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1,684,108

G. H. PHELPS

ELECTRIC WELDING

Filed Oct. 22, 1921

Fig. 1.

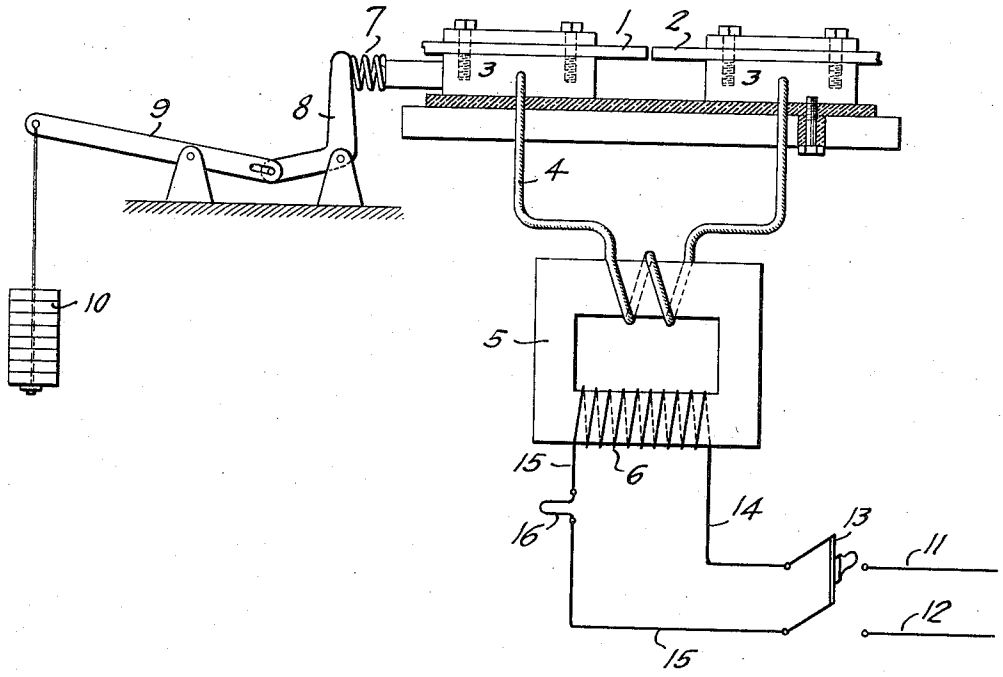
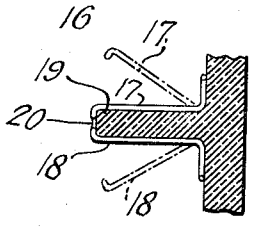


Fig. 2.



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UNITED STATES PATENT OFFICE.

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ELECTRIC WELDING.

Application filed October 22, 1921. Serial No. 509,459.

In certain prior patents of Thomas E. Murray, Jr., and others there is described a method of electric welding in which the parts to be welded are pressed together and a current is passed through the joint of extremely high amperage for a very brief interval of time.

The present invention is directed to welding methods of this character and aims particularly at controlling the duration of the current in such a way as to permit its application for a shorter interval than would otherwise be practicable.

The accompanying drawings illustrate the invention diagrammatically; Fig. 1 being an elevation of a complete apparatus; Fig. 2 is a detail view of a fuse.

Referring to the apparatus illustrated, 1 and 2 are bars to be welded together at their ends. They are held in clamps 3 which are connected to each other through the secondary line 4 of a transformer 5 carrying a primary winding 6, the terminals of which are connected to the source of current.

The right hand clamp 3 is fastened on the support and the left hand clamp is pressed toward it by any suitable mechanism. In the diagram, the spring 7 on the end of the clamp 3 is engaged by a bell crank lever 8 which is operated by a lever 9, the outer end of which is pulled down by a weight 10; so that the part 1 is pressed against the part 2 continuously and with a determined pressure as the metal is welded and taken up with a corresponding slight movement of the block 3.

The current from the mains 11 and 12 passes through a switch 13 to the line 14 going to one end of the primary winding of the transformer, and to the line 15 going to the opposite end of the same winding. In the line 15 there is inserted a fuse 16, calculated to break as soon as the current reaches a predetermined amperage.

This fuse is preferably of the repulsion type shown in Fig. 2 with branches 17 and 18 lying on opposite sides of the insulating spacer 19 and connected together by a portion 20 over the end of the spacer of reduced section. The passage of current causes a repulsion between the two parts 17 and 18 of the fuse so that as soon as the part 20 is sufficiently melted the arms will fly apart and make a quick and sure break in the current.

The greater the current impressed on the circuit, the more quickly will the fuse break. This is important, because any heating of the parts at the joint beyond a welding temperature lessens the quality of the weld. Fuses are used which are calibrated to break at a predetermined amperage. The area of the desired weld, and the desired density of current per square inch will determine the amperage to be imposed on the line. The full volume of current will flow after a minute interval of time and a fuse is used which will break after a certain interval under the conditions. The best interval of time for securing good welds under different circumstances can be determined by trial and can be readily ascertained by means of the indicator described in the Phelps application for Patent No. 505,140.

In previous patents it has been proposed to utilize a motive device of some sort, set in action by the current for cutting off the current after the device has advanced through a certain movement. For example in the patent of Woodrow No. 1,145,642 of July 6th, 1915 a rotary motor controlled by the welding current is used in this way. And in Woodrow Patent No. 1,230,357 of June 19, 1917 a watt-meter relay is used. All such separate devices require an appreciable interval of time before they are set in motion by the passage of the current and are moved a sufficient distance to break the current. This interval may be brought down to a small fraction of a second, say one-quarter of a second or even less. But they cannot be used for the extremely brief intervals to which my present invention is directed, and in some classes of work it is important to bring the time interval down to less than that which can be secured by these prior devices (at the same time using a correspondingly greater current density).

With the present apparatus I have been able to reduce the current interval well below one-twenty-fifth of a second.

This process is advantageous in making welds where the conditions are such that there is apt to be a comparatively rapid conduction of heat away from the point of the weld and where if the weld were made with so low a current density as to require a comparatively long time to bring the parts to a welding temperature, there would be a likelihood of burning one or both of the

parts to be welded and thus destroying the efficiency of the weld. Such a case, for example, is that in which the end of a rod is to be welded to the face of a plate, the latter being apt to carry away the heat so fast as to delay the bringing of it to the desired condition at the welding point.

This process is also advantageous in making welds in metals which are very easily oxidized, (such as aluminum for example), in that the extreme rapidity of the welding operation materially reduces the oxidation of the metal in the joint and thereby improves its properties.

The repulsion fuse illustrated has advantages in quickness and certainty of operation. But it will be understood that the invention contemplates the use of other styles of fuse, and in fact of any element in the conducting line which will be broken or rendered inoperative as a conductor by the passage of the current through it, and will thus break the circuit or interrupt the passage of the current.

Though I have described with great particularity of detail a specific embodiment of my invention, yet it is not to be understood therefrom that the invention is restricted to the particular embodiment illustrated. Various modifications thereof may be made by those skilled in the art without departure from the invention as defined in the following claims.

The invention is particularly important in the Murray patented method of welding referred to above in which the parts are welded directly to each other by pressing together the faces to be welded and passing a current of extremely high amperage for a brief interval of time and in other similar methods which may be classed generally as high speed welding. The fuse 16 is directly in the welding circuit. When it melts the welding current is broken instantly without the loss of time involved in operating an intermediate relay or controlling device as in the Woodrow patents above and others.

What I claim is:

1. A high speed electric welding apparatus including in combination means for pressing the parts together and means for passing a welding current between them to weld their faces directly to each other and a circuit breaker in the welding circuit adapted to break the circuit immediately upon the current's reaching normal amperage.

2. A high speed electric welding apparatus including in combination means for pressing the parts together and means for passing a welding current between them to weld their faces directly to each other and a fuse in the welding circuit adapted to break upon the passage through it of a normal welding current and thus to instantly break the circuit and terminate the current.

In witness whereof I have hereunto signed my name.

GEORGE H. PHELPS.