WAVEGUIDE

KS-20001 FLANGING KIT

FIELD FLANGING OF RECTANGULAR WAVEGUIDE SECTIONS

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1. GENERAL

1.01 This section describes the KS-20001 Flanging Kit and gives procedures for its use at microwave installations where it is necessary to modify the length of a section of the WR-90, WR-137, WR-159, or WR-229 size of LRM-244 rectangular, copper waveguide.

1.02 Flanges are applied to a waveguide section by cutting the waveguide to the required length, squaring the cut end, and then soldering the butt-type waveguide flange to the cut end. To ensure an acceptable flanging job it is important that this work be performed by a proficient person who is thoroughly familiar with the procedures covered in this practice as well as the instructions furnished with the kit.

1.03 ***Only one field applied flange shall be permitted on each of the indoor and outdoor waveguide runs.*** A field flange in an outdoor vertical run must be installed at the lowest point of the run.

2. DESCRIPTION

2.01 The KS-20001 Flanging Kit consists of fixtures, tools, and accessory items stored in two metal tool boxes. A padlock and keys are furnished with each tool box.

2.02 A miter box equipped with a hacksaw and hacksaw guides is a part of the kit and is used for cutting the waveguide relatively square to the waveguide axis. Hacksaw blades with 32 teeth-per-inch are furnished for this operation. Do not use any coarser hacksaw blade.

2.03 The rotary file assembly which is a part of the kit is used to accurately finish the end surface of the waveguide square with its axis.

2.04 A spring-loaded plier with a bead chain assembly is furnished to hold the special butt-type flange in place for soldering. These flanges are not furnished as a part of the kit and must be ordered as required in accordance with the applicable flange drawing numbers given in the following list:

WAVEGUIDE SIZE	FLANGE DRAWING NUMBERS	
	UNPRESSURIZED (INDOOR)	PRESSURIZED (OUTDOOR)
WR90	P49N879	P49N878
WR159	P49N880	P49N877
WR229	P49N881	P49N876

2.05 Two clamps are furnished to hold the waveguide for soldering.

2.06 A hand-operated air pump with pressure gauge, a flange end plate assembly, and a valve plate assembly are furnished for leak testing reflanged pressurized sections.

2.07 Special flux, WECO Spec. 50187 Designation S10, and solder, WECO Spec. 50187 per 58356 Alloy No. 108, are provided. Replacements

may be obtained locally if they meet the following composition requirements:

(a) Flux (composition by weight)

100 parts zinc chloride

10 parts ammonium choloride

30 parts concentrated hydrochloric acid

130 parts water

(b) Solder (composition by weight)

95 percent tin

3-1/2 percent silver

1 percent cadmium

2.08 Replaceable items required as part of the kit which must be obtained locally are:

(a) Propane cylinder (BERNZ-O-MATIC TX-9 or similar)

(b) A standard 10-quart pail or similar water container having a 10-inch depth

(c) Scott wipers, brand 590 (9-3/8 by 13-5/8 inches)

(d) Fine grit emery cloth

(e) Sodium bicarbonate.

2.09 The two tool boxes, including the items they contain, are identified as: Box 1, Flanging Kit, Fixtures, B-997450; Box 2, Flanging Kit, Tools, B-997451. The major components of the kit that are contained in each tool box are illustrated in Fig. 1 and 2.

3. PRECAUTIONS

3.01 The special flux used in the soldering operation is highly acidic. Use eyeshield when handling or applying the flux and when soldering. If flux should contact the skin, immediately rinse the area with a sodium bicarbonate solution or thoroughly flush the area with clean, cool water.

3.02 Since an open flame is used in the soldering operation, remove all flammable materials from the work area and make sure the atmosphere is nonexplosive.

3.03 Do not store propane cylinders in the tool boxes with other flanging kit tools. Propane cylinders should be stored in accordance with procedures for storing flammable materials.

4. FLANGING PROCEDURE

PREPARATION

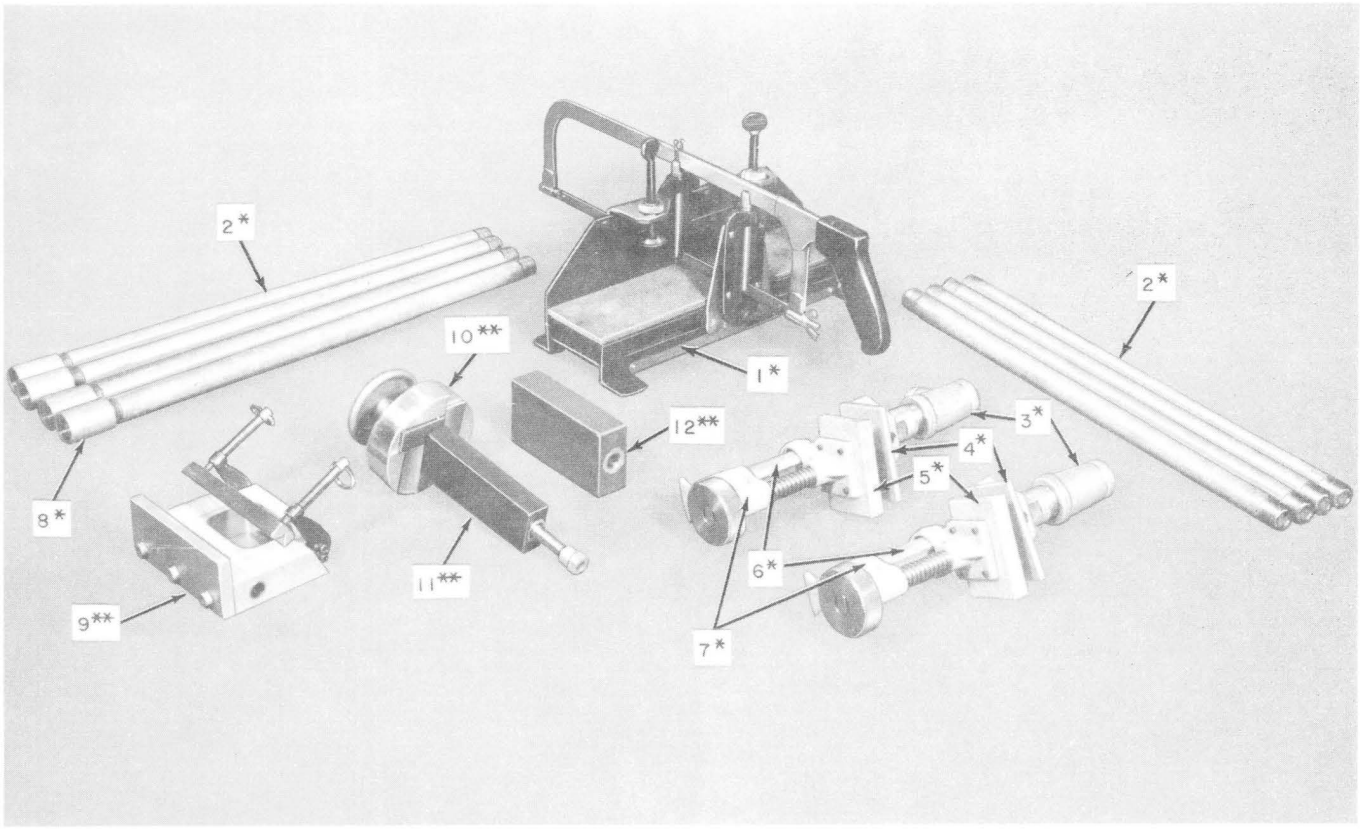
4.01 Determine the required overall length (including the factory flange) of the section to be modified and mark where the cut is to be made. On pressurized WR-159 and WR-229 waveguides, the section should be cut 1/8-inch shorter than the overall length. On WR-90 waveguides, the section should be cut 1/16-inch shorter than the overall length. The waveguide is cut shorter than the overall length to allow for the step in the field flange. On WR-137 or other nonstandard waveguide, the allowance must be determined by measuring the height of the step in the flange.

4.02 Before proceeding further examine the waveguide section for defects. Do not use waveguide having dents, twists, internal irregularities, bends, or any other signs of damage or defects.

4.03 If the waveguide section is painted, use fine grit emery cloth to remove all paint that is within six inches of the new joint.

CUTTING AND FILING

4.04 If the finished length of the waveguide section is to be less than 6-3/8 inches, it will be necessary to place 3/4-inch thick spacers of wood or other suitable material beneath the waveguide and also between the waveguide and the rear wall of the miter box to provide clearance for the flange so an accurate cut can be made. If the finished length of the waveguide section is to be greater than 6-3/8 inches but the cut is to be made within 6-3/8 inches of the existing flange, either remove the flange to enable the waveguide section to fit properly into the miter box or use the 3/4-inch thick spacers. To remove the flange, apply heat or remove the flange by making a rough cut between the flange and the proposed



1* - B-998314 MITER BOX
2* - 1/2-IN. IPS GALV. STL. PIPE 18 IN. LONG
3* - REDUCING TEE 3/4-IN. X 1/2-IN. X 1/2-IN.
4* - B-997075 ANGLE CLAMP
5* - B-997074 PLATE CLAMP
6* - 3/4-IN. IPS GALV. STL NIPPLE 9-IN. LONG
7* - B-997078 CLAMP
8* - 1/2-IN. IPS GALV. STL. PIPE COUPLING
9** - B-999250 ROTARY FILE GUIDE CLAMP
10** - B-998290 ROTARY FILE ASSEMBLY
11** - B-998301 MANDREL
12** - B-998300 MANDREL

*PART OF B-997079 CLAMP ASSEMBLY
**PART OF B-998347 BOX ROTARY FILES

Fig. 1—Major Components of B-997450 Flanging Kit, Fixtures—Box 1 of KS-20001 Flanging Kit

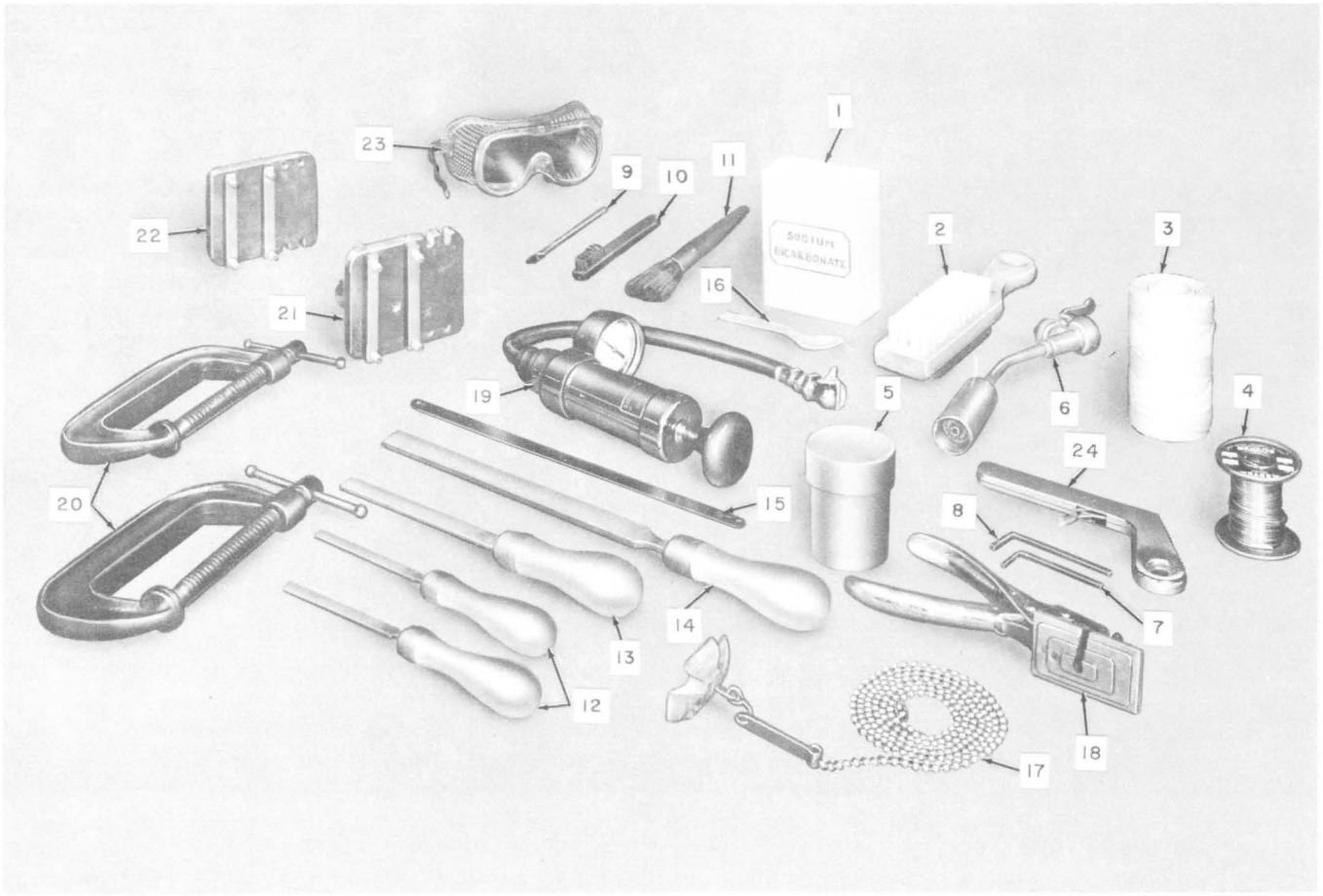
finish cut. In some cases, it may be helpful to interchange the last two sections in the run to obtain a section that can be more conveniently modified.

4.05 Place the waveguide section into the miter box and align the cutting mark. Position the miter box clamps so they will bear on the edge of the waveguide and ***hand*** tighten the clamps. Attach the hacksaw to the miter box (Fig. 3) by placing the two cylindrical saw guides into the sockets. The hacksaw blade must have 32 teeth-per-inch with no missing or damaged teeth.

Caution: Overtightening the miter box clamps will damage the waveguide section.

4.06 Cut through the waveguide section using gentle, even strokes of the hacksaw. When the cut has been completed, remove the hacksaw from the miter box, loosen the miter box clamps, and reposition the waveguide section so the cut end extends about three inches beyond the end of the miter box (Fig. 4) to allow using the rotary file. Retighten the miter box clamps, hand tight.

4.07 Choose the proper size mandrel for the WR-229 or the WR-159 Waveguide, secure



1- SODIUM BICARBONATE
2- FILE CARD AND BRUSH
3- LACING TWINE
4- SOLDER
5- FLUX
6- PUSH BUTTON TORCH
7- 3/32-IN ALLEN WRENCH
8- 1/8-IN ALLEN WRENCH
9- TIN FERRULE ACID BRUSH
10- TYPEWRITER BRUSH
11- SASH BRUSH
12- FILE, PILLAR, 4-IN., CUT NO. 6, WITH HANDLE
13- FILE, HAND, 6-IN., CUT NO. 6, WITH HANDLE
14- FILE, PILLAR, 10 IN., CUT NO. 0, WITH HANDLE
15- HACKSAW BLADES, 10-IN., 32 TEETH
16- MEASURING SPOON
17- B-997020 PLATE AND CHAIN ASSEMBLY
18- B-997081 TENSIONER, INDEX PLATE
19- B-997007 PUMP ASSEMBLY
20- C CLAMP, 6-IN.
21- B-997018 VALVE PLATE ASSEMBLY
22- B-997015 END PLATE ASSEMBLY
23- SAFETY GOGGLES, PLASTIC
24- TORCH LIGHTER

Fig. 2—Major Components of B-997451 Flanging Kit, Tools—Box 2 of KS-20001 Flanging Kit

the rotary file shaft in the mandrel, and insert the mandrel into the waveguide end as shown in Fig. 5. For WR-137 or WR-90 Waveguide, insert the rotary file shaft through the alignment hole in the guide clamp fixture (Fig. 6) and clamp the waveguide as shown in Fig. 7. Hand tighten only. Press the file head firmly against the waveguide and rotate the file clockwise until it is observed that the file is removing material from the entire end surface of the waveguide. Remove the rotary file assembly. Examine the entire surface of the filed end to ensure it has been milled smooth. Repeat the filing operation if necessary.

4.08 Use either the 4-inch or 6-inch, cut No. 6, pillar file to remove the burr on the inside

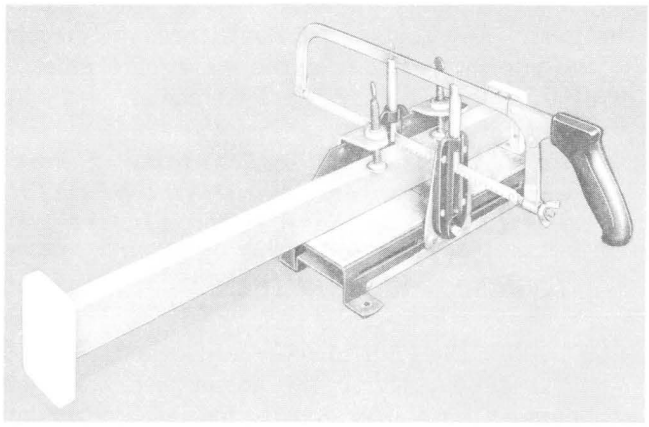


Fig. 3—Waveguide Section Clamped in Position with Hacksaw Assembled

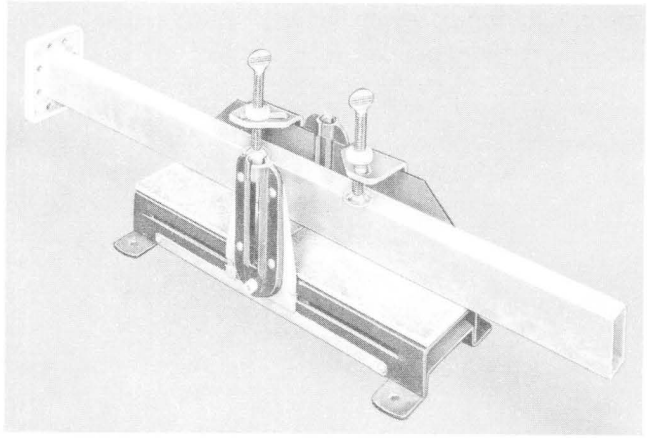


Fig. 4—Waveguide Section Positioned for Filing

edges. Hold the file flat on the work surface and at a slight angle (approximately 10 degrees) with respect to the inside surface of the waveguide (Fig. 8). The inside edge may be very slightly chamfered but should not be rounded as a result of filing. Deburr the outside edges using the same method.

> ***Caution: Use gentle strokes when filing the inside edges to avoid damaging the inside of the waveguide by gouging with the file.***

4.09 Fit the proper size field flange on the prepared end of the waveguide. If the flange will not fit or if force is required, the outside corners of waveguide should be slightly rounded by filing with the 10-inch file as shown in Fig. 9. Round the corners for a distance of 1/2 inch from the end of the waveguide removing only enough material to allow the flange to be easily seated.

4.10 Carefully use abrasive cloth to remove all oxidation from the waveguide in the area where solder will be applied.

SOLDERING

4.11 Assemble the components of the clamp assembly, as required, to support the waveguide section at a convenient working height. Two methods of supporting waveguide sections in the clamp assemblies are shown in Fig. 10 and 11. The threaded pipe connections should be only hand tight.

4.12 Place the bead chain through the waveguide section with the hook at the end to be reflanged and secure the waveguide with the clamp assembly. Using the acid brush, apply the special flux to the waveguide and flange surfaces to be soldered.

4.13 Place the flange on the waveguide and fasten the index plate to the hook on the bead chain (Fig. 12). Seat the flange squarely on the end of the waveguide and seat the index plate in the flange. Pull the chain tight from the opposite end of the waveguide section and, while maintaining tension on the chain, place the plier tensioner on the factory flange, squeeze the plier handles together, and engage the bead chain (Fig. 13). Release the plier handles and check that the tension on the bead chain is sufficient to hold the field flange firmly in place.

4.14 Center the field flange on the waveguide, by adjusting its position so the gaps between the flange and the sides of the waveguide appear to be equal on opposite sides.

4.15 Apply additional flux to the joint before soldering. To solder, use the torch to apply heat to the flange but not to the waveguide. Heat will be transmitted to the waveguide from the flange. Check frequently with a piece of solder to determine when soldering temperature has been reached. DO NOT OVERHEAT. When soldering temperature is reached, apply the special solder to the joint. The solder must fill all voids. Apply

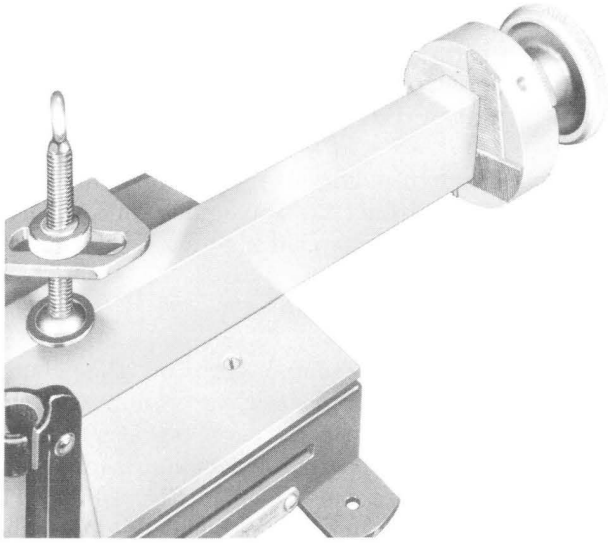


Fig. 5—Rotary File Assembly Inserted in Waveguide End

only enough solder to form a small fillet around the joint. Any solder that flows through the joint to the interior surfaces of the waveguide must be carefully removed after the joint cools.

Caution: The solder contains a small amount of cadmium. DO NOT BREATHE FUMES. USE WITH ADEQUATE VENTILATION. AVOID USE IN CONFINED, UNVENTILATED PLACES.

4.16 Allow the joint to cool undisturbed. ***Do not quench.*** After the solder has solidified, cooling may be accelerated by placing a wet cloth around the waveguide 2 or 3 inches from the flange.

4.17 Examine the inside of the joint and inside surfaces of the waveguide. The inner surfaces must be free of any solder fillets in the corners or any solder accumulation along the waveguide flange seam. Using a cut No. 0 safe-edge

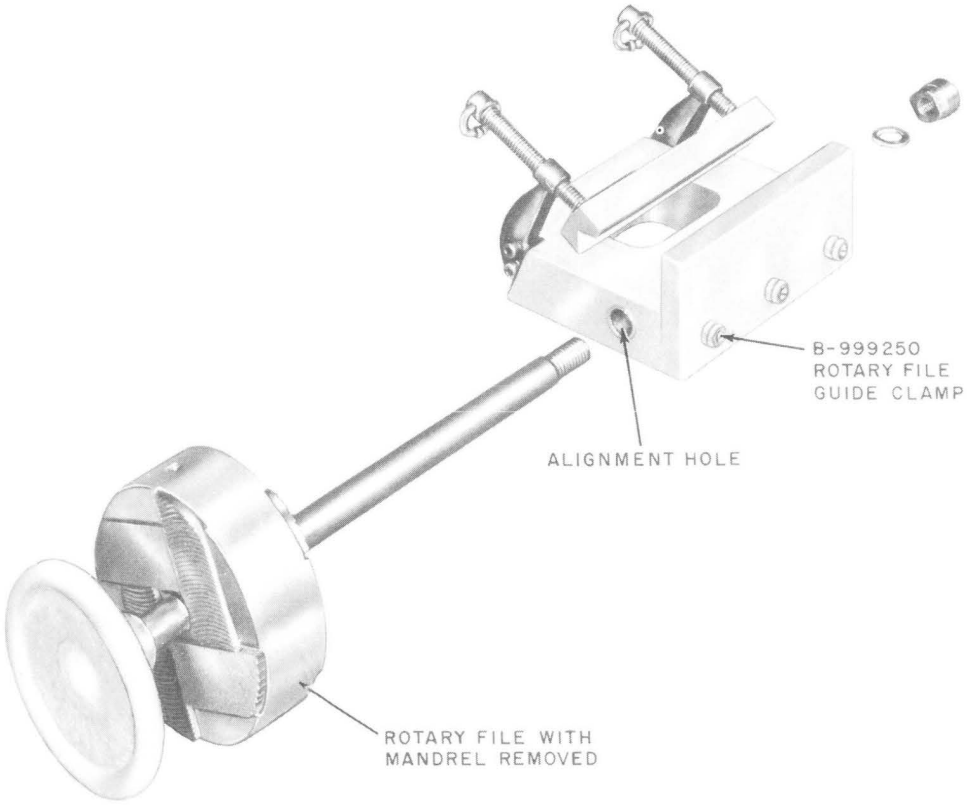


Fig. 6—Preparation for Filing WR-137 or WR-90 Waveguide

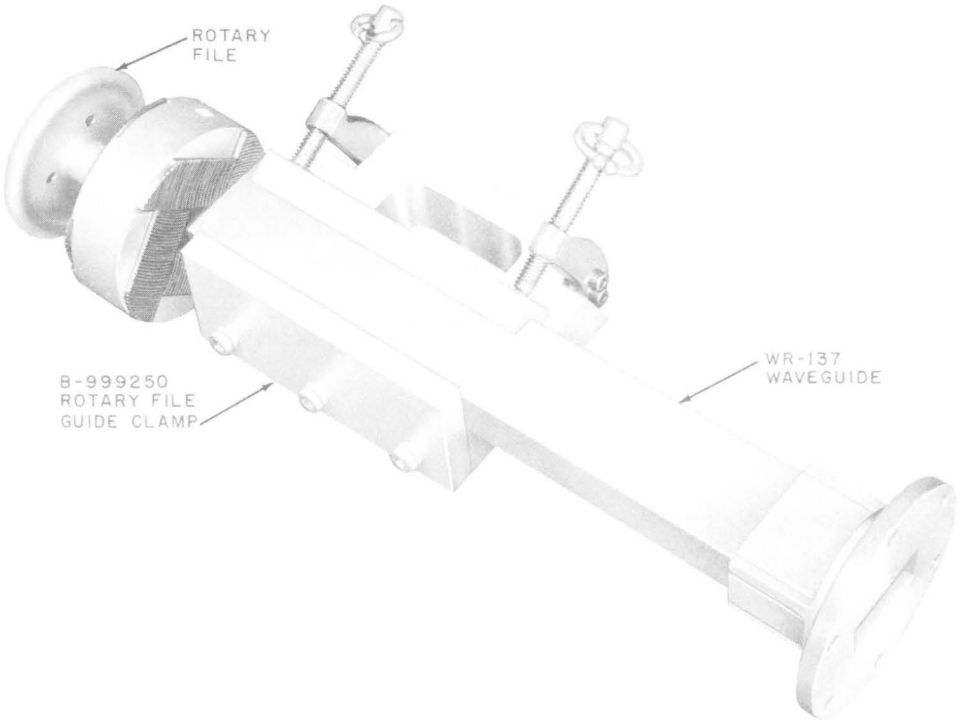


Fig. 7—WR-137 Waveguide Positioned for Filing

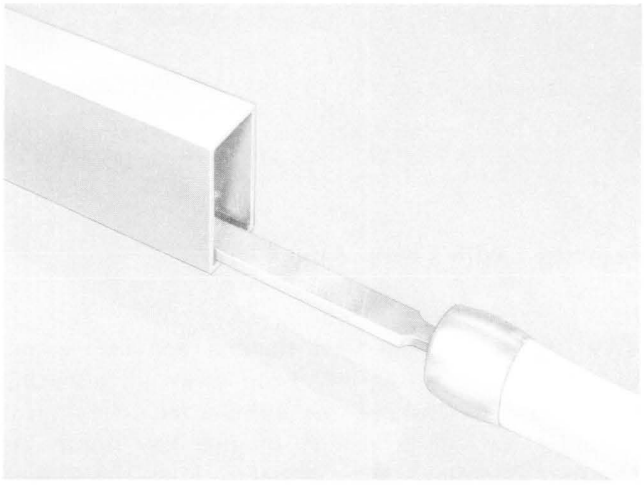


Fig. 8—Deburring Inside Edge of Waveguide

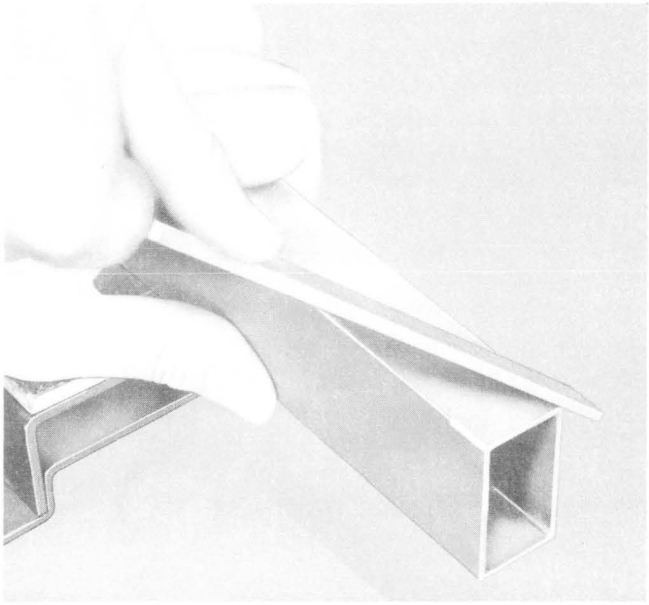


Fig. 9—Rounding Outside Corners of Waveguide

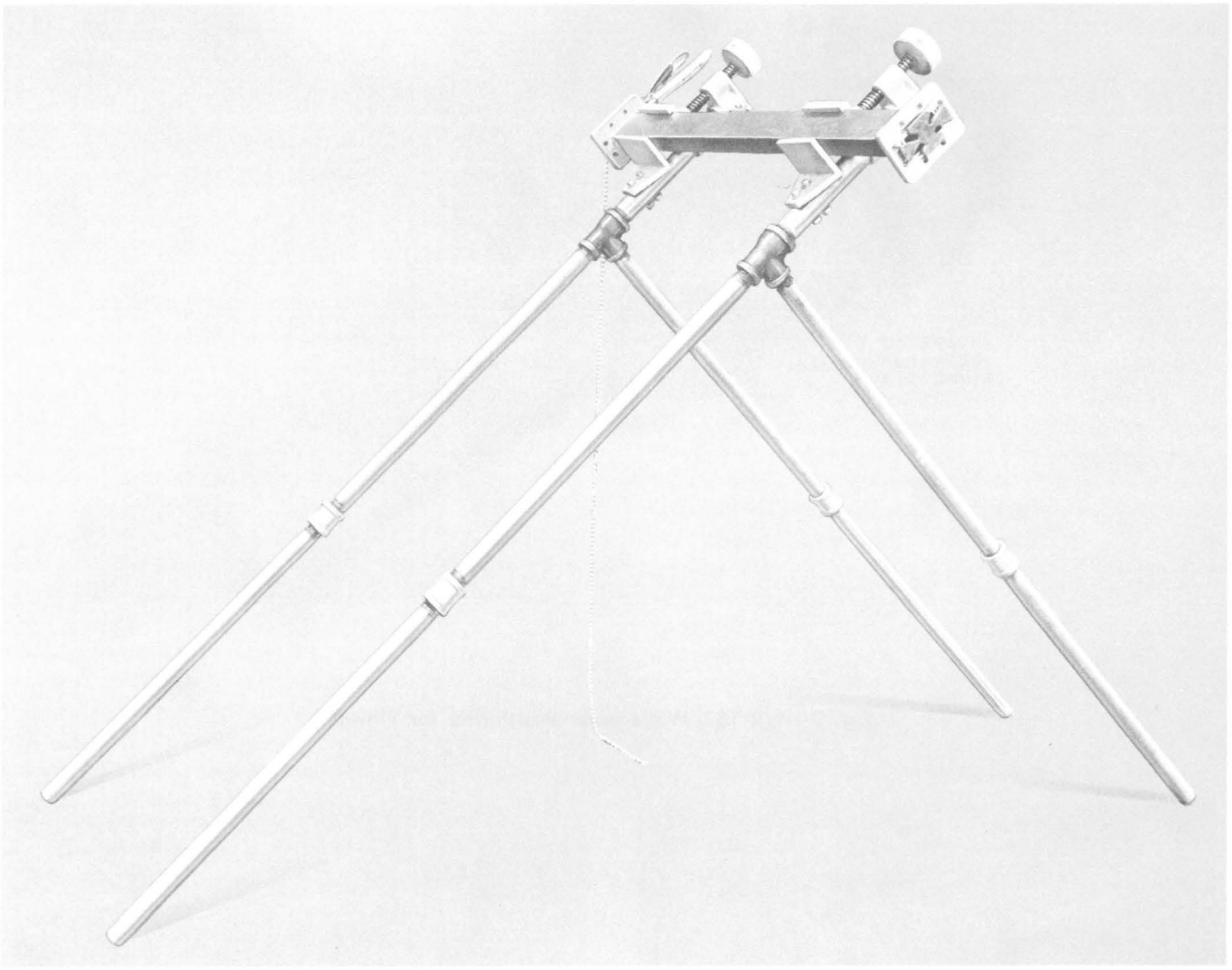


Fig. 10—Method of Supporting Waveguide Section with Clamp Assemblies

file, remove any solder buildup from the inside of the waveguide so the inner surfaces will be smooth, square, and uniform.

TESTING FOR PRESSURE TIGHTNESS

4.18 Field flanged sections of pressurized waveguide shall be tested for pressure tightness. Assemble the valve plate assembly to the factory flange and the end plate assembly to the field flange. Attach the hand pump to the air valve and charge the waveguide section to 15 psi. Leave the pump attached to provide a means of determining air pressure in the waveguide section.

4.19 Submerge the field flanged end into a pail of clear water and wipe away all adhering air bubbles. Observe the submerged section for escaping air for a period of not less than one minute. If no leakage is detected, keep the section submerged for at least ten minutes. Recharge the section, if necessary, and again observe for at least one minute. If no leakage is detected, the section may be considered to be airtight. If leakage is detected the flange must be resoldered repeating procedures in 4.13 through 4.19.

NEUTRALIZING ACID FLUX

4.20 The acid flux used in the soldering operation shall be neutralized after cooling but within

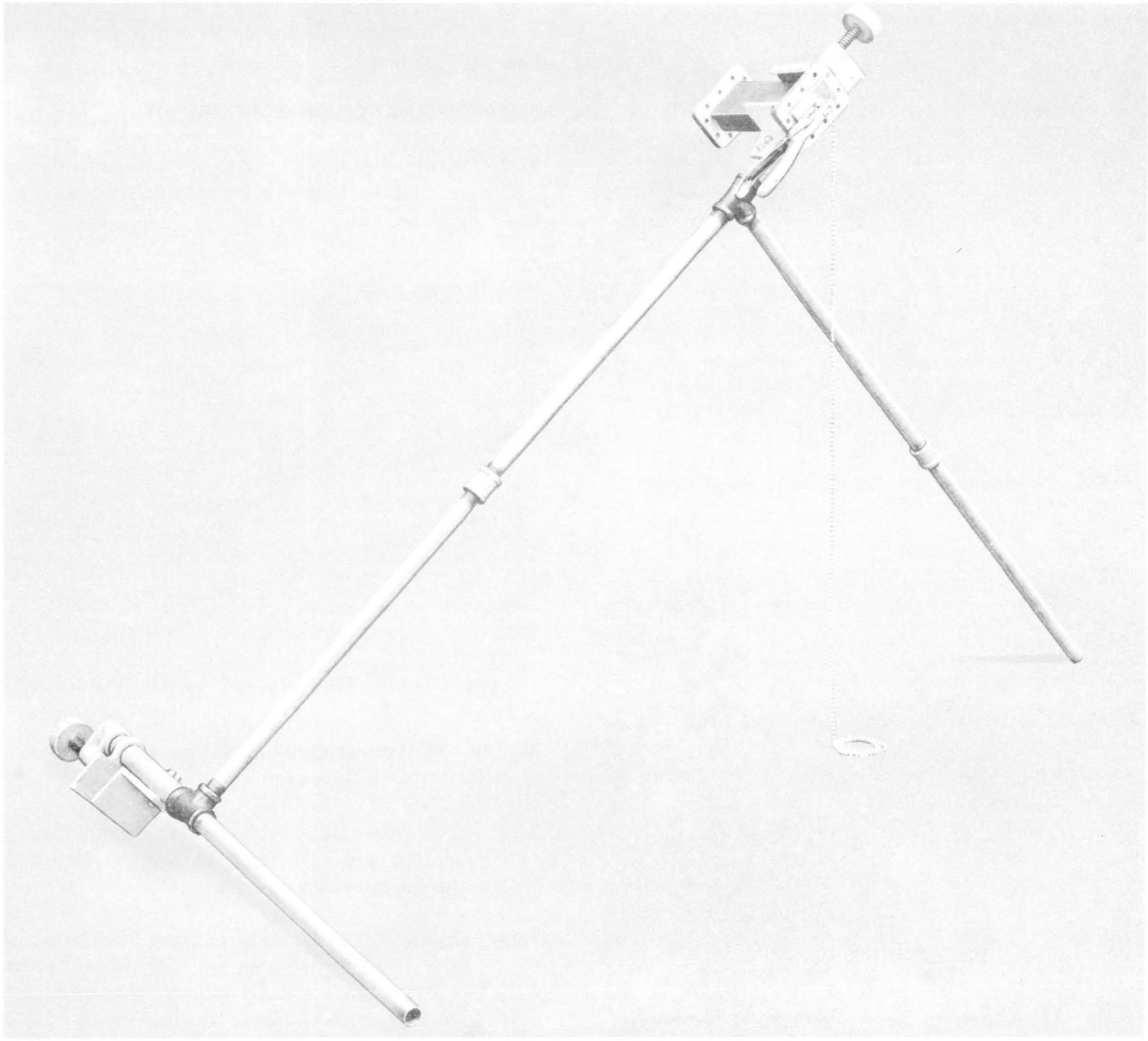


Fig. 11—Method of Supporting Short Section of Waveguide with Clamp Assemblies

one hour following the soldering operation. Prepare a solution of two heaping tablespoons of sodium bicarbonate per gallon of clean, cool water in a pail or similar water container.

4.21 Submerge the reflanged end of the waveguide section into the solution to a minimum depth of 6 inches. Scrub the inside and outside of the waveguide section in the area of soldered joint using the stiff bristled brush. Allow the waveguide section to soak in the solution for 10 minutes. Agitate periodically.

4.22 Remove the waveguide section from the neutralizing solution and rinse in clean, cool water. Wipe dry.

CLEANING WAVEGUIDE

4.23 Pass the bead chain through the waveguide section so the hook is at the factory flange

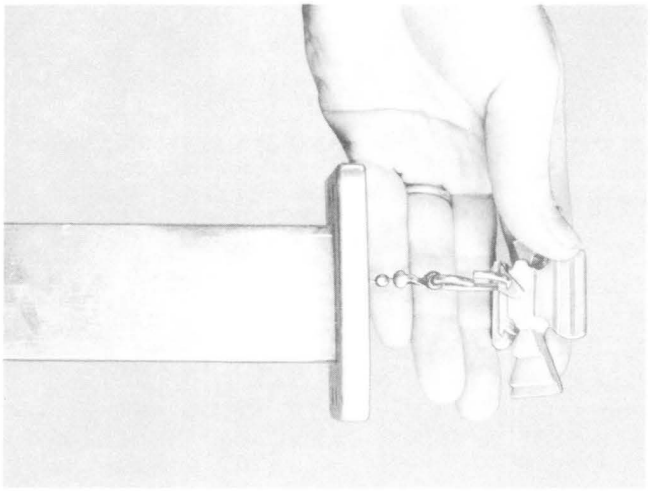


Fig. 12—Index Plate Attached to Bead Chain

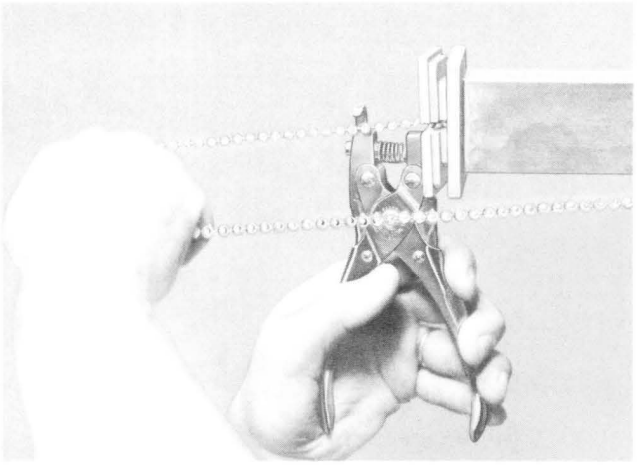


Fig. 13—Engaging Bead Chain with Tensioner

end. Loop the chain around one or more paper wipers (Fig. 14) and pull the wipers through the waveguide. Repeat the operation until the inside of the waveguide is clean.

4.24 Place protective covers on the flanges if the section will not be promptly installed in the waveguide run.

5. MAINTENANCE OF FLANGING KIT

5.01 Scrub the index plate in the neutralizing solution to remove all traces of flux residue, rinse in clean water, and dry.

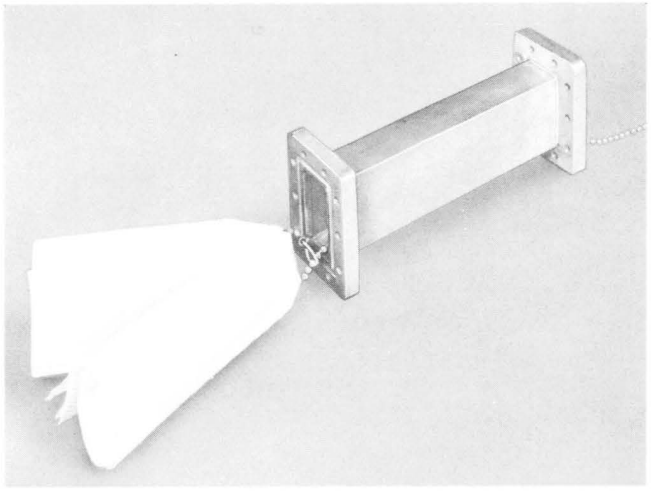


Fig. 14—Method of Cleaning Inside of Waveguide

5.02 Rinse the flux brush in the neutralizing solution and then in clean water. Dry and replace in the polyethylene bag.

5.03 Replace all tools, fixtures, and equipment in their proper places in the tool boxes when work has been completed. Be sure the flux container is in an upright position and the ***cap is tight.***

5.04 Inventory all expendable equipment and, when necessary, reorder to ensure adequate supplies for future operations. Refer to the charts on the inside of the tool box covers for inventory lists.