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[54] **ENVELOPE FOR EXPLOSIVE CONNECTION OF METAL PIPES**

[76] Inventors: **Vladimir Mikhailovich Kudinov,** ulitsa Filatova, 1/22, kv. 51; **Jury Petrovich Bushtedt,** Bulvar Likhacheva, 3, kv. 73; **Daniil Andreevich Dudko,** pereulok Mechikova, 3, kv. 7; **Georgy Alexandrovich Arkangelsky,** ulitsa Tsitadelnaya, 94/7, kv. 22; **Georgy Ivanovich Pogoretsky,** ulitsa Entuziastov, 35, kv. 151; **Leonid Lexandrovich Volgin,** ulitsa Erevanskaya, 14, kv. 33; **Viktor Anatolievich Kotov,** Goloseevo, 3, kv. 7; **Boris Anatolievich Surnin,** ulitsa Vandy Vasilevskoi, 3, kv. 34, all of Kiev; **Ikhail Vasiievich Degtyarev,** ulitsa Polotskaya, 5, korpus 2, kv. 10, Moscow, all of U.S.S.R.

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[51] **Int. Cl.** **B23k 21/00,** B23p 3/02

[58] **Field of Search** ..... 29/421 E, 470.1, 29/486, 497.5; 228/3; 72/56

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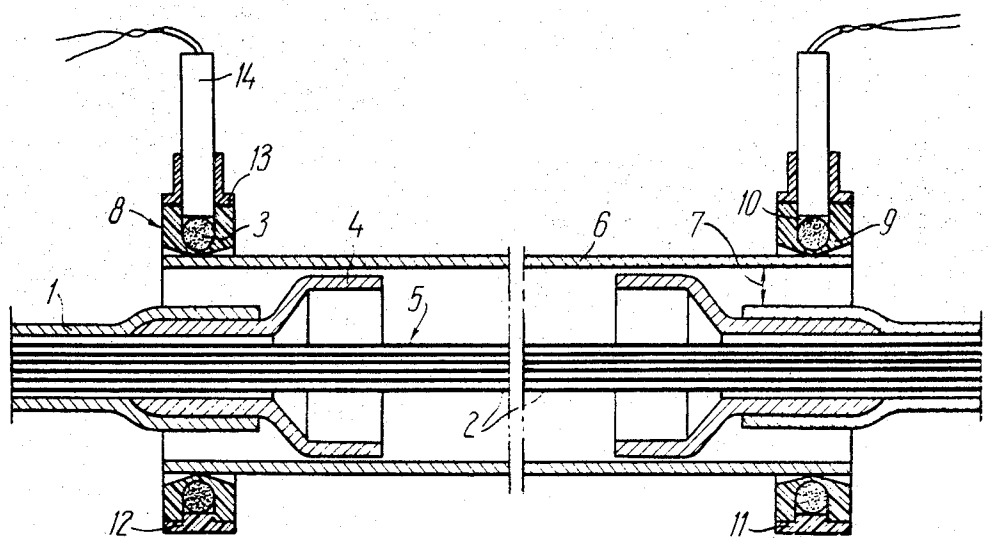
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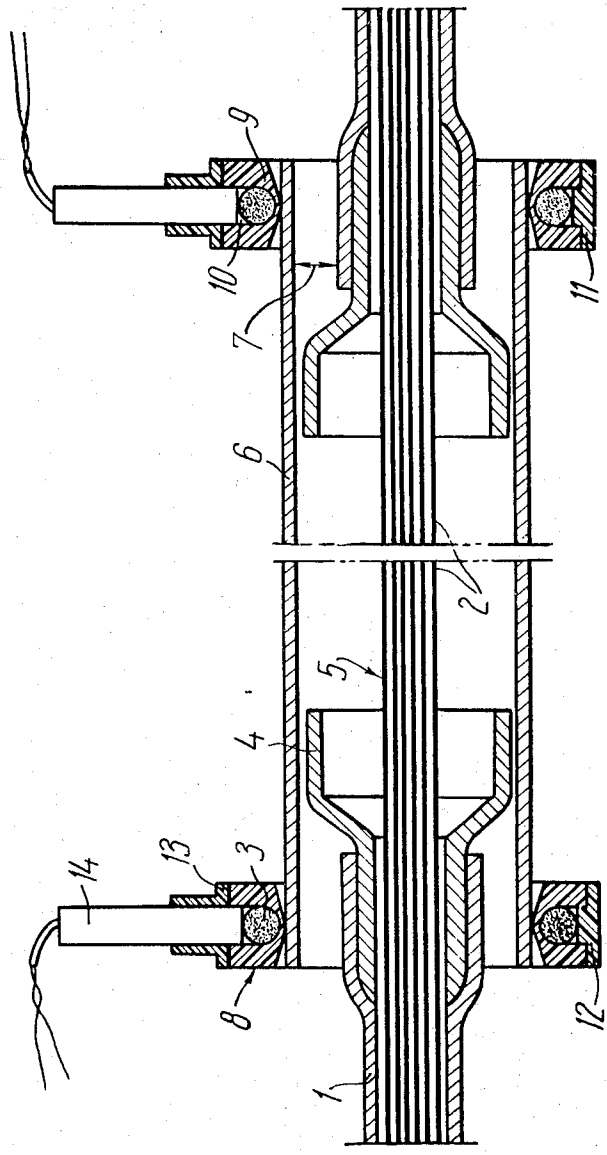
Primary Examiner—Robert D. Baldwin
Assistant Examiner—Ronald J. Shore
Attorney—John C. Holman et al.

[57] **ABSTRACT**

The connecting together of metal pipes by explosive welding, particularly metal sheaths for communication cables in which pipes of different diameters are inserted one into another, and a ring-shaped explosive charge is disposed on the outer surface of the pipe of large diameter over the location of its prospective joint with the other pipe, whereafter explosion of the charge connects the pipes together. On the outside of the charge, an inertial envelope is formed of a material, easier to deform than the metal pipes to be welded together.

1 Claim, 1 Drawing Figure




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ENVELOPE FOR EXPLOSIVE CONNECTION OF METAL PIPES

This is a divisional of application Ser. No. 110,001, filed Jan. 27, 1971.

BACKGROUND OF THE INVENTION

The invention relates to methods of connecting together metal pipes by explosive welding, particularly metal sheaths of communication cables.

At present in the cable making industry, lead is being replaced by cheaper and lighter aluminum in the production of cable sheathing. The main factor retarding a wide employment of communication cables with an aluminum sheathing is the absence of a secure method of connecting together the aluminum sheaths.

The method of hot soldering with a lead coupling presently employed for this purpose has a number of disadvantages. This process with aluminum sheathing is subject to a danger of burning the styroflex insulation of the conductors, which is not permissible and a solder joint of lead with aluminum is of low reliability. In addition, costly materials are required (lead, solder) and the soldering process consumes much labor.

The quality of the solder joint completely depends on the skill of the operator and a splice of dissimilar metals causes the formation of a voltaic couple, and corrosion of the cable.

The above disadvantages of the hot soldering method with the use of a lead coupling demonstrate that such a method does not achieve the required reliability of the joint of the aluminum sheaths of communication cables.

Known in the art is a method of explsively connecting metal pipes, in which pipes of different diameters are inserted one into one another, and a ring-shaped explosive charge is disposed on the outer surface of the pipe of larger diameter over the location of its connection with the other pipe, the explosion of the charge connecting the pipes together.

According to this method, the explosive charge is located on the outer surface of the pipe of larger diameter. One of the pipes has at least one circular collar welded thereto and following the blast, the outer pipe is deformed, thus tightly compressing the collar.

This method requires welding one or several circular collars to the pipe. In addition, the fact that such additional welding generally complicates the jointing process, this method cannot be employed to connect together aluminum sheaths of communication cables, since it is impossible to weld the collars to the aluminum sheathing of the cable.

An object of the present invention is to provide an inertial for explosive connection of metal pipes envelope which assure a leakproof joint for the pipes, particularly of communication cable sheaths, and rules out the danger of the failure of the cable conductors insulation.

SUMMARY OF THE INVENTION

The above and other objects are achieved by an inertial envelope used in a method of explosively connecting metal pipes, in which pipes of different diameters are inserted one into one another, and a ring-shaped explosive charge is disposed on the outer surface of the pipe of larger diameter over the location of its joint with the other pipe, with the explosion of the charge

connecting the pipes together, the improvement being that on the outside of the charge, an inertial envelope is formed of a material easier to deform than the metal pipes to be welded together. The charge can be placed directly on the pipe, with the envelope of a more easily deformable material being positioned on the top thereof.

Alternatively, the pipe can be first covered with a more easily deformable material, with the explosive charge being then placed thereon and thereafter covered with the more easily deformable material to provide the envelope.

As a result of the present invention, there has been provided an envelope for use in a method of explosively connecting metal pipes, particularly metal sheaths of communication cables, which secures a highly reliable and leakproof pipe joint, lower labor costs connect the pipes, and an economy of scarce materials.

The invention is further explained by an exemplary embodiment thereof and a drawing illustrating the method according to the invention, and the envelope, taking as an example, the explosive welding of metal sheaths of a communication cable.

DETAILED DESCRIPTION OF THE INVENTION

The sole FIGURE is a diagrammatic view in cross section of the invention.

Since the inner space of a cable sheath **1** is filled with current conductors **2**, an explosive charge **3** must be disposed outside the sheath.

To prevent destruction and deformation of the current conductors **2** of the sheath **1** at the place of welding, a stepped steel sleeve **4** (the sleeve can be made of another, no less strong, material) is pressed into the end of the sheath. The inner diameter of the sleeve **4** is being accord with the diameter of bundle **5** of the current conductors **2** of the cable. The larger outer diameter of the sleeve **4** equals the inner diameter of a coupling pipe **6**, while a clearance of 2–3mm is between its smaller outer diameter and the inner diameter of the coupling pipe. This clearance is necessary to realize the explosive welding of the pipes.

In order to achieve explosive welding, it is necessary that the velocity of the point of contact, which depends on the rate of detonation of the explosive, should be less than the velocity of sound propagation in the given metal, but sufficient to weld this metal (the velocity of the point of contact means the rate of displacement of the zone of collision of the components to be welded together).

Explosives whose rate of detonation is less than the sound velocity in aluminum have critical diameters of 8–10 mm. If a charge of such an explosive is made and employed, it will be so powerful that its detonating will damage the cable sections adjacent to the zone of welding.

Explosives having small critical diameters possess rates of detonation exceeding the sound velocity in aluminum. Employment of explosives with small critical diameters and high rates of detonation became possible due to the use of a special polyethylene envelope **8**, into which the annular charge **3** of this explosive is placed.

The aluminum sheaths **1** of the cable are connected together by means of the coupling pipe **6**, with the ends thereof being welded to the sheaths **1** of the cables being jointed.

The inertial envelope 8 are made collapsible into two rings each covering one another, the inner ring 9 has an outer circular slot 10 to accommodate the charge 3, the thickness of the sidewall being not less than the diameter of the charges, and outer ring 11 has a circular collar 12 located on its inner surface and entering the slot to compact the charge 3 when assembling the envelope 8. The inertial envelope prevents a momentary lateral burst of the explosive and permits the line of contact to move, upon impact of the article being welded, at right angles to the direction of detonation at a speed lower than the speed of sound propagation in the articles.

The envelopes 8 with the annular explosive charges 3 inserted therein are placed on the edges of the coupling pipe 6 and the explosive charge 3 is made of a detonating cord. the outer ring 11 has a socket or recess 13 into which an electric detonator 14 is inserted.

Due to the envelope 8 surrounding the charge 3, and bounding the spread of the explosion products as the charge is detonated, the size of the thrown area of the coupling pipe is significantly increased. The mass and the material of the envelope 8 are chosen so that during collision of the wall of the coupling pipe 6 with the cable sheath 1 the line of contact moves perpendicularly to the direction of detonation of the charge 3, i.e. along the cable axis, at a velocity of 2000-4000 m/sec, which is below the sound velocity in aluminum. The tapered shape of the inside surface of the inner ring 9 assists in widening the zone of welding, and is convenient for placing the envelope 8 with the charge 3 on the coupling pipe 6.

An explosive connection of the pipes can also be effected when the explosive charge is placed directly on the pipe, and is then covered with the envelope of the more easily deformable material.

Described below are examples of the employment of the present method, as well as of the envelopes.

EXAMPLE NO. 1

Explosive welding of aluminum sheaths of a telephone cable

Aluminum sheaths of a 16-conductor telephone cable were welded together by explosion.

The diameter of the cable aluminum sheathing is 19 mm.

The diameter of the coupling pipe is 33 mm.

The wall thickness of the coupling pipe equals 1.2 mm.

The envelope of the explosive charge was of polyethylene.

The inside surface of the envelope's inner ring had a tapered shape.

Serving as the explosive was a hexogen (RDX), based detonating cord with an outer diameter of 6 mm.

The wall thickness of the polyethylene envelope under the charge was 2 mm., the envelope width 16 mm, its outer diameter 55 mm, its inside diameter 33 mm.

The diameter of the annular explosive charge was 45 mm.

As a result, a high-quality weld joint was obtained.

EXAMPLE NO. 2

Explosive welding of pipes.

Welded together were two pipes of an aluminum alloy with a tensile strength of 32 kg/mm^2. The diameter of the first pipe is 300 mm, and of the second pipe 04 mm. The wall thickness of each pipe is 2 mm.

Employed as the explosive was hexogen (RDX) with a density of 1.3 gm/cm^3, and a diameter of 5 mm. A 1 mm-thick rubber liner was laid between the explosive charge and the wall of the cylinder of larger diameter. The envelope over the explosive charge was of rubber 15 mm wide, and 10 mm deep.

The charges were located outside the pipes.

A leak-proof and high-strength pipe joint was obtained.

What we claim is:

1. An inertial annular envelope for enclosing an explosive charge for joining metal pipes of different diameters inserted one into the other, with the charge being placed on the outer surface of the pipe of larger diameter at a point where it is to be jointed to the other pipe, said envelope comprising a first ring placed directly on the pipe of larger diameter, said first ring having an outer slot to accommodate an explosive charge, the inside surface of the first ring being tapered for widening the welding zone and for convenient mounting on the pipe of larger diameter, the thickness of the side wall of the first ring being not less than the diameter of the charge, and a second ring covering the charge, said second ring having on its inside surface a collar to engage the slot of the first ring to seal off the explosive charge.

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