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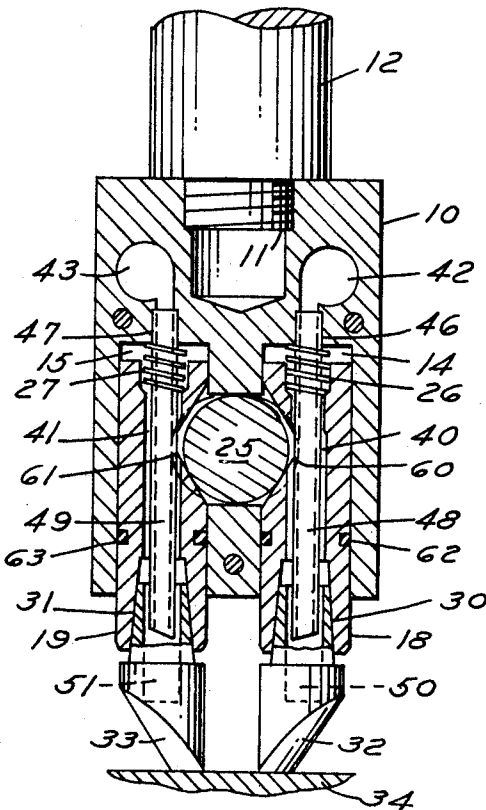
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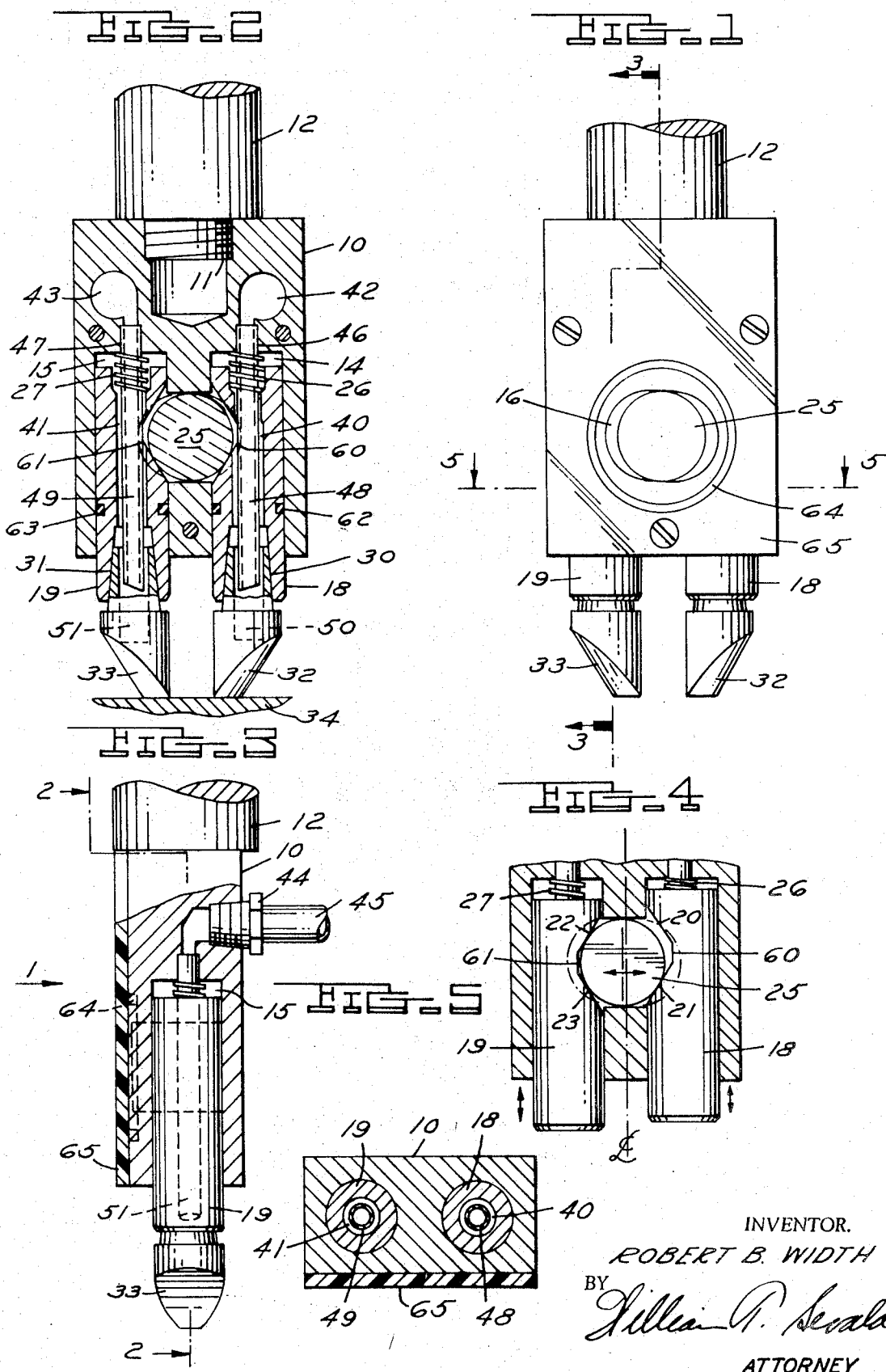
[54] **ELECTRIC RESISTANCE WELDING ELECTRODE
HOLDER FOR HOLDING TWO ELECTRODES IN
BALANCED FORCE CONTACT**
3 Claims, 5 Drawing Figs.

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ABSTRACT: A variable condition compensating and equalizing dual electrode holder having cam-surfaced pistons supporting the electrodes and a barrel cam coaxing with the cam surfaces on the pistons. The pistons are resiliently extended by springs and one piston retracts upon contact until the other piston makes contact with the workpiece in advancing movement of the holder. This action is permitted by transverse movement of the barrel. Further inward movement of the pistons due to advancing movement of the holder locks the pistons in their different extensions against the barrel. Further advancing movement of the holder presses the electrodes into equal contact with the workpiece. Coolant circulation is provided by tubular pistons and coaxial tubes and transferring coolant across the holder body through the barrel cam cavity from side apertures in the tubular pistons.





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ELECTRIC RESISTANCE WELDING ELECTRODE HOLDER FOR HOLDING TWO ELECTRODES IN BALANCED FORCE CONTACT

This invention relates to electric resistance welding means and in particular to electrode holders having two electrodes and which are capable of compensating for variable conditions to urge both electrodes into substantially equal contact to produce substantially equal welds.

When two electrodes are used to make two welds at the same time, they must be pressed into substantially equal electrical contact with the workpiece and the opposing base electrode or one electrode passes too much current and the other passes too little current resulting in extreme instances of burning out one weld and failing to make the other. Since the electric current follows the best conduction path, the electrical contact of each electrode is critical. As the equality of the electrical contact depends on the equality of the mechanical engagement of the conducting parts, the equality of the mechanical engagement of two electrodes on a single holder is critical.

The involved include the difference in thickness of workpieces, misalignment of tools, over and under seating of electrodes in the holder, difference in electrode length, mushrooming and other wear on electrodes, bends in workpieces, and unevenness of the base electrode, inter alia. These differences need only be minute to greatly change the conductivity of one electrode relative to the other.

With the foregoing in view, it is a primary object of the invention to provide a variable condition equalizing and compensating holder for holding two electrodes in substantially equal mechanical contact to effect substantially equal electrical contact to make substantially equal welds.

An object of the invention is to provide a very compact compensating holder so that little space is used and so that the electrodes may be located close to one another.

An object of the invention is to provide a holder which jams its moving compensating parts in solid electrical contact with one another prior to conducting welding current.

An object of the invention is to provide a holder which unjams after the welds are made so as to have its compensating parts readily movable for making the next welds.

An object of the invention is to provide coolant circulation means associated with the novel structure.

An object of the invention is to provide an very simple mechanism to obviate current conducting problems.

These and other objects of the invention will become apparent by reference of the following description of an equalizing and compensating dual welding electrode holder embodying the invention taken in connection with the accompanying drawing, in which:

FIG. 1 is a face elevational view of the holder seen in FIG. 3 in the direction of the arrow 1, wherein the barrel cam and the transverse cam track are seen through the transparent cover plate.

FIG. 2 is a cross-sectional view of the device shown in FIG. 3 taken on the line 2-2 of FIG. 3.

FIG. 3 is a cross-sectional view of the device shown in FIG. 1 taken on the line 3-3 thereof.

FIG. 4 is a partial cross-sectional view of the device as seen in FIG. 2 showing a different compensating position of the parts showing the pistons in elevation; and

FIG. 5 is a cross-sectional view of the device seen in FIG. 1 taken on the line 5-5 thereof with the barrel cam removed to show the roller track.

Referring now to the drawings wherein like numerals refer to like and corresponding parts throughout the several views, the equalizing and compensating dual electrode holder disclosed therein to illustrate the invention comprises, a holder body 10 having a threaded aperture 11 for securing the body 10 on a mounting stud 12, paired cylinders 14 and 15, and a transverse cavity 16 whose upper and lower defining walls constitute a cam track for a barrel cam. The cavity 16 partially interrupts the cylinders 14 and 15.

A pair of pistons 18 and 19 lie in the cylinders 14 and 15 respectively. Each piston 18 and 19 has a notch 60, 61 in the location of the cam track cavity 16 to form paired opposed top and bottom cam surfaces 20-23, FIG. 4. A barrel 25 constituting a cam lies in the cavity 16 with its periphery extending into the notches 60, 61 of the pistons 18 and 19 in working relationship with their cam surfaces 20-23. Springs 26 and 27 are positioned between the ends of the cylinders 14 and 15 and the tops of the pistons 18 and 19 respectively. The springs 26 and 27 resiliently urge the pistons 18 and 19 downwardly in the cylinders 14 and 15 with their top cam surfaces 20 and 22 respectively normally in contact with the barrel 25. The barrel 25 acts as a key to lock the pistons in the holder body 10.

The depth of the notches 60, 61 of the spacing of the cam surfaces 20-23 on the pistons 18 and 19, the dimension of the cam track cavity 16, and the size of the barrel 25 are coordinated to each other to facilitate relative axial movement of the pistons 18 and 19 relative to the barrel 25 and transverse relative movement of the barrel 25 relative to the pistons 18 and 19.

The outer ends of the pistons 18 and 19 have tapered sockets 30 and 31. Electrodes 32 and 33 are mounted in the sockets 30 and 31 of the pistons 18 and 19.

When the holder 10 is retracted with the electrodes 32, 33 out of contact with the workpiece 34, the springs 14, 15 urge the pistons 18-19 downwardly with the top cam surfaces 20, 22 in contact with the barrel 25. This substantially centers the barrel 25 and substantially equally extends the pistons 18, 19 and electrodes 32, 33 outwardly of the holder body 10. In this condition the bottom cam surfaces 21, 23 are spaced from the barrel 25.

Under completely ideal conditions of actual equality, when the holder 10 is advanced toward a workpiece 34, both electrodes 32, 33 contact the workpiece 34 equally and move the pistons 18, 19 against the springs 14, 15 equally until the bottom cam surfaces 21, 23 equally engage the barrel 25 preventing further axial inward movement of the pistons 18, 19, whereupon with further advancement of the holder 10, the electrodes are forced into substantially equal electrical contact with the workpiece 34 to make substantially equal welds.

However, when these ideal conditions do not obtain, which is the case much more often, one electrode 32, 33 first contacts the workpiece 34 and moves its piston 18, 19 axially inwardly of the holder body 10. Thus one bottom cam surface 21, 23 is moving axially inwardly in advance of the other and cams the barrel 25 transversely toward the other piston 18, 19 bottom cam surface 21, 23. When the trailing cam surface 21, 23 on the other piston 18, 19 contacts the barrel 25, further transverse movement of the barrel 25 is stopped and then further axial inward movement of the pistons 18, 19 is stopped as the barrel 25 is jammed therebetween. Upon further advancement of the holder body 10 the electrodes 32, 33 are forced into substantially equal engagement with the workpiece 34 to make substantially equal welds.

When the holder body 10 is retracted from the workpiece 34 after the welds are made both under equal and unequal conditions, the electrodes 32, 33 exert no axially inward force and the springs 14, 15 move the pistons 18, 19 axially outwardly until the top cam surfaces 20, 22 again engage and center the barrel 25 with the pistons 18, 19 again in substantially equal axial projection. Thus the device automatically compensates and equalizes the various conditions between the workpiece 34 and the electrodes 32, 33 each time welds are made and automatically reconditions itself after the welds are made to compensate and/or equalize the situation relative to the next welding operation.

Referring now to the novel coolant fluid circulation system, the pistons 18, 19 may be axially hollow or tubular as shown to include internal axial channels 40, 41 respectively. The notches in the pistons 18, 19 forming the cam surfaces 20-23 may communicate through the tubular wall of the pistons 18, 19 and thus constitute communicating apertures in the location of the cam track cavity 16 or other suitable apertures in

the pistons may be provided. This facilitates coolant fluid transfer between the interior channels 40, 41 of the pistons 18, 19 through the cavity 16.

Paired orifices 42, 43 in the holder body 10 are equipped with a fitting 44 and a hose 45 for supply and return of coolant fluid. Counterbores 46 and 47 above the cylinders 14, 15 communicate with the orifices 42, 43. Tubes 48, 49 are jam fitted in the counterbores 46, 47 and lie coaxially in the channels 40, 41 of the pistons 18, 19 with their bottom ends open and spaced from the base of the cavities 50, 51 in the electrodes 32, 33.

Coolant fluid supplied to the orifice 42 travels through the tube 48 to the electrode cavity 50, returns up through the coaxial piston channel 40 to the notch 60, crosses through the cam track cavity 16 past the barrel 25 to the notch 61 in the piston 19 and there enters coaxial channel 41 of piston 19 and travels down the channel 61 to the electrode 33 cavity 51 and returns up the tube 49 to the orifice 43 where it exits. The flow of the coolant fluid may, of course, be reversed by supply the fluid to the orifice 43 and returning it at the orifice 42.

O-ring seals 62, 63 on the pistons 18, 19 prevent fluid escape from the cylinders 14, 15 and an O-ring seal 64 at the cam track cavity 16 prevents fluid escape between the body 10 and the fact plate 65.

While only a single preferred embodiment of the invention has been shown and described in detail, it is obvious that many changes may be made in the various elements of the invention as to shape, size, detail and arrangement including fluid cooled and nonfluid cooled embodiments within the scope of the appended claims.

I claim:

1. A compensating electrode holder for making electric resistance welds with two electrodes for substantially equalizing varying conditions at one electrode relative to the other electrode to effect substantially equal welds by making substantial equal engagement of both electrodes against a workpiece, comprising:

- a holder body having paired cylinders and a transverse cam-track cavity between said cylinders;
- a piston in each said cylinder, and a round barrel in said cavity between said pistons;
- said pistons being relieved to form a lower cam surface on said pistons below said round barrel relief on said pistons leading from said cavity;
- said cam surface being adapted to engage said round barrel;
- said device being so coordinated as to allow axial movement of said pistons relative to each other and to said round barrel and to allow transverse movement of said barrel relative to said pistons;
- said pistons having outer ends beyond said holder body equipped with sockets for mounting electrodes therein;
- said pistons being selectively moved axially inwardly of said holder body when said holder body advances electrodes

mounted on said pistons into engagement with a work-piece;

said round barrel allowing different distances of axial inward movement of said pistons by transverse movement of said round barrel of said round barrel between said lower cam surfaces on said pistons so as to engage said lower cam surfaces at different rise points on said cam surfaces;

said round barrel when in engagement with both said lower cam surfaces of both said pistons being jammed therebetween preventing further axial inward movement of both said pistons securing said pistons and electrodes in their so adjusted axial projection; and

said pistons, cam surfaces, and round barrel by relative movement between each other thereby allowing for different axial extension of electrodes mounted on said pistons to compensate different workpiece engagement conditions at the electrodes.

2. In a device as set forth in claim 1:

- an upper cam surface on each said piston above said round barrel;
- said pistons having inner ends within said holder body;
- a spring in each said cylinder between said inner end of each said piston and said holder body; and
- said springs resiliently displaceably urging said piston upper cam surfaces against said barrel to roll said round barrel to center between said piston to position said pistons outer ends at maximum axial outer projection of said holder body.

3. In a device as set forth in claim 1:

- said pistons being axially hollow;
- said holder body having fluid coolant inlet and outlet orifices and channels; one said orifice and channel leading to one said cylinder and the other said orifice and channel leading to the other said cylinder;
- a tube lying coaxially in each said piston with each said tube connected to one said orifice and channel;
- each said piston having a radial aperture communicating between its axial hollow interior and said cam track cavity of said holder body;
- said coaxial tubes having bottom ends adjacent said piston sockets;
- coolant fluid fed into one said orifice and channel traveling down said coaxial tube to an electrode in said piston socket;
- back up the associated said piston hollow interior to its radial aperture, through said radial aperture, cam track cavity and said radial aperture of the other said piston into its hollow interior;
- down said other piston's hollow interior to an electrode mounted in said other piston socket;
- and back up said other piston's said associated coaxial tube to the other said channel and orifice of said holder body.