GENERAL SPOT WELDING PROCEDURE

MAINTENANCE INSTRUCTIONS

and

OPERATING AND ADJUSTMENT INSTRUCTIONS

for

FOOT OPERATED

ACME "HOT SPOT" WELDERS

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GENERAL SPOT WELDING PROCEDURE FOR FOOT OPERATED ACME "Hot Spot" WELDERS

Spot welding two or more thicknesses of sheet metal is accomplished by applying pressure upon the surfaces of the sheets through two relatively small welding tips, so that the sheets are forced tightly together at this area, and then passing an electric current through the tips and the sheets until the latter reach the melting or welding temperature. The pressure is maintained after the current is cut off until the weld has cooled and solidified.

The spot welding machine is designed to perform this welding cycle automatically. The proper spot welding machine settings, that is, size of the end of welding tips, the applied pressure, magnitude and time duration of welding current, etc., to be used for a certain job, depend on many factors, such as material, surface condition, size and strenghth of spot welds desired, etc.

It is not possible adequately to cover spot welding procedures in the space allowable in these condensed instructions. A brief summary of some of the major factors involved in spot welding follows:

A. MATERIAL

The material to be welded should be free from dirt, paint, and other foreign matter. Scale, rust, oxide, and other products of corrosion prevent the obtaining of best results, although welds can be made under these conditions at the expense of production, appearance and uniformity. A light film of clean oil or grease is not harmful. Coated and plated steels, such as Terne Plate, Tin Plate, Galvanized Steel, etc., usually can be readily spot welded. More welding current and about 25% greater pressure is required than for the same gauge of uncoated steel.

B. PART FIT UP

Sheet metals should fit closely along the surfaces to be spot welded so that extreme pressure is not required to force these surfaces together. Flanges should be wide enough to prevent bulging or distorting of metal at the edge adjacent to the spot weld, and to prevent squirting of unconfined metal from the fused area.

C. WELDING TIPS

Welding tips should be accurately aligned. When flat welding tip faces are used, these faces should be parallel, and should contact the material surfaces evenly over their entire areas. Domed, or slightly rounded, tip faces (about 4 inch radius) are easier to align and maintain.

The tip face diameter usually controls the size of the weld. If the tip face diameter is too small for the gauge of the metal employed, the welds may be too weak and the tips may dig into the surface of the material. If the tip face diameter is too large, a greater amount of welding current is required and the metal surrounding the weld may become overheated.

A reasonable value of tip face diameter is 0.1 inch plus twice the thickness of the thinner of the two sheets to be welded. For example: If 0.040 inch sheet is to be welded to 0.060 inch sheet, the tip face diameter should be 0.1 plus two times 0.040, or 0.180 (Approximately 3/16) inch.

Tips can readily be cleaned by means of a tip cleaning pad made from a piece of wood about ¼" thick, 1½" wide, and 8" long, faced both sides with fine abrasive cloth. Disconnect current and insert the pad between the tips, bring the tips together under light pressure and rotate the pad several times. The original diameter of the tips can be maintained by dressing the sides with a fine mill file.

D. WELDING PRESSURE

Too low welding pressure causes surface burning and arcing, squirting out of hot metal, and porous welds. Too high welding pressure causes excessive tip marking or indentation of material surfaces. Thicker materials require higher pressures.

E. WELDING TIME AND HEAT REGULATOR SETTING

When a too short welding time is used (obtained by setting the timer for too short a period or depressing the treadle too rapidly), a high heat regulator setting is required. This often results in sparking and squirting out of molten metal from the weld. When a too long welding time is used (obtained by setting the timer for too long a period, or depressing the treadle too slowly) with a too low heat regulator setting, excessive surface heating and marking of the sheets results. Also, the welding tips overheat and lose their shape. Therefore, the welding time and heat regulator should be adjusted according to the particular job in order to prevent these bad results.

F. HOW TO SET UP FOR A NEW SPOT WELDING JOB

Select welding tips and adjust the tip holder and horns as outlined in OPERATING AND ADJUSTMENT INSTRUCTIONS.

Adjust the welding pressure high or low, according to the gauge and type of material.

If a weld timer (to regulate the length of time of current flow) and contactor (to make and break the current) are employed, adjust the timer to an "ON TIME" value based on previous experience with similar material. Initially set the heat regulator to a position which you judge will give too little heat, rather than too much heat, to make the weld. Using scrap material of the same gauge and type as the part to be welded, make a few test welds. Inspect the outer surfaces for burning, indentations, etc. Tear, distort, or pry the welds apart to observe their size, and judge their strength. With the same heat regulator setting, vary the welding time and again inspect the welds in the same manner. On machines with no weld timer, vary the welding time by varying the speed of depressing the treadle.

Set the heat regulator to a higher position, one or two steps, depending on the results previously obtained.

Follow the same procedure, varying welding time, and also welding pressure, as the results indicate to be necessary.

Experimenting in this manner will allow you to arrive at the best settings for the job. As you gain experience, the set-up time required for each new job will be decreased.

MAINTENANCE INSTRUCTIONS FOR FOOT OPERATED ACME "Hot Spot" WELDERS

Refer to Figure 1, Page 5 for location of parts identified by numbers in parentheses.

MAINTENANCE

In order to minimize wear of moving parts and to enable the machine to function at top efficiency, a regular maintenance schedule should be arranged. Obviously, no general rule can be given for frequency of inspection and maintenance, as this will depend on many factors, including the number of hours per day the machine is used, shop fumes, etc. The following instructions should be employed in regard to maintenance:

1. LUBRICATION

The following parts should be lubricated periodically, using a light bodied machine oil:

a. Treadle bearings (3) (Oil holes provided)
b. Rocker arm bearings (1) (Oil holes provided)
c. Treadle clevis pin (32)
d. Circuit breaker trip pin (29)
e. Circuit breaker trigger pin (30)
f. Circuit breaker shaft (21) (Oil hole provided)

The following parts should be lubricated, using a medium bodied grease:

a. Face of circuit breaker trigger (22).
b. Push rod where it passes through push rod guide (13).

2. ELECTRICAL CONDUCTING SURFACES

All contacting surfaces through which the welding current flows should be kept clean of oil and dirt accumulations and corrosion in order to reduce the resistance to the flow of current. Those surfaces which demand attention are as follows:

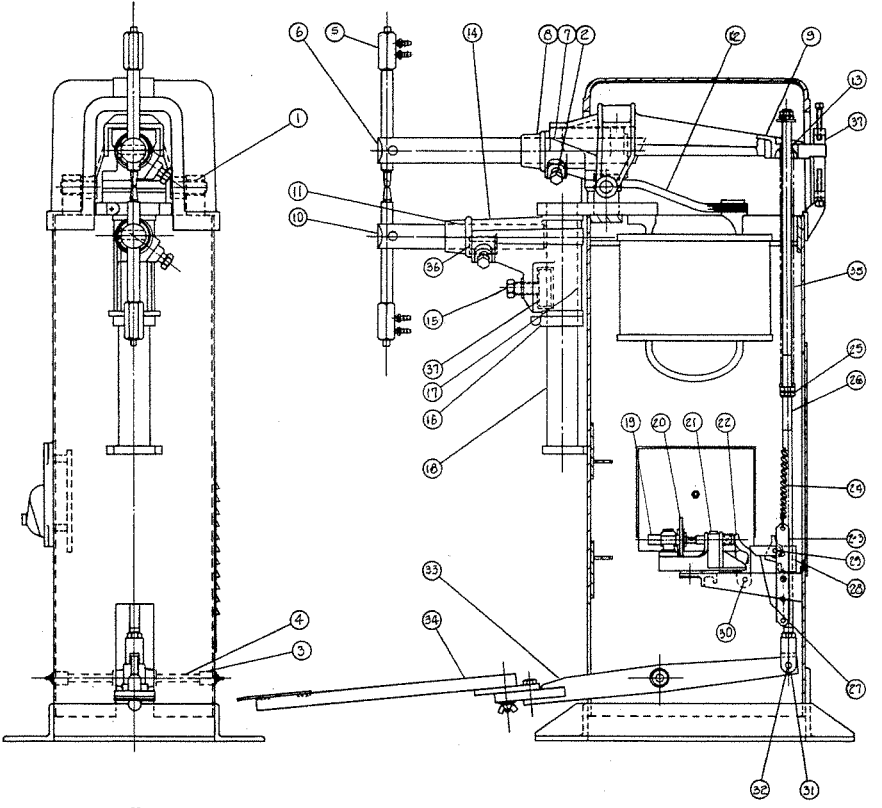
a. Upper horn holder socket (7).
b. Lower horn holder socket (11).
c. Column (18).
d. Lower horn holder swivel socket (17).
e. Those areas of the upper and lower horns (6) (10) that fit into the horn holder sockets.
f. Tip holder clamping sockets in the horns.
g. Barrels or bodies of tip holders (5).
h. Tip holder sockets.
i. Tapers on tips.

The above surfaces may be cleaned with kerosene. For good electrical contact, the surfaces should be cleaned with 180 grit, or finer, abrasive cloth. No appreciable amount of metal should be removed, but the contact surfaces should be cleaned bright.

3. CIRCUIT BREAKER

The roughened appearance of the contact surfaces of the circuit breaker disc (20) and plugs (19) is normal and is no indication that good contact is not being obtained. However, any little globules of copper that prevent the contacts from properly seating should be occasionally dressed off with a fine file.

When the circuit breaker is kept in proper adjustment and lubricated as described under LUBRICATION, very little maintenance is required.



FRONT Fig. 1 PHANTOM

MAINTENANCE AND REPAIR

ITEM NUMBER	PART NAME	ITEM NUMBER	PART NAME
1	Rocker arm bearings.	20	Circuit breaker disc.
2	Horn clamping screws.	21	Oil cup.
3	Treadle bearings.	22	Circuit breaker trip lever.
4	Treadle axle.	23	Hold down strap.
5	Tip holders.	24	Tension spring.
6	Upper horn.	25	Spring adjusting nut.
7	Upper horn socket.	26	Push rod.
8	Upper horn holder.	27	Circuit breaker trip.
9	Rocker arm.	28	Circuit breaker trip bracket.
10	Lower horn.	29	Circuit breaker trip pin
11	Lower horn socket.	30	Circuit breaker trip lever pin. in
12	Secondary laminations.	31	Clevis.
13	Push rod guide.	32	Clevis pin
14	Lower horn holder.	33	Treadle.
15	Swivel clamp screw.	34	Treadle rod
16	Column gauge.	35	Compression spring.
17	Swivel socket.	36	Horn clamping block.
18	Column.	37	Swivel clamping block.
19	Circuit breaker plugs.		

★ Refer to Fig. 3 Pg.11 for circuit breaker adjustment and complete list of parts.

OPERATING AND ADJUSTMENT INSTRUCTIONS FOR FOOT OPERATED ACME "Hot Spot" WELDERS

Refer to Figure 2, Page 7, for location of parts identified herein by numbers in parentheses.

I. INSTALLATION

A. Set the spot welder on a firm, level foundation and fasten it to the floor.

B. Connect water inlet (19) and water drain (20) and connect hoses to tip holders as shown in Fig. 2, Page 7.

C. Connect welder to electrical power and control supply, as shown in wiring diagram supplied with welder.

II. HORN AND ELECTRODE ADJUSTMENT

NOTE: While making adjustments, where it is unnecessary to get to the inside of the welder base, set the heat regulator (8) to the OFF position. This will prevent flow of current when the treadle foot plate (21) is depressed, which in turn brings the welding tips in contact with each other. Whenever making adjustments on the inside of the welder base, DISCONNECT THE MACHINE FROM THE POWER SUPPLY BY MOVING THE POWER SAFETY DISCONNECT SWITCH HANDLE TO THE OFF POSITION.

A. Insert the horns (4 & 5) in their holders, the longer horn in the upper horn holder (6) and the shorter horn in the lower horn holder(7). Either the vertical or angle end, as desired, may be employed.

B. Insert the tip holders (1) in the horns, and put the desired welding tips (2) in the holders, as follows:

Pull the adjustable water cooling tube (3) out, so that it extends just beyond the end of the tip holder to the extent that the welding tip forces the tube back when the tip is pressed into the tapered socket of the tip holder. This insures circulation of the cooling water to the extreme bottom of the cooling chamber in the welding tip.

Coating the tapered shank of the welding tip with a thin film of vaseline will prevent it from sticking or freezing in the holder socket, and will expedite removal of the tip when changing becomes necessary. With the ACME knock-out type water cooled tip holder, tip removal is especially convenient since all that is required is a blow with a light mallet on the hose attachment end of the holder.

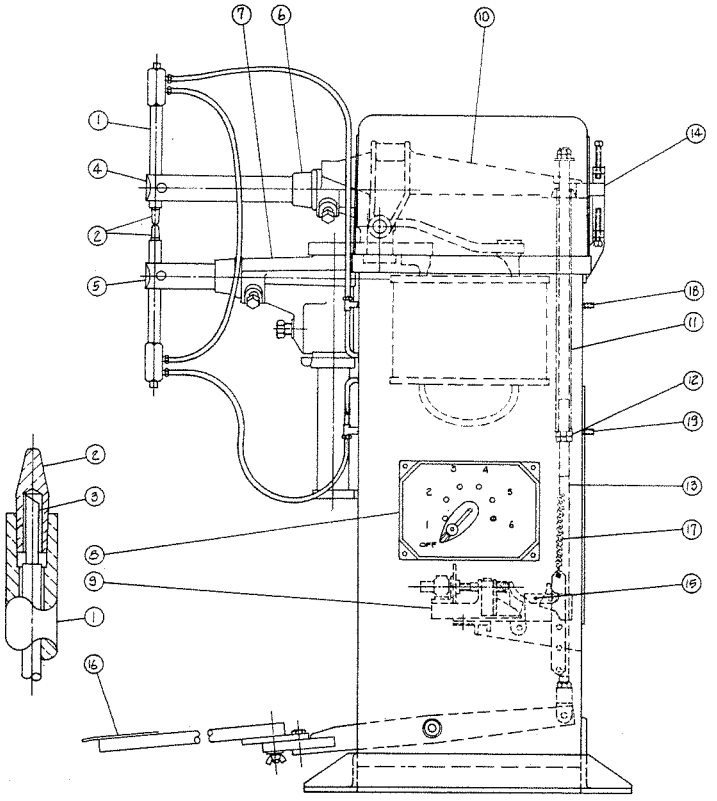


Fig. 2

OPERATING AND ADJUSTMENT

ITEM NUMBER	PART NAME	ITEM NUMBER	PART NAME
1	Tip holder.	11	Compression spring.
2	Welding tip.	12	Spring adjusting screw.
3	Water cooling tube.	13	Push rod.
4	Upper horn.	14	Stroke adjuster.
5	Lower horn.	15	Circuit breaker trip - used only on 40KVA and larger.
6	Upper horn holder.	16	Treadle foot plate.
7	Lower horn holder.	17	Tension spring.
8	Heat Regulator.	18	Water inlet.
9	Circuit breaker.	19	Water outlet.
10	Rocker arm.		

C. Adjust the lower swivel horn holder vertically to allow sufficient clearance for the parts being spot welded, keeping the horn spacing as close as possible. Adjust the lower swivel horn holder horizontally, and adjust the horns in their sockets so that the welding tips meet. (Keep the horns set well into their sockets to insure adequate bearing). The upper horn should always extend well into the rear portion of its holder bore, or beyond. Adjust the tip holders in the horn clamps so that the upper horn is in a horizontal position when the treadle is depressed, and the welding tips are on the material being welded. Tighten all clamping bolts securely.

III. PRESSURE ADJUSTMENT

Pressure is transmitted from the treadle to the rocker arm (11) through the push rod (16) and compression spring (12) located at the rear inside the welder base. To obtain greater pressure at the tips, the spring must be compressed, and to obtain lesser pressure the spring must be extended. This is accomplished by adjusting the collars (13&15) and adjusting nut (14) on the push rod, as follows:

A. To obtain greater pressure, loosen the set screw on the upper collar and turn the adjusting nut to compress the spring. (The nut can be turned on its threaded sleeve for approximately three inches). Tighten the set screw on the upper collar, loosen the set screw on the lower collar, and run the nut back on its sleeve. Slide the nut up against the upper collar, tighten the set screw on the lower collar, loosen the set screw on the upper collar, and proceed as before. When the desired extent of spring compression has been attained, be sure that the nut is tight against the upper collar, and that both set screws and set screw lock nuts are tight.

B. To obtain lesser welding tip pressure, loosen the set screw on the lower collar and slide the threaded sleeve and adjusting nut down on the connecting rod approximately two inches. Tighten the set screw on the lower collar, run the nut up against the upper collar, loosen the set screw on the upper collar, and run the nut down on the sleeve to allow the spring to extend. Tighten the set screw on the upper collar and repeat the procedure until the desired extent of spring extension has been attained. When completed, be sure that the nut is tight against the upper collar, and that both set screws and set screw lock nuts are tight.

IV. WELDING HEAT ADJUSTMENT

The welding current, or welding heat, is adjusted by means of the heat regulator (8) mounted on the side of the welder base. Position 1 gives the lowest heat, and position 2 gives

a higher heat, and so on upwards. On those machines equipped with two heat regulators, the "A" regulator supplies graduated heat adjustment through each of its steps on each of the settings of the "B" regulator.

The heat regulators are the positive locking type. For any heat setting, be sure that the handle locking pin is set into its proper locating hole.

V. WELDING TIME

On foot operated welders used without timer and magnetic contactor, the welding time is determined by the speed at which the treadle is pushed downward as far as it will go. Where a weld timer and contactor are used, the timer setting determines the length of "ON TIME" during which current flows. In such case, the treadle should be depressed rapidly to its extreme DOWN position, and released only after the magnetic contactor opens, which in turn shuts off the welding current.

When a weld timer and contactor is supplied by the factory along with the spot welder purchased, a limit switch is used in place of the standard circuit breaker. If the weld timer and contactor are purchased to be used on a foot operated spot welder already installed, the circuit breaker trip (22) must be adjusted to maintain full contact to the end of the treadle stroke.

VI. WELDING TIP SEPARATION

The welding tip separation, with the treadle released, should be as small as feasible and still allow the part to be welded to be placed in convenient welding position. The welding tip separation may be adjusted by setting the lower stop screw on the stroke adjuster (17) to the proper distance desired and securely fastening it in position with the lock nut.

NOTE:

The upper stop screw on the stroke adjuster is used to limit the final position of the upper tip on special spot welding applications, such as cross-wire welding when it is desired to control the extent of mash-down of the two wires. In such cases, it is necessary to adjust the circuit breaker so that the welding current is cut off before the rocker arm contacts the upper stop screw. FOR MOST SPOT WELDING JOBS, RUN THE UPPER STOP SCREW ALL THE WAY UP TO INSURE THAT THE ROCKER ARM DOES NOT CONTACT IT.

VII. COOLING WATER ADJUSTMENT

The welding tip cooling water control valve (10) should be adjusted to give a flow rate of one to two gallons per minute. For economy, the water should be shut off when the machine is not in use for any appreciable length of time.

If a shut-off valve is employed in the water pipe line ahead of the water control valve on the welder, the control valve, once set, need rarely be disturbed, thus insuring proper water flow at all times. The pipe line shut-off water valve will then be used in either fully open, or closed position.

A good rule of thumb measurement is that when feeling welding tips immediately after welding, if they are hand cool, sufficient water is being supplied, and if the tips are hot, insufficient water is being supplied.

Foot operated welders of 40 KVA and larger have water cooled transformers. The transformer cooling water control valve (18) should be adjusted to give a flow rate of one to two gallons per minute, according to the heat regulator setting and speed of welding.

VIII. CIRCUIT BREAKER ADJUSTMENT

The circuit breaker assembly (9) in the spot welder is properly adjusted at the factory, and ordinarily does not require further adjustment at the time of installation of the welder. However, after usage, servicing may be required and the circuit breaker may be adjusted as described hereunder.

CIRCUIT BREAKER ADJUSTMENT

When the circuit breaker is in the off position, that is, with the foot pedal not depressed, the end of the slide plunger (5) should be flush with the circuit breaker frame (11) at (A). This adjustment is made with the setscrew (D) at the bottom of trip lever (3). Circuit breaker disc shaft (6) should be adjusted by screwing it in or out of slide plunger (5) until the distance between the locknut (13) and the circuit breaker disc bushing (7) is ¾". (Be sure that locknut (13) is jammed tight). Contact plugs (10) should now be adjusted in their holders (9) so that a gap of approximately ¼" exists between the plug faces and the circuit breaker disc (8). Depress the foot pedal until the welding tips meet (adjust tip holders so that horns are parallel) and the push rod (1) protrudes ¾" through the push rod guide in the rocker arm (see items 9 and 13, Fig. 1, page 5). The top face of the trip (2) should now be about ⅛" below the top edge of the trip lever (3) as shown at (B). Adjust the trip bracket (17) on the push rod (1) until this condition is met, and check the gap between the disc bushing (7) and the head of the disc shaft (6) as shown as (C). This gap should be approximately 3/16", and can be set by sliding frame (11) backward or forward on bracket (15).

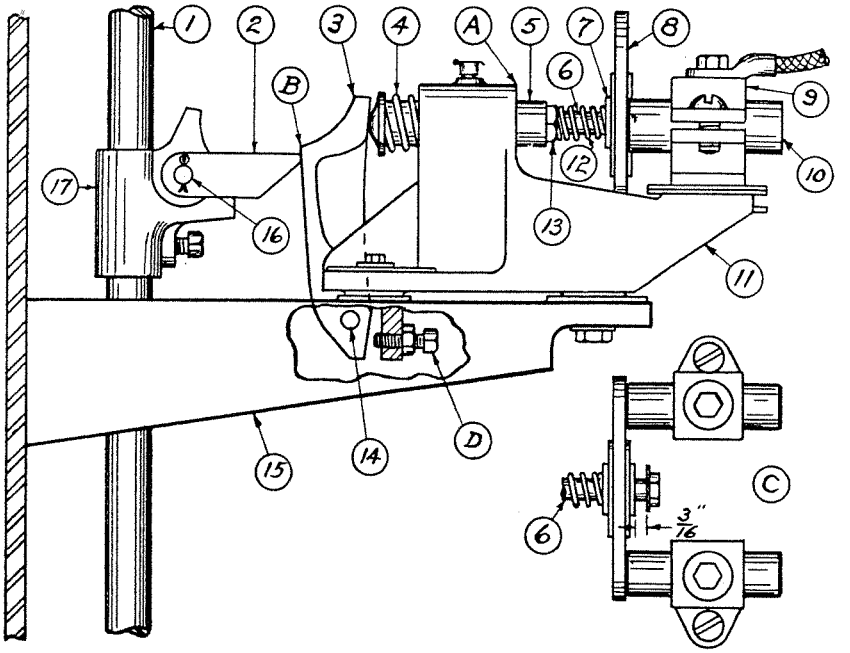
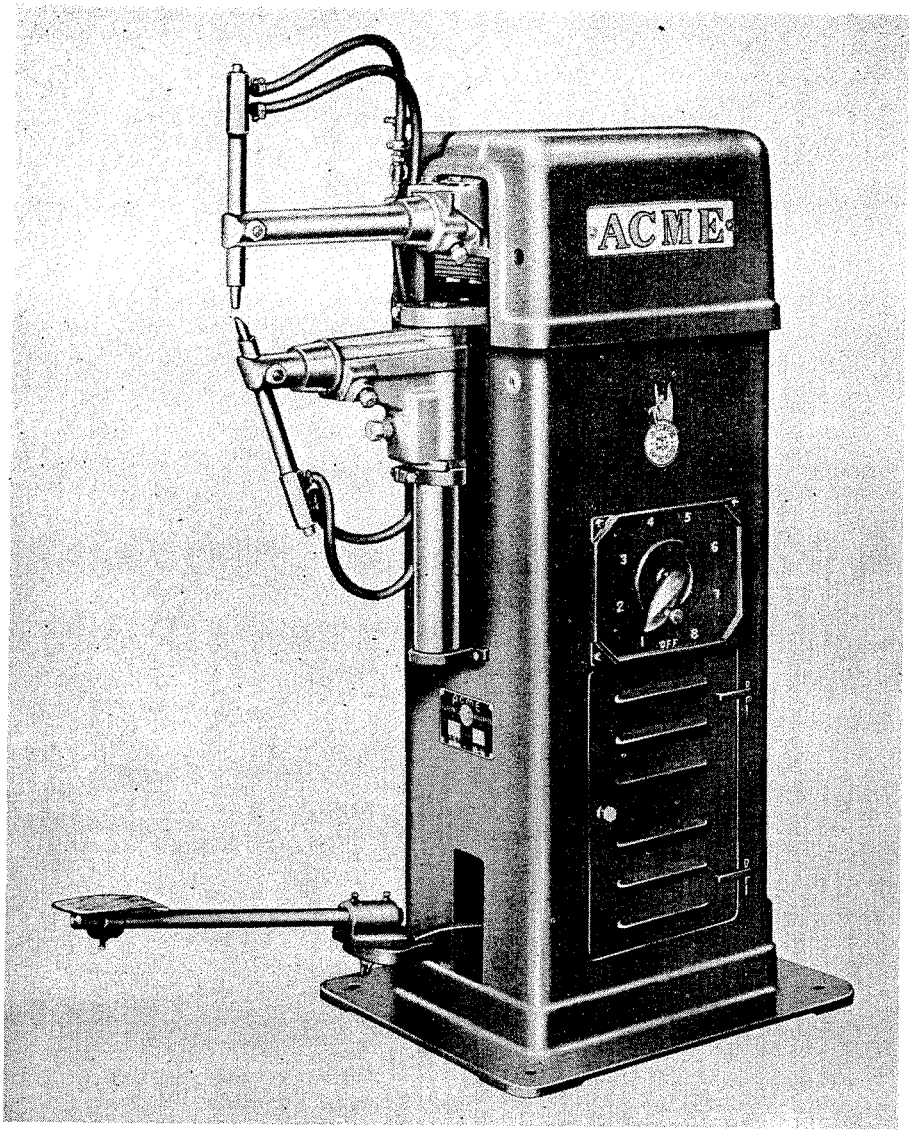


Fig. 3

CIRCUIT BREAKER

ITEM NUMBER	PART NAME	PART NUMBER
1	Push rod	
2	Circuit breaker trip	M117
3	Circuit breaker trip lever	313
4	Circuit breaker slide plunger spring	329
5	Circuit breaker slide plunger	322
6	Circuit breaker disc shaft	331
7	Circuit breaker disc bushing	332
8	Circuit breaker disc	317
9	Circuit breaker plug holder	315
10	Circuit breaker plug	316
11	Circuit breaker frame	314
12	Circuit breaker disc spring	330
13	Circuit breaker disc shaft lock nut	323
14	Circuit breaker trip lever pin	334
15	Circuit breaker bracket	312
16	Circuit breaker trip pin	118
17	Circuit breaker trip bracket	M115A

WHEN ORDERING REPLACEMENT PARTS, SPECIFY ITEM NUMBER, PART NAME, PART NUMBER (WHEN GIVEN), TYPE NUMBER AND SERIAL NUMBER OF WELDER.



TYPE 2

FOOT OPERATED

ACME "Hot Spot" WELDER

Note

WHEN ORDERING REPLACEMENT PARTS ALWAYS SPECIFY TYPE NUMBER AND SERIAL NUMBER OF WELDER, ITEM NUMBER, PART NAME, AND PART NUMBER (WHEN GIVEN).