Nov. 30, 1971 E. LUSSER 3,623,437

DEVICE FOR BURNING HOLES INTO CONCRETE, MASONRY, STONE OR METAL

Filed Feb. 24, 1970

Fig.1

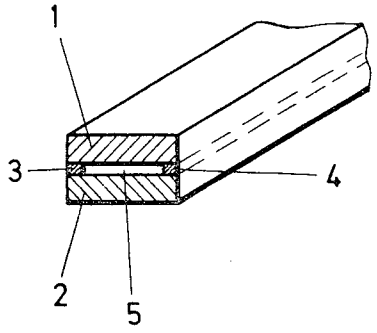


Fig. 2

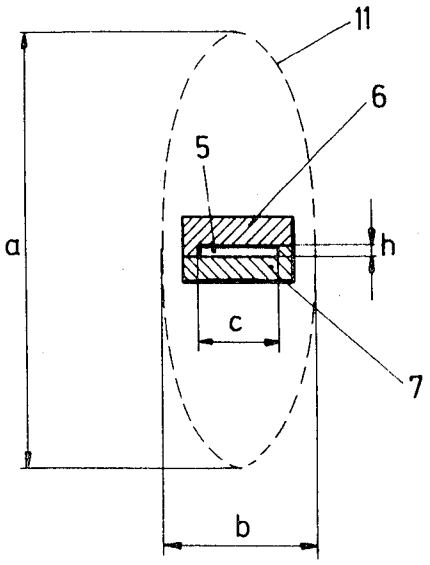
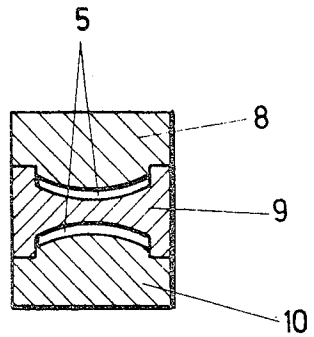


Fig. 3



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DEVICE FOR BURNING HOLES INTO CONCRETE, MASONRY, STONE OR METAL

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U.S. Cl. 110—1 R 6 Claims

ABSTRACT OF THE DISCLOSURE

Device for burning holes into concrete, masonry, stones or metal comprising a metallic burning rod which has at least one channel extending over the entire length thereof and which is connected at its rearward end with a source of oxygen under excess pressure, the channel or channels that conduct the oxygen being as seen in cross section in the form of longitudinal slots the length of which is a multiple of the width thereof and the main masses of the rod material as seen in cross section being disposed perpendicularly to the longitudinal side of the slot.

BACKGROUND OF THE INVENTION

The invention relates to a device for burning holes into concrete, masonry, stones or metal which consists of a metallic burning rod that has at least one channel which extends over the entire length and is connected at the rearward end with a source of oxygen under excess pressure.

Devices of this type are already known. They are frequently referred to as oxygen lances and heretofore they were usually made from a thick walled iron or steel tube in the hollow space of which iron or steel wires were arranged and often also magnesium wires. The oxygen is blown through at an excess pressure of 3.5 to 25 atm. and the front end of the burning tube is heated, for example, with a welding flame or torch until the tube itself begins to burn under the influence of the oxygen. The burning tube is now pressed against the material that is to be bored or cut off, fo rexample, concrete. The heat causes the metal to melt and the iron oxides start chemical reactions in concrete and stone which result in lower melting points so that the material flows out in the form of liquid lava.

The holes produced by this burning bore method are round holes corresponding to the form of the burning tube. If elongated cuts are produced, for example, in order to cut out a door opening in a concrete wall, then one hole has to be lined up with another until the clear cross section of the part to be cut out is severed.

The cost for this method heretofore were usually higher than for doing the same work by means of compressed air or electric hammers or drills. The burning bore method therefore was heretofore used primarily where its low noise level, the absence of vibration and dust were valued as great advantages or where for technictl reasons the use of compressed air or electro hammers was not taken into consideration.

SUMMARY OF THE INVENTION

It is the object of the present invention to provide a burning rod or lance by means of which the cost for a certain job can be reduced to a fraction of that for the same work when done with an oxygen lance known heretofore. In this connection the cutting of longer slots can be effected, particularly advantageously, i.e., that manner of use for which the burn boring is utilized in construction work in more than 95% of all cases.

The device, in accordance with the invention, has the qualities that the channel of the burning rod which conducts the oxygen is in the form of a longitudinal slot as seen in cross section, while the length of the slot is a multiple of the width of the slot and the main masses of the rod material as seen in this cross section are arranged perpendicularly to the length of the slot.

Owing to this specially shaped form of the passage aperture for the oxygen, it is accomplished that the oxygen that emerges from the slot expands preferably in that direction in which the main mass of the rod material is located, so that the liquid iron is pulled along in spark and droplet form primarily in both directions perpendicularly to the length of the slot and is cast against the material to be melted, for example, the concrete. If the rod is correspondingly dimensioned, this permits that the reduction of this material takes place in the form of an ellipse whose main axis extends perpendicularly to the length of the slot.

BRIEF DESCRIPTION OF THE DRAWINGS

Further details and advantages of the subject of the invention will be explained with reference to the embodiments of burning rods or lances illustrated in the drawing, and in which:

FIG. 1 is a perspective view of a section of a first embodiment of a burning rod,

FIG. 2 is a cross section through a second embodiment of a burning rod with the cross sectional plan of the bore produced with it, and

FIG. 3 is a cross section of a third embodiment of a burning rod assembled from three profiled bars.

DESCRIPTION OF THE INVENTION

The burning rod illustrated in FIG. 1 comprises two rectangular iron rods **1**, **2**, which are connected with one another, for example, by resistance welding with two sheet metal strips **3**, **4**, for example of iron, interposed to form a channel **5** for the passage of the oxygen. The cross section of the channel **5** must be formed in such a manner that its length *c* is a multiple of its width *h* (see FIG. 2). The main masses of the rod material are in this connection disposed perpendicularly to the length of the slot **5**.

FIG. 2 shows a cross section of a burning rod which is welded together out of two formed or profiled bars **6**, **7** which are L-shaped in cross section. In FIG. 3 an embodiment is illustrated assembled from three formed rods **8**, **9**, **10** and which has two arcuate slots **5** that are disposed convex with respect to one another in mirror image fashion.

Due to the channels **5** that conduct the oxygen being in the form of elongated slots, bundling and guiding of the effective ray of sparks of liquid iron is obtained in a desired direction. The burned out cross section of the hole has the form of an ellipse **11** as indicated in FIG. 2. The production of a cut in a concrete wall by burning of oval holes aligned with one another becomes all the more economical, the smaller the secondary axis *b* of an ellipse **11** is in relation to the major axis *a*, i.e. the less material has to be burned out in a direction transversely of the cut. A burning rod of the type illustrated in FIG. 3 having two slots **5** in this respect produces a still better effect because the curving of the slots produces an additional bundling of the spark ray in the directions of the greatest cross sections of the rod material, thus in the drawing upwardly and downwardly.

The progress obtained by means of the new burning rod as compared to a conventional burning lance of round cross section with wire filling will be explained hereinafter with reference to an embodiment.

A window of 1 m. x 1 m. is to be cut out in a concrete wall which corresponds to a cut that is 400 cm. in length.

If this work is carried out with the heretofore conventional round burning tube, for example, 17 mm. O.D. with wire filling, by means of which a round hole of an average diameter of 50 mm. can be burned, then 80 holes have to be burned with a total cross sectional area of 157,000 mm.^{2} The volume of concrete burned out corresponds to this surface times the thickness of the concrete wall. The costs of the work comprise the quantity of the iron to be liquefied, of the oxygen consumed and of the work time required. Thus, the costs are approximately proportional to the volume of concrete burned out or the cross sectional area.

Now if the same work is carried out with a burning rod in accordance with FIG. 1 or 2 which has a width of 17 mm., a height of 8 mm. and a slot of 11 x 0.5 mm., then an elliptical burning hole of 50 mm. height but of only 20 mm. width can be produced. Thus for the same job it is also necessary to burn 80 holes, but the cross sectional area thereof is only 78,500 mm.^{2}, i.e., roughly one-half, whereby a corresponding reduction in costs is obtained.

However, this is only a part of the progress achieved. It has been found that for burning out a certain volume of concrete with the new burning rod, less iron and oxygen are consumed than with a round burning tube having wire filling.

This can be explained in that with a burning tube of this type the oxygen sprays away out of many small cross sectional passages and in practically all directions. A large part of the liquid iron in spark and droplet form therefore does not impinge with full kinetic force against the concrete wall to be worked on. The energy is partly consumed by mutual collisions of the particles. As compared to this, with a burning rod having an oxygen channel in such a slot form without wires, practically the entire kinetic energy of the liquid iron particles is utilized in spark and droplet form for reducing the concrete.

To this is added the fact that the production costs for example of a burning rod in accordance with FIG. 1, are smaller than the production costs of a heretofore conventional burning tube having sealed in wires. For that reason the total costs for performing a certain task are reduced to a fraction of the prior costs.

The new burning tube however provides still other advantages. Since the burned out bores are of elliptical cross section, it is possible for example in order to produce an anchorage in a concrete wall to first burn an elliptical hole of a certain depth having a vertical main axis and then to turn the burning rod by 90° and produce in the depth an elliptical hole having a horizontal main axis. In this manner it is then possible to insert longitudinal anchoring plates into the bore and secure them by turning them 90°. Such an anchorage can absorb much higher dimensional forces than an anchorage concreted into a round hole.

Having now described my invention with reference to the embodiments illustrated, what I desire to protect by Letters Patent is set forth in the appended claims.

I claim:

1. Device for use in burning holes into concrete, masonry, stones or metal, comprising a metal rod of uniform rectangular cross section throughout its entire length and provided along its entire length with at least one channel adapted to conduct oxygen under pressure from one end of said rod to its other end, the cross section of said channel has the shape of a narrow slot having parallel walls disposed substantially parallel to two opposed sides of the cross section of said rod, the long sides of the cross section of said narrow slot having a dimension which is a multiple of the narrow width of said slot, while the thickness of the solid wall formed between the longitudinal dimension of said slot and said two opposed sides of the cross section of said rod is in excess of the narrow width of said slot.

2. Device for use in burning holes into concrete, masonry, stones or metal, comprising a metal rod of uniform rectangular cross section throughout its entire length and provided along its entire length with two laterally spaced channels adapted to conduct oxygen under pressure from one end of said rod to its other end, the cross section of each of said channels has the shape of a narrow slot having parallel walls disposed substantially parallel to two opposed sides of the cross section of said rod, the long sides of the cross section of said narrow slots having a dimension which is a multiple of the narrow width of said slots, while the thickness of the solid wall formed between the longitudinal dimension of each of said slots and said two opposed sides of the cross section of said rod is in excess of the narrow width of said slots (FIG. 3).

3. Device for use in burning holes into concrete, masonry, stones or metal, comprising metal rod means of uniform rectangular cross section throughout its entire length, one side of said cross section being longer than the one extending at right angles thereto, said metal rod means being provided along its center axis with a channel whose cross section is also rectangular, the two longer opposite sides of the cross section of said metal rod means being disposed parallel to the adjacent longer opposite sides of the cross section of said channel, whereby the longer side of the cross section of said channel is a multiple of the length of the smaller side of the cross section of said channel, and the thickness of the wall formed between the longer sides of said two cross sections is in excess of the smaller sides of the cross section of the channel.

4. Device according to claim 3, in which said metal rod means comprises two parallel rectangular metal bars spaced from each other and united with each other by two sheet metal strips extending therebetween and along the opposed faces of said two bars and along the outer edges of the same.

5. Device according to claim 3, in which said metal rod means comprises two similar bars of L-shaped cross section of which one leg of each bar of said cross section has a length equal to the smaller side of the cross section of said channel while the other leg is longer, whereby the end face of each short leg is attached to the inner face of the longer leg of the other bar, thereby forming said channel.

6. Device for use in burning holes into concrete, masonry, stones or metal, comprising a metal rod of uniform cross section throughout its entire length and provided along its entire length with at least one channel adapted to conduct oxygen under pressure from one end of said rod to its other end, the cross section of said channel has the shape of a narrow slot having parallel walls, the long sides of the cross section of said narrow slot having a dimension which is a multiple of the narrow width of said slot, while the thickness of the solid wall portions formed between the long sides of said slot and the perimetric surface of the rod at each point from said long sides is greater than the thickness of the solid wall portions formed between the short sides of said narrow slot and the perimetric surface of the rod at each point from said short sides.

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