

[54] **PILE SPLICER WITH RETAINING MEANS**

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[51] Int. Cl. **F16l 21/00, F16l 27/10, E02d 5/22**

[58] Field of Search **61/53; 285/417, 398, 371, 285/331; 287/108; 52/728; 138/89**

[56] **References Cited**

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Primary Examiner—Jacob Shapiro

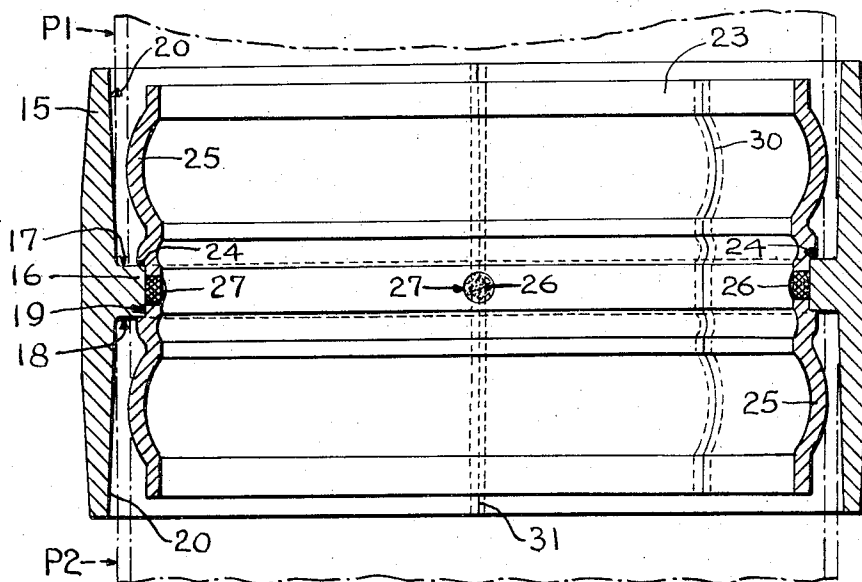
Attorney, Agent, or Firm—John M. Montstream

[57] **ABSTRACT**

A pile splicer or coupling is disclosed by which the

ends of two piles are spliced together for further driving into the earth and to align the ends of two piles. A double ended splicer includes an outer sleeve having an inwardly directed ledge between its ends. An inner retaining means for the end of each pile is carried by or secured to the ledge and is spaced from the outer sleeve so as to receive the end of the pile therebetween. The end of each pile engages opposite shoulders of the ledge. Each retaining means has a bulge extending outwardly therefrom and located between the ledge and the end of this means to frictionally engage the inner surface of the pile and more securely retain the end of the pile within the splicer. The inner surface of the outer sleeve tapers inwardly so as to freely guide the pile into the splicer. This taper also preferably is a little smaller at the inner end of the taper than the diameter of the pile so that the end of the pile is compressed to add its grip to the splicer as well as to contract the end of the pile somewhat. The retaining means may be a sleeve which also may be slotted for greater flexibility. A single ended splicer to frictionally receive the end of one pile has a shorter outer sleeve and a single inner retaining means.

16 Claims, 12 Drawing Figures



SHEET 1 OF 5

Fig. 1

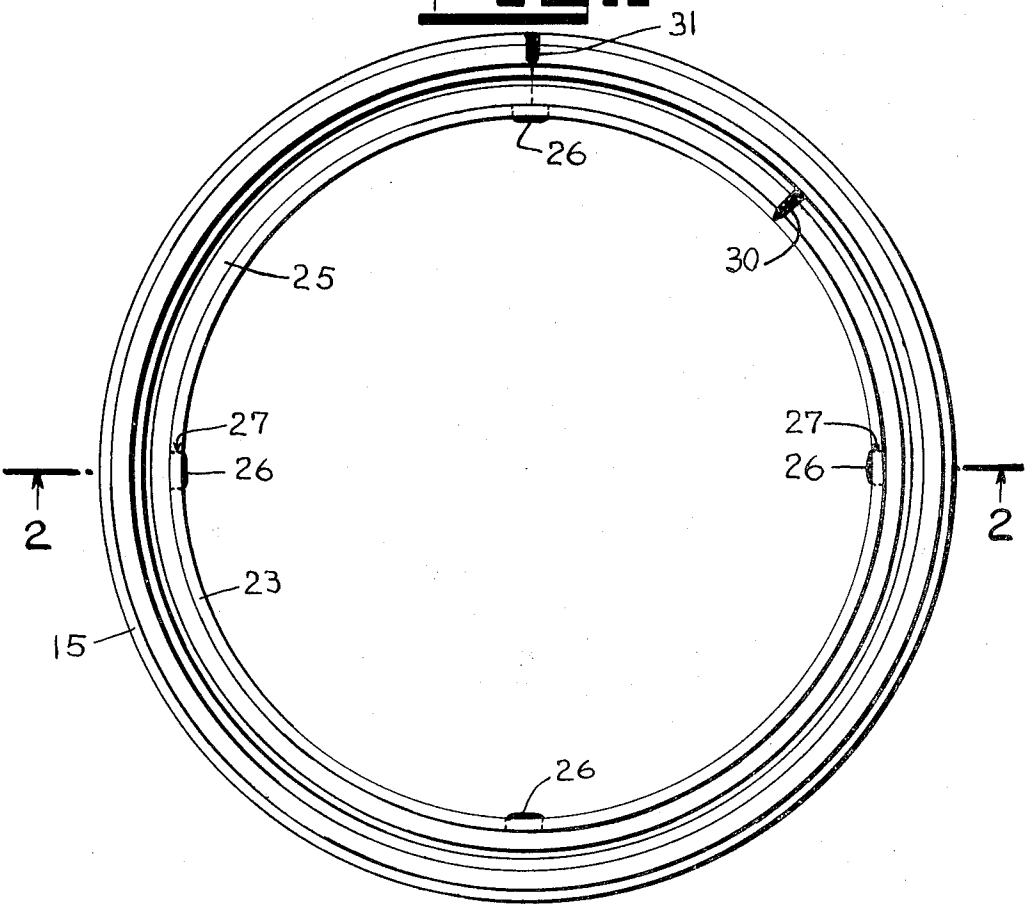


Fig. 2

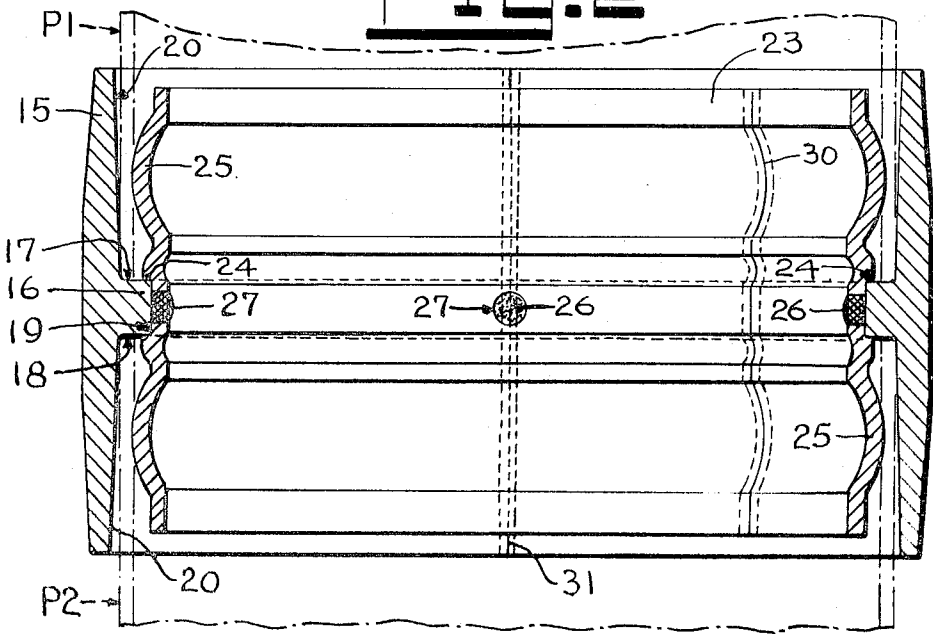


Fig. 3

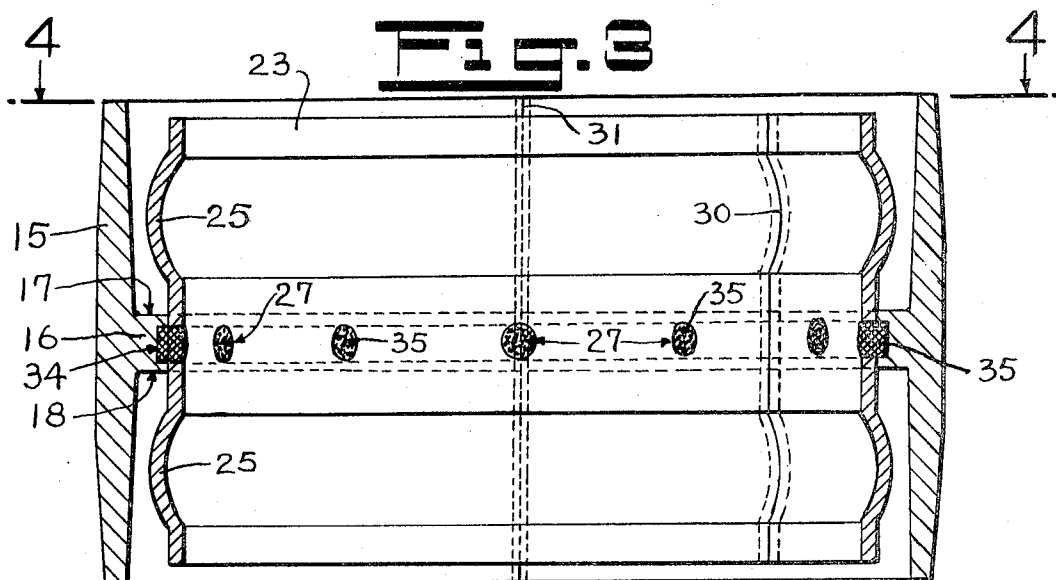


Fig. 4

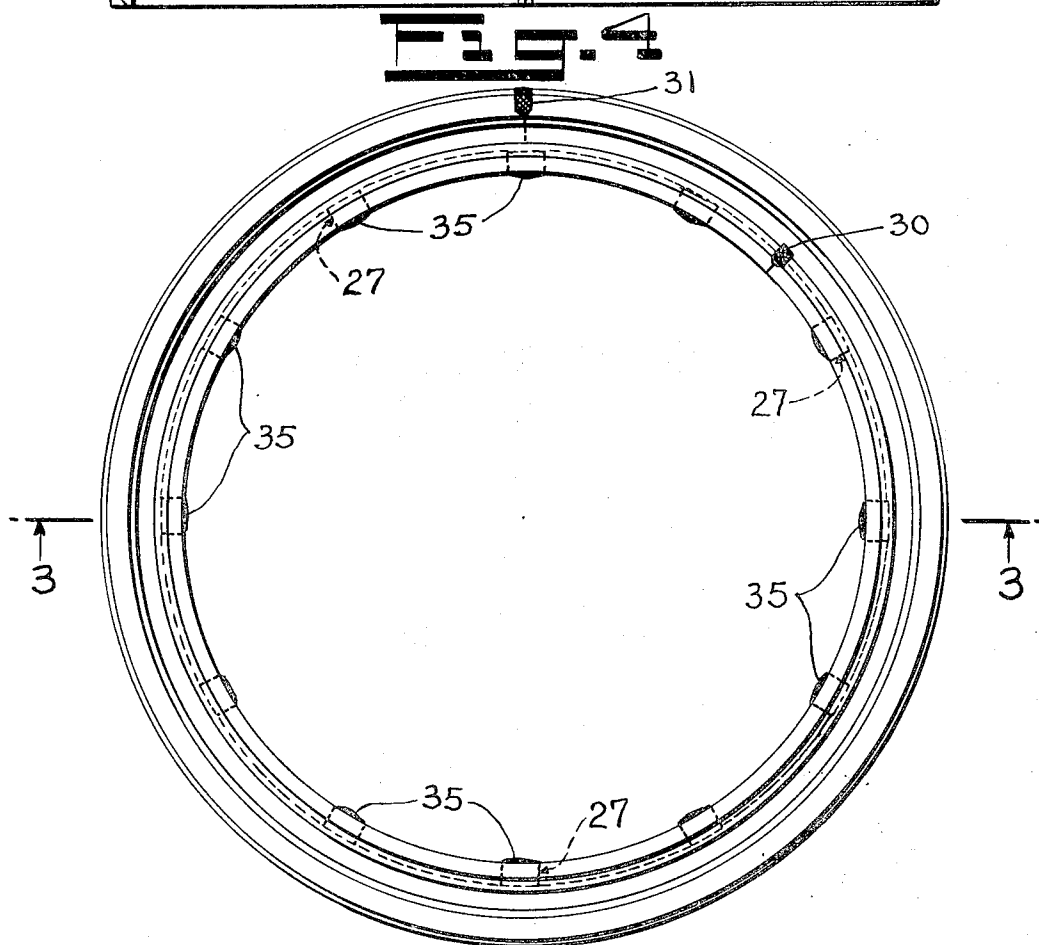


Fig. 5

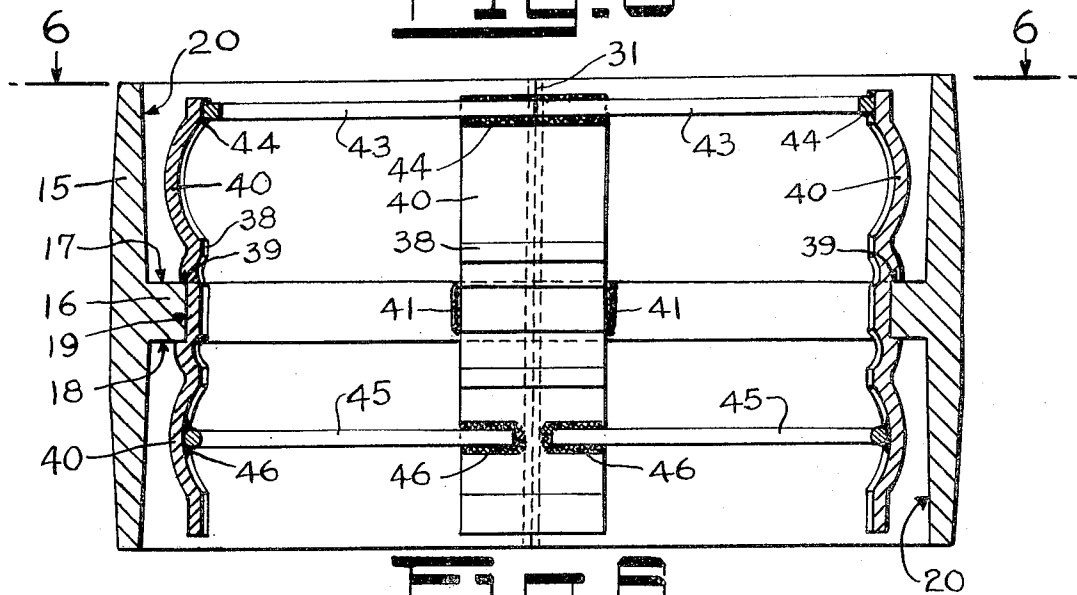


Fig. 6

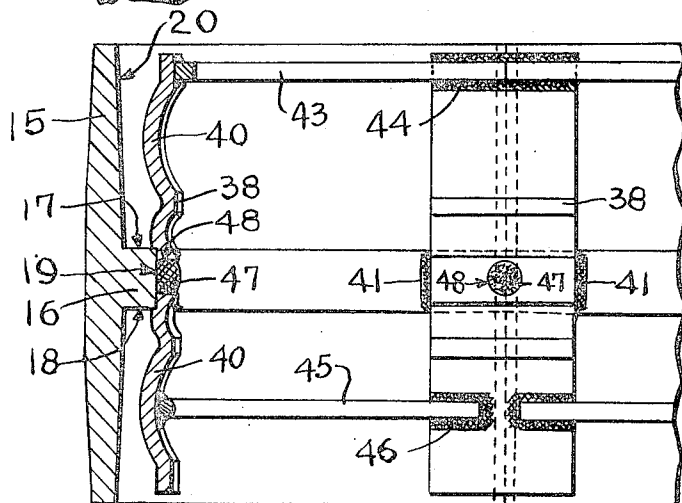
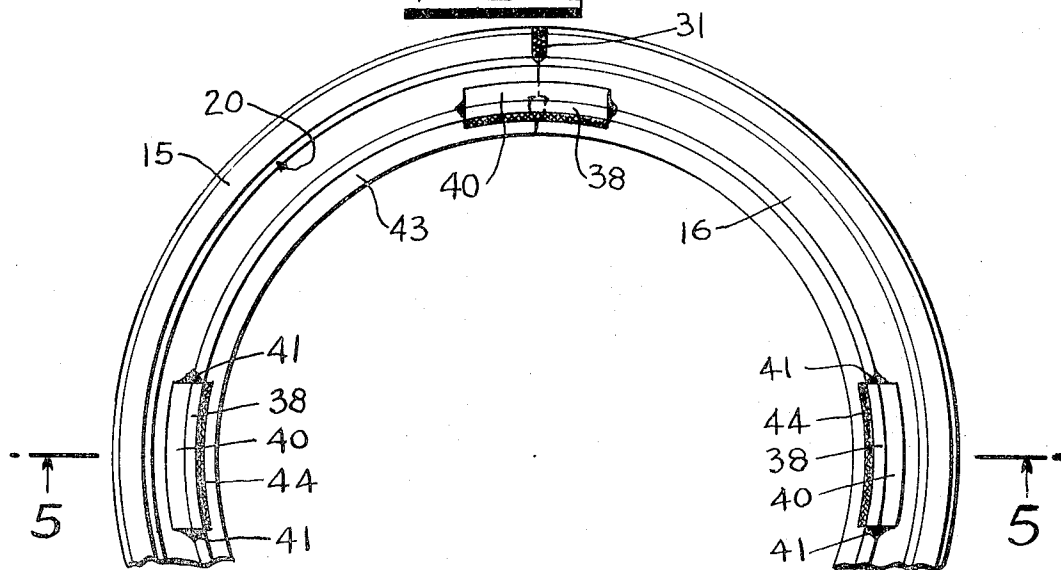


Fig. 7

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Fig. 8

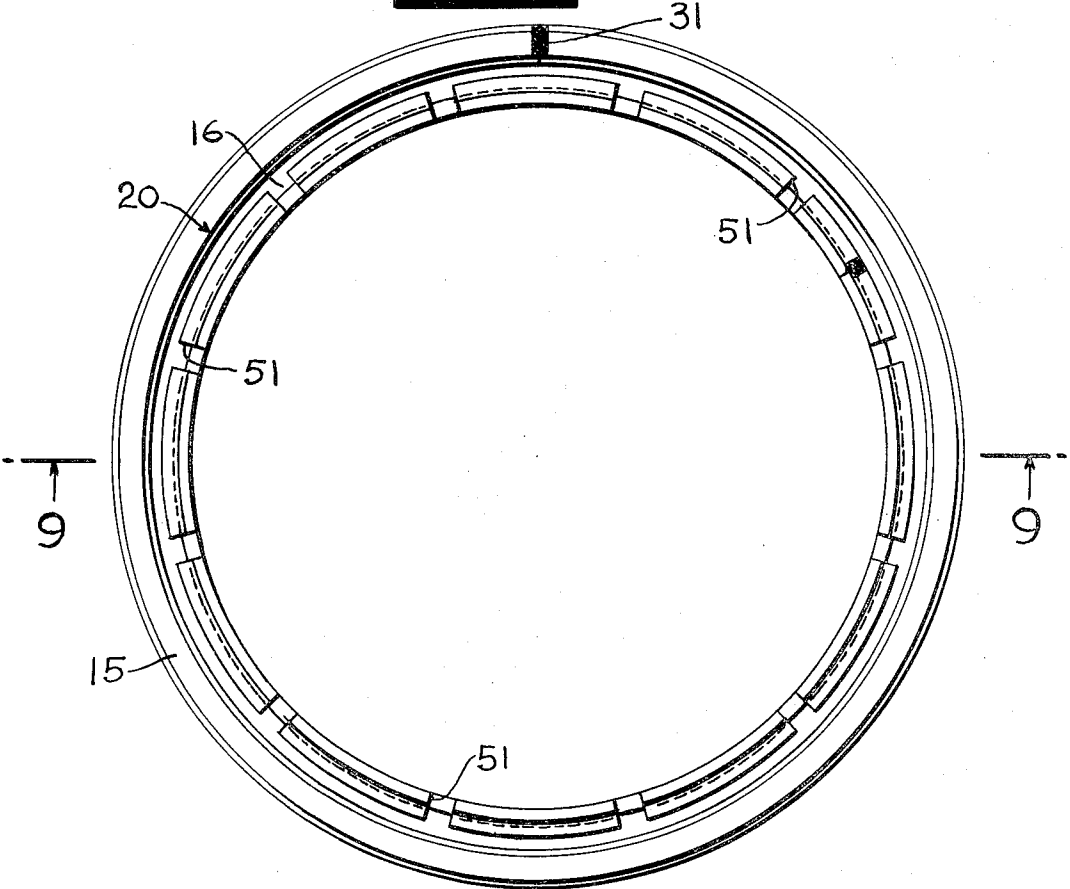


Fig. 9

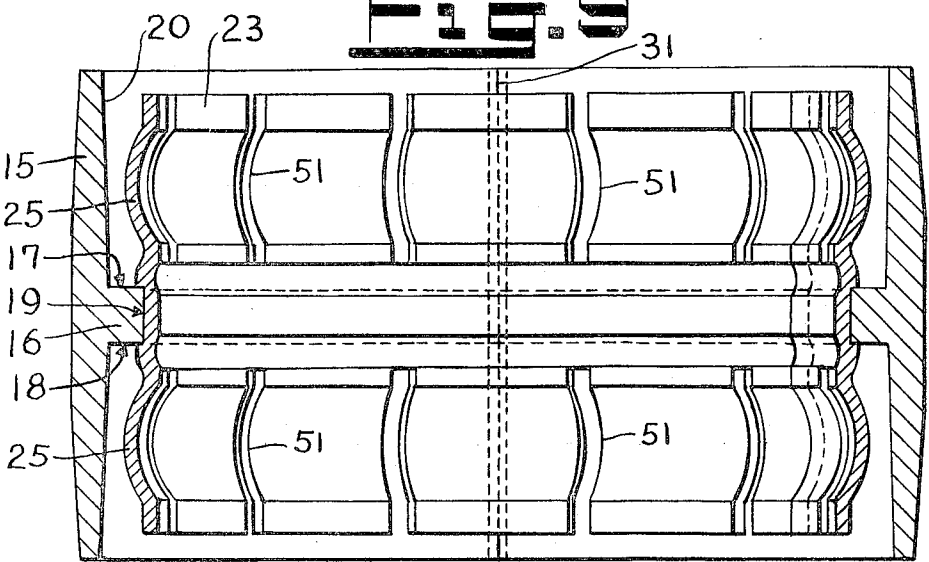


Fig. 12

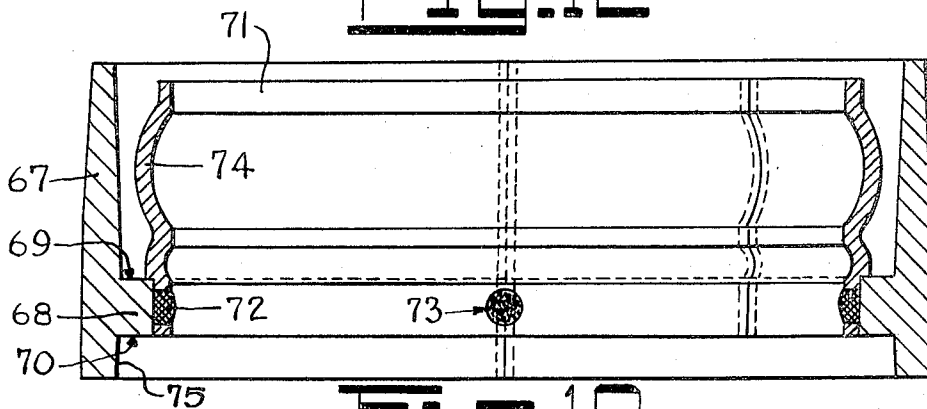


Fig. 10

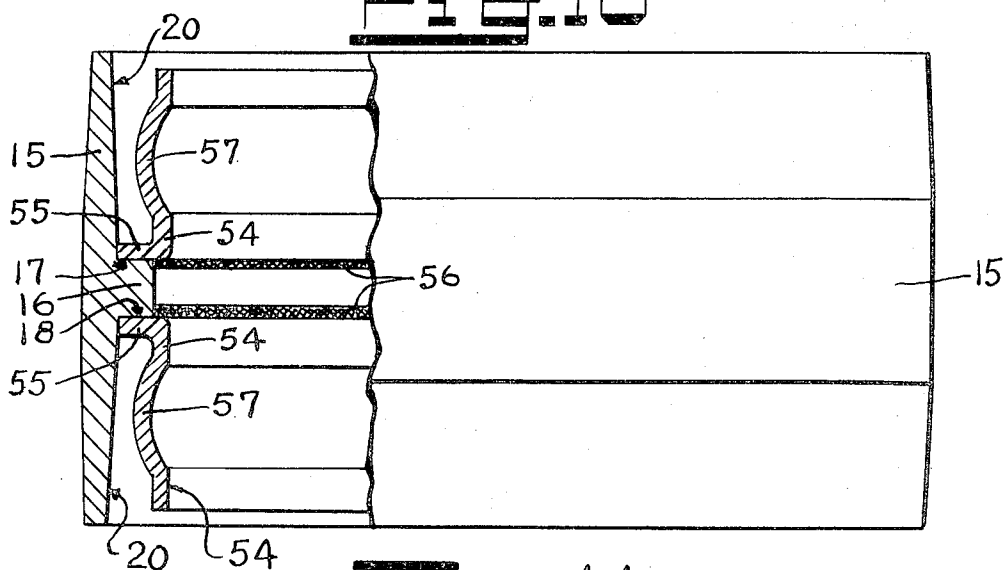
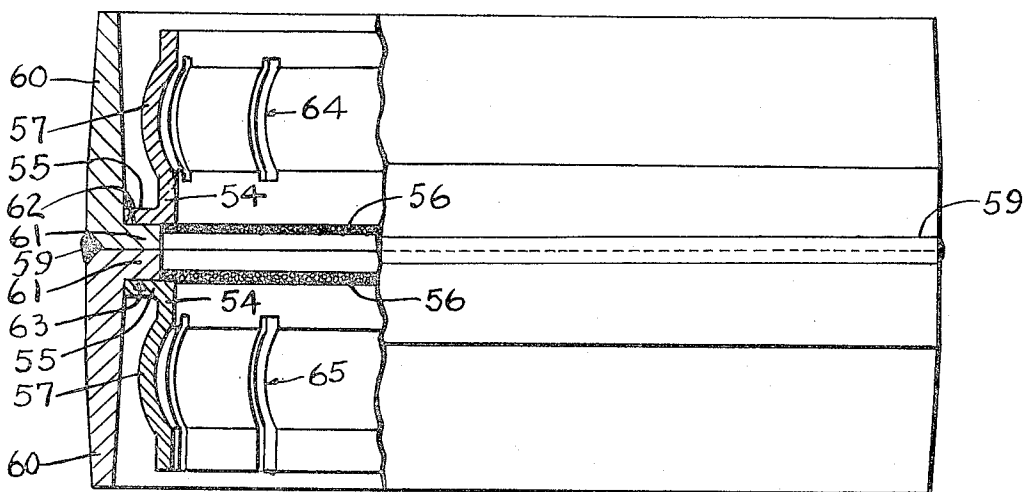


Fig. 11



PILE SPLICER WITH RETAINING MEANS

Frequently it is necessary to splice or couple the ends of two piles together such as when the pile being driven into the earth is not long enough to reach bed rock or a solid base. A splicer to connect together the ends of two piles for this purpose must be rugged enough to withstand the pounding to which it is subjected and must be adequately attached to the ends of the two piles so that the splicer does not separate from either or both piles as are being driven. Splicers heretofore used comprised an outer sleeve with an inner and centrally located ledge. The inner bore of this sleeve tapered so that the end of the pile is easily inserted therein and with an area adjacent to the ledge being smaller in diameter than the pile so that the end of the pile is compressed and wedged therein. In the splicer herein, the outer sleeve is the same or not essentially different but retaining means has been added to secure frictional engagement between the splicer and the inner surface of each pile end.

The principal object of the invention is to construct a pile splicer or coupling which is rugged to withstand the heavy pounding to which it is subjected and provides in addition frictional engagement or attachment between the splicer and the inner surface of the pile or piles.

Another object is as above and in addition to construct a splicer which is economical to manufacture.

A further object is to construct a pile splicer which has an inner retaining means with a bulge for frictional engagement with the inner surface of the pile and an outer sleeve with a taper bore to compress and grip the end of the pile received therein and also to compress the end of the pile inwardly of the bulge.

Other objects of the invention will be more apparent from the following description when taken in connection with the accompanying drawings illustrating preferred embodiments thereof in which:

FIG. 1 is a top view of one form of splicer;

FIG. 2 is a section taken on line 2—2 of FIG. 1;

FIG. 3 is a section of another form of splicer taken on line 3—3 of FIG. 4;

FIG. 4 is a top view of the splicer of FIG. 3 as viewed from line 4—4 thereof;

FIG. 5 is a section of another form of splicer taken on line 5—5 of FIG. 6;

FIG. 6 is a top view of the splicer of FIG. 5 as viewed from line 6—6 thereof;

FIG. 7 is a partial sectional view of the splicer of FIG. 5 with a central weld for the retaining means;

FIG. 8 is a top view of another form of splicer;

FIG. 9 is a section taken on line 9—9 of FIG. 8;

FIG. 10 is a partial section of another splicer having separate inner sleeves;

FIG. 11 is a partial section of another form of splicer in which the outer sleeve is of two sleeves welded together, and,

FIG. 12 is a section of a single ended splicer.

The pile splicers illustrated include basically an outer sleeve having an inwardly extending ledge with shoulders so that the end of the lower pile engages the lower shoulder and the end of the upper pile engages the upper shoulder so that the splicer is centralized with respect to the pile ends for a double ended splicer. Retaining means is secured to the ledge in any suitable

manner. The retaining means frictionally engages the inner surface of the pile to increase the grip of the splicer on the pile end or ends so that relative displacement is avoided or reduced materially.

The splicer of FIGS. 1 and 2 is double ended, that is the ends are alike and each end receives a pile. The splicer comprises an outer sleeve 15 having a ledge 16 extending inwardly at the center thereof which ledge has an upper shoulder 17 and a lower shoulder 18 and a face 19. The inner surfaces 20 taper inwardly from the ends so as to freely receive the ends of the piles P1 and P2. The bottom of the taper adjacent to the ledge is smaller than the diameter of the pile for any desired length of the taper so that the end of the pile is compressed and gripped by the outer sleeve.

The retaining means in FIGS. 1 and 2 is an inner sleeve 23 secured to the face 19 of the ledge 16. The retaining means may be secured to the ledge as well as properly located thereon by a circumferential groove 24 in the outer surface thereof with the ledge being received in the groove. The retaining means carries frictional gripping means for its pile end shown as a bulge 25 extending outwardly and located between the ledge and the end of the retaining means and is shown particularly about midway between these two points. The outer diameter of the bulge is spaced from the inner surface of the outer sleeve at least by the thickness of the pile wall and the bulge has an outer diameter greater than the internal diameter of the pile. This provides frictional contact with the inner surface of the lower pile P2 when the splicer is driven onto the end of this pile and frictional contact with the inner surface of the upper pile P1 when the pile end is driven into the splicer. In addition the retaining means may be welded at 26 to the face of the ledge through the holes 27. The bulge may be of different forms that shown being rounded so that a rounded or tapered surface is presented to the pile end.

The outer sleeve may be made by rolling a flat plate with a center projection to provide the ledge and tapering inner walls after which the plate is cut to proper length for the diameter of the pile for which the splicer is to be used. This plate is then shaped into circular form. The inner sleeve may be rolled as a plate which is out to length for the inner diameter of the pile, shaped to circular form and the abutting ends are welded together at 30. The outer sleeve is rolled or shaped onto the inner sleeve with the groove 24 receiving the ledge and the abutting edges of the outer sleeve are welded together at 31.

FIGS. 3 and 4 show a double ended splicer having the same outer sleeve 15 with the exception that the face of the ledge has a series of ledge holes 34 therein. The retaining means or the inner sleeve 23 does not have a central groove in the outer periphery thereof to assist in securing the retaining means on the ledge. The inner sleeve has additional holes 27 through the center of the inner sleeve in alignment with the holes 34 in the face of the ledge. The retaining means is welded to the face of the ledge through these holes with the welding metal forming a solid plug 35 into the ledge hole thereby giving the attachment the strength of the weld but also the strength of this plug.

FIGS. 5, 6 and 7 show a double ended splicer having the same outer sleeve 15 but the retaining means comprises a plurality of spaced flexible arms or elements 38 preferably having a locating and securing groove 39 in

the outer surface thereof which receives the ledge. Each arm has a bulge 40 conforming to the bulges of sleeve 23. Four such arms are shown although the number may vary from two to a relatively large number depending upon the number needed for adequate retention of the pile end therein and depending upon the width of the arms. When the arms are separate elements as shown in these figures, a ring or rings may be welded to the arms, such as the inner surface thereof, in order to secure the arms more firmly in place and to provide additional stiffness to the retaining means. One ring 43 is shown at the ends of the arms for the upper retaining means welded thereto at 44 and linking them together and another ring 45 is shown welded at 46 at the inner surface of the bulge for the lower retaining means and linking these arms together. Either form of linking ring may be used for the arms or if greater attachment or stiffness is desired both rings may be provided for each of the retaining means. FIG. 7 also shows each arm welded at 47 to the face of the ledge at holes 48 in the arm. An arm form of retaining means may be made from any of the inner sleeves shown herein by cutting away portions of the sleeve through the bulge. This may be accomplished in another way by, for example, removing alternate or more arms in the retaining means of FIG. 9.

A splicer, FIGS. 8 and 9, has the same outer sleeve 15 and the retaining means is the inner sleeve 23 of FIG. 2 with the sleeve having longitudinally extending slots 51 to give greater resiliency to the retaining means. These slots are shown as extending from the end of the retaining means through the bulge and thereby provide a plurality of flexible arms.

A splicer, FIG. 10, has the same outer sleeve 15 as shown in FIG. 2 but the retaining means are separate inner sleeves 54 for each end of the outer sleeve. This retaining means sleeve has an outwardly extending flange 55 which rests on the upper shoulder 17 of the ledge and an identical sleeve 54 rests against the lower shoulder 18 of the ledge. These two retaining means are welded to the ledge by the weld 56. Each retaining means has a bulge 57 as shown on the other retaining means illustrated herein and the dimensions and functions are the same.

The splicer of FIG. 11 has an outer sleeve which is made from two identical half sleeves 60 with an inwardly directed flange 61. The flanges of two such sleeves are welded together at 59 to form an outer sleeve with the two inwardly directed flanges forming the ledge therefor with an upper shoulder 62 and a lower shoulder 63. The inner surfaces of the two half sleeves are tapered the same as in the one piece outer sleeve. The retaining means are in the same as the retaining means 54 of FIG. 10 and are welded to the ledge by the welds 56. The retaining means in this figure may have slots 64 extending through the bulge only to provide greater flexibility to the retaining means. These retaining means may have slots 65 through to the edge of the same if desired. Greater or less flexibility may be secured by increasing or decreasing respectively the number of slots. Also considerable latitude in flexibility may be secured by using alternate full slots 65 and bulge slots 64 or any other combination of these slots.

A single ended splicer, FIG. 12, has a shorter outer sleeve 67 with its ledge 68 adjacent to the lower edge thereof and having an upper shoulder 69 and a lower

shoulder 70. A single retaining means, shown as an inner sleeve 71, is provided at one end. This inner sleeve is secured to the face of the ledge by welding at 72 in the holes 73 provided therefor. The retaining means has a bulge 74 as previously described. The outer sleeve preferably has a lower recess 75 which receives the end of the lower pile which has been driven into the earth whereupon the outer sleeve is welded to the pile. The upper pile is driven into the splicer between the outer sleeve and the retaining means as described herein. The retaining means of FIGS. 10 and 11 may be used in place of that shown in FIG. 12 if desired.

This invention is presented to fill a need for improvements in a Pile Splicer with Retaining Means. It is understood that various modifications in structure, in mode of operation, assembly, and manner of use, may and often do occur to those skilled in the art, especially after benefiting from the teachings of an invention. This disclosure illustrates the preferred means of embodying the invention in useful form.

What is claimed is:

1. A pile splicer for connecting the ends of two piles having wall thickness comprising an outer cylindrical sleeve having ends and an inner surface, a ledge projecting inwardly from the inner surface having upper and lower shoulders and a face, the inner surface of the outer sleeve tapering inwardly from an end thereof to the ledge, retaining means for at least one end of the outer sleeve and having an outer surface spaced from the inner surface of the outer sleeve to freely receive the end of the pile between the outer sleeve and the retaining means, the retaining means having a length extending to or approximately to an end of the outer sleeve, a bulge extending outwardly from the retaining means in a central region between the ledge and the end of the retaining means, the bulge having a dimension to frictionally engage the inner surface of the pile when the latter is driven between the outer sleeve and the retaining means, and means securing the retaining means to the ledge.

2. A pile splicer as in claim 1 in which the ledge is centrally of the outer sleeve and the inner surface of the outer sleeve tapering inwardly from each end thereof to the ledge, and a retaining means for each end of the outer sleeve.

3. A pile splicer as in claim 1 in which the ledge is adjacent to one end of the outer sleeve, and the retaining means is solely at one end of the outer sleeve.

4. A pile splicer as in claim 2 in which the retaining means for both ends of the outer sleeve is an integral inner sleeve having an outer surface and ends, and the means to secure the retaining means to the ledge comprising a circumferential groove in the outer surface of the inner sleeve located centrally between the ends thereof and receiving the ledge therein.

5. A pile splicer as in claim 4 including welding holes through the retaining means at the groove, and the retaining means being welded to the face of the ledge through the holes.

6. A pile splicer as in claim 1 in which at least one retaining means is a plurality of arms spaced from each other.

7. A pile splicer as in claim 6 in which the arms are separate elements and including ring means for each retaining means secured to the inner surfaces of the arms.

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8. A pile splicer as in claim 7 in which each arm has an outer end and the ring means is a ring secured to the outer ends of the arms.

9. A pile splicer as in claim 7 in which the ring means is a ring secured to the inner surface of the bulge.

10. A pile splicer as in claim 9 in which the ring means includes a ring secured to the outer ends of the arms.

11. A pile splicer as in claim 6 in which the retaining means is an inner sleeve and the arms are formed by slots extending longitudinally from the outer end thereof and through the bulge.

12. A pile splicer as in claim 1 in which the retaining means is slotted longitudinally at the bulge solely.

13. A pile splicer as in claim 1 in which the retaining

means is a sleeve having an outwardly extending flange at the inner end thereof resting on a shoulder of the ledge.

14. A pile splicer as in claim 2 in which the outer sleeve is two half sleeves having an inwardly directed flange, and the two half sleeves having their flanges in contact and welded together to form a ledge.

15. A pile splicer as in claim 14 in which the retaining means is a sleeve having an outwardly extending flange at the inner end thereof resting on a shoulder of the ledge.

16. A pile splicer as in claim 1 including a plurality of longitudinally extending slots at least through the bulge.

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