April 6, 1965 W. D. HOFFMANN 3,177,338

MULTI-OPERATOR RESISTOR GRID WELDING APPARATUS

Filed June 29, 1962 2 Sheets-Sheet 1

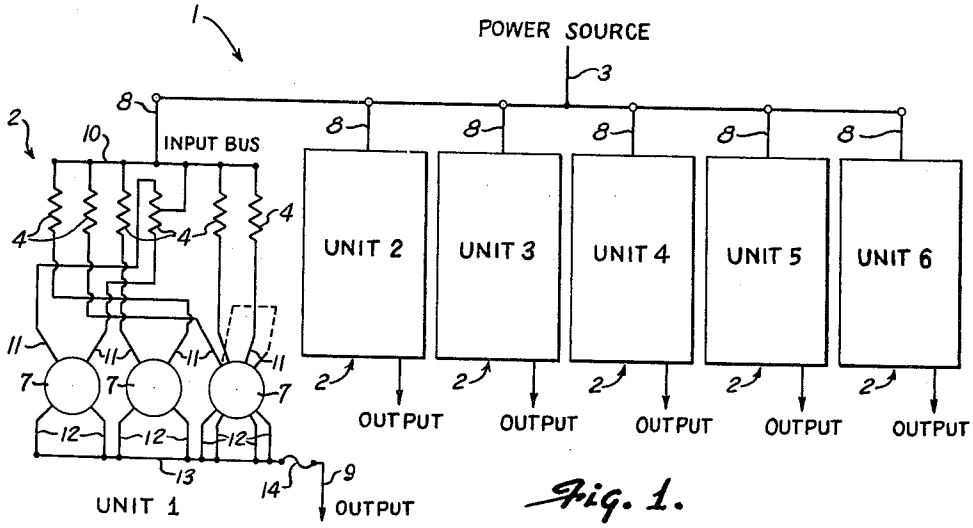


Fig. 1.

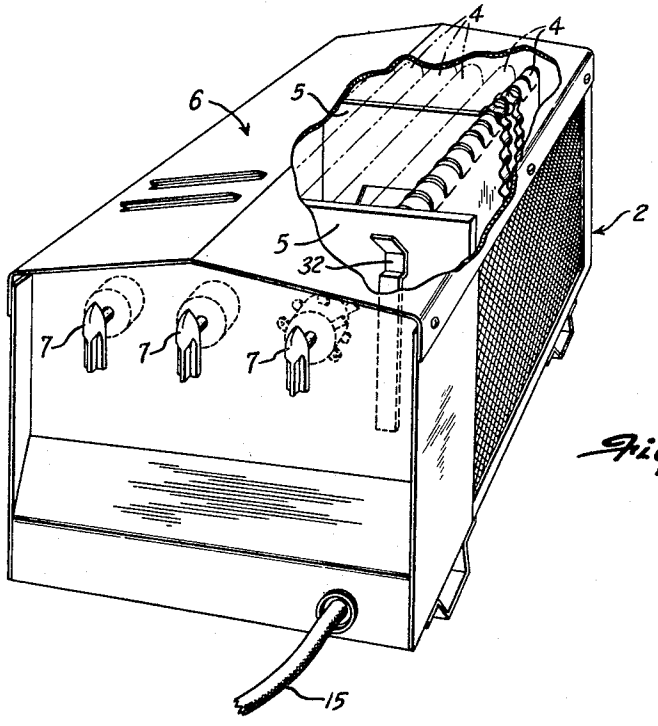


Fig. 2.

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MULTI-OPERATOR RESISTOR GRID WELDING APPARATUS

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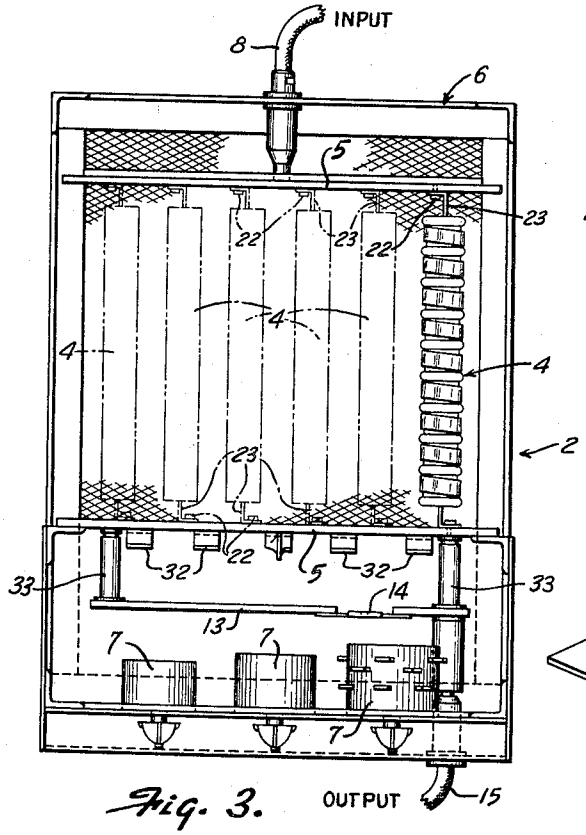


Fig. 3.

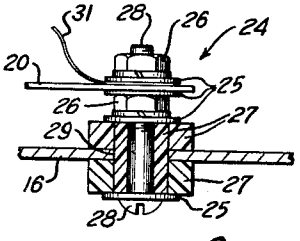


Fig. 6.

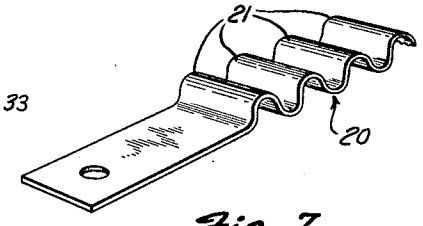


Fig. 7.

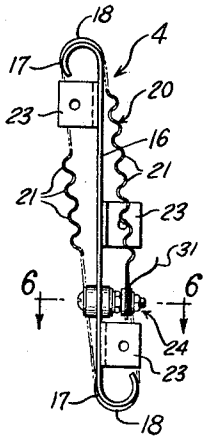


Fig. 5.

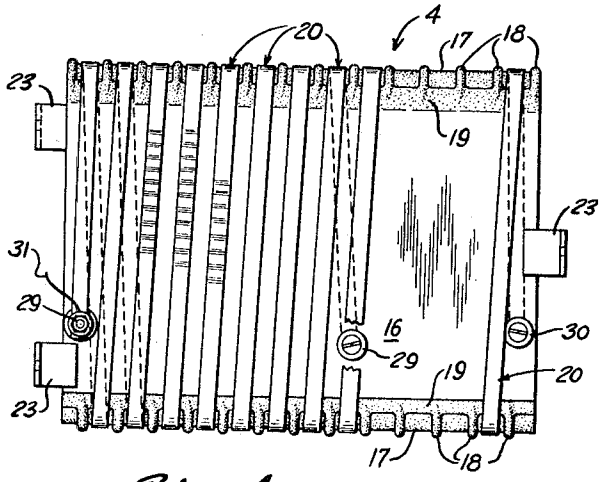


Fig. 4.

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MULTI-OPERATOR RESISTOR GRID WELDING APPARATUS

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3 Claims. (Cl. 219—131)

This invention is directed to a resistor grid assembly, and more particularly to an improved grid construction which is employed in multi-operator welding apparatus to make it possible for an individual welder to control the volt-amp characteristics of his welding arc without affecting the other arcs being operated simultaneously off the same power supply. The resistor grid assemblies of this invention are rugged to withstand the punishment received in rough field use, such as in building construction, ship building, and similar jobs. The units can be made portable, so that the welder can carry his control system along to the particular place where he is working. This is an immediate advantage, because the welder can make his arc adjustments without leaving the work site.

The resistor grid assemblies of this invention may be used in combination with a constant potential, rectifier power supply, and the desired amperage can be supplied for use in a particular welding unit by manipulation of switches located on the resistor grid assembly.

The individual resistor grid components comprise crimped ribbon or wire resistance material wrapped around glass coated steel plates. These steel plates are also coated with an additional insulating material at the points where the ribbon or wire resistance material comes in contact with the plates.

The coated plates provide a particularly rugged support for the resistance material, and will not break if handled roughly, even when subjected to harsh jolts. In addition, the glass coating provides excellent corrosion resistance.

The particular crimped ribbon or wire configuration saves space and, in addition, provides a natural compensation means to absorb expansion and contraction of the resistance material during changes of temperature.

The grid plates are well adapted to convection cooling because of their vertical disposition in the unit. A heat barrier wall and a plurality of copper heat sinks are provided between the resistor grid plates and the switching section to protect the switches from overheating.

The individual resistor grid plates are floated in insulation, thus eliminating a voltage potential to ground in the event that a coil becomes shorted to its grid plate. In addition, each grid assembly is provided with a safety limit fuse to prevent dangerous overloading.

The apparatus of the invention provides a simple, rugged and portable resistor grid assembly for use with a multi-operator welding power supply. Each unit is convection cooled and provides separate and accurate control of each welding arc operated from a single power source.

The drawings illustrate the best mode presently contemplated for carrying out the invention.

In the drawings:

FIGURE 1 is an electro-schematic diagram of a multi-operator resistor grid apparatus incorporating the present invention;

FIG. 2 is a perspective view of one of the resistor grid assemblies of the invention with parts broken away for clarity;

FIG. 3 is a top elevational view of the assembly shown in FIG. 2 with the top of the housing removed;

FIG. 4 is a side elevational view of a grid plate employed in the resistor grid assembly;

FIG. 5 is an end view of the grid plate of FIG. 4;

FIG. 6 is an enlarged sectional view taken on line 6—6 of FIG. 5 showing the assembly for attaching the resistor ribbon to the grid plate; and,

FIG. 7 is a perspective view showing the crimped resistor ribbon of the invention.

As shown in the drawings, a resistor grid apparatus 1 comprises a plurality of resistor grid assemblies 2. Each resistor grid assembly 2 is connected by leads 3 to a constant potential, rectifier power source (not shown).

Each resistor grid assembly 2 is generally similar to the other resistor grid assemblies, and comprises a plurality of resistor grid units 4 disposed on a pair of mounting boards 5 in a housing 6. Also included are selector switches 7, an input lead 8, and output lead 9. The input lead 8 connects to a bus 10, to which the resistor grid units 4 are connected in parallel. The resistor grid units 4 are also connected by means of leads 11 to the selector switches 7, which are snap action, manually operable switches to electrically connect any predetermined combination of the resistor grid units 4 into the welding circuit. The selector switches 7 are connected by means of a plurality of leads 12 to an output bus 13, which is electrically connected through a fuse 14 to output lead 9. The output lead 9 is thereafter connected to welding cable 15 to supply resistance controlled power to each individual weldor from a common power supply.

In the schematic shown in FIG. 1, all of the resistor grid units 4 are shown in a paralleled resistance circuit. This is not essential, however, since any portion, or all of the grid units 4, could also be placed in series relationship to each other. The actual construction of the resistor grid units 4 is an important feature of the invention.

Each resistor grid unit 4 comprises a glass coated grid plate 16 which includes a pair of oppositely curved flange edges 17, and a plurality of ridges 18, stamped in the flange edges 17. The flange edges 17 are additionally spray coated with an insulating layer 19 of a material such as aluminum oxide to insure adequate insulation in the area of heat concentration.

Resistor ribbons 20 are wound on the grid plate 16, with the ridges 18 serving as a spacing means to correctly space apart the successive winds of the resistor ribbons 20. The resistor ribbons 20 are crimped, as best seen in FIG. 7, to provide increased surface area for a given amount of space. In addition, crimps 21 provide an elastic means for absorbing the expansion and contraction of the grid plates 16, and the resistor ribbons 20 when the apparatus is heated up during operation of the arc welding equipment.

As best seen in FIG. 3, each resistor grid assembly 4 comprises 6 resistor grid units disposed parallel to each other and attached to the mounting boards 5 by means such as bolt 22 extending through brackets 23 on each grid plate 16. The mounting boards 5 are fabricated from an insulating material of asbestos or plastic and serve to electrically isolate the resistor grid units 4 from the housing 6.

The resistor ribbon 20 is secured to the grid plate 16 by means of an insulator attachment assembly 24, as shown in FIG. 6 of the drawings. The insulator assembly includes a plurality of washers 25, nuts 26, insulators 27, and a bolt 28 to secure the end of the ribbon 20 to a point 29 on the grid plate 16, a second attachment point 30 is disposed on the opposite end of the grid plate 16 and has an insulator attachment assembly similar to the attachment assembly 24 described above. A plurality of short wire leads 31 extend from the respective attachment assemblies 24 to the input bus 10 and the output bus 13, respectively, to provide a complete electrical circuit through the selector switches 7 so that the weldor

may preselect the amount of resistance to be placed in his particular leg of the multi-operator welding circuit.

A plurality of copper heat sink brackets **32** are provided on the mounting board **5** between the resistor ribbons **20** and the selector switches **7**. The copper heat sink brackets **32** serve to dissipate heat generated from the resistor grid assemblies **2**, thereby protecting the switches **7** from excessive heat. The output bus **13** is secured to and supported by the front mounting board **5** through a plurality of mounting assemblies **33**.

This invention provides a durable, lightweight, resistor grid assembly which may be used in combination with a multi-operator welding power source to provide arc control means remote from the power source within convenient access to the individual weldor.

Various modes of carrying out the invention are contemplated as within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. A resistor assembly for multiple welding units operated from a single constant potential power source comprising in combination, a main housing, a plurality of insulated support means extending from the main housing and attached thereto, a plurality of glass coated, unitary metal plates having a generally elongated S configuration when viewed edgewise and including reversely bent flanges, said flanges having an additional insulation coating of aluminum oxide fused to the outer surfaces thereof, said plates being secured to said insulating support means, thereby completely insulating the plates from the main housing, said plates being disposed in parallel relationship to each other, a plurality comprising *n* number of crimped resistor ribbons, each of said ribbons being helically wrapped on the reversely bent flanges of one of said metal plates and being in contact with said metal plate only at the reversely bent flanges and insulated from said metal plate by the glass coating and the aluminum oxide coating, and multi-position selector switch means for electrically connecting any number of resistor ribbons from 0 to *n* number into said welding unit, thereby providing a preselected resistance in the respective welding unit for controlling the respective welding arc.

2. Arc welding apparatus for supplying a plurality of independently controlled welding arcs operated from a single, constant potential power source comprising in combination, a constant potential power source, a plurality of resistor grid control units, each resistor grid control unit including a plurality comprising *n* number of resistor grid assemblies, a crimped resistor ribbon associated with each of said resistor grid assemblies, an arc welding unit associated with each of said resistor grid control units, a multi-position switch means included in each control unit for electrically connecting any number of resistor grid assemblies from 0 to *n* number into its associated arc welding unit, and a plurality of glass coated, unitary metal plates each having an intermediate elongated web and integral, reversely curved end flanges extending outwardly from the opposite ends of said plates, said metal plates being associated with each of said resistor grid control units, each metal plate providing support means for one of said resistor ribbons, said resistor ribbon being in contact with the metal plate only at the curved flange portions thereof.

3. A resistor ribbon support means for supporting a continuous, helically wrapped, crimped resistor ribbon thereon, comprising a unitary, glass coated metal plate having a substantially elongated S-shaped profile with oppositely curved end flanges for receiving a resistor ribbon, said flange edges including integral notches formed therein for spacing adjacent wraps of said resistor ribbon, said flange edges being additionally coated with a second insulating material comprising aluminum oxide in the portion thereof in contact with the resistor ribbons to completely electrically isolate the resistor ribbon from said support member.

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