)	5.50
022C-4	Controller Cable	.50
	Three-Conductor Cable (Per Foot)	.06

Part No.	Part Name	List Price
28-6	Red Lamp	.30
61-14	Eyelet	.02
88-2	Binding Post Nut	.03
88-8	Eyelet	.05
211-12	Washer	.02
259-7	Ground Binding Post	.05
408-45	Green Lamp	.30
711-37	Fixed Contact Assembly	.40
711-44	Mounting Spacer	.05
711-45	Coil Tube	.10
711-52	Red Lens	.02
711-53	Green Lens	.02
711-54	Lantern Assembly	.40
711-60	Insulation	.05
711-65	Retaining Pin	.02
711-75	3½" Lamp Lead	.10
711-77	Plunger Arm Assembly	.25
711-88	Washer	.02
711-99	Solder Lug	.02
711-100	Binding Post	.10
711-101	Bakelite Bushing	.10
711-111	Lantern Retainer Pivot	.02
711-113	Lock Hinge	.10
711-119	Lantern Retainer	.25
711-121	Lock Spring	.10
711-129	Terminal Plate Assembly	.35
711-147	Lamp Bracket Assy. (Screw Type)	.15
711-150	Rack & Pin	.15
711-151	Fixed Voltage Plug	.25
711-161	Cover	.50
711-163	Motor Assembly	4.75
711-170	Moving Contact Assy. (Alternate)	.50
711-188	Insulating Washer	.02
711-191	Frame & Coils Assy. (Alternate)	1.75
711-202	Coil	.40
711-206	Lamp Bracket Assy. (Bayonet)	.20
711-207	Rivet	.05
711-213	Frame & Coils Assy.	1.75
711-216	Moving Contact Assembly	.50
711-217	Contact Plate	.35
711C-27	Controller Cover	.35
752-9	Lamp (Screw Base)	.30
2026-58	Lamp (Bayonet Base)	.30
A-77	Eyelet (Used with 711-147)	.02
KL-23	Insulating Washer	.02
OC-18	Track Pin (Doz.)	.10
R-91	Lamp Spring	.05
4-36 x 3/16" B.H.	Fixed Voltage Plug Screw	.02
4-36 x 3/16" B.H.	Mounting Post Screw	.02
4-36 x 1/4" B.H.	Motor Mounting Screw	.02
4-40 x 1/4" R.H. Groove	Cover Screw	.02

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No. 022 - "O" Gauge Remote Control Switch

Part Number	Location	Unit Price	Min. Quan.	Description
011-11	LC	.60 dz.	5 dz.	Fibre Pin ("O" Gauge)
022-6	G-96	.50		Swivel Rail Assem. - R.H.
022-7	G-96	.50		Swivel Rail Assem. - L.H.
022-13	G-106	.05	12	Contact Spring
022-14	G-106	.05	12	Mounting Post
022-15	Substitute 022-95			Long Straight Rail - R.H.
022-16	G-106	.20		Long Straight Rail - L. H.
022-19	H-51	.20		Straight Center Rail
022-20	H-51	.20		Curved Center Rail
022-22	H-51	.20		Short Straight Rail
022-23	H-61	.25		Curved Inside Rail
022-28	H-61	.10		Center Connection
022-30	H-61	.20		Straight Side Connection L.H.
022-31	H-41	.20		Straight Side Connection R.H.
022-34	H-71	.15	4	Nameplate
022-36	B-71	.05	12	Drive Screw (Nameplate)
022-37	H-71	.20		Straight Side Connection R.H.
022-38	H-71	.20		Curved Side Connection L.H.
022-40	H-71	.02	25	Swivel Driving Pin
022-45	H-71	.40		Common Center Rail R.H.
022-46	H-51	.40		Common Center Rail L.H.
022-47	H-81	.60		Switch Bottom Plate R.H.
022-48	H-81	.60		Switch Bottom Plate L. H.
022-54	H-91	.20		Curved Control Rail - R.H.
022-55	H-91	.20		Curved Control Rail - L.H.
022-61	H-57	.25		Long Curved Rail - R.H.
022-62	H-57	.25		Long Curved Rail - L. H.
022-67	H-57	.02	25	Rail Plate
022-69	H-57	.10	6	Nut (Motor Mtg.)
022-70	H-57	.16	6	Ground Link
022-79	H-57	.02	25	Shoulder Rivet
022-81	Substitute 022-109			Base Complete - R.H.
022-82	H-52	6.00		Base Complete - L.H.
022-83	H-52	.10	6	Auxiliary Rail - R.H.
022-84	H-62	.10	6	Auxiliary Rail - L.H.
022-88	H-41	.05	12	Bottom Holding Screw
022-93	H-41	.15	4	Auxiliary Rail - R.H.
022-94	H-41	.15	4	Auxiliary Rail - L.H.
022-95	F-27	.25		Long Straight Rail - R.H.
022-96	F-27	.25		Long Straight Rail - L.H.

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Part Number	Location	Unit Price	Min. Quan.	Description
022-109	Q-47	6.00		Base Complete - R.H.
022-111	H-23	.60		Switch Bottom Plate - R.H.
022-112	H-41	.60		Switch Bottom Plate - L.H.
022-126	H-67	.20		Curved Control Rail - R.H.
022-127	H-67	.20		Curved Control Rail - L.H.
022-129	H-67	.25		Long Curved Rail - R.H.
022-130	H-77	.25		Long Curved Rail - L.H.
022-132	H-72	.10	6	Ground Link
022C-1	C-31	4.00		Controller Complete
022C-51	G-66	.30	12	Fixed Voltage Plug
28-6	Substitute 432-301			Red Lamp
61-14	G-95	.02	25	Eyelet
61-22	A-61	.05	25	Washer and Eyelet
88-2	G-83	.05	25	Binding Post Nut
88-8	G-95	.05	12	Eyelet
211-12	A-81	.02	25	Washer
259-7	G-95	.05	12	Ground Binding Post
408-45	Substitute 432-302			Green Lamp
432-301	LC	.30	10	Red Lamp
432-302	LC	.30	10	Green Lamp
711-37	G-95	.40		Fixed Contact Assem.
711-44	G-56	.05	12	Mounting Spacer
711-45	G-95	.10	6	Coil Tube
711-52	F-27	.02	25	Red Lens
711-53	F-27	.02	25	Green Lens
711-54	G-45	.50	6	Lantern Assem.
711-60	F-27	.05	12	Insulation
711-65	F-17	.02	25	Retaining Ring
711-77	F-17	.30		Plunger and Arm Assem.
711-99	F-17	.02	12	Solder Lug
711-100	F-17	.15	12	Binding Post
711-101	F-17	.10	12	Bakelite Bushing
711-111	G-56	.02	12	Lantern Retainer Ring Stud
711-113	G-56	.15	4	Lock Hinge
711-119	G-56	.30		Lantern Retainer
711-121	G-56	.10	6	Lock Spring
711-127	O-95	.50		Coil
711-129	G-76	.50		Terminal Plate Assem.
711-147	R-55	.40		Lamp Bracket Assem. (Screw Type)
711-150	G-66	.25		Rack and Pin Assem.

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Part Number	Location	Unit Price	Min. Quan.	Description
711-151	Substitute 022C-51			Fixed Voltage Plug
711-161	G-66	.75		Cover
711-163	A-23	5.50		Motor Assem.
711-170	Substitute 711-216			Moving Contact Assem.
711-188	G-56	.02	25	Insulating Washer
711-191	Substitute 711-213			Frame and Coil Assem.
711-202	Substitute 711-127			Coil
711-206	O-95	.40		Lamp Bracket (Bayonet Type)
711-207	O-95	.05	12	Rivet
711-213	G-26	2.75		Frame and Coil Assem.
711-216	G-26	1.00		Moving Contact Assem.
711-217	G-86	.50		Contact Plate Arm
711C-27	H-72	.40		Controller Cover
752-9	Substitute 1447-300			Lamp
933		.06 ft.		3-Conductor Cable
2026-58	Substitute 1445-30			Lamp
A-77	A-62	.02	25	Eyelet
KL-23	G-85	.02	25	Insulating Washer
OC-18	A-13	.15 dz.	12	Track Pin ("O" Gauge)
R-91	N-55	.05	12	Lamp Spring
4-36 x 3/16" BH	Q-51	.02	25	Fixed Voltage Plug Screw
4-36x 1/4" BH	Q-51	.02	25	Frog Screw
4-36x 1/4" BH	Q-51	.02	25	Motor Mtg. Screw
4-40 x 1/4"	B-92	.02	25	Cover Screw - RHST"F"

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