May 5, 1925.

H. GEISENHÖNER

1,536,838

SPOT WELDING MACHINE

Filed Oct. 20, 1923

Fig. 1.

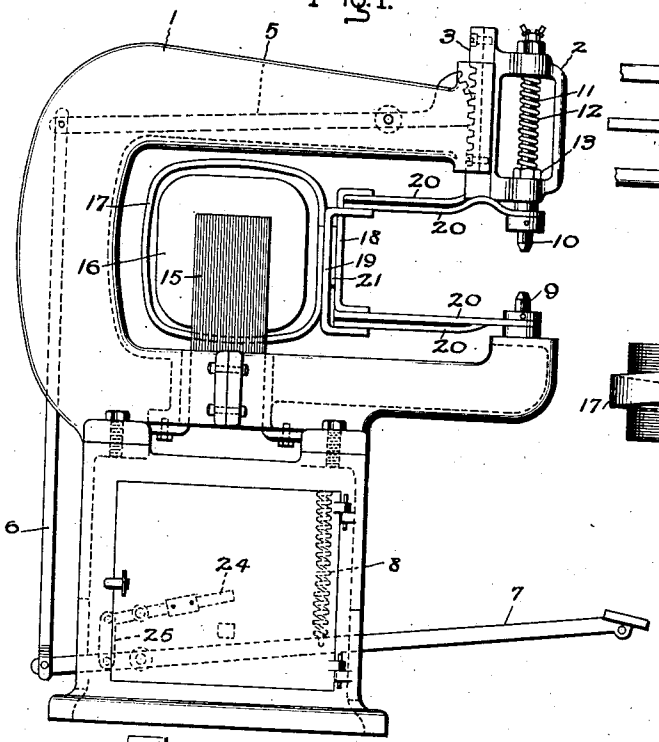


Fig. 2.

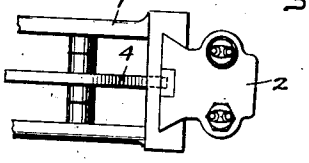


Fig. 3.

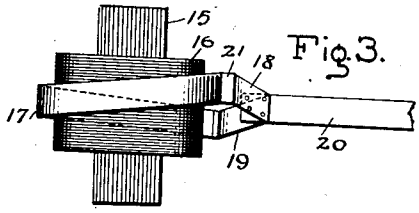


Fig. 4.

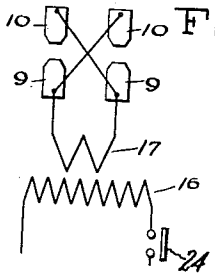


Fig. 5.

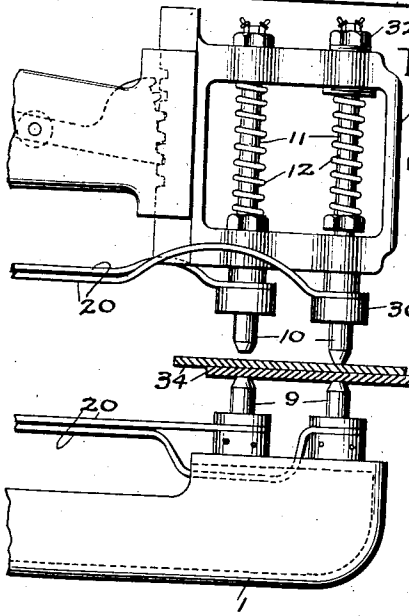


Fig. 6.

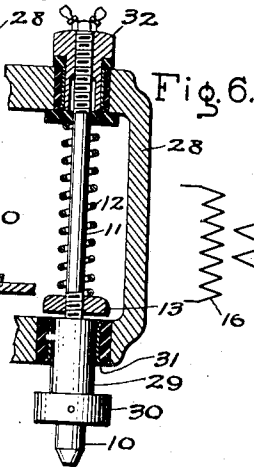
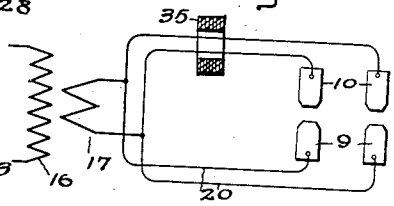


Fig. 7.



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UNITED STATES PATENT OFFICE.

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SPOT-WELDING MACHINE.

Application filed October 20, 1923. Serial No. 669,823.

To all whom it may concern:

Be it known that I, HENRY GEISENHÖNER, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Spot-Welding Machines, of which the following is a specification.

My invention relates to electric welding and particularly to machines for spot welding plates or other structural parts and an object of my invention is to provide an improved machine for this purpose which shall be simple and rugged in construction and efficient in operation.

My invention will be better understood from the following description and accompanying drawing, in which Fig. 1 is a side elevation of a machine embodying my invention; Fig. 2 is a fragmentary top view of the same showing the slidable electrode carrier; Fig. 3 is a top view of the transformer and attached leads forming a part of the machine; Fig. 4 is a circuit diagram of the arrangement shown in Fig. 1; Fig. 5 is fragmentary side elevation of a modified form of machine; Fig. 6 is a detail of the same; and Fig. 7 is a circuit diagram of the modified form.

Referring first to Fig. 1, the frame 1 has a vertically slidable head or electrode carrier 2 mounted thereon, which carrier is provided with a rack 3 meshing with a gear segment 4 on the end of a lever 5. A link 6 connects the lever 5 with a foot lever 7, a spring 8 normally holding the lever 7 and connected parts in the position illustrated by Fig. 1. The frame 1 supports two fixed electrodes 9 (see Fig. 4), the one arranged behind the other, as seen in Fig. 1, and cooperating with this pair of electrodes is a movable pair of electrodes 10 carried by the carrier 2 and having a limited vertical movement relative thereto. Each electrode 10 has secured to it a guide rod 11 surrounding which is a comparatively stiff coil spring 12. These springs being compressed between the carrier 2 and a nut 13 on each rod 11 serve to equalize the pressure exerted on the work by the two movable electrodes, thereby compensating for any irregularity therein.

Located within the throat of the frame 1 is a transformer from which the electrodes are supplied with the necessary current. The core 15 of this transformer carries a primary winding 16 and a secondary winding 17, the latter comprising, in the form illustrated, a single turn of ribbon conductor. The two ends of the secondary winding are connected respectively with the central portions of connectors 18 and 19 whose ends in turn connect with four leads 20 extending to the electrodes. The leads 20 are arranged in two spaced pairs as shown, the two leads comprising a pair being arranged one above the other and separated only by a thin strip of insulation. For the sake of greater clearness in illustrating these connections, connector 18 is shown positioned slightly forward of connector 19 and connected to the secondary winding by a spacer 21.

The leads and connectors are so arranged that the two leads which lie adjacent each other carry current in opposite directions and the two leads attached to a single connector connect with diagonally opposite electrodes.

The manner of connecting the electrodes to the secondary is clearly shown by the diagram comprising Fig. 4. It will thus be seen that I connect the single secondary winding to supply current in parallel to the two circuits including the two pairs of cooperating electrodes and since the leads forming a pair lie close to each other and carry current in opposite directions the reactances of the two circuits neutralize each other.

The primary winding 16 of the transformer is connected to be controlled by a switch 24 which is operated by a link connection 25 with the foot lever 7. The switch 24 is so adjusted that the circuit is not closed until after the lever 7 has been moved a sufficient distance to firmly clamp the work between the electrodes and upon the release of the foot lever the switch will open before the pressure is relieved.

It has been found that where a single

secondary is connected to supply current in parallel to two sets of welding electrodes any appreciable difference in the amount of scale, rust or other matter on the work to be welded affects the distribution of current taken by the two sets of electrodes. The voltage applied to the electrodes being small, usually in the neighborhood of two volts, the path between that pair of electrodes providing the lower resistance, in breaking down first, may so reduce the potential applied to the other pair of electrodes that that path will fail to break down immediately if at all. This condition is avoided to a certain extent by so arranging the leads connecting the secondary and the electrodes that the conductors carrying current in opposite directions are grouped in pairs and lie closely adjacent each other as has already been described above. Further equalization of the currents in the two parallel circuits may be effected by surrounding a pair of leads carrying current in opposite directions by a laminated ring as shown in Fig. 7 in connection with the modification now to be described.

In the modified form illustrated by Fig. 5, the two pairs of electrodes are arranged in a slidable carrier 28 but with the one in front of the other instead of side by side as in Fig. 1. In both forms it is obviously necessary to insulate one or the other electrode and its guide rod 11 from the carrier. This construction is shown for example in Fig. 6 and is applicable to both forms. In that figure it will be seen that the electrodes 10 are carried by plungers 29 having collars 30, which plungers slide in insulated bearings 31 in the carrier 28. The upper end of the rod 11 and the nut 32 are also insulated from the carrier 28 by bushings and washers as shown. In the case of the modified form illustrated by Fig. 5, the leads 20 connecting with the forward pair of electrodes are necessarily longer than the two others. The effect of the resulting increase in impedance of the two longer leads is partly if not entirely compensated by so adjusting the parts that the forward electrodes will engage the work first and exert a greater pressure thereon. Fig. 5 illustrates the position of the parts when the frame 2 has been depressed an amount sufficient to cause the forward pair of electrodes only to engage and begin to compress a pair of plates 34 to be welded. Further movement of the foot lever 7 causes the switch 24 to close the primary circuit and then the rear pair of electrodes to engage and compress the plates. The increase in pressure between the two forward electrodes naturally decreases the resistance therebetween, other conditions being the same. The earlier contact of these electrodes also provides a slightly longer heating interval. As a further means of maintaining an equal current flow through the two pairs of electrodes, a laminated core 35 may be employed to surround one or the other pair of leads 20 as shown for example in Fig. 7.

While I have described certain embodiments of my invention, I do not wish to be limited to the particular forms shown and described as it will be apparent that many modifications thereof may be made without departing from the scope of my invention as set forth in the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. A spot welding machine comprising a frame, two pairs of electrodes carried thereby and adapted simultaneously to produce a pair of spaced spot welds, a transformer having a secondary winding for supplying current to said electrodes and pairs of leads for connecting said secondary winding with said two pairs of electrodes in parallel relation, the leads forming each pair being respectively connected to opposite terminals of said secondary winding.

2. A spot welding machine comprising a frame, two pairs of relatively movable electrodes carried thereby and adapted simultaneously to produce a pair of spaced spot welds, a transformer having a secondary winding for supplying current to said electrodes, and a separate lead for each of said electrodes, said leads being arranged in closely adjacent pairs, each comprising a positive and a negative lead and connected to said secondary winding to provide two circuits in parallel.

3. A spot welding machine comprising a frame having opposed jaws, an inner pair and an outer pair of electrodes for simultaneously producing a pair of spaced spot welds, a transformer, leads extending therefrom along said jaws to said electrodes and forming therewith two circuits connected in parallel, and means for pressing together said electrodes, said means being constructed to press together the electrodes forming said outer pair with a greater pressure than the electrodes forming said inner pair.

4. A spot welding machine comprising a frame having opposed jaws, an inner pair and an outer pair of electrodes for simultaneously producing a pair of spaced spot welds, a transformer, leads extending therefrom along said jaws to said electrodes and forming therewith two circuits connected in parallel, and means for pressing together said electrodes to cause the electrodes forming the outer pair to engage the work before the electrodes forming the inner pair.

5. A spot welding machine comprising a frame having opposed jaws, an electrode carrier slidably mounted on the upper of said jaws, electrodes mounted on said carrier and on the lower of said jaws forming an inner and an outer pair adapted to form

simultaneously two spaced spot welds, a transformer having a single secondary winding, two sets of leads extending respectively from said winding along said jaws to said inner and outer pairs of electrodes, means for depressing said carrier to cause said electrodes to engage the work, and means for causing said outer pair of electrodes to exert a greater pressure than said inner pair of electrodes.

In witness whereof, I have hereunto set my hand this 19th day of October, 1923.

HENRY GEISENHÖNER.