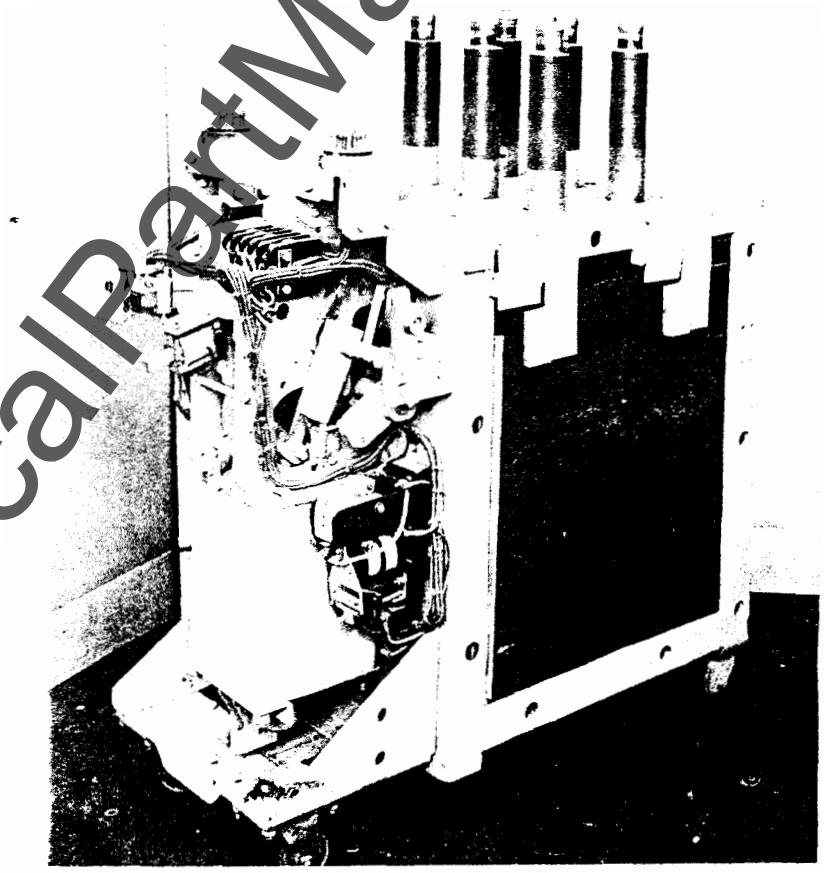
INSTRUCTIONS
AND
RENEWAL PARTS

GEI-77070 B
SUPERSEDES GEI-77070A

MAGNE-BLAST CIRCUIT BREAKERS

Types
AM 4.16-75-1
AM 4.16-75A-1
AM 4.16-75H-1
with
MS-9 Mechanism



CONTENTS

MEDIUM VOLTAGE SWITCHGEAR DEPARTMENT

GENERAL ELECTRIC

PHILADELPHIA, PA.

GENERAL ELECTRIC INSTALLATION AND SERVICE ENGINEERING OFFICES

FIELD SERVICE OFFICE CODE KEY
- * Mechanical & Nuclear Service
- † Electrical & Electronic Service
- ‡ Marine Service
- ¥ Transportation

FOR YOUR LASTING SATISFACTION . . . with the performance and availability of your General Electric equipment, GE provides this nationwide network of field service offices, serving utility, industrial, transportation and marine users. Qualified field engineers provide installation, start-up, employee training, engineering maintenance and other services, throughout the productive life of the equipment. For full information, call your nearest Installation & Service Engineering office.

ALABAMA
- † Birmingham 35205 . . . . 2151 Highland Ave.
- * † ‡ Mobile 36609 . . . . .1111 S. Beltline Highway

ALASKA
- † Anchorage 99501. . . . . 115 Whitney Rd.

ARIZONA
- * † Phoenix 85012 . . . . . 3550 N. Central Ave.
- † Tucson 85716. . . . . 151 S. Tucson Blvd.

ARKANSAS
- † North Little Rock 72119. . . . . .120 Main St.

CALIFORNIA
- * † ‡ Los Angeles 90054 . . . . . .212 N. Vignes St.
- † Palo Alto 94303 . . . . . 960 San Antonio Rd.
- † Sacramento 95808. . . . . 2407 J St.
- † San Diego 92103 . . . . . 2560 First Ave.
- * ‡ San Francisco 94119 . . . . 55 Hawthorne St.
- * Vernon 90058. . . . . 3035 E. 46th St.

COLORADO
- * † Denver 80206. . . . . 201 University Blvd.

CONNECTICUT
- * † Meriden 06450 . . . . . 1 Prestige Dr.

FLORIDA
- † ‡ Jacksonville 32203 . . . . 4040 Woodcock Dr.
- † ‡ Miami 33134 . . . . . 4100 W. Flagler St.
- * † ‡ Tampa 33609 . . . . . 2106 S. Lois Ave.

GEORGIA
- * † ‡ Atlanta 30309. . . . .1860 Peachtree Rd., NW
- † ‡ Savannah 31405 . . . . . .5002 Paulsen St.

HAWAII
- * † ‡ Honolulu 96813. . . . . .440 Coral St.

ILLINOIS
- * † ‡ ¥ Chicago 60680 . . . . . .840 S. Canal St.

INDIANA
- † Evansville 47705 . . . 2709 Washington Ave.
- † Fort Wayne 46807 . . . . 3606 S. Calhoun St.
- * † Indianapolis 46207 . . . 3750 N. Meridian St.

IOWA
- † Davenport 52805 . . . P. O. Box 630, 1039 State St., Bettendorf

KENTUCKY
- † Louisville 40218 . . . . . 2300 Meadow Dr.

LOUISIANA
- † Baton Rouge 70803 . . . . .8312 Florida Blvd.
- * † ‡ New Orleans 70125 . . . . 4747 Earhart Blvd.
- * † Shreveport 71104 . . . . 2020 Centenary Blvd.
- † Monroe 71201 . . . . . .1028 North 6th St.

MARYLAND
- * † ‡ Baltimore 21201. . . . . 1 N. Charles St.

MASSACHUSETTS
- * † ‡ Wellesley 02181 . . . . . .1 Washington St.

MICHIGAN
- * † ‡ Detroit 48202 . . . . . 700 Antoinette St.
- † Jackson 49201 . . . . . 210 W. Franklin St.
- † Saginaw 48607 . . . . . 1008 Second National Bank Bldg.

MINNESOTA
- * † ‡ Duluth 55802 . . . . . 300 W. Superior St.
- * † ‡ Minneapolis 55416 . . . 1500 Lilac Drive So.

MISSOURI
- * † Kansas City 64199. . . . . 911 Main St.
- * † St. Louis 63119 . . . . . 111 West Ma

MONTANA
- † Butte 59701 . . . . . 103 N. Wyoming St.

NEBRASKA
- * † Omaha 68102 . . . . . 409 S. 17th St.

NEW JERSEY
- * † Millburn 07041. . . . . 25 E. Willow St.

NEW YORK
- † ‡ Albany 12205 . . . 15 Computer Drive West
- * † ‡ Buffalo 14205 . . . . . 625 Delaware Ave.
- * † ‡ (New York 10022 . . . . . 641 Lexington Ave.
- * Rochester 14604 . . . . . 89 East Ave.
- * † ‡ Syracuse 13205 . . . . . 3532 James St.

NORTH CAROLINA
- * † ‡ Charlotte 28207 . . . . 141 Providence Rd.
- * Wilmington Reigelwood 28456 . . . . P. O. Box 186

OHIO
- * † Cincinnati 45206. . . . . 2021 Victory Pkwy.
- * † ‡ Cleveland 44104 . . . . 7000 Lakeside Ave.
- † Columbus 43229 . . . . . 1110 Morse Rd.
- † ‡ Toledo 43606 . . . . . 3125 Douglas Rd.
- † Youngstown 44507 . . . . 272 Indianola Ave.

OKLAHOMA
- * † Oklahoma City 73106 . . . 2000 Classen Blvd.
- † Tulsa 74105 . . P. O. Box 7646, Southside Sta.

OREGON
- † Eugene 97401. . . . . 1170 Pearl St.
- * † ‡ Portland 97210. . . . . 2929 NW 29th Ave.

PENNSYLVANIA
- * Allentown 18102 . . . . . 1444 Hamilton St.
- * † ‡ Philadelphia 19102 . . . 3 Penn Center Plaza
- * † Pittsburgh 15222 . . . . 300 6th Avenue Bldg.

SOUTH CAROLINA
- † ‡ Columbia 29204 . . . . . 2700 Middleburg Dr.
- † Greenville 29607. . . 41 No. Pleasantburg Dr.

TENNESSEE
- * † Chattanooga 37411 . . . . . 5800 Bldg, Eastgate Center
- † Memphis 38130. . . . . 3385 Airways Blvd.

TEXAS
- * [illegible] . . . . . 3535 Greenbriar
- * † Beaumont 77704 . . . . . 3385 Cardinal Ave.
- * ‡ Corpus Christi 78401 . . 305 N. Chaparral St.
- * † Dallas 75222 . . . . 8101 Stemmons Freeway
- * † El Paso 79945 . . . . . 215 N. Stanton
- † Fort Worth 76102 . . . . . 408 W. Seventh St.
- * † ‡ Houston 77027 . . . . . 4219 Richmond Ave.
- † San Antonio 78204. . . . . 434 S. Main St.

UTAH
- † Salt Lake City 84111 . . 431 S. Third East St.

VIRGINIA
- * ‡ Newport News 23601 . . . . . 311 Main St.
- † ‡ Richmond 23230. . . . 1508 Willow Lawn Dr.
- † Roanoke 24015. . . . . 2913 Colonial Ave.

WASHINGTON
- * † ‡ Seattle 98188 . . . . . 112 Andover Park East, Tukwila
- † Spokane 99202 . . . . . E. 1805 Trent Ave.

WEST VIRGINIA
- * † Charleston 25326 . . 306 MacCorkle Ave., SE

WISCONSIN
- * Appleton 54911. . . . . 3003 West College Dr.
- † ‡ Milwaukee 53202 . . . . . 915 E. Michigan St.

GENERAL ELECTRIC SERVICE SHOPS

WHEN YOU NEED SERVICE . . . These GE Service Shops will repair, recondition, and rebuild your electric apparatus. The facilities are available day and night, seven days a week, for work in the shops or on your premises. Latest factory methods and genuine GE renewal parts are used to maintain performance of your equipment. For full information about these services, contact your nearest service shop or sales office.

ALABAMA
- • * Birmingham 35211 . . 1500 Mims Ave., S. W.
- • Mobile 36609 . . . . . 721 Lakeside Dr.

ARIZONA
- • (Phoenix) Glendale 85019 . 4911 W. Colter St.
- • Phoenix 85019 . . . . . 3840 W. Clarendon St.
- • Tucson 85713. . . . 2942 So. Palo Verde Ave.

CALIFORNIA
- • Los Angeles 90301 . . . . 6900 Stanford Ave.
- • (Los Angeles) Anaheim 92805 . . . . . 3601 E. LaPalma Ave.
- • (Los Angeles) Inglewood 90301 . . . . . 228 W. Florence Ave.
- • Sacramento 95814. . . . . 99 North 17th St.
- • * (San Francisco) Oakland 94608 . . . . . 1650 34th St.

COLORADO
- • * Denver 80205. . . . . 3353 Larimer St.

CONNECTICUT
- • * (Southington) Plantsville 06479 . . . . . 370 Atwater St.

FLORIDA
- • * Jacksonville 32203 . . . . 2020 W. Beaver St.
- • (Miami) Hialeah 33010. . . 1062 East 28th St.
- • * Tampa 33601 . . . . . 19th & Grant Sts.

GEORGIA
- • Atlanta, Chamblee 30341 . . . . . 5035 Peachtree Industrial-Blvd.
- • * Atlanta . . . . . 2379 John Glenn Dr.

ILLINOIS
- • * Chicago 60638 . . . . 6045 S. Nottingham Ave.

INDIANA
- • Evansville 47711 . . . 401 N. Congress Ave.
- • Ft. Wayne 46803. . . . . 1731 Edsall Ave.
- • Hammond 46320 . . . . . 1138 164th Place
- • * Indianapolis 46222 . . . 1740 W. Vermont St.

IOWA
- • (Davenport) Bettendorf 52722 . 1025 State St.

KENTUCKY
- • Louisville 40209. . . . 3900 Crittenden Drive

LOUISIANA
- • Baton Rouge 70814 . . . 10955 North Dual St.
- • * New Orleans 70114 . . . . . 1115 DeArmas St.

MARYLAND
- • * Baltimore 21230. . . . . 920 E. Fort Ave.

MASSACHUSETTS
- • * ▲ (Boston) Medford 02155 . . . . . 3960 Mystic Valley Pkwy.

MICHIGAN
- • * ▲ (Detroit) Riverview . . . . 18075 Krause Ave.
- • Flint 48505 . . . . . 1506 E. Carpenter Rd.

MINNESOTA
- • Duluth 55807 . . . 50th Ave. W. & St. Louis Bay
- • * Minneapolis 55430 . . . . 2025 49th Ave., N.

MISSOURI
- • * Kansas City 64120. . . . . 3525 Gardner Ave.
- • * St. Louis 63110 . . . . . 1115 East Rd.

NEW JERSEY
- • New Brunswick 08902 . . . . . 3 Lawrence St.

NEW MEXICO
- • Albuquerque 87109 . . . 4420 McLeod Rd. NE

NEW YORK
- • Albany 12205 . . . . . 1097 Central Ave.
- • * Buffalo, Tonawanda 14150 . . 175 Milens Rd.
- • (Long Island) Old Bethpage 11804 . . . . . 183 Bethpage-Sweet Hollow Rd.
- • (New York City) North Bergen, N. J. 07012 . . . . . 6001 Tonnelle Ave.
- • (New York City) Clifton, N. J. 07012 . . . . . 9 Brighton Rd.
- • ▲ Schenectady 12305 . . . . . 1 River Rd.
- • Syracuse 13208. . . . 1015 E. Hiawatha Blvd.

NORTH CAROLINA
- • * Charlotte 28208 . . . . . 2328 Thrift Rd.

OHIO
- • Akron (Canton) 44720 . . . . . 7900 Whipple Ave. N. W.
- • * Cincinnati 45202. . . . . 444 West 3rd St.
- • * ▲ Cleveland 44125 . . . . . 4477 East 49th St.
- • Columbus 43229. . . . . 6660 Huntley Rd.
- • * Toledo 43605 . . . . . 405 Dearborn Ave.
- • Youngstown 44507. . . . 272 E. Indianola Ave.

OKLAHOMA
- • Tulsa 74145. . . . . 5229 S. 79th East Ave.

OREGON
- • Eugene 97402 . . . . . 570 Wilson St.
- • * Portland 97210 . . . . . 2727 NW 29th Ave.

PENNSYLVANIA
- • Allentown 18103 . . . . . 668 E. Hianland St.
- • (Delaware Valley) Cherry Hill, N. J. 08034 . . . . . 1790 E. Marlton Pike
- • Johnstown 15902 . . . . . 841 Oak St.
- • Philadelphia 19124 . . . 1040 East Erie Ave.
- • * Pittsburgh, West Mifflin 15122 . . . . . 4930 Buttermilk Hollow Rd.
- • York 17403 . . . . . 34 N. Harrison St.

SOUTH CAROLINA
- • (Charleston, No. Charleston 29401 . . . . . 2469 Deguincy St.

TENNESSEE
- • Knoxville 37914 . . . . . 2621 Governor John Sevier Hwy.
- • Memphis 38107. . . . . 706 North Main St.

TEXAS
- • Beaumont 77705 . . . . 1490 W. Cardinal Dr.
- • Corpus Christi 78401 . . . . . 115 Waco St.
- • * Dallas 75235 . . . . . 3202 Manor Way
- • Houston 77036 . . . . 5534 Harvey Wilson Dr.
- • Houston 77036 . . . . . 5918 Harwin Dr.
- • Midland 79701 . . . . . 704 S. Johnston St.

UTAH
- • * Salt Lake City 84110 . . . 301 S. 7th West St.

VIRGINIA
- • * Richmond 23224 . . . . . 1403 Ingram Ave.
- • Roanoke 24013 . . . . . 1904 River Ave., SE

WASHINGTON
- • * Seattle 98124 . . . . . 3422 First Ave., South
- • Spokane 99211 . . . . . E. 4323 Mission St.

WEST VIRGINIA
- • * Charleston 25328 . . 306 MacCorkle Ave., SE

WISCONSIN
- • (Appleton) Menasha 54910 . . 1725 Racine St.
- • Milwaukee 53207 . . . 235 W. Oklahoma Ave.

• Electrical/Mechanical Service Shop * Instrumentation Shop ▲ Special Manufacturing Shop

PRINTED IN U.S.A.

MAGNE-BLAST CIRCUIT BREAKER
TYPES AM 4.16-75-1 AND AM 4.16-75A-1
WITH MS-9 MECHANISM

INTRODUCTION

The Magne-blast Circuit Breaker is the removable interrupting element for use in vertical-lift metal-clad switchgear, to provide reliable control and protection of power systems.

The Magne-blast Circuit Breaker operates on the principle that an arc can be interrupted in air by sufficiently elongating and cooling it. This is accomplished by means of a strong magnetic field that lengthens the arc and forces it into intimate contact with cool dielectric material.

Refer to the breaker nameplate for the complete rating information of any particular breaker. The short circuit conditions to be imposed on the breaker must not exceed its rating, nor should it be called upon to operate at voltages or currents greater than those given on the nameplate. Since this book is written to cover several ratings of breakers that are of the same general design, all instructions will be of a general character and all illustrations will be typical, unless otherwise specified.

PROPER INSTALLATION AND MAINTENANCE ARE NECESSARY TO INSURE CONTINUED SATISFACTORY OPERATION OF THE BREAKER. The following instructions will provide information for placing the magne-blast breaker in service and for maintaining satisfactory operation.

RECEIVING, HANDLING AND STORAGE

Cover (8028976)

RECEIVING AND HANDLING

Each breaker is carefully inspected and packed by workmen experienced in the proper handling and packing of electrical equipment. Immediately upon receipt of the circuit breaker, an examination should be made for any damage sustained in transit. If injury or rough handling is evident, a damage claim should be filed immediately with the transportation company and the nearest General Electric Sales Office should be notified.

It is expected that due care will be exercised during the unpacking and installation of the breaker so that no damage will occur from careless or rough handling, or from exposure to moisture or dirt. A nail puller should be used to open the crates, and care should be exercised to prevent tools from striking either the crate or any part of the breaker. Loose parts associated with the breaker are always included in the same crate. Check all parts against the packing list to be sure that no parts have been overlooked.

STORAGE

It is recommended that the breaker be put into service immediately in its permanent location. If this is not possible, the following precautions must be taken to insure the proper storage of the breaker:

1. The breaker should be carefully protected against condensation, preferably by storing it in a warm dry room, since water absorption has an adverse effect on the insulation parts. Circuit breakers for outdoor metal-clad switchgear should be stored in the equipment only when power is available and the heaters are in operation to prevent condensation.
2. The breaker should be stored in a clean location, free from corrosive gases or fumes; particular care should be taken to protect the equipment from moisture and cement dust, as this combination has a very corrosive effect on many parts.
3. Machined parts of the operating mechanism, etc., should be coated with a heavy oil or grease to prevent rusting.

If the breaker is stored for any length of time, it should be inspected periodically to see that rusting has not started and to insure good mechanical condition. Should the breaker be stored under unfavorable atmospheric conditions, steps should be taken to dry out the breaker before it is placed in service.

INSTALLATION

Remove box barrier and make a visual inspection to ascertain that the breaker is in satisfactory condition. Check all bearing surfaces of the mechanism for lubrication. Refer to the section on LUBRICATION (page 11).

Operate breaker manually using the maintenance closing device provided with the breaker. During the closing operation, check to insure that the mechanism and breaker does not stick or bind during the entire stroke, that it latches securely in the closed position, and that it trips freely when the manual trip plunger is operated. The breaker should not be operated electrically until it has been operated manually to insure this freedom of action.

The following adjustments should be checked at this point.

a. Primary contact wipe (page 5).

b. Primary contact gap (page 5).

c. Prop clearance (page 5).

Attach test coupler to circuit breaker and operate electrically several times. The control voltage should be checked at the breaker as indicated under CONTROL POWER CHECK (page 10).

Remove test coupler and replace box barrier.

If breaker has been stored for a long period of time, it is recommended that the insulation be checked with the standard 60 cycle high potential test --- see INSULATION TEST (page 11).

Lubricate the silver portion of the primary disconnect studs by rubbing a small amount of contact lubricant D50H47 to form a thin coating on the ball contact.

Refer to instruction book GEH-1802 for final instructions before inserting the breaker into the metal-clad unit.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

DESCRIPTION OF OPERATION

The magne-blast breaker is composed of two major parts, the breaker element Fig. 9 and the operating mechanism Figs. 7 and 8. The breaker element comprises three similar pole units, each pole unit consisting of main and arcing contacts, an interrupter, and an enclosing box barrier that segregates the interrupting units from each other to provide insulation between phases as well as from each phase to ground. The primary connections to the associated metal-clad equipment are made through the primary disconnect studs.

The MS-9 operating mechanism shown in Fig. 7 is of the solenoid type designed to give high speed closing and opening. The closing operation is controlled by the control relay. The control relay scheme permits trip-free operation (tripping the breaker at any time during the closing operation), and prevents solenoid pumping (reclosing) after a trip-free operation. For a-c closing operation, rectifiers mounted elsewhere in the metal-clad unit are used to supply the direct current on which the closing coil operates. The breaker can be opened electrically, by remote control, or manually, by means of the manual trip device. All secondary connections from the breaker to the metal-clad unit are made through the coupler.

A positive interlock and interlock switch is provided between the breaker and metal-clad unit to prevent the raising or lowering of the breaker in the unit while in the closed position and to prevent a closing operation when the breaker is not in either the fully raised or lowered position. A plunger type interlock can also be provided.

OPENING OPERATION

REFER TO FIGS. 8 & 9

An electrical opening operation is initiated by energizing the trip coil. This is accomplished either by actuating the opening control switch on the metal-clad unit or by a combination of relays and current devices used to detect a fault on the load side of the breaker. By energizing the trip coil, the trip plunger rotates the trip latch, causing the operating mechanism linkage to collapse. The energy stored in the opening spring is thus released, opening the breaker. During this operation, the trip coil circuit is de-energized, and upon completion of the opening operation, the operating mechanism is returned to its normal position, ready for closing.

As the breaker opens, the main contacts part first, shunting the current through the arcing contacts. An arc forms as the arcing contacts part. As the movable arcing contact is withdrawn through the slot in the arc runner, the upper end of the arc is transferred to the upper arc runner. To assist the interruption at this point, a stream of air is emitted from the booster tube and forces the arc onto the lower arc runner. Establishment of the arc on the runners automatically inserts the blowout coil into the circuit, introducing a magnetic field between the pole pieces which tends to draw the arc away from the arcing contacts. At the same time, the arc is being forced into the arc chute which is composed of a series of gradually interleaving insulating fins. These fins, which project alternately from the two opposite inner surfaces of the chute, elongate the arc into a gradually deepening serpentine path, so that the electrical resistance in the path of the arc is rapidly increased and the heat from the arc is absorbed. The increased resistance reduces both the magnitude and the phase angle of the current, and at an early current zero the arc path is so long and the gases produced by the arc so cooled that the arc cannot re-establish itself, and interruption occurs.

Manual tripping follows the same procedure except that instead of energizing the trip circuit, the manual trip button is used.

CLOSING OPERATION

REFER TO FIGS. 8 & 9

The closing operation of the breaker is primarily controlled by the control device, Figs. 5 and 6 mounted on the breaker frame. The closing sequence is initiated from a control switch mounted on the door of the metal-clad unit or at a remote operating station. Operation of the closing control switch energizes the pick-up coils of the control relay. As the control relay closes, seal-in contacts shunt the closing control switch to allow the opening of the closing control switch contacts without affecting the overall closing operation. This type of arrangement assures complete closing of the breaker with only momentary contact of the closing control switch.

Operation of the control relay energizes the breaker closing coil by closing the main control relay contacts. Once the control relay contacts are picked up, they are electrically held in the closed position until the breaker closing operation is completed. Energizing the breaker closing coil raises the armature which in turn lifts the closing roller by action of the solenoid plunger rod. This motion is transmitted through the mechanism linkage and rotates the main crank closing the breaker contacts. As the armature reaches the end of its travel, the prop rotates beneath the pin latching the breaker in the closed position. During the closing operation, the opening spring is compressed in readiness for an opening operation. Air trapped above the armature acts as a dash pot to absorb the energy of the mechanism as it approaches the end of its stroke.

TRIP FREE OPERATION

REFER TO FIG. 8

If the trip coil circuit is energized while the breaker is closing, the trip plunger will force the trip latch away from the trip roller causing the mechanism linkage to trip free and the breaker to re-open. The closing armature completes its closing stroke, but the closing coil is de-energized at the end of the stroke, and the armature is returned to its original position by gravity.

ADJUSTMENTS

DO NOT WORK ON EITHER THE BREAKER OR THE MECHANISM WHILE IN THE CLOSED POSITION UNLESS THE PROP AND TRIP LATCH HAVE BEEN SECURELY WIRED OR BLOCKED TO PREVENT ACCIDENTAL TRIPPING.

A maintenance operating handle is provided for operation of the breaker during these adjustment checks. Electrical operation must not be attempted until the breaker has been operated manually through its complete stroke several times and final inspection has been completed.

All adjustments should be checked during periodic inspections and whenever it becomes necessary to repair or replace parts that have become worn or defective while in service.

PRIMARY CONTACTS

REFER TO FIGS. 1 AND 9

The primary contacts, Fig. 1, can be adjusted by means of the operating rod adjusting screw. To adjust, remove the pin fastening the adjusting screw to the mechanism crank and push the contact blade far enough closed so the adjusting screw can be turned. To increase the primary contact travel, turn the adjusting screw in the direction to lengthen the rod, and to decrease the primary contact travel, turn the screw to shorten the rod (1/2 turn gives approximately 1/32" change in contact travel). Reconnect the operating rod to the crank, and close the breaker manually to check the adjustment.

After the above adjustment has been made, the travel of the contact surface of the primary contact should be measured on a manual closing operation. The primary contact wipe should be 1/8" + 1/16" -0.

ARCING CONTACT WIPE

Refer to Fig. 1. Close the breaker until the arcing contacts just touch. This can be determined with the use of a circuit continuity tester such as a light indication or bell set. In this position, the gap between the stationary primary contacts and the movable primary contact should be 7/32" to 9/32". To adjust, the following procedure should be followed:

(a) Loosen the lock nut on the arcing contact stop bolt.

(b) With Allen wrench, turn the stop bolt until the arcing contacts just touch when the gap at the primary contact is 7/32" to 9/32".

(c) Lock the stop bolt in position with the locknut, and close the breaker manually to check the adjustment.

ARCING CONTACT CLEARANCE

REFER TO FIG. 1

The movable arcing contact should be centered between the arcing plates located on the arc runner. This is accomplished by moving the arc chute sideways to the correct position. The mounting support has an oversize hole to permit adjustment.

CONTACT GAP

REFER TO FIG. 6

With the breaker tripped from the closed position, the minimum distance from the primary contact fingers to the surface of the primary contact on the movable contact blade should be 4-1/16" to 4-1/4". To adjust for these conditions, turn the stop nut (21), Fig. 8, to increase or decrease the contact gap. After making the adjustment, close and trip the breaker manually and measure the gap once more.

NOTE: A change in this adjustment may require a change in the adjustment of the plunger rod (17), Fig. 8, in the mechanism as described later.

LATCH WIPE

REFER TO FIG. 2

The wipe of the latch on the trip roller should be from 1/8" to 1/4". This can be determined easily by putting a film of grease on the latch, closing the breaker part way, and tripping. To adjust, add or remove washers under the head of the stop bolt located near the top of the latch on the trip coil frame.

Fig. 1 (6496371)

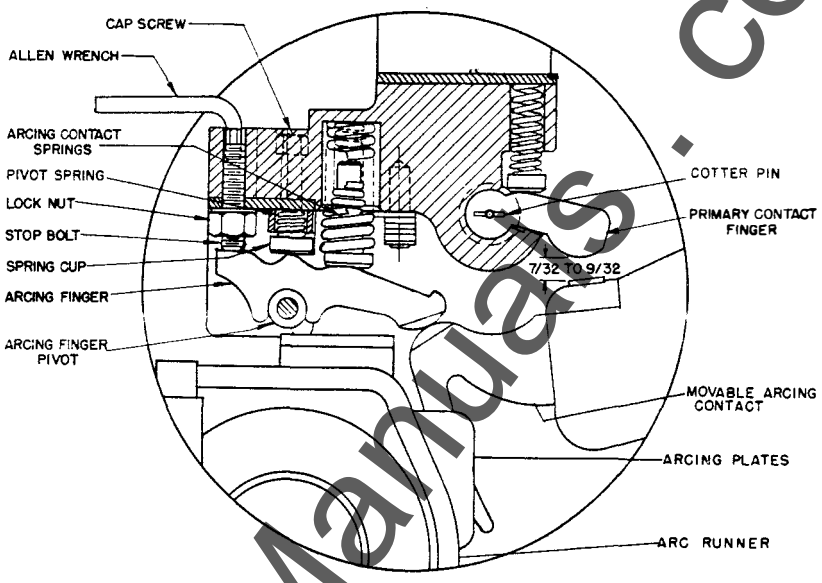


Fig. 1 Contact Assembly

PROP CLEARANCE

REFER TO FIG. 2

With the breaker closed as far as possible with the manual handle, the clearance of the pin through the closing roller over the prop should be 1/32" to 3/32" with a maximum variance of 1/32" between sides. This can be adjusted by dropping the closing armature (18), Fig. 8, and closing plunger rod (17), Fig. 8, and screwing the rod into or out of the armature. To do this turn the breaker on its back as shown in Fig. 15 and disassemble the wheel base and solenoid pot assembly as described in replacement of a closing coil on page 15.

NOTE: Two set screws are used to lock the plunger rod in position in the armature. If the rod adjustment is changed the rod must be spotted in the correct position and the set screws replaced.

LATCH CLEARANCE

REFER TO FIG. 3

The clearance between the trip latch and roller with the breaker open should be approximately 1/32" to 1/16". This can be adjusted by means of the stop bolt (12), Fig. 7, in the front of the mechanism frame near the bottom. The lock nut should be fastened securely if any adjustment has been made.

Fig. 2 (K-6496373)

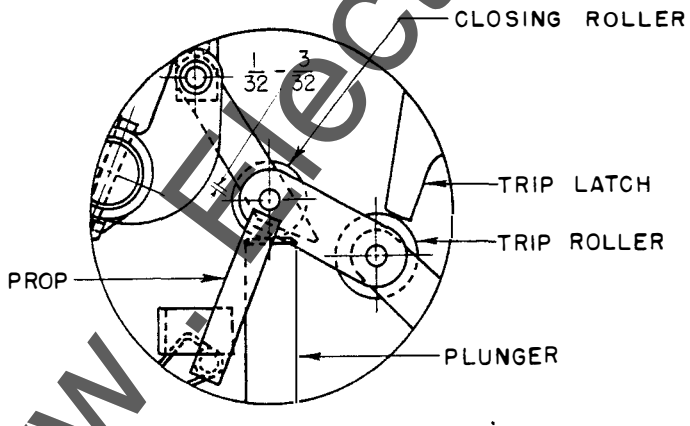


Fig. 2 Mechanism Linkage Closed Position

Fig. 3 (K-6496374)

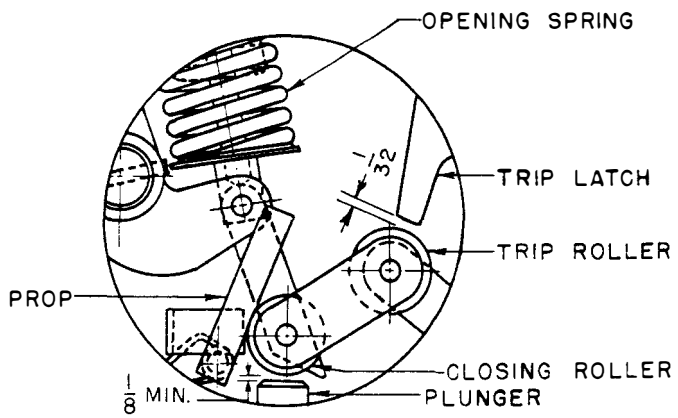


Fig. 3 Mechanism Linkage Open Position

PLUNGER CLEARANCE

REFER TO FIGS. 3 AND 8

With the breaker in the open position there should be at least 1/8" clearance between the plunger and closing roller. To increase this clearance, the brackets (22), Fig. 8 should be lowered by placing a shim between the bracket and the bottom plate of the solenoid housing.

INTERLOCK SWITCH WIPE

REFER TO FIG. 4

Rotate the interlock shaft manually counter clockwise. The point at which the contacts break can be determined with a circuit continuity tester such as a light indicator or bell set. To adjust interlock switch (1), Fig. 4 move switch bracket (6). The roller and crank on the interlock switch should have 1/32" to 1/16" overtravel after final adjustment.

CUT-OFF SWITCH ADJUSTMENT

REFER TO FIGS. 5 AND 5A

Using a manual closing handle, close the breaker as far as possible. (So that the prop pin is over the prop and not resting on the prop). At this point the "S" shaped striker rod should be resting against the striker rod guide bracket (3), Fig. 5 as shown in Fig. 5A.

Adjust cut-off switch striker rod (2), Fig. 5 so that it is against the switch roller (7), Fig. 5 and so that the switch roller has an additional overtravel of 1/32".

CONTROL RELAY ADJUSTMENT

REFER TO FIGS. 5 AND 6

TYPE HJA RELAY

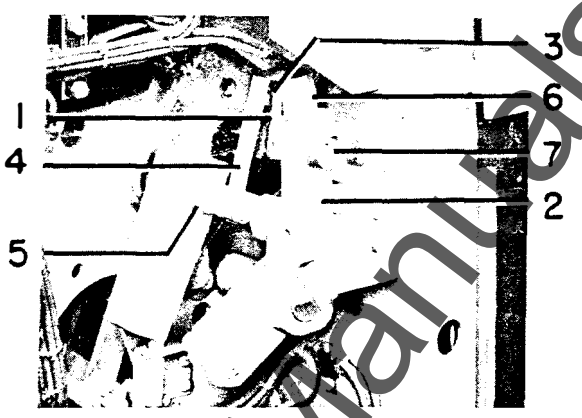
The relays have been adjusted at the factory to pick up at 61 per cent of rating for d-c relays and 80 per cent for a-c relays. The settings of the various contact gaps and wipes should not be disturbed.

If it is necessary to readjust the relays the following points should be observed. The wipe of the main contacts should be 1/8" measured at the top edge of the pole piece while that of the auxiliary should be 1/8" when measured at the rear edge of the armature stops.

If the setting of the control spring must be changed for any reason, care must be taken during the readjustment to see that the control spring is not weakened to the point of permitting the minimum of wipe to exist at the normally closed auxiliary interlock contacts.

The relay contains a permanent magnet which has numbers stamped on one end only. The magnet is oriented properly in the relay when it is positioned so that the numbers are located on the left hand side. (Facing relay.)

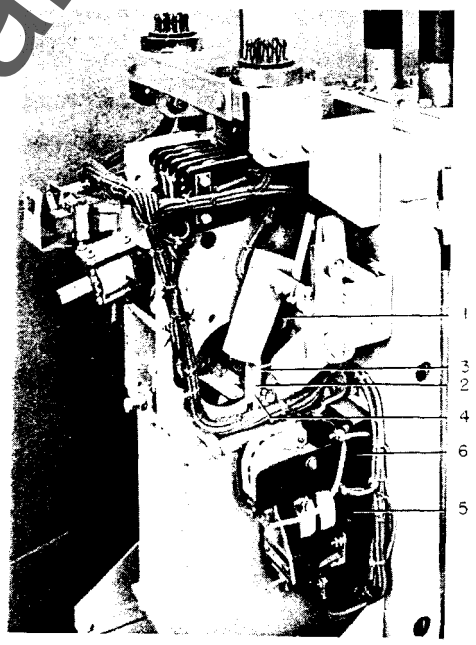
On d-c operated relays, a visible check should be made to see that the arc being interrupted by the relay is directed through the arc chute and not back over the relay



1. Positive Interlock Switch
2. Interlock Arm
3. Switch Roller
4. Switch Actuator Cam
5. Interlock Shaft
6. Switch Mounting Bracket
7. Interlock Indexing Roller

Fig. 4 (8028976)

Fig. 4 Positive Interlock Switch



1. Cut-off Switch
2. Cut-off Switch Striker Rod
3. Striker Rod Guide Bracket
4. Striker Rod Adjustment Nut
5. Control Relay (HJA Relay)
6. Control Relay Mounting Plate

Fig. 5 (8028974)

Fig. 5 Side View of Control Relay and Cut-off Switch Assembly

Fig. 5A (688C503)

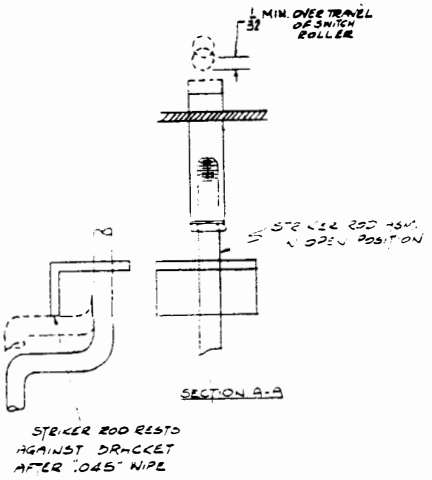
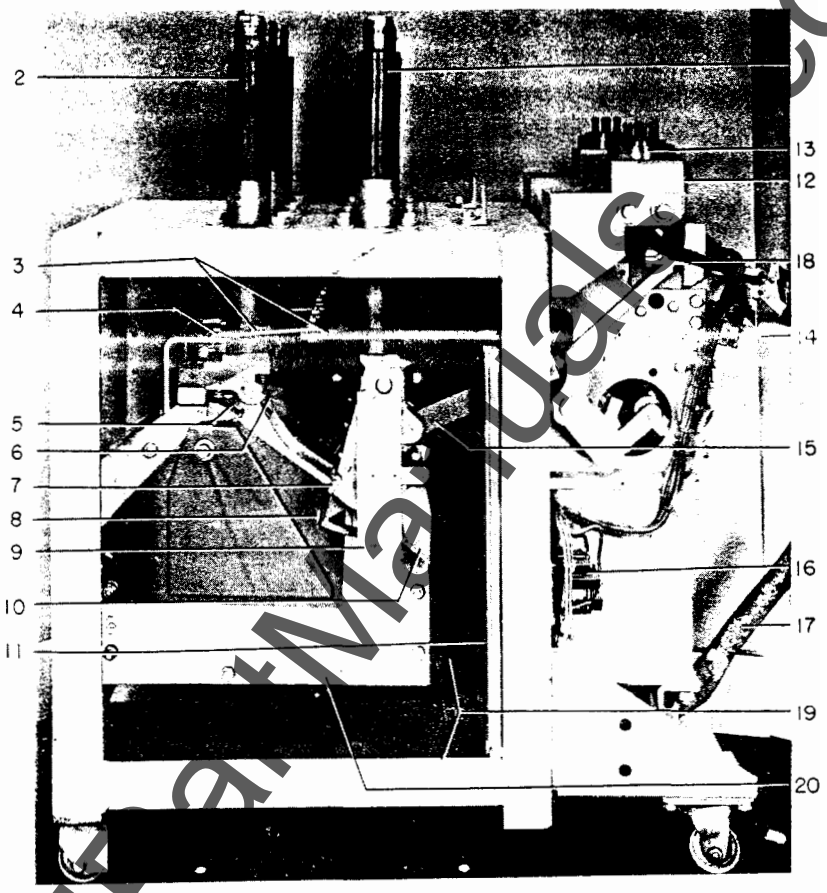


Fig. 5A

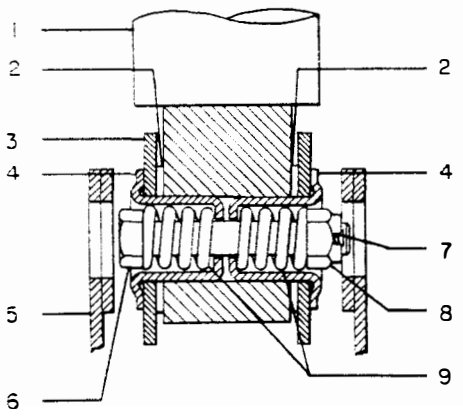
Fig. 6 (8028975)



1. Front Bushing
2. Rear Bushing
3. Horizontal Barriers
4. Arc Chute Support Bolt
5. Stationary Arcing Contact
6. Stationary Primary Contact
7. Movable Primary Contact
8. Movable Arcing Contact
9. Arc Chute Support Bracket
10. Booster Cylinder
11. Front Vertical Barrier
12. Breaker Handle
13. Secondary Couplers
14. Manual Trip Button
15. Connecting Rod
16. Control Device (HMA Relay)
17. Removable Manual Operating Handle
18. Operating Mechanism
19. Insulating Base
20. Arc Chute Assembly

Fig. 6 Partial Side View of Breaker

Fig. 6 "AA" (6496372)



1. Front Bushing
2. Washer
3. Contact Arm
4. Bearing
5. Support Asm.
6. Screw
7. Cotter Pin
8. Nut
9. Spring

CONTACT BLADE HINGE

Fig. 6 Sec. "AA"

coil. If the arc is not being directed through the arc chute the following checks should be made:

1. Check the polarity of the control power.

2. Check the control device to see if the magnet is assembled properly. (As described previously.)

3. Check to see that the closing coil leads have been assembled properly. (Refer to the section on repair and replacement of closing coil).

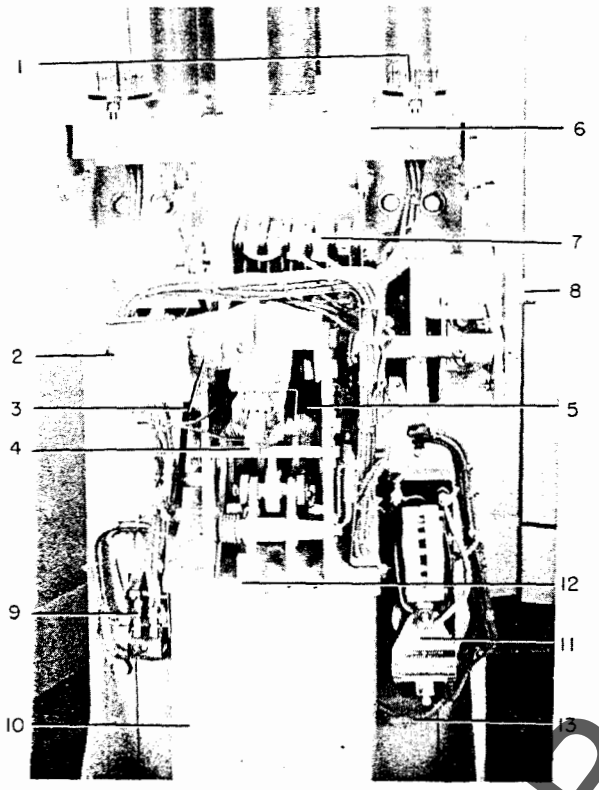
TYPE HMA RELAY

The relays are properly adjusted at the factory for operation when mounted on a vertical surface. Relays for d-c service are adjusted to pick up at 60 per cent of their rating when cold and 80 per cent when hot. Relays for a-c service are adjusted to pick up to 80 per cent of their rating.

Normally it should not be necessary to make any further changes in these adjustments. If, however, the correct pickup is not realized, adjustments can be made by changing the tension of the armature restraining spring. This is accomplished by bending the projecting spring holder on the armature stop. The spring tension should not be so low that the back wipe is sacrificed.

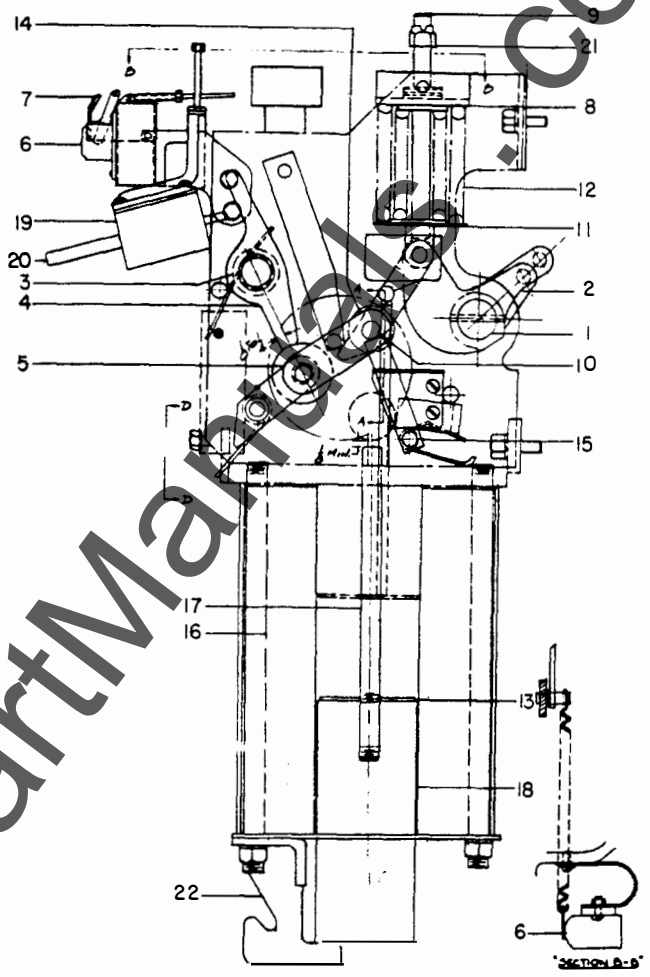
AUXILIARY SWITCH

The auxiliary switch (7) is mounted on the right side of the operating mechanism Fig. 7. The shaft of the position indicator operates the auxiliary switch shaft which opens and closes the "a" and "b" contacts. (The "a" contacts are open when the breaker is open and the "b" contacts are open when the breaker is closed.)



1. Secondary Coupler
2. Position Indicator
3. Operation Counter
4. Manual Trip
5. Opening Spring Unit
6. Breaker Handle
7. Auxiliary Switch
8. Positive Interlock Arm
9. Control Relay
10. Closing Solenoid
11. Control Relay (HJA)
12. Stop Bolt
13. Closing Coil Leads

Fig. 7 MS-9 Operating Mechanism



1. Main Operating Shaft
2. Main Crank
3. Trip Latch Shaft
4. Trip Latch
5. Trip Roller
6. Operations Counter
7. Position Indicator
8. Upper Spring Support
9. Adjustable Spring Stud
10. Prop Rest Pin
11. Lower Spring Support
12. Opening Spring
13. Impact Shim
14. Closing Roller
15. Prop
16. Closing Coil
17. Closing Plunger Rod
18. Closing Armature
19. Trip Coil
20. Manual Trip Button
21. Mechanism Stop Nut
22. Bracket

Fig. 8 Type MS-9 Solenoid Operating Mechanism

Fig. 7 (8028977)

Fig. 8 (688C503)

AUXILIARY DEVICES

LATCH CHECKING SWITCH WIPE

REFER TO FIG. 11

The latch checking switch is used to insure that the mechanism latch has been reset after a tripping operation. The latch checking switching contacts are connected in the control circuits in the metal-clad unit to prevent the closing coil from being energized until the latch is reset. The contacts in the switch should "make" at the end of the reset stroke of the tripping latch. The point at which the switch contacts "make" may be adjusted by adding or removing shims.

PLUNGER INTERLOCK

Refer to Fig. 9. With the breaker in the closed position, the vertical distance from the top of the interlock bolt to the top of the breaker frame should be 5-5/8" + 1/16" -0. To change this adjustment add or remove washers.

IMPACT CURRENT TRIP, CAPACITOR TRIP AND UNDERVOLTAGE TRIP DEVICES

REFER TO FIG. 12

When these devices are furnished with the breaker, the wipe of the impact current trip latch should be 1/32" to 1/16". This can be adjusted by the use of the small adjusting screw located behind and near the right end of the current trip mounting bracket. Also, the adjusting screw (14) should be set 1/16" below the pin (12). This is to prevent the cam latch (3) from going over center.

INSPECTION AND TEST

For ease in reviewing the adjustments the following are recapitulated:

a. Primary contact wipe: 1/8" + 1/16" - 0.

b. Arcing contact wipe: 7/32" to 9/32".

c. Primary contact gap: 4-1/6" to 4-1/4".

d. Trip latch wipe: 1/8" to 1/4".

e. Prop clearance: 1/32" to 3/32" with a maximum variance of 1/32".

f. Trip latch clearance: 1/32" to 1/16"

g. Solenoid plunger clearance: 1/8" or greater.

h. Impact trip wipe: 1/32" to 1/16".

j. Impact cam latch clearance: 1/16".

k. Interlock switch: 1/32" to 1/16" overtravel.

l. Cut-off switch overtravel: 1/32" to 1/16".

m. Plunger interlock: 5-1/8" + 1/16" - 0.

Check all nuts, bolts, screws, and cotter pins to make certain that they are properly tightened.

Inspect all wiring. Check all terminals, screws, and connections and test the circuits for possible short circuits or grounds.

See that all bearing surfaces of the mechanism have been lubricated. Refer to the section on LUBRICATION.

Operate the breaker slowly with the maintenance closing handle and note that there is no excessive binding or friction and that the breaker can be moved to the fully opened and fully closed positions.

See that any place where the surface of the paint has been damaged is repainted immediately.

Check the operating voltage for both the closing coil and trip coil to determine if, with line drop, it is within the limits specified on the nameplate. In the case of a rectifier operated mechanism, the d-c voltage across the coil terminals with full closing coil current flowing should be 105-110 volts. (For applications of repetitive operations, the d-c voltage across the closing coil should not exceed 110 volts.) Refer to section on CONTROL POWER CHECK.

AUXILIARY DEVICES

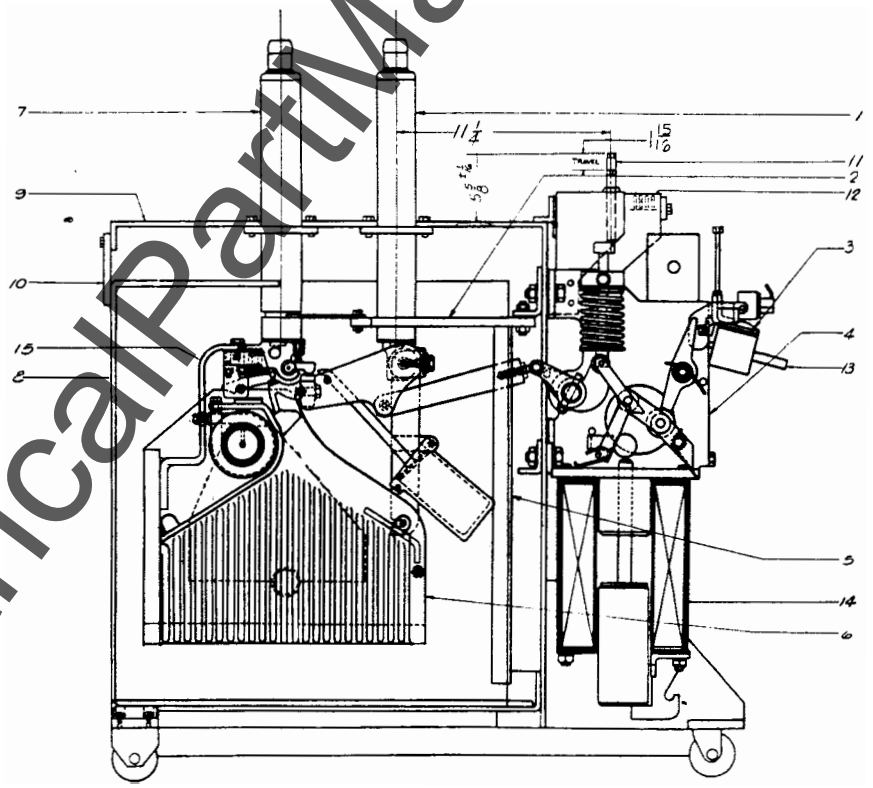
On breakers that are equipped with auxiliary devices such as current trip, undervoltage trip or capacitor trip, the device should be checked for proper electrical operation. The current trip device should trip the breaker at 3 amperes. The undervoltage device should trip the breaker when the control voltage drops below 40 to 60% of rated voltage, and it should pick-up at 80% of the control voltage or less. An adjustment plate is provided on the front of the undervoltage trip device as an aid in obtaining the desired setting.

NOTE: When checking the pick-up value of the undervoltage device, apply a voltage equal to 80% of normal control voltage to the undervoltage device coil. The device should pick up at this value. Do not increase the voltage gradually on this coil as it will overheat the coil, producing a false reading, and may damage the coil if excessive overheating occurs.

OPENING AND CLOSING SPEED

The closing speed of the arcing contact should be 12 to 16 feet per second with rated closed circuit voltage at the closing coil terminals. These speeds represent the average speed of the movable arcing contact from a point 1" before the tip is tangent to the lower surface of the upper arc runner transfer lugs to the tangent position.

Fig. 9 (9626735)



1. Front Bushing
2. Horizontal Barrier
3. Trip Coil
4. Operating Mechanism
5. Front Vertical Barrier
6. Arc Chute Assembly
7. Rear Bushing
8. Box Barrier
9. Breaker Frame
10. Box Barrier Locking Plate
11. Plunger Interlock
12. Secondary Coupler
13. Manual Trip Button
14. Closing Coil
15. Arc Chute Mounting Support

Fig. 9 Side View AM-4.16-75-1 Breaker with MS-9 Mechanism

The opening speed of the arcing contact should be 12 to 16 feet per second at rated control voltage. This speed represents the average speed over 3" from the point when the tip on the movable arcing contact is tangent to the lower surface of the upper runner transfer lug.

CONTROL POWER CHECK

After the breaker has been closed and opened slowly several times with the maintenance operating handle and the mechanism adjustments checked as described above, the operating voltages should be checked at the closing coil and trip coil terminals. For electrical operation of the breaker, the control power may be either an alternating or direct current source. The operating ranges for the closing and tripping voltages are given on the breaker nameplate. Ordinarily, standard ranges apply which are as follows:

NOMINAL VOLTAGE	CLOSING RANGE	TRIPPING RANGE
125v d-c	90-130v d-c	70-140v d-c
250v d-c	180-260v d-c	140-280v d-c
230v a-c	190-250v a-c	190-250v a-c

NOTE: Where repetitive operation is required from a direct current source, the closed circuit voltage at the closing coil should not exceed 115v d-c and 230v d-c at the nominal voltages of 125v d-c and 250v d-c respectively.

To check the d-c voltage at the closing coil terminals, proceed as follows:

Close the breaker by manually operating the control relay, Fig. 5 and 6. Hold the contacts in the closed position and read the d-c voltage at the closing coil terminals. To de-energize the circuit release the control device.

If the closed circuit voltage at the terminals of the closing coil does not fall within the specified range on d-c operated breakers, check the voltage at the source of power and the line drop between the power source and the breaker.

For a-c operation a germanium (color-black, flanged base) or a silicon (color-blue, hex base) rectifier bridge assembly mounted elsewhere in the metal-clad unit is used. These rectifiers are of the button-type and are hermetically sealed units. They have been tested and the resistor has been set to 2 ohms at the factory. Unlike rectifiers of previous design the output of the germanium or silicon unit is affected very little by ambient temperature changes and it should not be necessary to disturb the factory setting.

DO NOT MAINTAIN VOLTAGE ON THE CLOSING COIL ANY LONGER THAN THE TIME REQUIRED TO CLOSE THE BREAKER. (20 cycles maximum at nominal voltage). Both the coils and rectifiers are designed for intermittent operation and will be damaged by prolonged current flow.

When two or more breakers, operating from the same control power source, are required to close simultaneously, the closed circuit voltage at the closing coil of each breaker must fall within the specified limits.

Electrical closing or opening is accomplished by merely energizing the closing or trip coil circuit. Control switches are provided for this purpose on the metal-clad unit. It is also possible to trip the breaker manually by pressing the manual trip button (Fig. 9).

When all the foregoing inspection details have been checked, the breaker may be placed in service. Before the breaker is finally raised into position in the metal-clad unit, rub a small amount of G-E contact lubricant D50H47 on the silvered portion of the breaker studs to form a thin coating for contact purposes.

NOTE: This breaker mechanism combination is designed only for electrical closing when in use. NEVER ATTEMPT MANUAL CLOSING WITH THE BREAKER IN SERVICE, for under such conditions, sufficient closing force and speed cannot be applied.

MAINTENANCE

Dependable service and safer power equipment are contingent upon the unfailing performance of the power circuit breaker. To maintain such service, it is recommended that a definite inspection and maintenance schedule be set up and followed, as serious shutdowns can often be avoided by locating potential sources of trouble in an early stage. A periodic lubrication of parts subject to wear is also vitally important for the successful operation of the breaker.

BEFORE ANY MAINTENANCE WORK IS PERFORMED, MAKE CERTAIN THAT ALL CONTROL CIRCUITS ARE DE-ENERGIZED AND THAT THE BREAKER IS REMOVED FROM THE METAL-CLAD UNIT. DO NOT WORK ON THE BREAKER OR MECHANISM WHILE IN THE CLOSED POSITION UNLESS THE PROP AND TRIP LATCH HAVE BEEN SECURELY WIRED OR BLOCKED TO PREVENT ACCIDENTAL TRIPPING.

PERIODIC INSPECTION

At this time a thorough inspection should be made of all parts of the breaker and mechanism.

BREAKER CONTACTS

REFER TO FIG. 6

After removing box barrier, the contacts on the two outside phases can readily be inspected. The contacts on the center phase can be seen with the aid of a mirror and flashlight. If the contacts are in good condition, there is no need of removing the arc chute. If, however, the surface of the contacts needs smoothing up with a fine file or sandpaper, the arc chutes can be removed as described under REPLACEMENT OF PARTS.

ARC CHUTE

REFER TO FIG. 14

If the arc chutes are removed for contact maintenance, and are for any reason disassembled for inspection, the following points should be noted:

1. Scale formed over the surface of the chute must not be removed but loose particles collected in the muffler should be blown out.

2. Cracks which have formed in the fins of the arc chute are to be expected in ceramic materials of this type when subjected to the severe heat of an arc. These cracks do not interfere with the operation of the device in any way and should be disregarded. If the chute has had any mechanical injury due to dropping or accidental striking which has resulted in actual breaking off of fins, replacement of the arc chute is necessary.

INSULATION PARTS

The insulation parts on the breaker should be kept clean and dry. Smoke or dust collected between inspection periods should be wiped off, and if dampness is apparent, heaters should be installed to insure dryness.

BUSHINGS

REFER TO FIG. 6

The surface of the bushings should be smooth and unscratched. If the insulation surface should become damaged, it should be well cleaned, and then refinished.

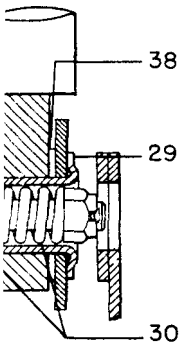
MECHANISM

REFER TO FIGS. 7 AND 8

Careful inspection should be made to check for loose nuts or bolts and broken cotter pins. The latch surface should be inspected for wear and the surface of the rollers should be inspected for chipping or other evidences of damage. Lubrication should be done in accordance with the instructions under LUBRICATION.

INSULATION TEST

When insulation has been repaired or replaced or when the breaker has been stored under adverse conditions, it is recommended that the insulation be checked before the breaker is placed in service. A standard 60 cycle high potential test at 14,000 volts RMS will normally indicate whether the breaker is satisfactory for service. With the breaker contacts in the fully opened position, apply the high potential to each terminal of the breaker individually for one minute with all other terminals and the breaker frame grounded. After high potential test are made on organic insulating materials, these materials should be inspected for visible leakage



ADE HINGE

current paths, and necessary action must be taken to replace insulation that may have been affected by moisture absorption.

LUBRICATION

In order to maintain reliable operation, it is important that all circuit breakers be properly lubricated at all times. During assembly at the factory, all bearing surfaces, machined surfaces, and all other parts of the breaker and mechanism subject to wear have been properly lubricated using the finest grade of lubricants available. However, even the finest oils and greases have a tendency to oxidize with age, as evidenced by hardening and darkening in color. Elimination of the hardened lubricant is essential for the proper operation of circuit breakers. Also frequent operation of the breaker causes the lubricant to be forced out from between the bearing surfaces. A simple lubrication will often clear up minor disturbances which might be mistaken for more serious trouble.

A definite lubrication schedule should be set up taking into consideration the frequency of operation of the breaker and local conditions. Until such a schedule is worked out, the breaker should be lubricated at each periodic inspection and also whenever it is overhauled, in accordance with the lubrication chart, Fig. 10. It is also recommended that all circuit breakers be operated at regular intervals to insure the user that the equipment is operating freely.

The lubrication chart is divided into two methods of lubrication. The first method outlines the maintenance lubrication which should be performed at the time of periodic maintenance, and requires no disassembly. The second method outlines a lubrication procedure similar to that performed on the breaker at the factory, but should be used only in case of a general overhaul or disassembly for other reasons, or if the operation of the breaker becomes slower.

General Electric lubricants D50H15 and D50H47 are available in 1/4# collapsible tubes. It is so packaged to insure cleanliness and to prevent oxidation.

Part	Lubrication at Maintenance Period	Alternative (Requires Di
Ground surfaces such as cams, rollers, latches, etc.	Wipe clean and apply D50H15.	Wipe clean a D50H15.
Sleeve Bearings (Mechanism and Breaker Linkage)	Very light application of light machine oil SAE-20 or -30.	Remove pins and clean as ing instructi Apply D50H1
Removable Seal and Open Type Ball, Roller and Needle Bearings	Light application of light machine oil SAE-20 or -30.	Clean as per instructions with D50H15
Silver Plated Contacts and Primary Disconnect Studs	Wipe clean and apply D50H47.	Wipe clean a D50H47.
Arcing Contacts	Do not lubricate.	
CONTACT ARM HINGE ASSEMBLY		
1. Cup Bearing	No lubrication required.	Wipe clean a D50H47.
2. Loose rings between bushing and contact arm.	No lubrication required.	Wipe clean a D50H47.
Booster Cylinders	No lubrication required.	No lubricatio

Fig. 10 Lubrication Chart

METHOD OF CLEANING BEARINGS

Wherever cleaning is required, as indicated in the lubrication chart, the following procedures are recommended:

Sleeve Bearings

The pins should be removed and all old oxidized grease removed by immersion in clean petroleum solvent or similar cleaner. DO NOT USE CARBON TETRACHLORIDE. Wipe the bearing clean. Apply a small amount of G-E lubricant D50H15 to the entire surface of the bearing and pin just before reassembling.

Removable Seal and Open Type Ball, Roller and Needle Bearings

The bearings should be first removed from the mechanism and disassembled by the removal of the seals or inner race in the case of needle bearings. They should then be placed in a container of clean petroleum solvent or similar cleaner. DO NOT USE CARBON TETRACHLORIDE. If the grease in the bearings has become badly oxidized it may be necessary to use alcohol (type used for thinning shellac) to remove it. Ordinarily, by agitating the bearings in the cleaning solution, and using a stiff brush to remove the solid particles, the bearings can be satisfactorily cleaned. Do not handle the bearings with bare hands as the deposits from the skin onto the bearings are inducive to corrosion. If the bearings are touched, the contamination can be removed by washing in alcohol. After the bearings have been thoroughly cleaned, spin them in clean new light machine oil until the cleaner or solvent is entirely removed. Allow this oil to drain off and then repack them immediately with G-E lubricant D50H15 being sure all metal parts are greased. The removable seals should then be replaced.

NOTE: If it becomes necessary to clean the bearings in alcohol (shellac thinner) be sure the alcohol is perfectly clean, and do not allow the bearings to remain in the alcohol more than a few hours. If it is desirable to leave the bearings in the alcohol for a longer time, an inhibited alcohol such as is used for anti-freeze should be used. Even then the bearings should be removed from the al twenty-four hours. Esso Anti Du Pont Zerone are satisfact purpose. Precautions again effects of the alcohol must be wearing rubber gloves and alcohol in a well ventilated room exposure to the fumes is so pleasant to personnel. Washing in light oil and draining shoul mediately then apply the lubric

TROUBLE SHOOTIN

Failure of a breaker to o erly will generally fall within eral classes: Failure to trip close or latch closed, and The following is a brief out particular types of distress be encountered, together with for remedying the trouble:

FAILURE TO TRIP

1. Mechanism binding or sti by lack of lubrication.
   REMEDY: Lubricate comp nism.

2. Mechanism binding or sti by being out of adjustment.
   REMEDY: Check all me justments, latches, stops, vices, etc. in accordance w LATION, ADJUSTMENTS latch and roller surfaces fo

3. Damaged trip coil.
REMEDY: Replace damaged coil.

4. Blown fuse in trip circuit.
REMEDY: Replace blown fuse after determining cause of failure.

5. Faulty connections in trip circuit.
REMEDY: Repair broken or loose wires and see that all binding screws are tight.

6. Damaged or dirty contacts in trip circuit.
REMEDY: Recondition or replace contacts.

FAILURE TO CLOSE OR LATCH CLOSED

1. Mechanism binding or sticking caused by lack of lubrication.
REMEDY: Lubricate complete mechanism.

2. Mechanism binding or sticking caused by being out of adjustment.
REMEDY: Check all mechanism adjustments, latches, stops, auxiliary devices, etc., in accordance with INSTALLATION, ADJUSTMENTS. Examine latch and roller surfaces for corrosion.

3. Control relay sticking or not operating properly.
REMEDY: Check and adjust control relay or replace.

4. Damaged or dirty contacts in control circuit, including control relay.
REMEDY: Recondition or replace contacts.

5. Damaged control relay coil.
REMEDY: Replace damaged coil.

6. Damaged closing coil.
REMEDY: Replace damaged coil.

7. Defective cut-off switch, latch-checking switch, or interlock switch.
REMEDY: Replace defective switch.

8. Blown fuse in closing circuit.
REMEDY: Replace blown fuse after determining cause of failure.

9. Faulty connections in closing circuit.
REMEDY: Repair broken or loose wires and see that all binding screws are tight.

10. Insufficient control voltage caused by excessive drop in leads.
REMEDY: Install larger wires and improve electrical contact at connections.

OVERHEATING

1. Poor condition of contacts due to lack of attention after severe duty or too frequent operation.
REMEDY: Recondition or replace burned and pitted contacts. (Contacts should be reconditioned very carefully and only when absolutely necessary).

2. Contacts not properly aligned or adjusted.
REMEDY: Check all adjustments in accordance with INSTALLATION, ADJUSTMENTS.

3. Breaker kept closed or open for too long a period.
REMEDY: Operate breaker more often to wipe contacts clean. Replace contacts if necessary.

4. Overloading.
REMEDY: Replace breaker with one of adequate rating for present or future load, or re-arrange circuits so as to remove excess load.

5. Primary connections of inadequate capacity.
REMEDY: Increase size or number of conductors or remove excess current.

6. Loose connections or terminal connectors.
REMEDY: Tighten.

7. Ambient temperature too high.
REMEDY: Relocate in a cooler place, or arrange some means of cooling.

RECOMMENDED MAINTENANCE FOR MAGNE-BLAST BREAKERS APPLIED TO REPETITIVE SWITCHING DUTY

Magne-blast breakers applied to repetitive operation such as switching arc furnaces, capacitors and motors should be serviced and maintained according to the following schedule:

A. Every 2000 Operations, or Every Six Months - Whichever Comes First

1. Remove the box barriers.

2. Wipe all insulating parts, with a clean dry cloth, including the bushings, clean of smoke deposit and dust, also the inside of the box barriers.

3. Primary Contacts - Inspect the condition of the stationary contact fingers and movable contact blocks. Badly pitted or burned contacts should be replaced. (Note: Burned primary contacts indicate the probable need for arcing contact replacement). If the contact surfaces are only roughened or galled, they should be smoothed with crocus cloth or draw filed. After contact dressing the contacts should be greased lightly with D50H47 and the breaker should be operated several times. After operation, the contacts should be wiped dry with a clean rag. Sufficient grease will remain on the contacts for proper lubrication.

4. Arcing Contacts - When the arcing contact wipe is less than the minimum specified under ADJUSTMENTS, the contacts should be replaced. The contacts should be inspected for uneven wear and/or damage using a mirror to inspect the stationary contacts. Normally it will not be necessary to remove the arc chutes for this 2000 operation servicing unless inadequate wipe or contact condition indicate a need for replacement. Do not grease the arcing contacts under any circumstances.

5. Check the breaker and mechanism adjustments as summarized under INSPECTION AND TEST. The necessary readjustments should be made as described under ADJUSTMENTS.

6. The breaker and operating mechanism should be carefully inspected for loose nuts, bolts, retaining rings, etc.; all cam, latch and roller surfaces should be inspected for damage or excessive wear. The buffer blocks on the bottom of the stationary contact support should be inspected for possible damage and replacement.

7. The main contacts of the control relay should be inspected for wear and possible replacement.

8. Lubricate the breaker operating mechanism in accordance with the table under paragraph heading LUBRICATION.

9. Inspect all wiring for tightness of connections and possible damage to insulation.

10. After the breaker has been serviced, it should be operated slowly with the maintenance closing device to be sure there is no binding or friction and that the breaker contacts can move to the fully opened and fully closed positions. Its electrical operation should then be checked using either the test cabinet or the test couplers.

B. After Every 10,000 Operations

1. In addition to the servicing done each 2,000 operations, the arc chutes should be removed from the breaker and disassembled to permit a detailed inspection of insulation, blow-out coil and arc runners.

2. The throat area of the arc chute should be thoroughly cleaned by using sandpaper. This cleaning should be performed any time the arc chute is removed. The arc chute fins should not be cleaned. Whenever the arc chute is removed, loose dust and dirt should be blown out before replacing arc chutes.

3. The blow-out coil should be carefully examined and if the insulation has been cracked, shrunk or eroded from arc action and heat so that the turns of the coils are not fully insulated from each other the coils should be replaced. All connections should be checked for tightness.

4. The arc runners should be inspected and replaced when any part of their area has been reduced to 25% of the original metal thickness as a result of arc erosion.

5. Check the stationary arcing contacts to assure that the arcing contacts are not broken and that their connections are tight.

6. Insulating material that is carbonized and cannot be satisfactorily cleaned should be replaced.

7. Any parts damaged or severely burned and/or eroded from arc action should be replaced.
NOTE: Fine cracks may develop in the fins of the arc chute sides. This is to be expected with ceramic materials when subjected to the high

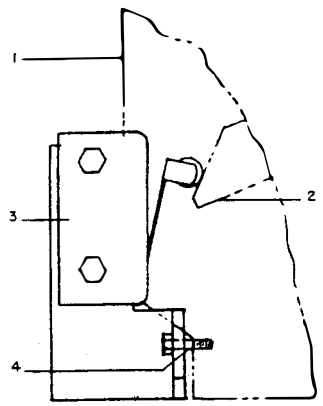


Fig. 11 (688C503)

1. Mechanism Frame
2. Linkage
3. Latch Checking Switch
4. Shims

Fig. 11 Latch Checking Switch

heat of an arc and may be disregarded unless they are long and present a possibility of fin sections breaking completely off. Small broken corners on the exhaust end of the arc chute will not interfere with its performance and can also be disregarded.

C. Every 20,000 Operations or Approximately Every Five Years - Whichever Comes First

1. At this time the breaker should be given a general overhaul and all excessively worn parts in both the mechanism and breaker replaced. Such wear will usually be indicated when the breaker cannot be adjusted to instruction book tolerances. This overhaul and inspection is more detailed and will require disassembly of mechanism and breaker operating parts.

2. The trip roller and trip shaft bearings in the operating mechanism should be disassembled, cleaned and repacked with G-E lubricant D50H15 as described under LUBRICATION.

3. The cup bearing at the hinge point of the contact blade should be disassembled, inspected, cleaned and re-lubricated with G-E contact lubricant D50H47. It is not necessary to grease the self-lubricating contact ring at the hinge point between the contact blade and bushing. The contact ring should be inspected for wear and replaced when reduced in thickness to less than 1/32".

4. The stationary primary contact fingers should be disassembled and the silver-plated pivot area of the contact and contact support cleaned and lubricated with G-E lubricant D50H47.

5. The breaker and operating mechanism should be serviced as described for every 2,000 operations and properly adjusted before being put back into service.

REPAIR AND REPLACEMENT

The following information covers in detail the proper method of removing various parts of the breaker in order to make any necessary repairs. This section includes only those repairs that can be made at the installation on parts of the breakers that are most subject to damage or wear.

IMPORTANT: UPON COMPLETION OF ANY REPAIR WORK, ALL BREAKER AND MECHANISM ADJUSTMENTS MUST BE CHECKED. Refer to the section on ADJUSTMENTS, INSPECTION AND TEST.

Before maintenance or replacement of contacts, the arc chutes must be removed.

ARC CHUTE REMOVAL

REFER TO FIG. 13

To remove the arc chutes, first loosen the arc chute support bolt (2), Fig. 13, and remove the arc runner connecting bolt (1), Fig. 13. The arc chute is then free to be pulled away from the breaker.

PRIMARY CONTACTS

REFER TO FIG. 1

The primary contacts are designed to carry the normal load current with a minimum amount of heating and are provided with an inlaid block of silver to minimize the effects of wear. The stationary primary contacts consist of 4 fingers for the 1200 ampere breaker and are mounted along with the associated springs on the support casting carried by the rear bushing. The fingers may be replaced after removing the cotter pin through the pivot end.

REFER TO FIG. 6

The movable primary contact (7), Fig. 6 is carried on the blade hinged at the front bushing. The arc chute must be removed (see section ARC CHUTE REMOVAL) and the following steps should be followed for replacement of the contact blade:-

(a) Remove the bolt fastening the arc chute supporting the bracket to the lower end of the front bushing, and remove the bracket.

(b) Disconnect the puffer tube and operating rod from the contact blade.

(c) At the blade hinge, remove the bolt, springs, spacers (only on 600 amp. breaker) and thimbles, see Fig. 6.

(d) Slip the contact blade off the end of the bushing and withdraw.

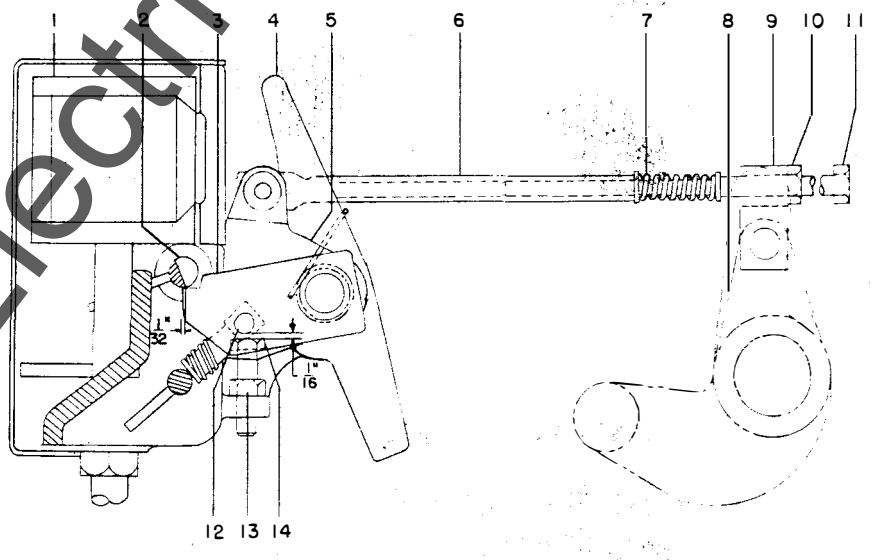
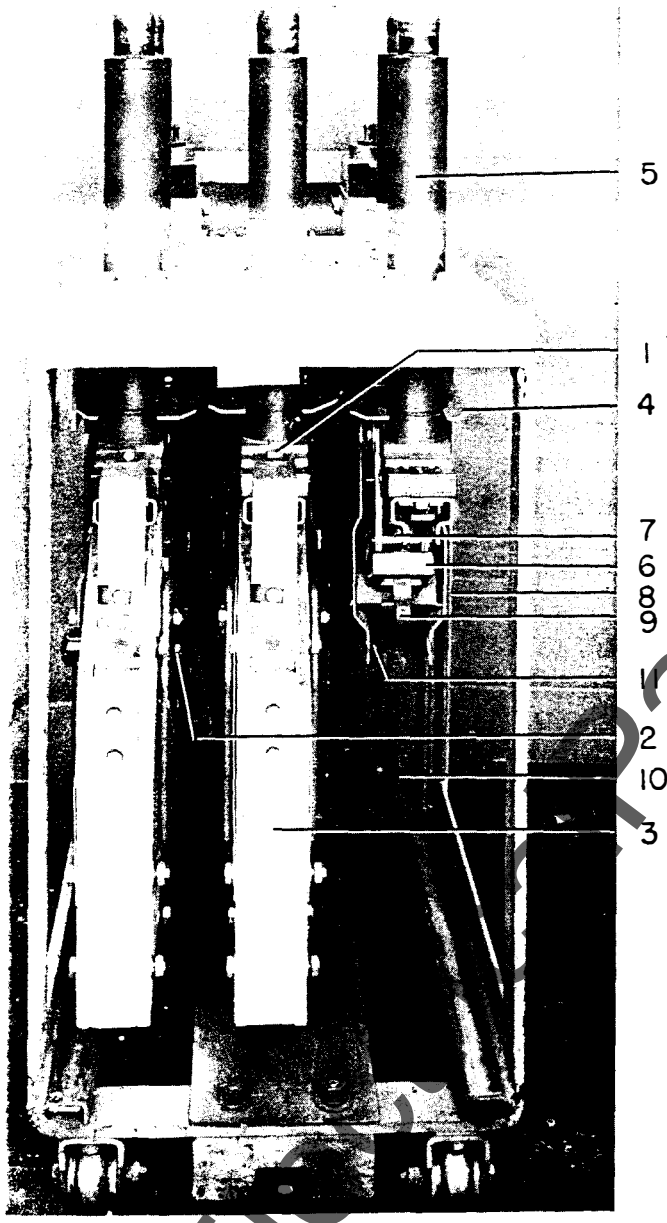


Fig. 12 (264B180)

1. Current Trip Unit
2. Trip Shaft
3. Cam Latch
4. Breaker Trip Latch
5. Latch Bracket
6. Guide
7. Spring
8. Crank
9. Spacer Block
10. Lock Nut
11. Adjustable Rod
12. Pin
13. Locknut
14. Adjusting Screw

Fig. 12 Current Trip Assembly MS-9 Solenoid Mechanism

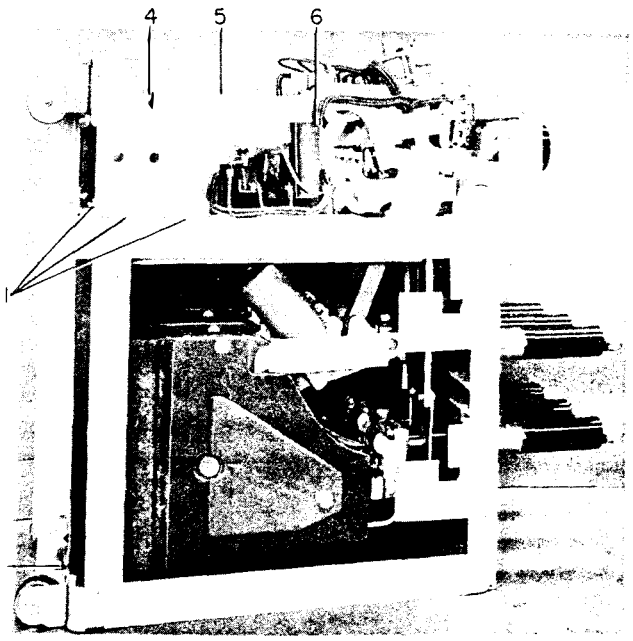


1. Arc Chute Connection Bolts
2. Arc Chute Supporting Bolts
3. Arc Chute Assembly
4. Upper Horizontal Barrier
5. Rear Bushing Assembly
6. Movable Primary Contact
7. Tube and Piston Assembly
8. Arc Chute Support Bracket
9. Movable Arcing Contact
10. Front Vertical Barrier
11. Booster Cylinder

Fig. 13 Rear View of Breaker With Box Barrier and Two Arc Chutes Removed

1. Hanger Support
2. Shield
3. Pole Piece Mounting Bolt
4. Pole Piece
5. Bolt
6. Arc Chute Side
7. Insulation Block
8. Upper Runner
9. Lower Runner
10. Arc Chute Mounting Lug

Fig. 14 Side and End View of Arc Chute



1. Wheel Base Bolts
4. Solenoid Pot Assembly Nuts
5. Solenoid Pot Assembly Cover
6. Control Relay

Fig. 15 AM-4.16-75-1 Magne-blast Breaker Resting on Frame Back

Fig. 13 (8028978)

Fig.14 (8028844 & 8028845)

Fig. 15 (8025213)

Reassemble the replacement parts making certain that all cotter pins are replaced. If a new hinge bolt has been used, or if it seems desirable for any other reason, the pressure at the hinge joint should be checked by measuring with a spring balance the force required to swing the contact arm. For both the 600 and 1200 ampere breakers, this force should be between 40 and 60 pound-inches.

ARCING CONTACTS

REFER TO FIG. 1 AND 3

The stationary arcing contact (see Fig. 1) is carried by the bracket fastened to the lower side of the rear bushing. To remove, take out the two Allen head cap screws from the top (not shown). To replace, the following steps should be followed:

(a) Remove lock nut and stop bolt.

(b) Place arcing finger on pivot pin.

(c) Place fibre spring cup on top of the arcing finger.

(d) Place pivot spring guide block in position on the underside of the top of the bracket.

(e) Insert spring through the top of the bracket, spring block and into the spring cup.

(f) Place the assembly on the underside of the bushing, and engage the cap screws one turn in the spring guide block.

(g) Insert the arcing contact springs and guide.

(h) Tighten the cap screws, and reassemble the stop bolt and lock nut.

The contacts should be adjusted as described previously under ADJUSTMENTS.

CLOSING COIL

REFER TO FIG. 15

To replace the closing coil turn the breaker over on its back. Remove the wheel base by removing eight bolts (1) holding it to the frame. Disconnect closing coil leads (13) Fig. 7. Remove four nuts (4) holding the solenoid pot assembly together, Slide cover (5), closing coil (16) Fig. 8, and armature and plunger assembly (17) and (18), Fig. 8 out. To assemble, reverse the above procedure.

When making the final connection of the closing coil wires be careful on d-c operated breakers to connect the bottom coil lead (designated with a wire tap, lettered "B") to the HJA relay terminal #3 and connect the top coil lead (designated with a wire tap, lettered "T") to the HJA relay terminal #1. (NOTE: The letters "T" and "B" designate top and bottom in relation to the physical position of the closing coil as it is assembled in the mechanism on the breaker.) A final check should be made to see if the connection is made accurately. After the breaker adjustments have been made, and the breaker manually operated a few times, operate it electrically and observe the direction of the arc on the control relay (5) Fig. 5. If it is directed through the arc chute the connection is made correctly. If the arc is directed toward the relay coil, a careful check for other trouble should be made by going over the check list as described under HJA CONTROL RELAY ADJUSTMENT.

RENEWAL PARTS

It is recommended that sufficient renewal parts be carried in stock to enable the prompt replacement of any worn, broken or damaged parts. A stock of such parts minimizes service interruptions caused by breakdowns, and saves time and expense. When continuous operation is a primary consideration, more renewal parts should be carried, the amount depending upon the severity of the service and the time required to secure replacements.

NOTE: The listed terms "right" and "left" apply when facing the solenoid mechanism end of the breaker.

ORDERING INSTRUCTIONS

1. ALWAYS SPECIFY THE COMPLETE NAMEPLATE DATA OF BOTH THE BREAKER AND THE MECHANISM.
2. SPECIFY THE QUANTITY, CATALOG NUMBER (IF LISTED), REFERENCE NUMBER (IF LISTED), AND DESCRIPTION OF EACH PART ORDERED, AND THIS BULLETIN NUMBER.
3. STANDARD HARDWARE, SUCH AS SCREWS, BOLTS, NUTS, WASHERS, ETC., IS NOT LISTED IN THIS BULLETIN. SUCH ITEMS SHOULD BE PURCHASED LOCALLY.
4. FOR PRICES, REFER TO THE NEARES OFFICE OF THE GENERAL ELECTRIC COMPANY.

ILLUSTRATION REFERENCE

PARTS RECOMMENDED FOR NORMAL MAINTENANCE

In the tabulation below are listed the parts which are usually recommended for stock for normal maintenance. Other parts are listed on the following pages.

PARTS FOR ALL RATINGS

REF. NO.	CAT. NO. FOR AM-4.16-75-1	NO. PER BREAKER	DESCRIPTION
27	0958C0649 G-0002	3	Movable Arcing Contact
28	0958C0638 G-0010	3	Movable Contact Arm
34	281B793 P-1	3	Booster Cylinder
45	236C770 G-5	3	Operating Rod and Eye Bolt
52	269C864 P-15	12	Primary Contact Finger
53	6301381 P-1	12	Spring for Primary Contact
54	6242891 P-1	15	Spring Guide
56	269C828 G-2	3	Buffer
57	6301242 G-1	3	Arcing Contact
58	369A460	3	Spring, Outside
59	6301364 P-1	3	Spring, Inside
60	269C828 P-1	3	Guide Pin
62	6370615 P-1	3	Spring for Arc Contact
76	0958C0637 P-0014	3	Insulation Block
146	6306734 G-2	1	Closing Coil (125v d-c)
146	6306734 G-3	1	Closing Coil (250v d-c)
146	6306734 G-2	1	Closing Coil (230v a-c)
147	6174599 G-4	1	Potential Trip Coil (125v d-c)
147	6174599 G-15	1	Potential Trip Coil (250v d-c)
147	6275084 G-22	1	Potential Trip Coil (230v a-c)
147	6174599 G-11	1	Potential Trip Coil (24v d-c)
147	6174599 G-3	1	Potential Trip Coil (48v d-c)
147	6174599 G-6	1	Capacitor Trip Coil
176	6275017 G-12	1	Undervoltage Device Coil (230v a-c)
200B	6174599 G-2	3	Current Trip Coil (3 Amp. a-c)

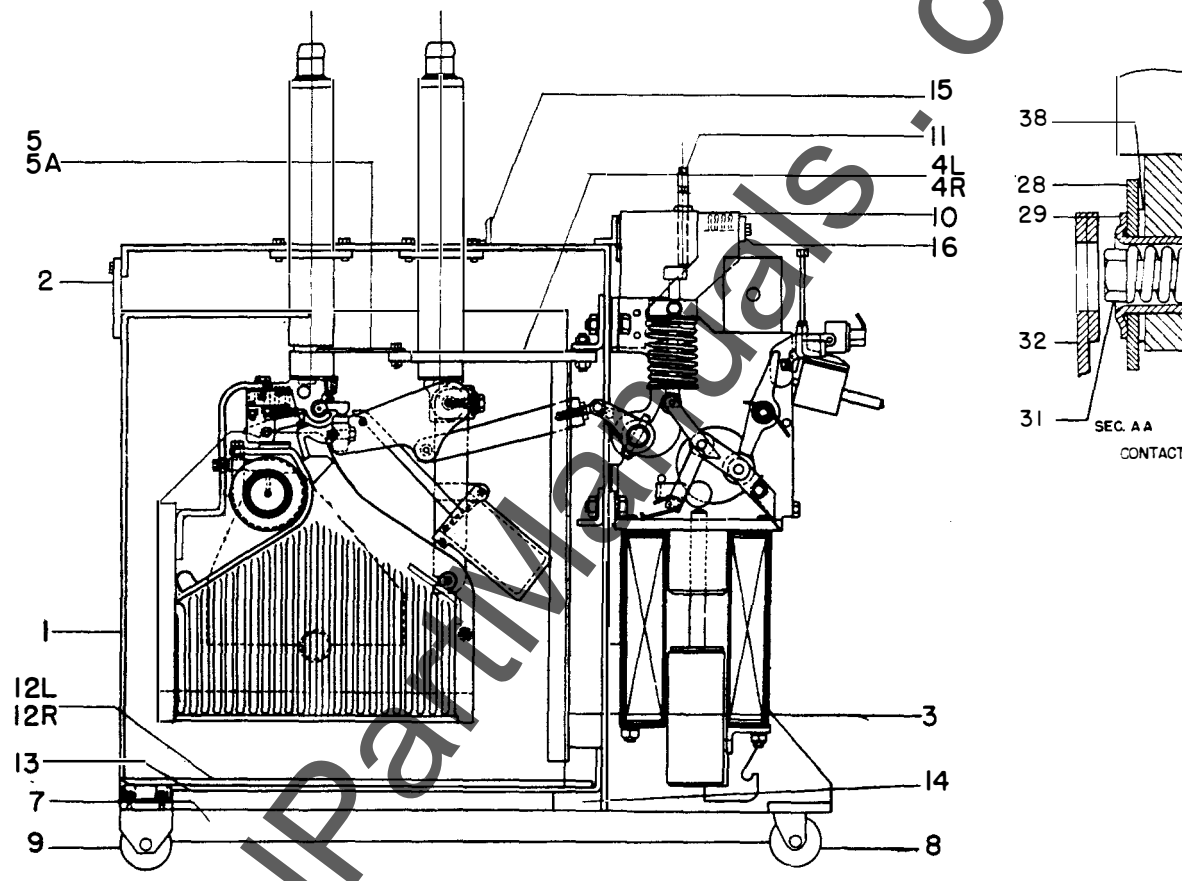


Fig. 16 (962C731 & 6496372)

Fig. 16 Cross Section Type AM-4.16-75-1

PARTS REFERENCED IN FIG. 16

REF. NO.	AMPS	CAT. NO. FOR AM-4.16-75-1	NO. PER BREAKER	DESCRIPTION
1	ALL	269C862 G2	1	Box Barrier
2	ALL	269C846 P12	1	Box Barrier Clamp
3	ALL	236C770 G6	1	Vertical Barrier
4L	ALL	236C771 P10	3	Horizontal Barrier (Left)
4R	ALL	236C771 P8	3	Horizontal Barrier (Right)
5	ALL	236C771 P6	1	Horizontal Barrier (Center
5A	ALL	236C771 P7	2	Horizontal Barrier (Outer Ø
7	ALL	269C830 G1	1	Wheel Base Assembly
8	ALL	6597296 P5	2	Front Wheel & Caster
9	ALL	6597296 P6	2	Rear Wheel
10	ALL	264B173 G4	2	Secondary Coupler Plug
11	ALL	269C861 G3	1	Plunger Interlock Assembly
12L	ALL M/C	236C771 P15	1	Box Barrier Guide (Left)
12L	ALL △	236C771 P17	1	Box Barrier Guide (Left)
12R	ALL M/C	236C771 P16	1	Box Barrier Guide (Right)
12R	ALL △	236C771 P18	1	Box Barrier Guide (Right)
12	ALL	236C771 P14	1	Barrier
14	ALL	6176109 P21	1	Spacer
15	ALL	414A126 P1	2	Lifting Angle
16	ALL	269C828 P15	1	Handle

△ Mine type

Fig. 17A (8023751)

Fig. 17B (8023750 & 9620732)

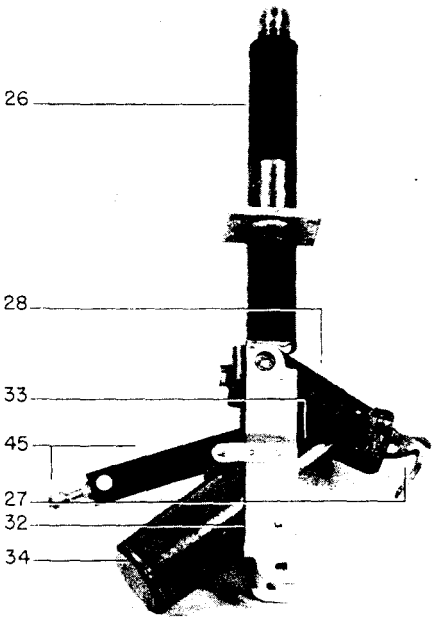


Fig. 17A Complete Assembly

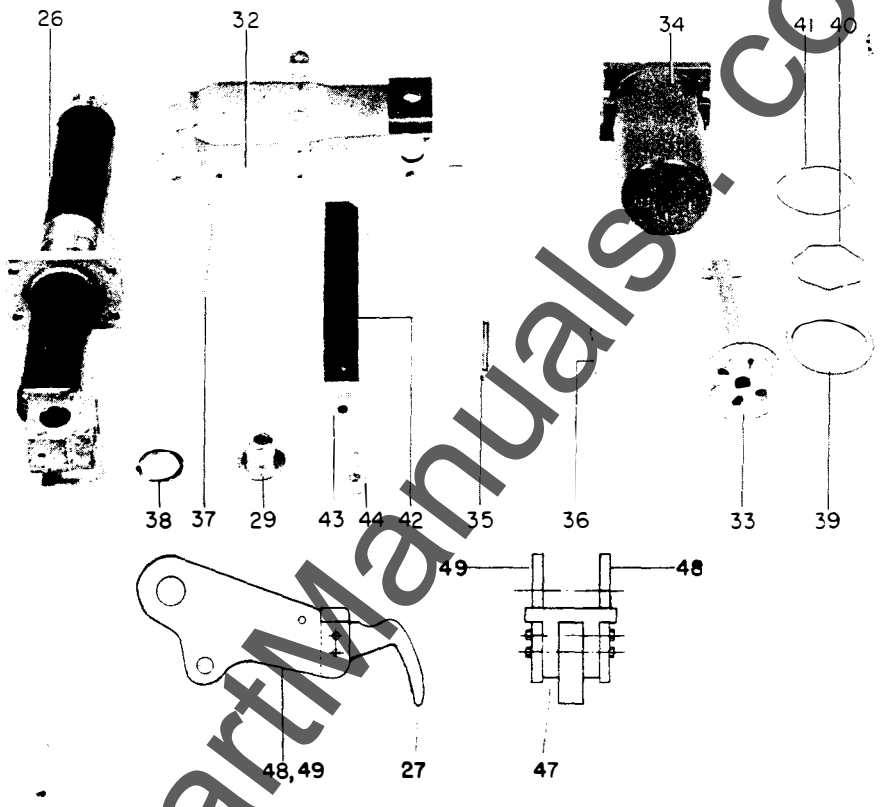


Fig. 17B Component Parts

Fig. 17 Front Bushing Assembly (Ref. No. 25)

PARTS REFERENCED IN FIGS. 16, 17A AND 17B

REF. NO.	AMPS	CAT. NO. FOR AM-4.16-75-1	NO. PER BREAKER	DESCRIPTION
25	600 M/C	0958C0638 G0001	3	Front Bushing Complete
25	1200 M/C	0958C0638 G 0002	3	Front Bushing Complete
25	600 △	0958C0638 G0003	3	Front Bushing Complete
26	600 M/C	0962C0728 G0001	3	Front Bushing
26	1200 M/C	0114C5488 G0001	3	Front Bushing
26	600 △	0898B0292 P0001	3	Front Bushing
27	ALL	0958C0649 G0002	3	Movable Arcing Contact
28 *	ALL	0958C0638 G0010	3	Movable Contact Arm Assembly
29	ALL	006243035 P0001	6	Cup Bearing
30	ALL	006172976 P0001	6	Hinge Spring
31	ALL	0269C0828 P0008	3	Hinge Bolt
32	ALL	0269C0864 G0008	3	Support Assembly
33	ALL	0269C0864 G0002	3	Piston Assembly
34	ALL	0281B0793 P0001	3	Booster Cylinder
35	ALL	0269C0827 P0016	3	Pin
36	ALL	006076401 P0025	3	Pin
37	ALL	006076401 P0049	3	Pin
38	ALL	0104A2495 P0004	6	Washer
39	ALL	0421A0248 P0002	3	Piston Ring
40	ALL	0383A0999 P0002	3	Piston Ring Expander
41	ALL	0456A0874 P0001	3	Piston Ring Equalizer
42	ALL	0236C0770 P0017	3	Rod
43	ALL	0236C0770 P0018	3	Nut
44	ALL	0236C0770 P0020	3	Eye Bolt
45	ALL	0236C0770 G0005	3	Operating Rod and Eye Bolt
47	ALL	0958C0649 P0002	3	Contact
48	ALL	0958C0649 G0003	3	Blade Assembly (Right)
49	ALL	0958C0649 G0004	3	Blade Assembly (Left)

△ Mine type
* Includes Reference Nos. 27 & 47

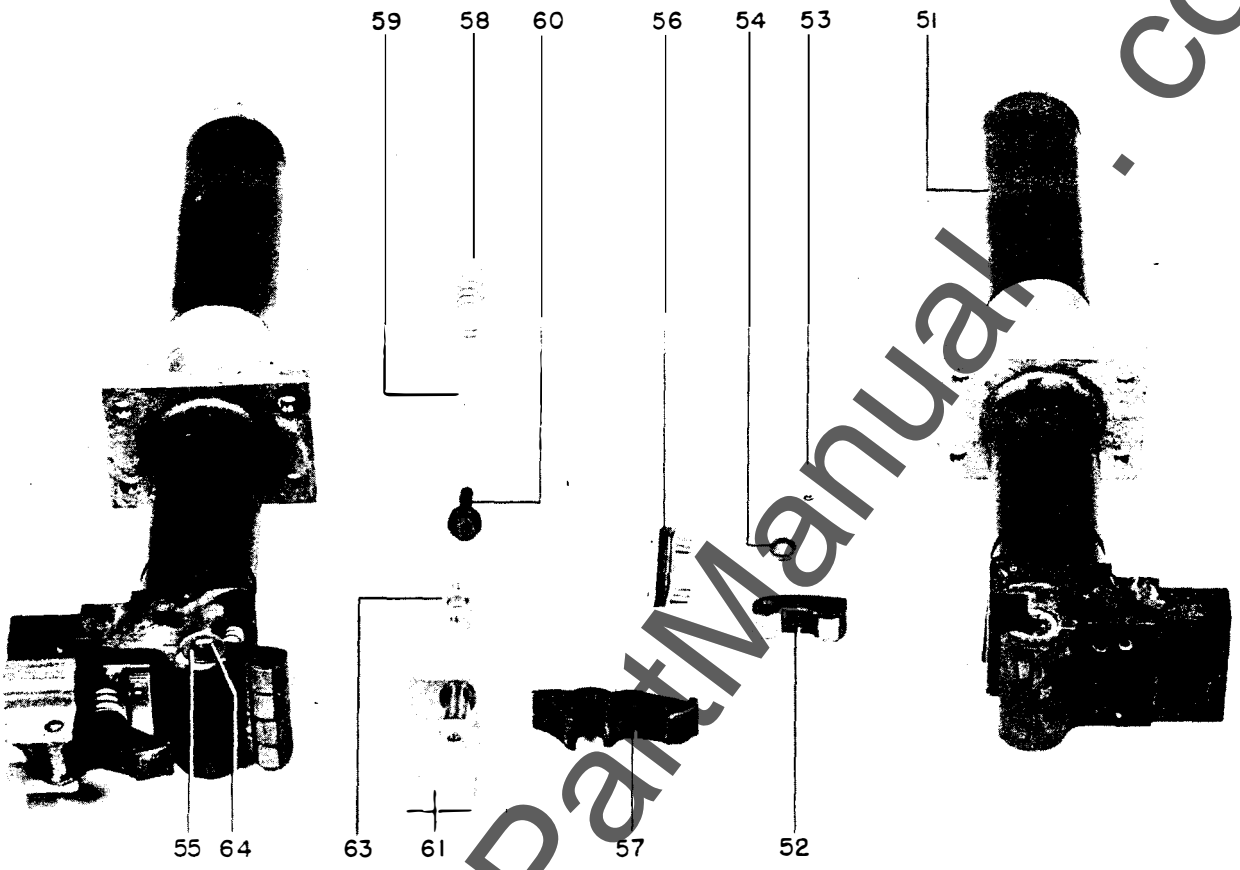


Fig. 18A Complete Assembly

Fig. 18B Component Parts

Fig. 18 Rear Assembly (Ref. No. 50)

Figs. 18A & 18B (8023749)

PARTS REFERENCED IN FIG. 18

REF. NO.	AMPS	CAT. NO. FOR AM-4.16-75-1	NO. PER BREAKER	DESCRIPTION
50	600	0958C0638 G0012	3	Rear Bushing Assembly Complete
50	1200	0958C0638 G0013	3	Rear Bushing Assembly Complete
50	600 △	0958C0638 G0014	3	Rear Bushing Assembly Complete
51	600	0962C0728 G0002	3	Rear Bushing
51	1200	0114C5488 G0002	3	Rear Bushing
51	600 △	0898B0292 P0002	3	Rear Bushing
52	ALL	0269C0864 P0015	12	Primary Contact
53	ALL	006301381 P0001	12	Spring for Primary Contact
54	ALL	006242891 P0001	15	Spring Guide
55	ALL	0269C0828 P0007	6	Washer
56	ALL	0269C0828 G0002	3	Buffer
57	ALL	006301242 G0001	3	Arcing Contact
58	ALL	0369A0460	3	Spring, Outside
59	ALL	006301364 P0001	3	Spring, Inside
60	ALL	0269C0828 P0001	3	Guide Pin
61	ALL	0269C0828 G0001	3	Contact Support
62	ALL	006370615 P0001	3	Spring for Arcing Contact
63	ALL	0269C0828 P0014	3	Spring Guide for Arcing Contact
64	ALL	0269C0828 P0006	3	Cotter Pin

△ Mine Type

Fig. 19A (8028844)

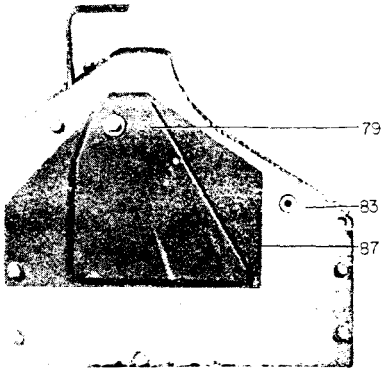


Fig. 19B (8028847)

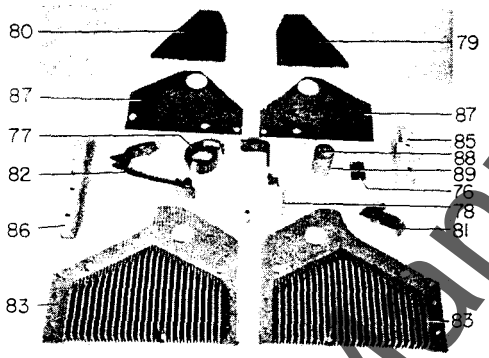


Fig. 19C (8028846)

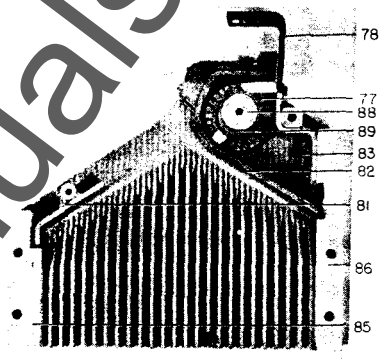


Fig. 19A Complete Assembly

Fig. 19B Component Parts

Fig. 19C Cut-away View

Fig. 19 Arc Chute (Ref. No. 75)

PARTS REFERENCED IN FIG. 19

REF. NO.	CAT. NO. FOR AM-4.16-75-1	NO. PER BREAKER	DESCRIPTION
75	0634D0366 G0001	3	Arc Chute Assembly Complete
76	0958C0637 P0014	3	Insulation Block
77	0269C0854 G0001	3	Coil
78	0958C0637 G0001	3	Coil Support
79	0958C0637 G0004	3	Pole Piece
80	0958C0637 G0005	3	Pole Piece
81	0958C0637 G0002	3	Arc Runner
82	0958C0637 G0003	3	Arc Runner
83	* 0958C0636 P0001	3	Arc Chute Side
83	* 0958C0636 P0002	3	Arc Chute Side
85	0958C0637 P0012	3	Spacer
86	0958C0637 P0013	3	Spacer
87	0958C0637 P0009	6	Shield
88	0958C0637 P0010	3	Core
89	0958C0637 P0011	3	Insulating Tube

* Shipped in Pairs Only.

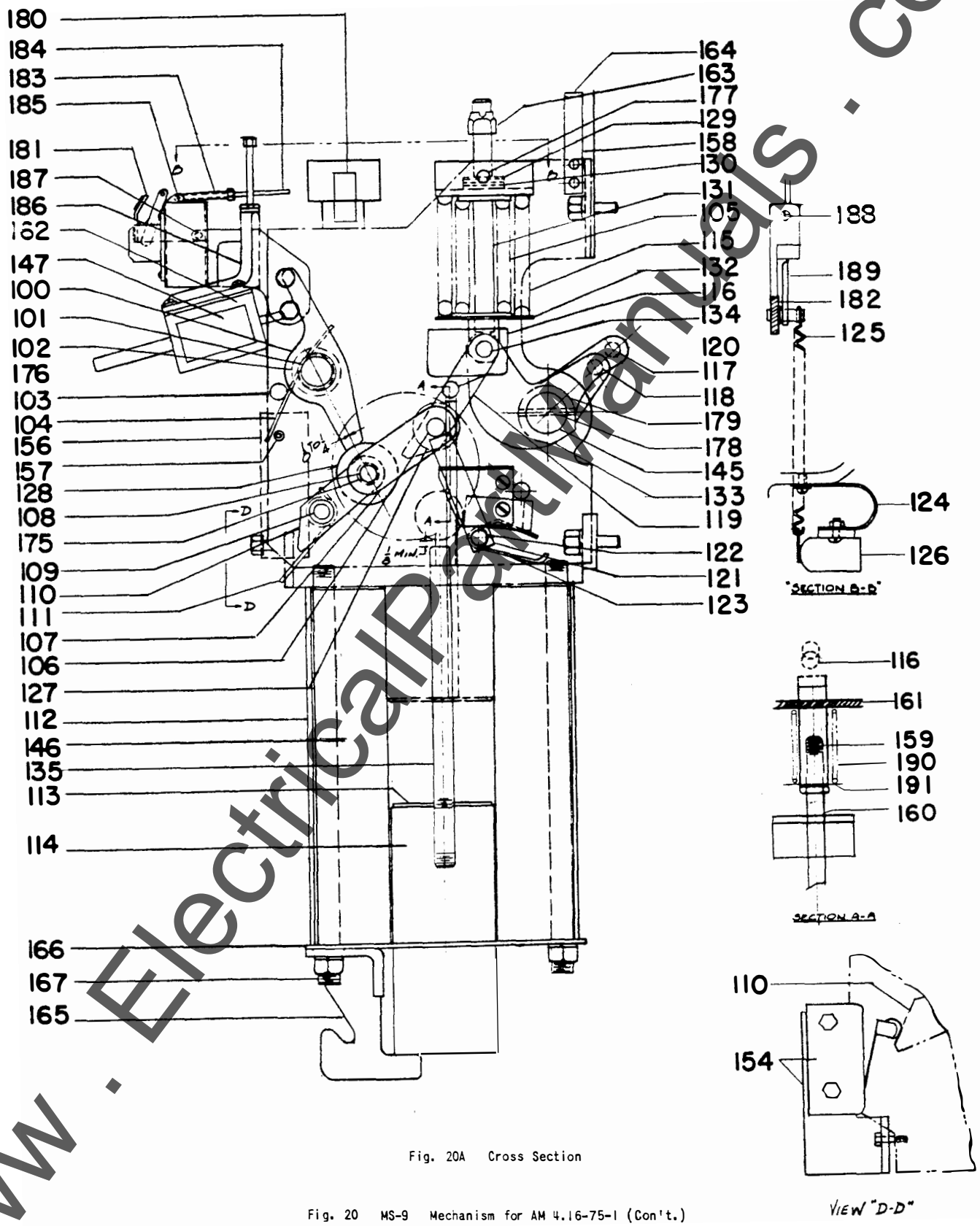


Fig. 20A (962C729)

Fig. 20A Cross Section

Fig. 20 MS-9 Mechanism for AM 4.16-75-1 (Con't.)

Fig. 20B (9626C732)

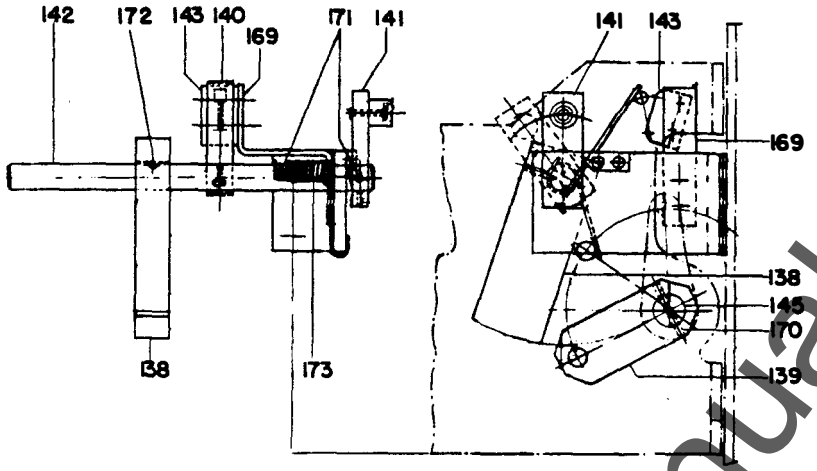


Fig. 20B Positive Interlock Linkage

Fig. 20C (6438456)

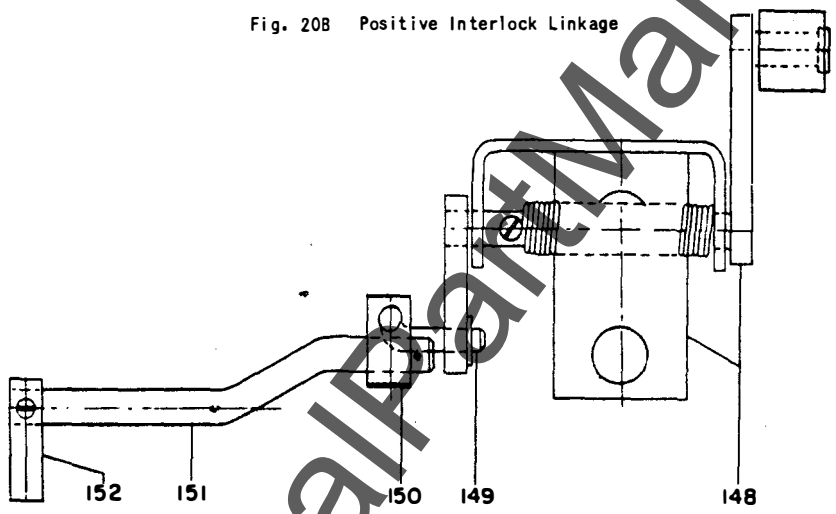


Fig. 20C Trip Mechanism (Ref. No. 153)

Fig. 20 MS-9 Mechanism for AM 4.16-75-1

PARTS REFERENCED IN FIGS. 20A, 20B AND 20C

REF. NO.	MVA	CAT. NO. FOR AM-4.16-75-1	NO. PER MECHANISM	DESCRIPTION
100	ALL	269C858 G-4	1	Latch
101	ALL	6077971 P-7	1	Pin
102	ALL	414A112 P-34	1	Needle Bearing
103	ALL	6076404 P-59	2	Pin
104	ALL	6509718	1	Spring
105	ALL	456A387 P-1	1	Spring
106	ALL	6370095 P-2	1	Pin
107	ALL	269C857 G-6	1	Link Assembly
108	ALL	6370095 P-3	1	Pin
109	ALL	6370095 P-4	1	Pin
110	ALL	269C858 G-1	1	Link
111	ALL	6370646	1	Spring
112	ALL	269C859 P-7	1	Pot
113	ALL	6440893 P-1	1	Shim
114	ALL	269C859 P-9	1	Armature
115	ALL	269C861 P-10	1	Spring
116	ALL	456A866 P-1	1	Cut-off Switch
117	ALL	6076404 P-105	3	Pin
118	ALL	269C858 P-14	1	Pin
119	ALL	269C858 P-13	2	Link
120	ALL	6370289 P-1	2	Crank

PARTS REFERENCED IN FIGS. 20A, 20B AND 20C (Con't.)

REF. NO.	MVA	CAT. NO. FOR AM-4.16-75-1	NO. PER MECHANISM	DESCRIPTION
121	ALL	269C858 G-3	1	Prop
122	ALL	6076404 P-159	1	Pin
123	ALL	6301361	1	Spring
124	ALL	269C860 P-4	1	Support
125	ALL	6370647	1	Spring
126	ALL	6192382 P-6	1	Operation Counter
127	ALL	6477649 G-3	1	Roller
128	ALL	6441826	1	Ball Bearing
129	ALL	269C861 P-11	1	Disc
130	ALL	414A109 P-6	2	Cushion
131	ALL	269C861 P-7	1	Guide
132	ALL	6245880	1	Seat
133	ALL	6210959 P-2	1	Crank
134	ALL	6370095 P-1	1	Pin
135	ALL	269C859 P-10	1	Plunger
138	75	958C645 P-5	1	Prop
139	75	958C645 G-2	1	Stop Blade and Pin
140	75	958C645 P-4	1	Paddle
141	75	958C645 P-9	1	Crank
142	75	258C695 P-5	1	Shaft
143	75	456A866 P-1	1	Interlock Switch
145	ALL	258C694 P-7	1	Shaft
146	ALL	6306734 G-2	1	Closing Coil (125v d-c)
146	ALL	6306734 G-3	1	Closing Coil (250v d-c)
146	ALL	6306734 G-2	1	Closing Coil (230v a-c)
147	ALL	6174599 G-4	1	Potential Trip Coil (125v d-c)
147	ALL	6174599 G-15	1	Potential Trip Coil (250v d-c)
147	ALL	6275084 G-22	1	Potential Trip Coil (230v a-c)
147	ALL	6174599 G-11	1	Potential Trip Coil (24v d-c)
147	ALL	6174599 G-3	1	Potential Trip Coil (48v d-c)
147	ALL	6174599 G-6	1	Capacitor Trip Coil
148	75A	6438456 G-3	1	Trip Arm Bracket Asm.
149	75A	6242840 P-1	1	Crank
150	75A	6242839 P-1	1	Arm
151	75A	6242838 P-1	1	Crank Shaft
152	75A	6242837 P-1	1	Trip Latch
153	75A	6438456 G-4	1	Trip Mechanism, Complete
154	ALL	269C859 G-3	1	Latch Checking Switch and Support
156	ALL	684C642 G-1	1	Terminal Block (6 Point)
157	ALL	6002721 P-114	2	Spacer for Terminal Block
159	ALL	281B792 P-2	1	Plunger
160	ALL	281B792 P-3	1	Rod
161	ALL	281B792 P-4	1	Bracket
162	ALL	269C861 G-1	1	Manual Trip Assembly
163	ALL	414A146 P-4	1	Flex Nut
164	ALL	269C861 G-4	1	Support
165	ALL	269C859 G-2	1	Bracket Assembly
166	ALL	269C859 P-6	1	Plate
167	ALL	269C859 P-8	4	Stud
169	75	958C645 P-3	1	Support
170	75	958C645 P-21	2	Pin
171	75	958C645 P-19	2	Pin
172	75	958C645 P-20	1	Pin
174	75	456A343 P-1	1	Spring
175	ALL	6176109 P-71	2	Spacer
176	ALL	6242834 P-1	2	Spacer
177	ALL	6247762 P-1	2	Pin
178	ALL	269C857 P-32	4	Pin
179	ALL	6370567 P-51	2	Bushing
180	ALL	269C860 P-2	1	Base Plate
181	ALL	269C860 G-2	1	Indicator
182	ALL	269C860 P-6	1	Crank and Pin
183	ALL	269C860 P-9	1	Clevis
184	ALL	269C860 P-10	1	Rod
185	ALL	269C860 P-11	1	Pin
186	ALL	6420279 P-1	1	Support
187	ALL	6076401 P-125	1	Pin
188	ALL	414A146 P-1	1	Flex Nut
189	ALL	269C860 P-20	1	Connection Link

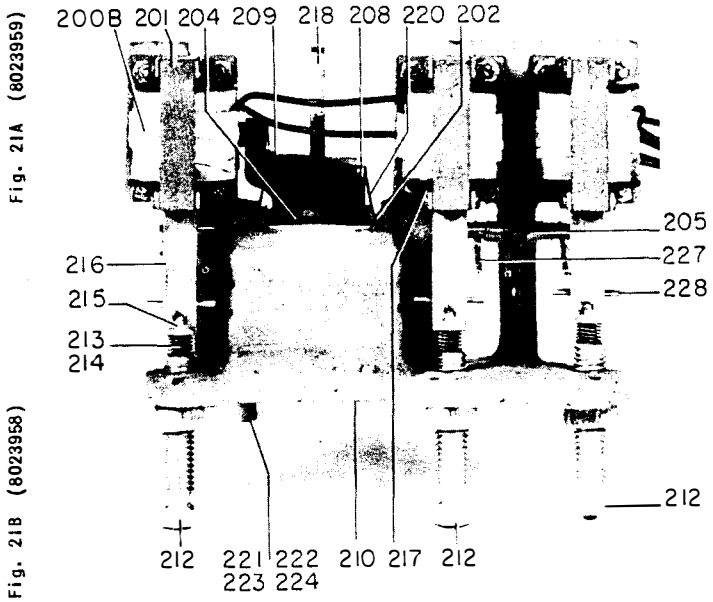


Fig. 21A (8023959)

Fig. 21A Front View

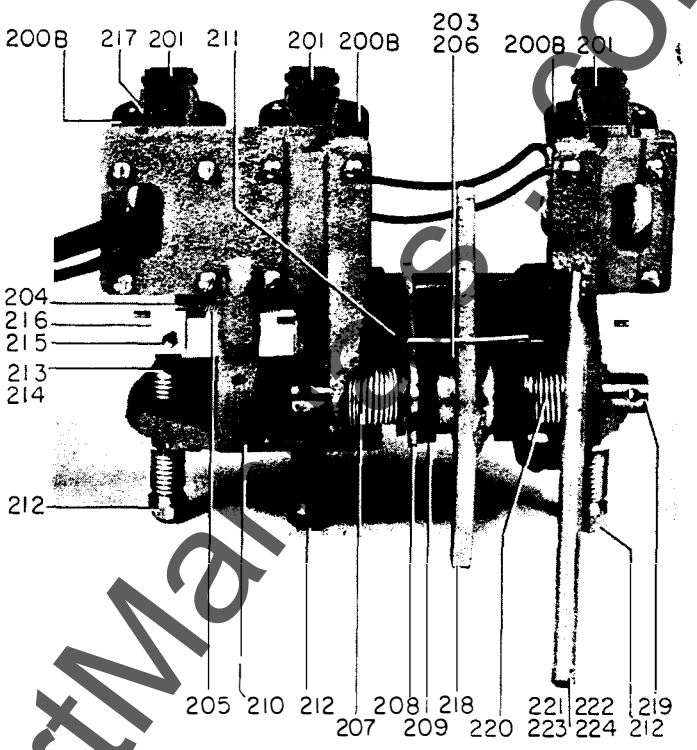


Fig. 21B (8023958)

Fig. 21B Rear View

Fig. 21 Current Trip Mechanism (Ref. No. 200)

PARTS REFERENCED IN FIGS. 21A AND 21B

REF. NO.	CAT. NO. FOR AM-4.16-75-1	NO. PER BREAKER	DESCRIPTION
200A	6193957 G-13	1	Current Trip Mechanism
200B	6174599 G-2	3	Coil (3 Amp. a-c)
200C	6193957 G-7	1	Sol. Frames and Armature Assemblies
201	4905058 G-4	3	Solenoid Frame
202	6193957 P-8	2	Bearing
203	6247930 P-1	1	Spring Guide
204	6370224 P-1	1	Shaft
205	6509725 P-1	1	Spring
206	6247928 P-1	1	Pin
207	6247932 P-1	2	Spacer
208	6442898 P-1	1	Cam Latch
209	6508774 P-110	1	Latch Bracket Assembly
210	6327893 P-2	1	Frame
211	6247929 P-2	1	Pin
212	6247924 P-1	3	Calibrating Tube
213	6247925 P-1	3	Guide Pin
214	6477094 P-1	3	Spring
215	6247927 P-1	3	Pin
216	6247926 P-1	3	Armature
217	2236575 P-1	6	Guide
218	269C858 G-4	1	Latch
219	6077971 P-7	1	Shaft
220	6509718 P-1	1	Spring
221	6442397 P-1	1	Guide
222*	6509714 P-1	1	Spring
223*	6508767 P-125	1	Adjusting Rod Assembly
224*	6442895 P-1	1	Clevis
225*	6247919 P-1	3	Calibrating Strip
226*	6370500 P-9	1	Cover
227	6193957 P-209	5	Pin
228	6193957 P-34	3	Pin

* Not Shown

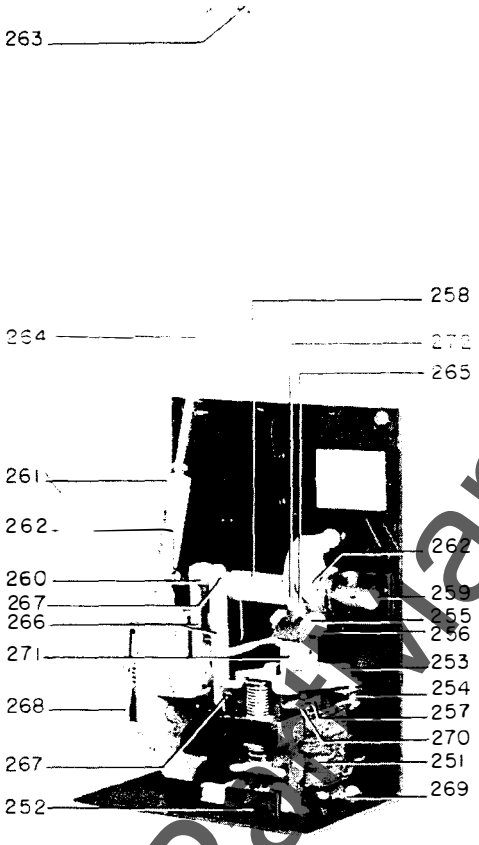


Fig. 22 (8006345)

Fig. 22 Undervoltage Device, Cover Removed (Ref. No. 250)

PARTS REFERENCED IN FIG. 22
FOR PG-6 AND PG-7 UNDERVOLTAGE DEVICES

REF. NO.	UNDERVOLTAGE DEVICE TYPE	CAT. NO. FOR AM-4.16-75-1	NO. PER MECHANISM	DESCRIPTION
250	PG-6 INSTANTANEOUS	6476723 G-14	1	Undervoltage Device, Complete
250	PG-7 TIME DELAY	6476723 G-38	1	Undervoltage Device, Complete
251	ALL	6275017 G-12	1	Undervoltage Device, Coil (230v a-c)
252	ALL	6275259 G-1	1	Cut-out Switch
253	ALL	6275264 P-1	1	Operating Lever
254	ALL	2412699 P-1	2	Spring
255	ALL	2437146 P-1	2	Roller
256	ALL	2239800 P-1	1	Pin
257	ALL	2433013 P-1	2	Guide Strip
258	ALL	6172878 P-1	1	Spring
259	ALL	6300040 G-3	1	Crank and Shaft
260	ALL	6243282 P-1	1	Eye Bolt
261	ALL	6440967 P-1	1	Coupling
262	PG-6	6076401 P-101	2	Pin
262	PG-7	6076401 P-101	1	Pin
263	ALL	6440971 P-1	1	Trip Nut
264	ALL	6440966 P-1	1	Trip Rod
265	ALL	6243283 P-1	1	Link
266	PG-7	6243281 P-1	2	Link
267	PG-7	6076401 P-106	2	Pin
268	PG-7	6926026 G-2	1	Escapement Device
269	ALL	2234099 G-1	1	Solenoid Frame
270	ALL	2236258 P-1	2	Spring
271	ALL	2234101 G-1	1	Core
272	ALL	6301233 G-1	1	Adjusting Plate
273*	ALL	6113966 G-4	1	Cover
274*	ALL	6043479 P-1	1	Thumb Nut for Cover

* Not Shown