SPECIFIC INFORMATION FOR TYPE 5HV-150 REMOVABLE ELEMENTS

DESCRIPTION, MAINTENANCE, ADJUSTMENTS AND ELECTRICAL TESTS

BULLETIN 49105

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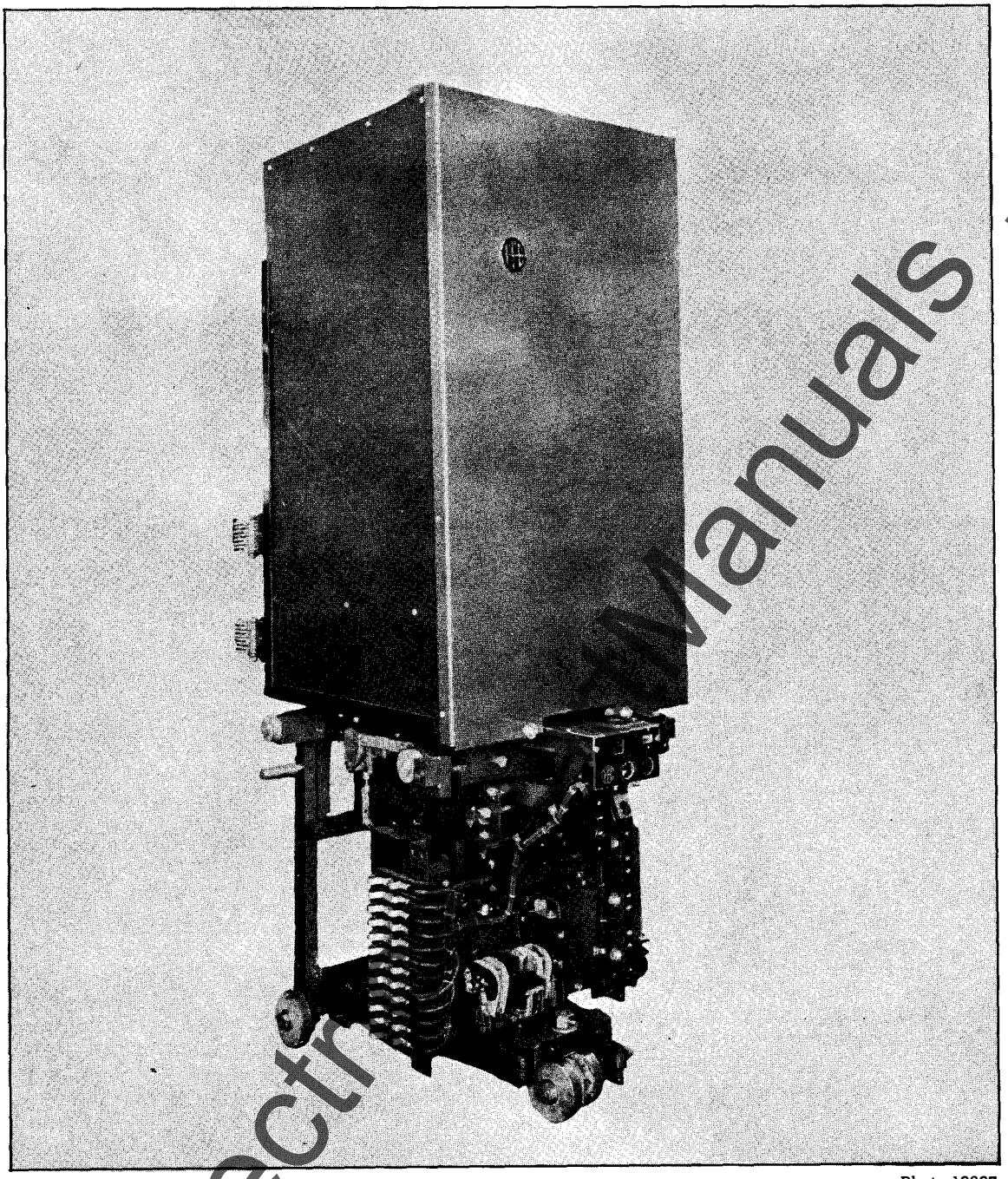


Photo 16867

FIG. 1—TYPE 5HV-150 REMOVABLE ELEMENT

INTRODUCTION

It should not be necessary to make any adjustments on the removable element shown in Figure 1 before installation, since adjustments for proper operation were made at the factory.

Under normal operating conditions, adjustments or replacements of parts will not be required.

The factory adjustments as stated, are those which should be followed when removable elements are periodically inspected, and when installation of renewal parts are needed.

Periodic inspection depends entirely on the amount of usage to which the removable elements are subjected to. However, it is recommended that an inspection be made every six months.

SPECIFIC INFORMATION FOR TYPE 5HV-150 REMOVABLE ELEMENTS

DESCRIPTION
MAINTENANCE
ADJUSTMENTS
ELECTRICAL TESTS

DESCRIPTION

CURRENT STUDS

The current studs (See Figure 2) are constructed of bare copper and insulated with a rectangular bakelite tube having a conductive inner surface lining to which the bar copper is pressed.

The rear ends of the removable element current studs carry the finger contact parts of the disconnecting device. Multi-finger parts are mounted on the withdrawal portion, and when removed from the housing are easily inspected.

The front end of the upper current stud carries the stationary main and arcing contact. The moving contact assembly is pivoted on the lower current stud. Lower contact inserts are brazed on the lower studs. The lower stud also supports the contact pressure spring.

BRIDGE

The bridge assembly (Figure 2) is comprised mainly of parallel copper bars to carry the load current with the arcing contacts supported between them. No pig tails are used, and contact springs are located close to the pivot stud.

Operation through an insulated pivot pin located above the physical center of the bridge arm produces a "blow-on" action. At higher currents, magnetic forces tend to increase contact pressure at all points. Spring biased pivoting in an inclined, elongated bushing at the stud connection end, raises the bridge at the end of the closing stroke, wiping contacts and imparting positive contact pressure.

BLOWOUT STRUCTURE

The blowout structure (Figure 2) is supported directly on the back panel supports and located directly above the main contacts and consists of a blowout coil and its iron core. The core plates directly above the main contacts completely cover the field of the arc and serve as supports for the arc chute.

The side blowout iron plates form rails supporting the arc chute which is latched when fully in place.

ARC CHUTE

The arc chute (Figure 2) mounted above the contacts provide a positive and efficient arc interruption. It consists of insulation side walls, front and back arc runners, and a series of ceramic plates mounted in spaced relation, transverse to the arc path, all in a strong magnetic blow-out field which forces the arc into the arc chute.

Specially located plates, below the outside arcing horn, combined with the long travel of arcing contact, effectively interrupt low magnetizing currents and low arc charging currents.

The complete arc chute assembly is removable for inspection without the use of any tools.

INTERPHASE BARRIER

The interphase barrier (Figure 1) provides ample insulation between phases in the element and is interlocked so as to make removal impossible with the element in the operating position. This barrier is a complete structure which can be handled by one man.

OPERATING MECHANISM

The operating mechanism is located below the contact structure. The mechanism is conventional, having the usual toggle system for transmitting the closing force of the solenoid.

The mechanism is designed to require very little force to trip the element. This is necessary for some needs which might require a transformer trip. The transformer trip works directly from the current transformers without relays.

The elements are mechanically trip free, making it impossible to close on a fault when provided with an overcurrent protective device. As soon as the contacts touch under such conditions, the trip coil energizes the trip mechanism releasing the tripping toggle to allow the partly compressed opening springs to return the contacts to fully open position.

SOLENOID

The solenoid is attached directly below the operating mechanism and uses the same system of levers. The solenoid plunger through the push rod actuates the toggles of the operating mechanism when the solenoid coil is energized.

A solenoid "bb" switch operates at the end of the plunger stroke. This switch in turn opens the solenoid coil circuit.

CONTROL PANEL

The control panel as shown in Figure 3 serves as a shelf on which are mounted various trip units.

The shunt trip is mounted on the left hand side. Transformer trip units may also be supplied with time delay.

A type R-14 trip free control relay used in the closing circuit, protects against pumping or repetition of the closing strokes and any damage to the closing coil which is not designed for continuous service. Further information for this control relay can be found in Bulletin IB-1003-R14.

An associate resistor is also mounted on the control panel. On the back of the panel is a six contact auxiliary switch. A second six contact switch may be added when necessary. Further information on this auxiliary switch is found in Bulletin IB-1003-AUX.

The separable control contacts as shown in Figures 2 and 3 are mounted on each side of the control panel. A maximum of 24 contacts can be supplied on each removable element.

In addition to the above units, a latch checking switch can be furnished for the use of reclosing relays.

Ninety percent of all the wiring required on the removable element is done on the panel, which is drilled to receive any or all of the units mentioned above. Any additions to the breaker can be made without the necessity of additional drilling.

GROUND CONNECTION

The ground connection mounted to the bottom rear cross frame bracing, provides a positive clamping action upon engagement with the stationary ground bus in the housing.

RACKING AND VISUAL INDICATOR ASSEMBLY

The assembly as shown in Figure 3 is located at the front directly above the control panel. The visual indicator plate fastens to a supporting bracket. On this plate is an opening for the visual indicator, an operation counter, a center opening for racking the element from test to operating position, or vice versa. Whenever the element is in the closed position the racking opening is closed automatically by a shutter, thus preventing racking in the element until opened.

The manual trip button is also found on this indicator plate.

Another name plate to the right of the indicator plate has been installed for the purpose of showing the position of the locking bar.

For electrical operation of the element, the close and trip buttons found on the plate adjacent to the racking and indicator plate are used to operate the element when in the test position, but will not operate element when in the closed position.

The name plate of the removable element is attached to the top of the racking and indicator assembly and contains all the information concerning the interrupting rating and serial number identification. Position of the pointer indicates when the removable element has been fully racked in to operating position.

When the element has been racked to test position, it has been moved four inches forward from operating position. In this position the element has been completely disconnected from the bus. However, the control separable contacts are still in engagement, permitting the element to be electrically operated while being tested.

REMOVABLE ELEMENT TRIPPING EQUIPMENT

The removable element tripping equipment is designed to fit the various applications of such a device. Tripping is normally accomplished through overcurrent relays and a shunt trip attachment, which may be supplied for either d-c or a-c operation without rectifiers.

Provision is also made for mounting 5 ampere transformer trip coils for tripping the removable element directly from the secondary of current transformers.

Capacitor tripping may be used with the shunt trip coil when no separate tripping source is available. Another tripping scheme that may be used is tripping reactors with 3 ampere coils and circuit closing protective relays.

INTERLOCKS

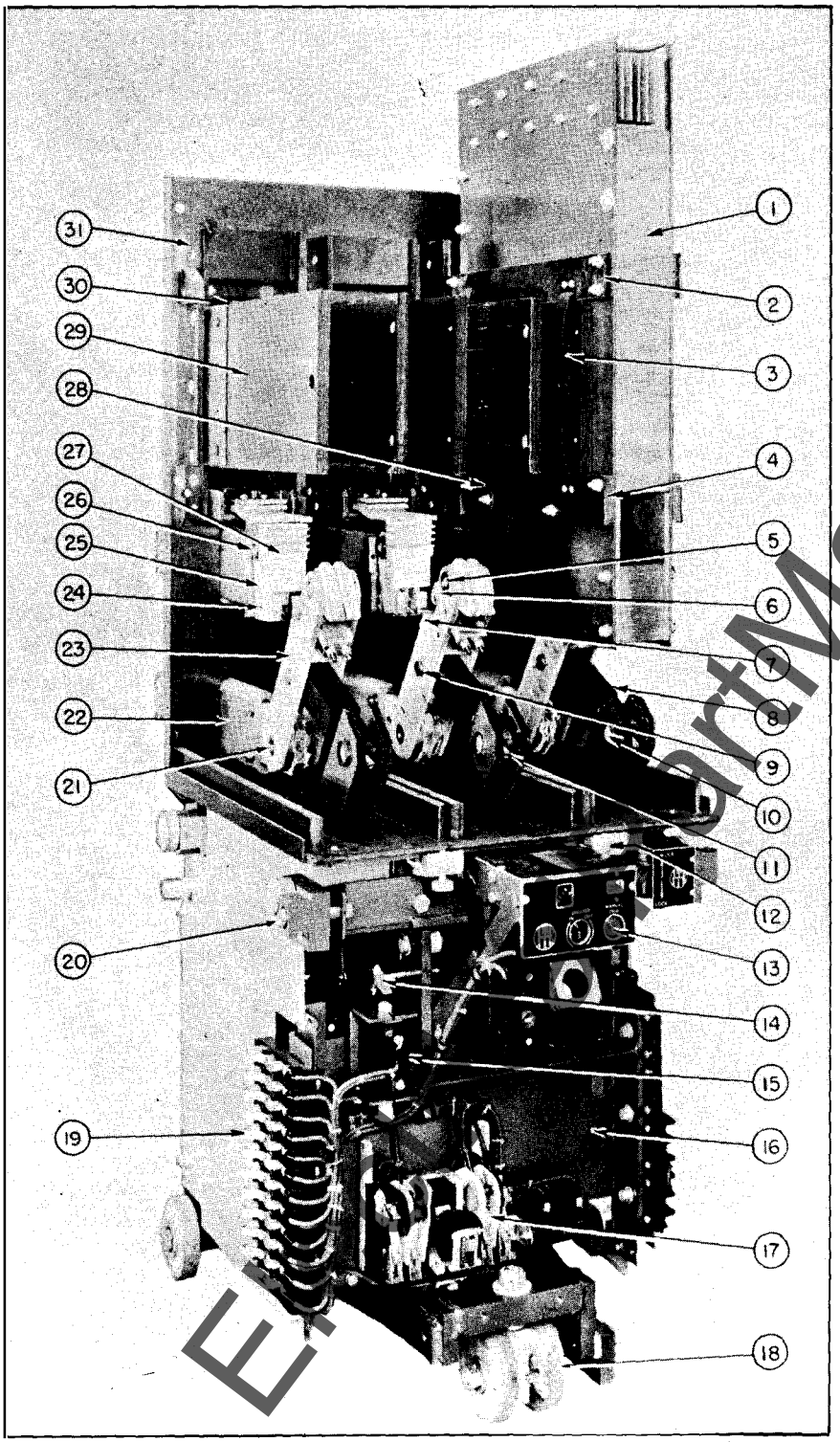
Interlocks are provided to protect the operator and the removable element mechanism under all known conditions. The interlocks prevent movement of the element into or out of the operating position while in the closed position.

This interlock consists of two parts. One part prevents the insertion of the racking handle unless the element is in the open position. The second part holds the element latch disengagement at all positions of the element between the connected "OPERATING" and disconnected "TEST" position.

A key interlock which is not standard equipment is available, and only used when specified. The key is removable only when the removable element is in the disconnect or "TEST" position.

INTERRUPTING CAPACITY

In addition to the usual temperature, operation, potential and life tests made in the development of this removable element, a comprehensive series of interrupting tests have been made. These have been conducted at various operating voltages and under conditions that may be encountered in service. They prove that the interrupting ability of the element is well above the stated interrupting rating.



1 ARC CHUTE
2 SUPPORT STRIP (upper)
3 SPRING CLIP
4 SUPPORT STRIP (lower)
5 PIVOT PIN
6 ARCING CONTACT (moving)
7 MAIN CONTACT (moving)
8 INSULATING LINK
9 INNER LINK PIN
10 OUTSIDE LINK PIN
11 ADJUSTING SCREW
12 BARRIER SCREW
13 MANUAL TRIP BUTTON
14 TRIP SHAFT
15 SHUNT TRIP DEVICE
16 CONTROL PANEL
17 CONTROL RELAY (R14)
18 FRONT ROLLERS (swivel)
19 SEPARABLE CONTACT (moving)
20 LOCKING BAR
21 BRIDGE PIVOT PIN
22 CURRENT STUD (lower)
23 BRIDGE
24 MAIN CONTACT (stationary)
25 RETAINING SCREW (arcing contact)
26 PIVOT (main contact)
27 ARCING CONTACT (stationary)
28 AUXILIARY BLOWOUT IRON PLATE
29 BLOWOUT IRON PLATE
30 BLOWOUT COIL
31 PANEL SUPPORT

Photo 13546-A

FIG. 2—TYPE 5HV-150 REMOVABLE ELEMENT
Barrier and Arc Chutes Removed to Show Contact Structure

MAINTENANCE

Inspection should be made to determine the condition of the contacts and electrical connections of the removable element. This inspection can be made by measuring the drop across the removable element. To obtain accurate reading, pointed terminals of a low direct current voltage should be used. The measured d-c drop between the ends of the main studs, at the rear of the removable element should be less than 20 millivolt at rated current.

All mounting screws, supporting assemblies such as operating mechanism and operating accessories, should be tight against their supporting members.

The interrupting contacts can be exposed for inspection by removing the interphase barrier and arc chutes from the removable element.

Remove the barrier by loosening two screws (Figure 2) enough to allow them to be swung out of engagement with barrier, then lift off barrier.

The arc chute (Figure 2) can be removed by lifting the spring clip and pull arc chute from the blowout iron plates that support it.

The arcing contacts as shown (in Figure 2) are made of hard non-welding alloy. No cleaning is necessary, but should they become pitted, dress them sparingly with a fine file. Remove any file accumulations.

The main contacts as in Figure 2 are faced with silver alloy blocks. Do not use abrasives on these contacts. Generally the only cleaning necessary can be done by opening and closing the element several times under no load conditions. The wiping action of the contacts dislodges any dirt or film. This also applies to the silver plating found on the lower inside of the bridge bearing against the lower stud.

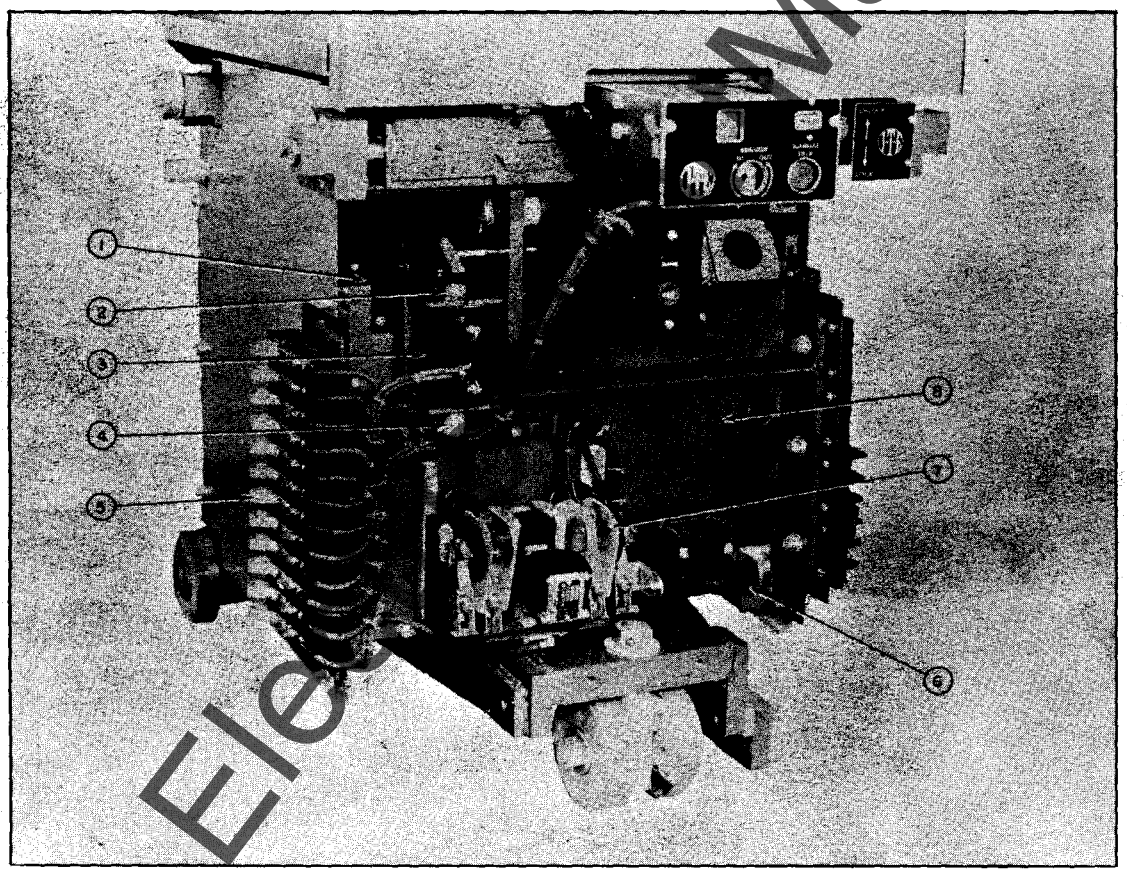


Photo 13549-A

1 AUXILIARY SWITCH
2 ADJUSTING NUT
3 SHUNT TRIP COIL
4 ARMATURE (shunt trip)
5 SEPARABLE CONTROL CONTACTS (moving)
6 RESISTOR
7 CONTROL RELAY (R14)
8 CONTROL PANEL

FIG. 3—CONTROL PANEL FOR TYPE 5HV-150 REMOVABLE ELEMENT

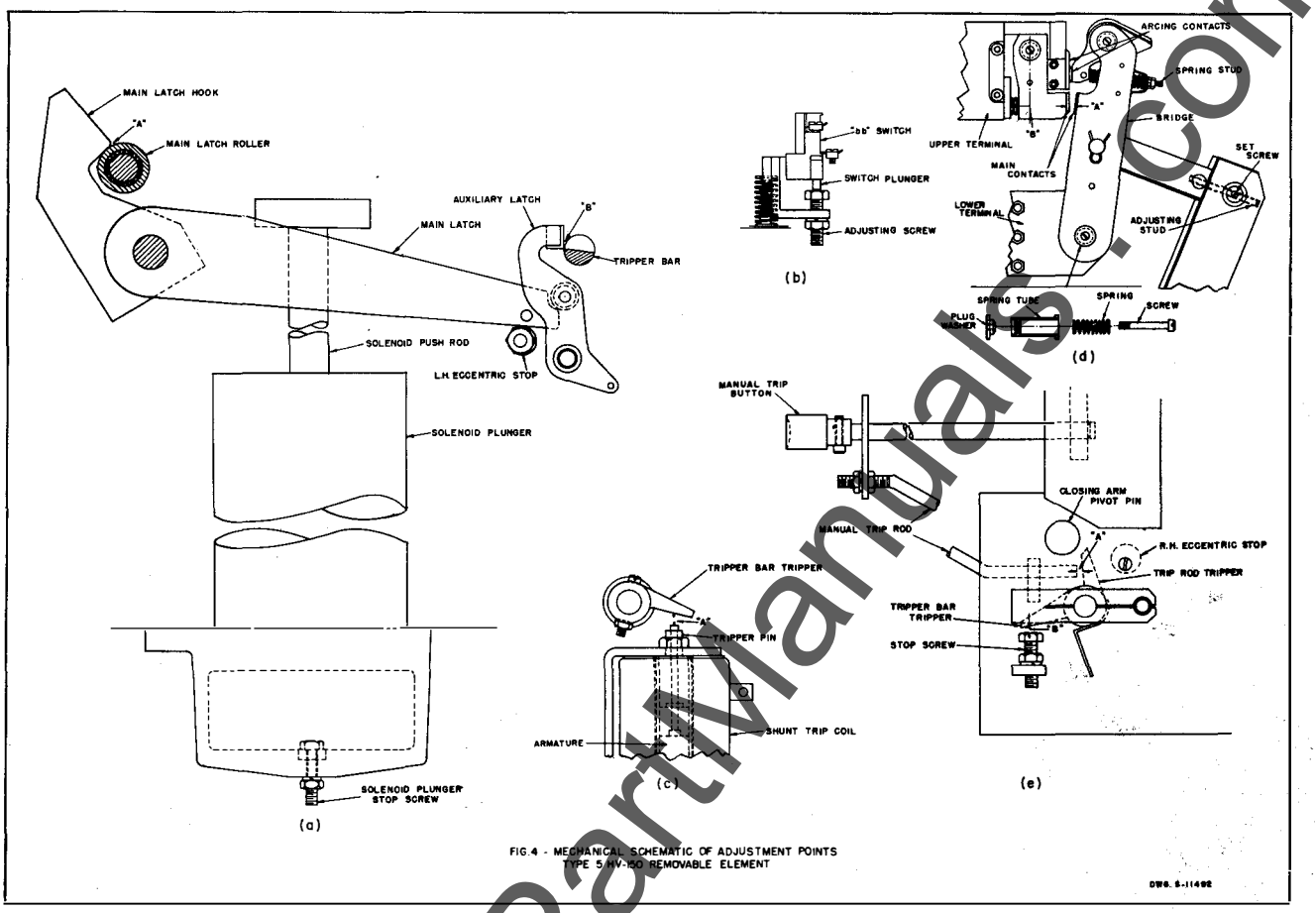


FIG.4 - MECHANICAL SCHEMATIC OF ADJUSTMENT POINTS TYPE 5HV-150 REMOVABLE ELEMENT

DWG. 6-11498

ADJUSTMENTS AND ELECTRICAL TESTS

FREENESS OF PARTS

The solenoid push rod, main latch, auxiliary latch, toggle, toggle pins and toggle roller should be free operating with their adjacent parts.

TRIPPER BAR INSPECTION

1. The tripper bar should show some side play.
2. The shunt trip tripper pin must have clearance at "A" Figure 4(c) to the tripper bar tripper.
3. Some clearance must show between the manual trip rod and its relative tripper at "A" Figure 4(e).

CONTACT SEQUENCE

When the arcing contacts Figure 4(d) just touch, the main contacts should have a gap of 3/16 inch, plus 1/32 or minus 0 at "A".

Adjustments can be made by the nuts on the spring studs, Figure 4(d).

MAIN CONTACT PRESSURE

The main contacts (Figure 2) on the upper terminal should move 1/8 inch, plus 0 or minus 1/32 from the time of making contact until the removable element is fully closed. This measurement is made at point "B" Figure 4(d). The center pole might show a more slight pressure which is permissible.

Adjustment of the main contact pressure and sequence between poles is made by loosening set screw for adjusting stud. Turn stud in direction needed. Figure 4(d).

ALIGNMENT BETWEEN POLES

A variation of 1/32 inch between poles is permissible. All arcing contacts should touch within 1/32 of each other.

SIDE PRESSURE FOR BRIDGE, MOVING ARM ARCING CONTACTS AND UPPER TERMINAL STATIONARY MAIN CONTACTS

This pressure is fixed and is maintained by a tension spring assembly. Figure 4(d).

Adjustment for the correct pressure should replacement be needed is as follows:

1. Turn screw in until spring is completely compressed.
2. Back off screw 1½ turns.
3. Peen over end of screw in countersunk end of plug washer.

MAIN LATCH RESET STOP

The solenoid should first be at normal rest position. The reset stop point of the main latch is adjusted by turning the eccentric stop Figure 4(a) (on left side of mechanism housing). When this stop is adjusted correctly, there should be a clearance of .004 inch between the tripper bar and the auxiliary latch face at "B" Figure 4(a). Any amount in excess of this measurement will cause unnecessary hammering of the auxiliary latch face against the latch surface of the tripper bar. **Important.** The locking nut with lock washer under it, should be tightened securely after any adjustment changes are made on this eccentric.

MAIN LATCH ADJUSTMENT

The gap at "A" Figure 4(a) between the main latch hook and the main latch roller should be approximately .125 inch. If adjustments are needed, hold the tripper bar in a tripped position and raise the operating arm assembly manually, and then ease the same back against the buffer. The set screw at the bottom of the solenoid pot can then be adjusted to the given dimension. Lowering this screw will increase the gap "A" Figure 4(a) and vice versa. This screw must be locked securely with its lock nuts.

TRIPPER BAR LATCH BITE

This adjustment has been accurately made at the factory. However, a check test can be made by placing a .125 inch feeler gauge shim between the stop screw and tripper bar tripper at "B" Fig. 4(e). Hold tripper bar against shim and close the element. When pressure is released from tripper bar, the element should trip out. However, with a .110 shim held in the same place, and holding the tripper bar the element should remain closed when pressure is released from the tripper bar. If adjustment is needed make correction by stop screw.

SETTING RIGHT HAND ECCENTRIC STOP FOR DIRECTION OF TRIPPER BAR ROTATION

Hold the tripper bar in full tripped position while auxiliary latch is held forward against its stop. See Figure 4(a). Turn the tripper bar eccentric stop (R.H. Side) of mechanism housing, Figure 4(e), until slight gap of .004 inch shows between the auxiliary latch and the tripper bar. **Important.** Securely lock nut on eccentric.

ELECTRICAL TRIP ADJUSTMENTS

Shunt Trip Tripper Travel. With the shunt trip armature Figure 4(c) held all the way up, there should be a clearance between the tripper bar stop screw and the tripper bar tripper at "B" Figure 4(e) of not less than .165 inch minimum.

With removable elements having a capacitor trip (shunt trip), it will be necessary to hold this travel close. Clearance should be .165 minimum to .170 inch maximum.

Solenoid "bb" Switch. Adjustments for the "bb" switch Figure 4(b) is made with the removable element out of the housing. Turn the adjusting screw down making certain switch plunger follows until the circuit across the contacts is just broken (check this with a bell alarm set), then screw up ½ turn and lock nut for adjusting screw.

Capacitor Trip. If a capacitor trip is used, it may be checked by seeing if the capacitor has sufficient charge to trip the removable element after the control voltage has been removed for 60 seconds.

BIBLIOGRAPHY

Description	Reference
General Instructions for Type 5HV-50 and 5HV-150 Multumite Switchgear	Bulletin 49103
Specific Information for Type 5HV-50 Removable Elements	Bulletin 49104
Specific Information for Type 5HV-250 Removable Elements	Bulletin 50731

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