

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

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SEALING DUCTS

SPLIT RUBBER CONDUIT PLUGS

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1. GENERAL

1.01 This section describes a series of Split Rubber Conduit Plugs for use in sealing round or square bore ducts occupied by cables. Other methods of sealing occupied ducts are described in related sections.

1.02 The information in this section is a revision of a portion of G55.150 primarily to include a series of round split rubber plugs and to add a square split plug for sealing alpeh or other types of cables up to about 2-13/16 inches in diameter.

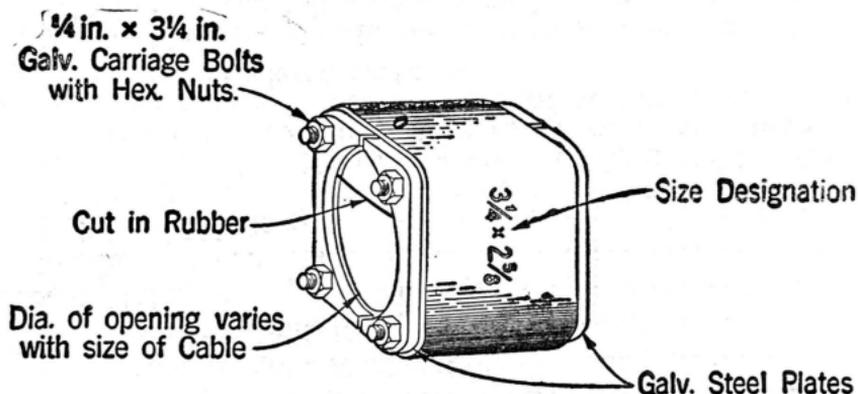
2. DESCRIPTION AND USE

2.01 In the Split Rubber Conduit Plug, the rubber portion of the plug is molded to fit around cables of varying diameters. The plug has a diagonal cut in one wall to allow it to be placed over the cable and is furnished with sectional plates shaped to conform to that of the plug. Compression of the rubber is accomplished by means of four 1/4-inch carriage bolts which extend through the plates and the rubber portion of the plug, as illustrated. Split Rubber Conduit Plugs are available in the square type for all sizes of cables and in the round type for all situations where approximately 1/2 inch or more annular space remains between the cable and the duct wall. Individual parts of all plugs can be obtained for replacement purposes.

2.02 Plug sizes are designated by duct dimension and the nominal diameter of the largest cable for which the plug is designed. Each plug is adaptable to a range of cable sizes, as indicated in the tables following. The plugs possess sufficient flexibility to permit some overlap of ranges so that a plug designed for a certain range of cable diameters frequently can be used on the larger cables of the next lower range and on the smaller cables of the next higher range. As an example of the way in which this flexibility can be used to advantage, if difficulty is encountered in obtaining a seal with the plug of indicated size, try the next smaller size to make use of the increased expansion provided by the heavier wall thickness.

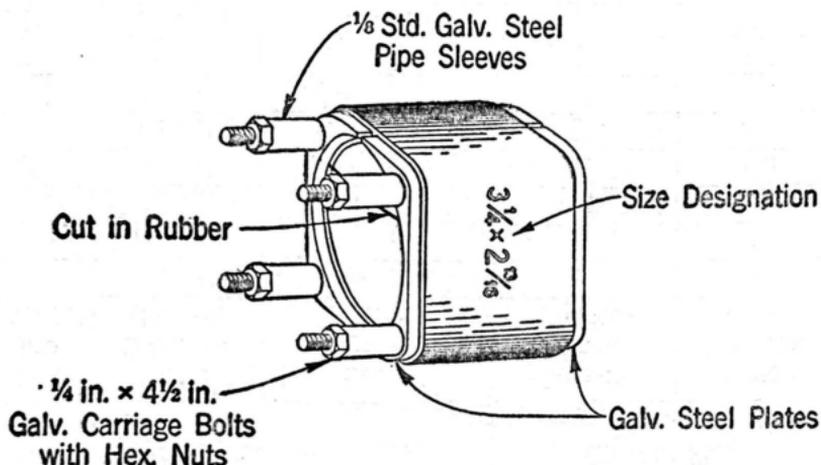
Square Split Rubber Conduit Plugs

2.03 The plug illustrated below is for use in sealing all sizes of cables up to and including full size lead sheath cable in 3-1/4-inch square bore conduit and oversize lead sheath cable in 4-1/4-inch square bore conduit.



Square Bore Duct and Cable Size			Conduit Plug Size	
Duct Size (Inches)	Cable Diameter (Inches)	Cable Circumference (Inches)	Outside Dimension (Inches)	Hole Diameter (Inches)
3/4	1/2 - 1 1/16	1 9/16 - 3 5/16	3/4	1 1/16
3/4	1 1/8 - 1 5/8	3 3/8 - 5 1/16	3/4	1 5/8
3/4	1 11/16 - 2 1/16	5 1/8 - 6 7/16	3/4	2 1/16
3/4	2 1/8 - 2 13/32	6 1/2 - 7 9/16	3/4	2 13/32
3/4	2 7/16 - 2 5/8	7 5/8 - 8 1/4	3/4	2 5/8
4 1/4	2 7/16 - 2 5/8	7 5/8 - 8 1/4	4 1/4	2 5/8
4 1/4	3 3/8	9 13/16	4 1/4	3 3/8

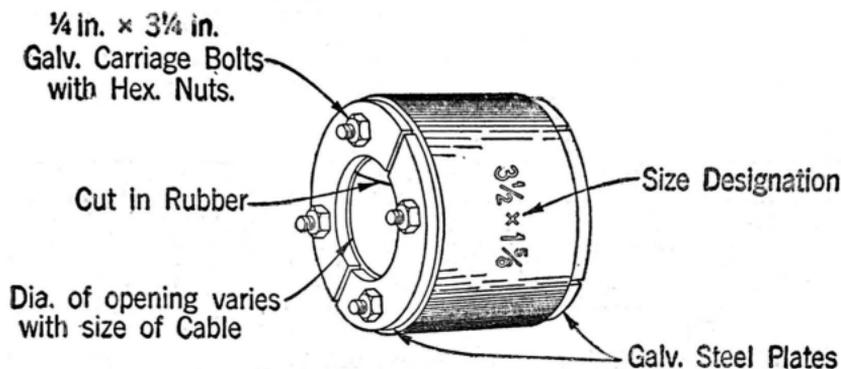
2.04 In sealing 3-1/4-inch square bore conduit containing full size alpeth or other polyethylene sheath cable, a plug of the following type is required. The restricted space between such cable and the duct wall requires the use of elongated bolts with pipe spacers to make the nuts accessible to the split conduit plug wrench.



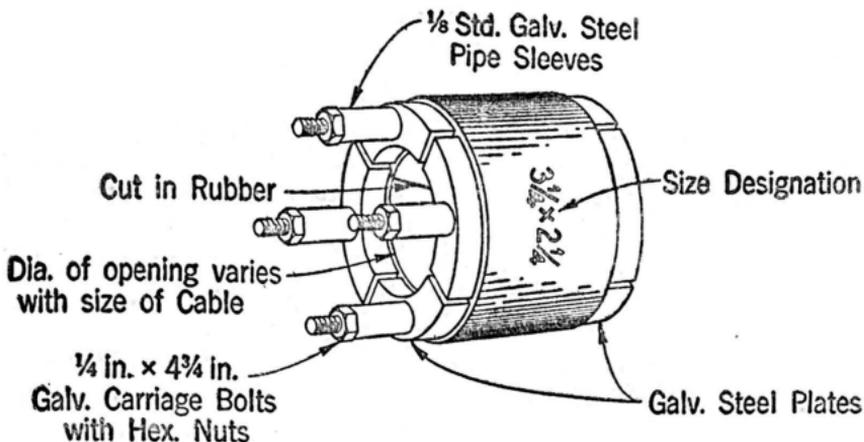
Square Bore Duct and Cable Size			Conduit Plug Size	
Duct Size (Inches)	Cable Diameter (Inches)	Cable Circumference (Inches)	Outside Dimension (Inches)	Hole Diameter (Inches)
3/4	2 ¹¹ / ₁₆ - 2 ¹³ / ₁₆	8 ⁷ / ₁₆ - 8 ⁸ / ₁₆	3/4	2 ¹¹ / ₁₆

Round Split Rubber Conduit Plugs

2.05 The following plugs are designed for use in sealing cables in round bore conduit, such as single round bore clay conduit, steel pipe, fiber and cement conduit, etc. Because of space limitations, it is not practical to provide plugs for the largest size cables that may be installed in ducts of the sizes indicated. In such cases, if the use of a rubber plug would normally be indicated, make the seal with Waterplug.



Round Bore Duct and Cable Size			Conduit Plug Size	
Duct Size (Inches)	Cable Diameter (Inches)	Cable Circumference (Inches)	Outside Diameter (Inches)	Hole Diameter (Inches)
3	$\frac{1}{2} - 1\frac{1}{16}$	$1\frac{9}{16} - 3\frac{5}{16}$	3	$1\frac{1}{16}$
3	$1\frac{1}{8} - 1\frac{5}{8}$	$3\frac{3}{8} - 5\frac{1}{16}$	3	$1\frac{5}{8}$
$3\frac{1}{4}$	$\frac{1}{2} - 1\frac{1}{16}$	$1\frac{9}{16} - 3\frac{5}{16}$	$3\frac{1}{4}$	$1\frac{1}{16}$
$3\frac{1}{4}$	$1\frac{1}{8} - 1\frac{5}{8}$	$3\frac{3}{8} - 5\frac{1}{16}$	$3\frac{1}{4}$	$1\frac{5}{8}$
$3\frac{1}{4}$	$1\frac{11}{16} - 2$	$5\frac{1}{8} - 6\frac{5}{16}$	$3\frac{1}{4}$	2
$3\frac{1}{2}$	$\frac{1}{2} - 1\frac{1}{16}$	$1\frac{9}{16} - 3\frac{5}{16}$	$3\frac{1}{2}$	$1\frac{1}{16}$
$3\frac{1}{2}$	$1\frac{1}{8} - 1\frac{5}{8}$	$3\frac{3}{8} - 5\frac{1}{16}$	$3\frac{1}{2}$	$1\frac{5}{8}$
$3\frac{1}{2}$	$1\frac{11}{16} - 2\frac{1}{16}$	$5\frac{1}{8} - 6\frac{1}{16}$	$3\frac{1}{2}$	$2\frac{1}{16}$



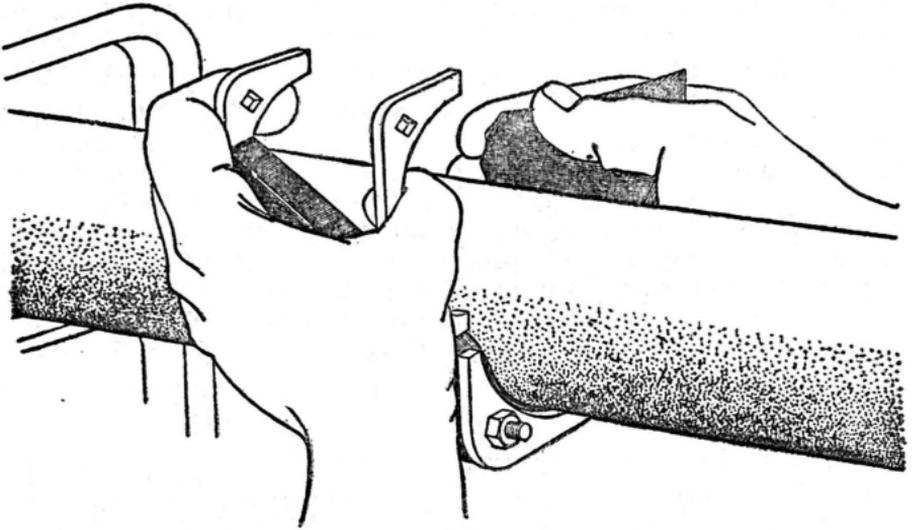
Round Bore Duct and Cable Size			Conduit Plug Size	
Duct Size (Inches)	Cable Diameter (Inches)	Cable Circumference (Inches)	Outside Diameter (Inches)	Hole Diameter (Inches)
3	1 ¹¹ / ₁₆ - 2	5 ¹ / ₈ - 6 ⁵ / ₁₆	3	2
3 ¹ / ₄	2 ¹ / ₁₆ - 2 ¹ / ₄	6 ³ / ₈ - 7 ¹ / ₁₆	3 ¹ / ₄	2 ¹ / ₄
3 ¹ / ₂	2 ¹ / ₈ - 2 ¹ / ₂	6 ¹ / ₂ - 7 ³ / ₈	3 ¹ / ₂	2 ¹ / ₂

3. INSTALLATION

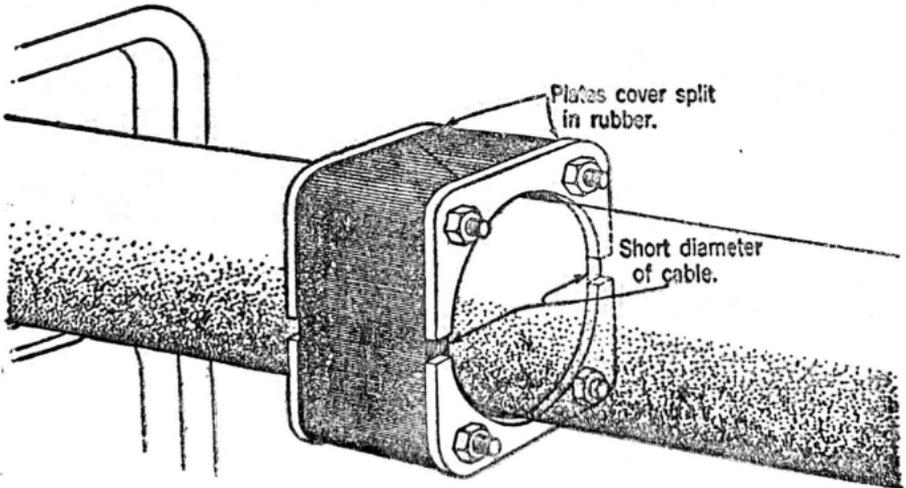
3.01 Before installing Split Rubber Conduit Plugs, examine the duct and remove any rough spots or accumulations of grease or silt. Inspect the cable for kinks just inside the duct, as the existence of such kinks will determine to some extent the depth to which the plug is to be placed in the duct. Minor indentations of the sheath will be sealed by the plug, but when deep kinks are found, it may be necessary to place the plug beyond the kink or to use an alternative method of sealing to obtain water-tightness.

3.02 Inspect the split rubber plug to see that the parts are properly assembled, with the nuts all in the same end and with the split in the rubber covered by a section of metal plate at each end. Examine the nuts to see that they are free and not compressing the rubber.

3.03 To place a square split plug on a cable, remove one of the bolts holding the plates covering the split in the rubber. Swing these plates on the other bolt to uncover the split in the rubber. Spread the rubber as illustrated and slip the plug over the cable with the nuts facing outward.



3.04 Restore the plates to position and replace the bolt and nut. When the cable is out of round, place the plug so that the openings between the end plates are in line with the short diameter of the cable. This same procedure should be followed when the bend in the cable extends into the duct.

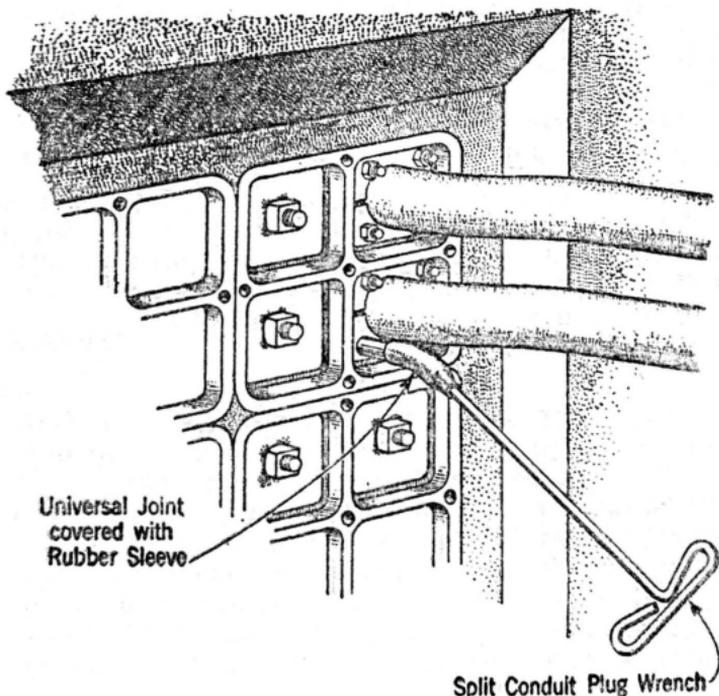


3.05 The same operations are followed in placing a round split plug, except that the bolt to be removed from the plugs having four plates on each end is the one that passes through the cut in the rubber.

3.06 Slide the plug along the cable and into the duct. If difficulty is experienced in sliding the plug into the duct, apply B or C Pressure Testing Solution as a lubricant to the cable and the inside of the plug. After the plug has been started in the duct, it will usually be found possible to insert it completely by the application of steady pressure. If it is necessary to apply additional force, proceed carefully to avoid damage to the sheath by the metal washers. The plug should be placed far enough into the duct to be flush with the inner edge of the bevel of the conduit or to clear any breaks extending into the bore.

Note: Plugs equipped with elongated bolts should be inserted into the duct only far enough to make the seal and yet leave the nuts outside the face of the duct when the plug is fully compressed.

3.07 Tighten the nuts with the Split Conduit Plug Wrench illustrated, turning down each nut a little at a time so as to keep the pressure as uniform as possible on all sides. Too much tightening of one nut may displace the cable to one side and make access to the remaining nuts difficult.



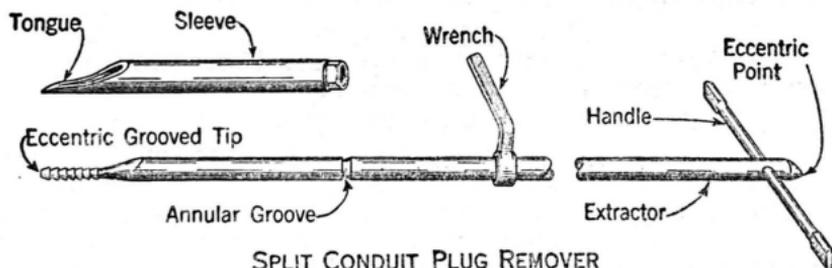
3.08 When all nuts are tight and the rubber evenly compressed, there will be only a slight bulging of the rubber around the edges of the compression plates. If the plug is found leaking after it has been in place a few days, the condition can usually be corrected by drawing up slightly on the bolts. If this does not stop the leak, remove the plug and examine the cable and duct for irregularities that may be overcome by changing the position of the plug. Failing in this, seal around the cable with Waterplug, as described in the section dealing with calking materials.

4. REMOVAL

4.01 To remove Split Rubber Conduit Plugs, first remove the nuts and outside plates from the plug, then push the bolts all the way back through the holes in the rubber to free the back plates from the rubber.

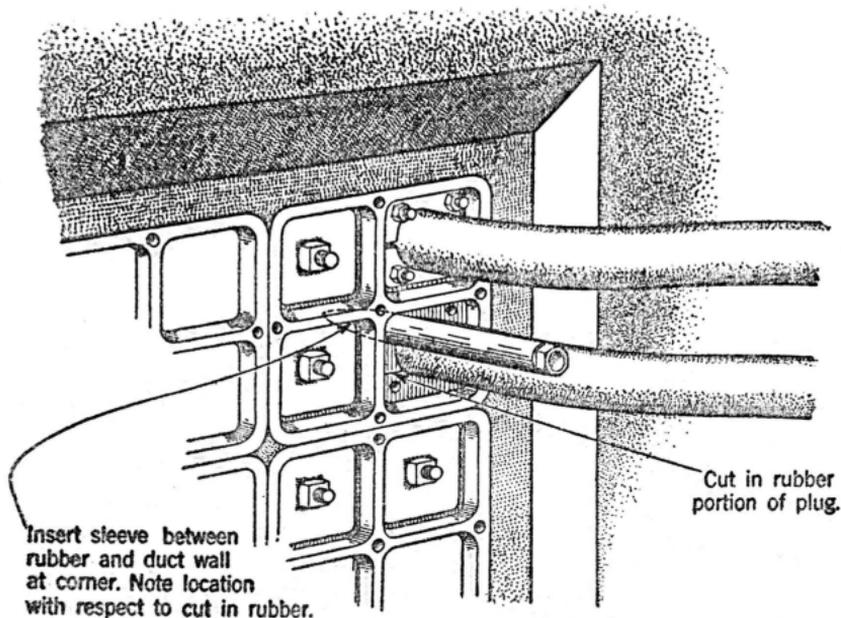
4.02 Plugs which have been in place for only a short time can sometimes be removed by using long-nose pliers to grip the rubber through one of the holes near the cut. Grip the plug at the hole in the free end of the rubber and attempt to pull out the rubber by "peeling" it from around the cable. If this is not successful, it will be necessary to use the Split Conduit Plug Remover.

4.03 The Split Conduit Plug Remover consists of three parts—sleeve, extractor and wrench, as illustrated.



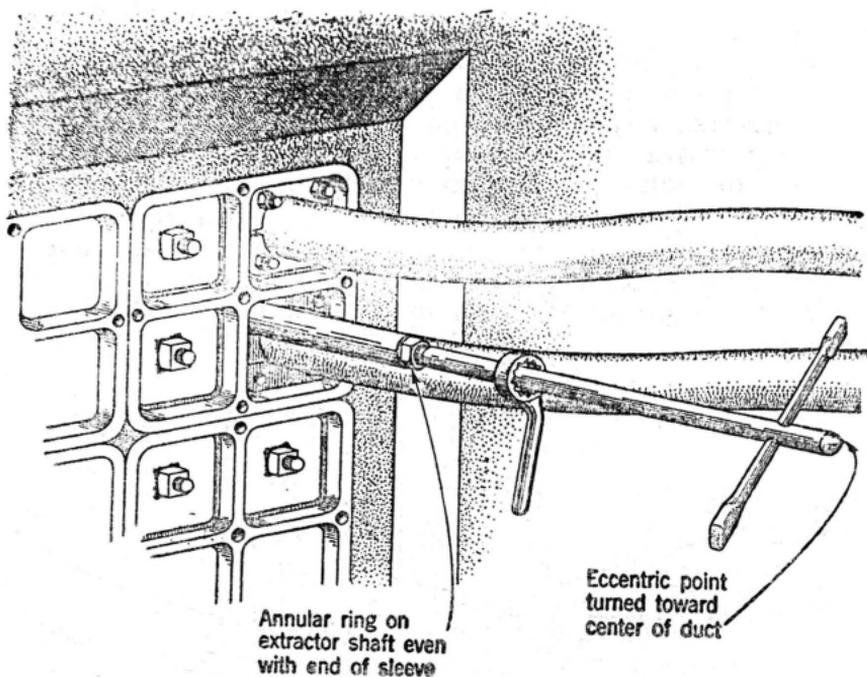
4.04 The following explains the use of the extractor in removing square split plugs. With minor variations, round split plugs are removed in the same manner.

- (1) Insert the tongue of the sleeve between the rubber and the duct wall at the hole in the free end of the rubber near the cut as it appears in the face of the plug.

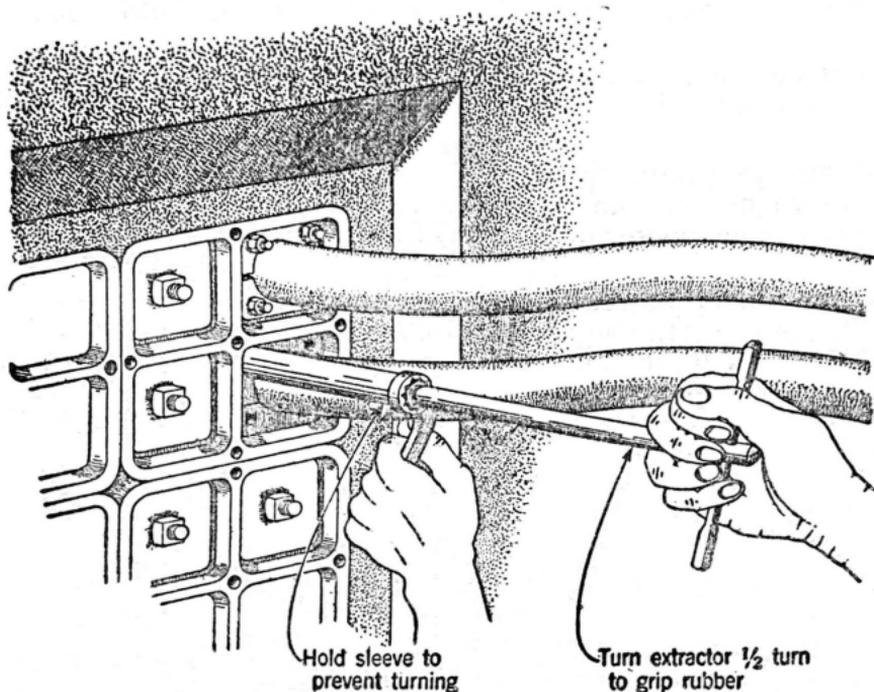


- (2) Push the tongue of the sleeve to its full depth between the rubber and the duct wall. It may be found convenient to insert the handle end of the extractor into the sleeve to provide an extension which permits a firmer grip.
- (3) Assemble the wrench on the extractor and pass the extractor through the sleeve, as illustrated. There is an eccentric point on the handle end of the extractor which is in line with the grooved tip. Turn this point toward the center of the duct and away from the wall of the conduit. This will place the tip approximately in line with the bolt hole in the rubber.

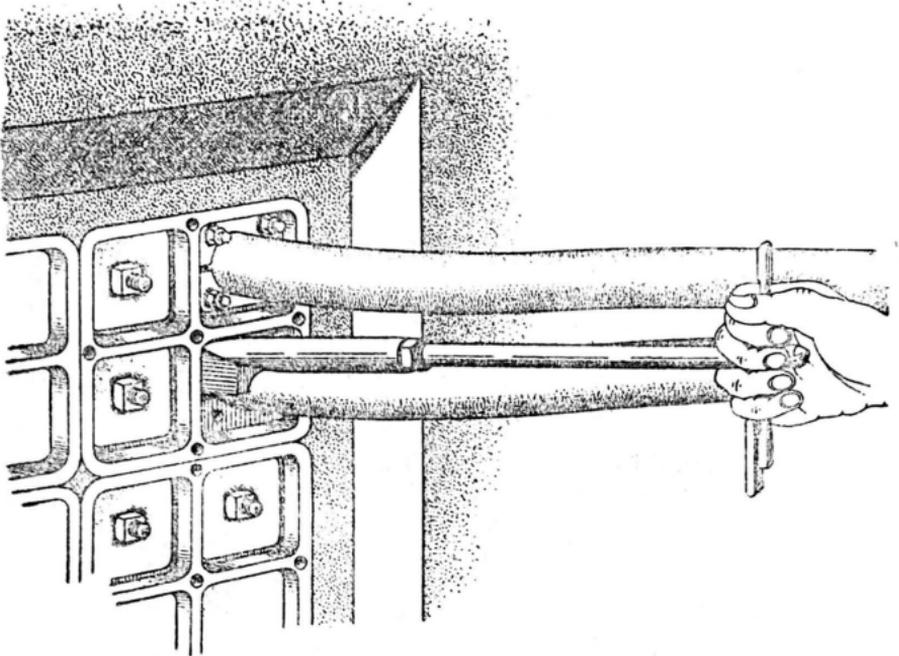
- (4) Press the extractor forward until the tip is completely embedded in the rubber. This position is reached when the annular groove in the extractor shaft is even with the end of the sleeve.



(5) Engage the wrench with the hexagonal end of the sleeve. By means of the wrench, hold the sleeve to prevent it from turning while rotating the extractor just one-half turn. This causes the tip of the extractor to grip the rubber between it and the tongue of the sleeve. The eccentric point on the handle end will be toward the corner of the duct when the grip is fully tightened.



(6) Slide the wrench back against the handle of the extractor. Gripping both the wrench and the extractor, pull gently on the extractor while shaking the cable slightly until the plug separates at the cut and starts to come out. As pulling is continued, the rubber will stretch and tend to unwrap from the cable.



(7) If the rubber adheres to the duct or cable and makes removal difficult, release the grip on the rubber, disassemble the tool and reinsert the tongue of the sleeve by itself in a number of places around the duct to break whatever bond exists. Then reassemble the tool in the plug and resume pulling.

(8) As the rubber emerges from the duct, move the tool around the cable while pulling on the rubber so that the tool will be opposite or slightly ahead of the point where the rubber is emerging.

(9) After the rubber is out, remove from the duct all of the bolts and the two back plates of the plug and reassemble the plug.

4.05 Plugs in use over long periods in dry locations may be cemented so firmly to the conduit that they can not be removed in a condition suitable for reuse. In removing such plugs, care should be exercised not to damage the cable sheath.