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JOINT FOR ELECTRIC CABLES

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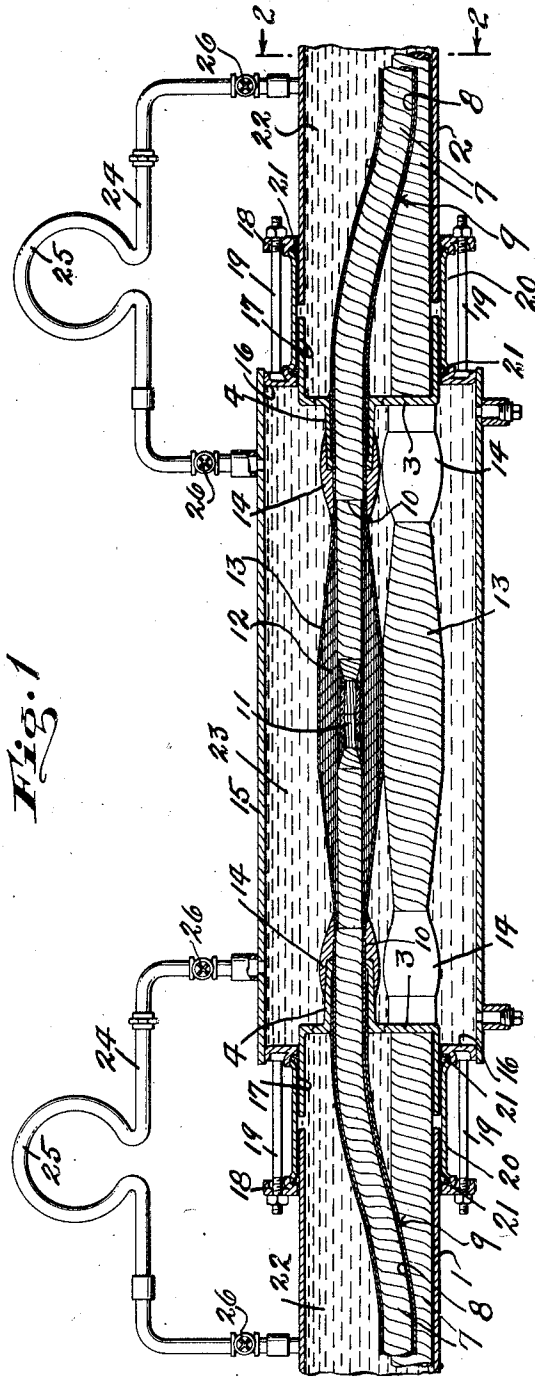


Fig. 1

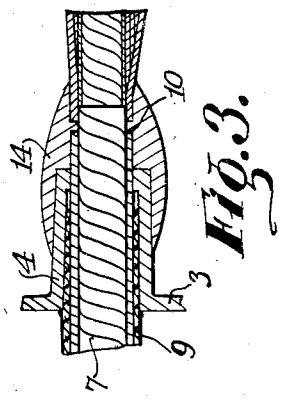


Fig. 3.

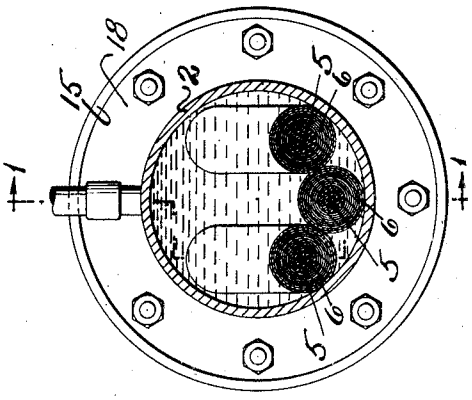


Fig. 2

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JOINT FOR ELECTRIC CABLES

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4 Claims. (Cl. 247—3)

This invention relates to joints for electric cables and is particularly well adapted for cable systems of the type in which the insulated unsheathed cable conductors are loosely enclosed in a pipe line filled with oil under sufficiently high pressure to increase its dielectric strength, and in which the conductors and their insulation are submerged. The pipe line is sufficiently large internally to permit the cables to be readily drawn thereinto, and for the cables to "snake". The present invention provides a joint for such a cable system whereby the pipe line can contract and expand without detrimental effect on the joint.

In the drawing accompanying this application:

Fig. 1 is a longitudinal section through a joint made in accordance with this invention, the section being taken on the line 1—1 of Fig. 2;

Fig. 2 is a section on the line 2—2 of Fig. 1; and

Fig. 3 is an enlarged sectional view of the structure of the joint where the cable is brought into the joint casing.

Referring to the drawing in detail, 1 and 2 designate the adjacent ends of two sections of a pipe line in which the insulated unsheathed cable conductors are drawn. At the adjacent ends of the pipe lines 1 and 2 we provide a barrier plate 3, each of these barrier plates being provided with thimbles 4, the bore of each of which is slightly tapered. While these thimbles are shown integral with the barrier plates they may be separate therefrom, and as will be understood each barrier plate is provided with as many thimbles as there are cable conductors to be joined.

The cable conductors are designated 5. Each conductor is insulated with paper tape 6 on the exterior of which is applied a shielding tape 7. In the manufacture of the cable a temporary lead sheath is applied about the insulation and shielding tape of each conductor and on installing this sheath is removed as the conductors are drawn into the pipe line except for short lengths 8 which are left in place on each conductor where the conductors come through the thimbles 4 and for ten or fifteen feet to the rear of these thimbles. About these short lengths of sheath we apply a fabric such as surgical webbing designated 9 which reinforces the sheath lengths and enables them to withstand the high pressure at which the oil in the joint and the pipe line is carried and which may be as high as two hundred pounds or more.

With the surgical webbing or tape 9 in place the cable conductor is jammed into the tapered bore in each of the thimbles 4 practically to provide a stop joint. The cable conductors as will be understood project through the thimbles for some distance, but the short lengths of lead sheath are terminated at 10 just beyond the forward ends of the thimbles, while the webbing 9 terminates short of the forward ends of the thimbles.

The adjacent ends of the conductors entering the joint at opposite ends are brought together at the middle of the joint and joined as shown at 11 and then wrapped with varnished cambric and paper 12, a copper braid 13 being applied finally about this insulation. Each end of the forward terminal of each sheath length is wiped to the thimbles 4 by a wipe joint 14, the copper braid 13 being soldered to this wipe. The sheath length 8, fabric 9 and the wipe joint 14 as will be appreciated provides a liquid tight joint at the thimbles to prevent oil from passing from one side of the barrier plates 3 to the other, exterior of the cable insulation, as will be appreciated, while permitting of seepage of oil from one side of the plates to the other through the cable insulation. The enclosing casing 15 of the joint is slipped to one side along the pipe line during the process of drawing in the cable conductors and making up the joint as will be understood.

At each end the enclosing casing 15, which overlaps the barrier plates 3, is provided internally with an inwardly extending flange or annulus 16. Each barrier plate is of the same diameter as the outside diameter of the cable pipe line and is disposed concentric with the pipe line. Each plate is provided with a rearward extension 17 extending outwardly of the joint toward the end of the pipe line, these extensions, however, terminating short of the pipe line. The flanges 16 of the joint casing, and which may be welded to the joint casing, receive the extensions of the barrier plates.

Surrounding each of the pipe sections 1 and 2 and movable relatively thereto is a ring 18 connected to the flanges 16 by bolts 19.

Intermediate the rings 18 and flanges 16 and surrounding the ends of the pipe sections 1 and 2 as well as the rearwardly extending portions 17 of the barrier plates 3 is a sleeve 20, and between the ends of each of these sleeves and the flanges 16 as well as the rings 18 we provide lead tipped gaskets 21.

By drawing up the bolts 19 the pipe line sections 1 and 2, enclosing casing 15 and the barriers 3 are all united or coupled together liquid tight, such a joint being capable of holding pressures as high

as those contemplated, which as mentioned may be two hundred pounds or more. It will be understood that this construction permits of a certain amount of settling of the pipe line and joint and expansion and contraction of the pipe line without causing the joint to leak, and without injuring the splice of the cable conductors.

The pipe lines 1 and 2 are maintained filled with oil 22 under high pressure and the interior of the enclosing casing 15 of the joint also is maintained filled with oil 23 under the same high pressure, for while the sheath lengths 8, webbing 9 and the wipe joints 14 prevent the passage of oil through barrier plate thimbles, we provide at each end of the joint casing valve controlled pipes 24, one end of each of these pipes communicating with the interior of the joint casing the other end with the interior of the pipe line.

Each of the pipes 24 as will be seen from the drawing is bowed as shown at 25 to accommodate the same to relative movement between the casing of the joint and the pipe line. The pipes 24 are provided with shut-off valves 26 which may be either manual or automatic in operation.

From the foregoing it will be appreciated that we have provided a joint structure for cable systems of the general type above referred to in which the conductors are free to "snake" within the cable pipe, the latter being free to expand and contract due to thermal conditions without detrimental effect on the joint.

What we claim is:—

1. A joint for high tension electric cables of the type in which the insulated cable conductors are laid in a pipe line filled with oil under high pressure in which the conductors and their insulation are submerged, said joint comprising in combination an enclosing casing secured liquid tight to the cable pipes, barrier plates within the casing, each barrier plate being provided with a rearward extension of the same outside diameter as the cable pipe line and disposed concentric therewith and secured liquid tight thereto, said barrier plates being provided with thimbles for receiving the conductors which are to be joined within said casing, that part of the insulation of each conductor which passes through the thimbles being provided with a soft metal impervious length of sheath, fabric about the sheath, the thimbles having a tight fit on the fabric, a wipe joint uniting each sheath to its thimble, said construction resisting the flow of oil from one side of the barrier plates to the other, oil within the joint casing, and valve controlled pipes, one end of each of which enters the joint casing at one side of the barrier plates and the other end the pipe line, thereby to maintain the oil within the joint casing at the same high pressure as the oil within the pipe line.

2. A joint for high tension electric cables of the type in which the insulated cable conductors are laid in a pipe line filled with oil under high pressure in which the conductors and their insulation are submerged, said joint comprising in combination an enclosing casing secured liquid tight to the cable pipes, barrier plates within the casing, each barrier plate being provided with a rearward extension of the same outside diameter as the cable pipe line and disposed concentric therewith, an expansion joint securing the extension of each barrier plate liquid tight to the cable pipes, said barrier plates being provided with thimbles for receiving the conductors which are to be joined wtihin said casing, that part of the insulation of each conductor which passes through the thimbles being provided with a soft metal impervious length of sheath, a wipe joint uniting each sheath to its thimble, oil within the joint casing, and valve controlled pipes, one end of each of which enters the joint casing at one side of the barrier plates and the other end the pipe line, thereby to maintain the oil within the joint casing at the same high pressure as the oil within the pipe line.

3. A joint for high tension electric cables of the type in which the insulated cable conductors are laid in a pipe line filled with oil under high pressure in which the conductors and their insulation are submerged, said joint comprising in combination an enclosing casing secured liquid tight to the cable pipes, barrier plates within the casing, each barrier plate being provided with a rearward extension of the same outside diameter as the pipe line and disposed concentric therewith, an expansion joint securing the extension of each barrier plate liquid tight to the pipe line, said barrier plate being provided with thimbles each of which has a tapered bore for receiving the cable conductors which are to be passed therethrough and joined to each other within said casing, that part of the insulation of each conductor which passes through the thimbles being provided with a length of impervious soft metal impervious sheath terminating a short distance away from the said thimbles, reinforcing fabric about said sheath, the cable being jammed into the thimble, and a wipe joint uniting the forward end of each sheath to a corresponding thimble, said construction preventing the free flow of oil from the cable pipe line into the joint casing exterior to the insulation of the cable while permitting of the slow seepage of oil through the insulation of the cable conductors from one side of the barrier plates to the other.

4. In combination a pipe line filled with oil under high pressure, insulated conductors within the pipe line submerged in said oil, the cable pipe line being of sufficiently large internal diameter to permit of free movement of the insulated conductors therein relatively to each other, a joint in the pipe line comprising an enclosing casing, barrier plates within the casing secured liquid tight to the casing, expansion joints connecting the barrier plates liquid tight to the cable pipe line, thimbles carried by said barrier plates for receiving in a substantially liquid tight manner the insulated conductors which are to be joined within said casing, flexible pipes at each end of the joint casing, one end of each of said pipes communicating with the interior of the joint casing at one side of the barrier plates, the other end communicating with the pipe line at the other side of the barrier plates, and oil filling the joint casing.

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