Nov. 3, 1942. F. A. DOLL 2,300,656

GANG SPOT WELDER

Filed Jan. 2, 1940 2 Sheets-Sheet 1

Fig. 1.

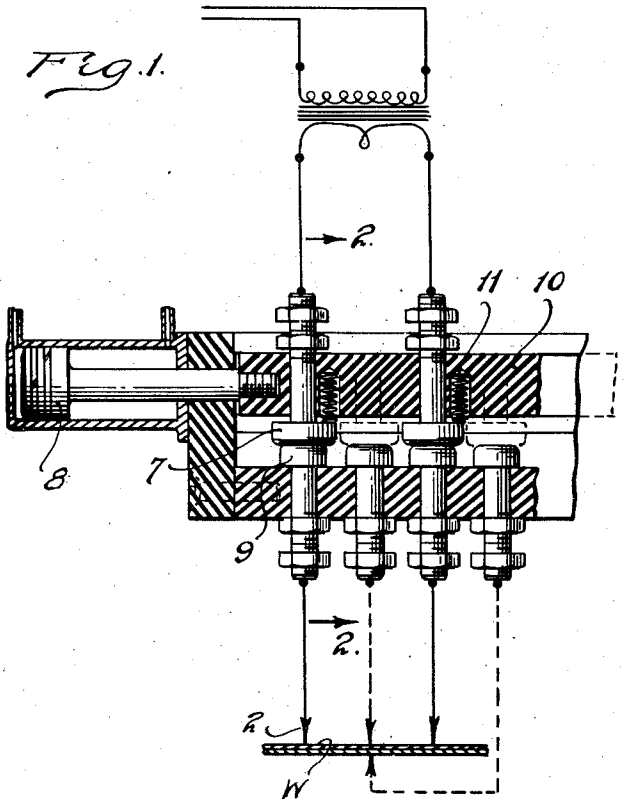
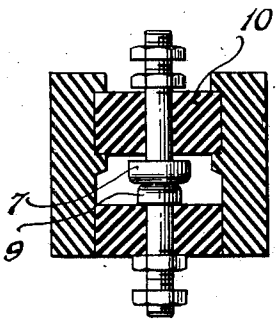


Fig. 2.



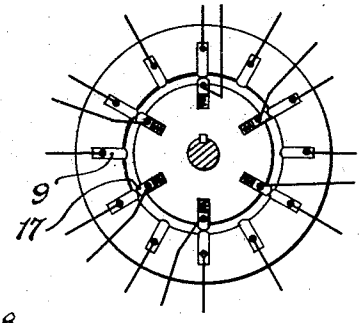


Fig. 4.

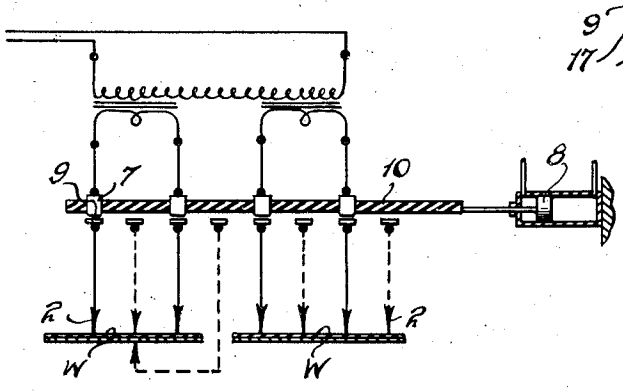


Fig. 3.

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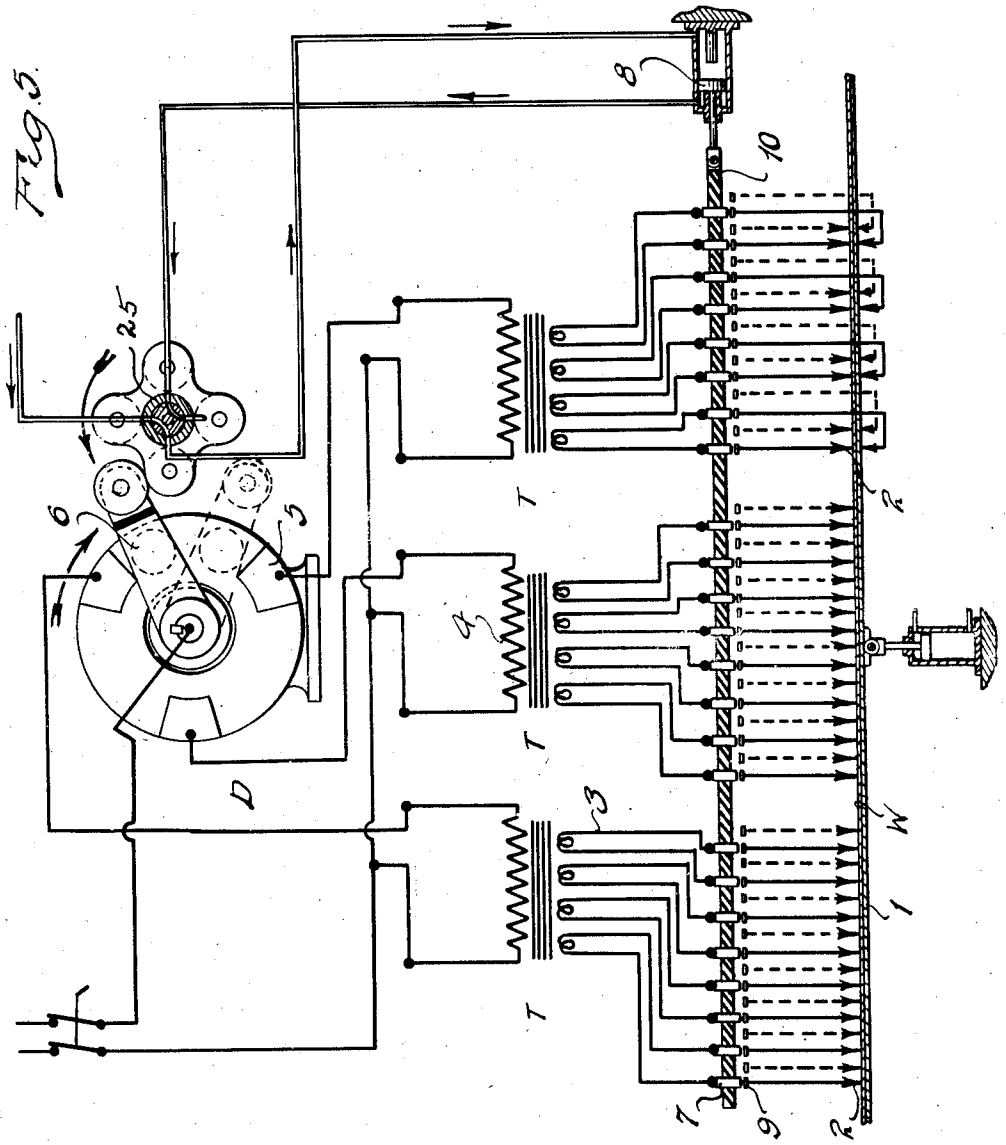
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Fig. 5.



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UNITED STATES PATENT OFFICE

2,300,656

GANG SPOT WELDER

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Application January 2, 1940, Serial No. 312,048

7 Claims. (Cl. 219—4)

This invention relates to gang spot welders. Gang and multiple spot welders in which all of the electrodes are arranged to contact the work at one and the same time are old. It is desirable to successively energize the electrodes or groups of electrodes to reduce the load on the supply lines and insure adequate welds. The difficulty has been to provide suitable distributing or switching apparatus which will avoid destructive arcing. Various plans have been proposed including coordinating a distributor in the secondary circuits with a circuit breaker in the primary, impulse generators, etc.

One successful arrangement is that shown and described in the Biederman and Harder application, Serial No. 282,640, filed July 3, 1939. In this welding apparatus, the electrodes are connected in groups with a plurality of electrode sets to each transformer. The transformers have their primaries successively energized and deenergized. This has been found to work satisfactorily but the arrangement requires a large number of transformers in a given piece of apparatus and is, therefore, somewhat expensive to build and occupies a considerable space when space in a machine may be at a premium.

It is the object of the present invention to overcome this difficulty by making possible the use of each transformer to serve at different times different groups of electrodes. This means the number of electrodes served by a given number of transformers may be doubled, tripled, or otherwise multiplied as will be apparent from the description hereinafter given.

In the drawings:

Fig. 1 is a sectional detail of apparatus by which the number of electrodes handled by the machine may be doubled.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged diagrammatic view.

Fig. 4 is a diagrammatic view of a modified form.

Fig. 5 is a diagram of the complete apparatus.

Referring to Fig. 5, the general nature of the apparatus will be apparent. 1 is a back-up electrode or a bed on which the work is laid. This will ordinarily be copper or some copper alloy which is a good conductor. The electrodes are designated 2 and shown in Fig. 5 as the arrowheads. These are connected in the secondary circuits 3. It will be noticed that the two transformers T on the left of Fig. 5 have two electrodes in series so that the current passes through the work designated W, then into the back-up electrode and then to another electrode 2 and back to the transformer. This means that each pair of electrodes makes two spot welds. The transformer at the right shows a modified form in which the electrodes are located opposite one another and, consequently, each pair of electrodes makes only one spot weld.

The primaries 4 of each transformer are connected to distributor segments 5 on the distributor D. A rotating distributor arm 6 successively energizes the primaries of the several transformers. In a large machine where large pieces of work, such as automobile doors, automobile floor pans, etc. are welded, there will be quite a number of transformers and there will have to be quite a number of segments on the distributor. Only three transformers are shown in Fig. 5 in order to simplify the disclosure. In actual operation, the distributor might not be used for giving successive charges of electricity to the transformer primaries, or a distributor might be used with a suitably timed circuit breaker to obviate the arcing problem in the primary circuit. For the purposes of illustration, this simple distributor is sufficient to disclose the improvement here sought to be claimed.

The improvement consists in affording, in the secondary circuits, a plurality of contacts which may be shifted. These contacts designated 7 may be all carried on one bar which may be connected with a fluid-operated piston 8 so that it may be shifted by fluid pressure or by any other means. The secondary circuit portions connected with the transformer each have two of these shiftable contacts. Each pair of electrodes has two contacts 9. The contacts 7 on the bar 10 are shifted after the distributor has made one complete cycle and then the distributor arm makes another complete cycle energizing again in succession the transformers and each transformer has a new group of electrodes connected with it. The shift may be made manually or the distributor arm can be made to trip an air valve 25 (as shown in Fig. 5) after one welding operation so as to reverse the air on piston 8 and automatically shift the contacts after one complete cycle. In Figs. 1, 2 and 3, the shift is a longitudinal one, the transformer contacts 7 being supported on a shifting bar 10 of insulating material and urged into engagement with the electrode contacts by means of springs 11.

A modified form is shown in Fig. 4 where the electrode contacts 9 are arranged around a cyl-

inder and the transformer contacts 17 are carried on the rotor. The principle of operation is the same except one is a rotating action and the other a rectilinear shifting action.

What I claim is:

1. In a spot welding apparatus, the combination of a plurality of transformers, each transformer having one or more secondary circuits, two or more electrode sets associated with each secondary circuit, and all the electrodes contacting the work at one time, contacts relatively shiftable in said secondary circuits and means for shifting the said contacts whereby a different electrode set may be actively connected with each secondary circuit after a shift to thereby multiply the number of electrodes that may be served by each transformer and means for successively energizing the transformers each time a shift of contacts is made.

2. In a spot welding apparatus, the combination of a multiplicity of electrodes which all contact the work at the same time, separate transformers for serving designated groups of said electrodes and means by which the electrodes of each group are divided into sub-groups which are successively served by one transformer.

3. In a spot welding apparatus, the combination of a multiplicity of electrodes all contacting the work at one time, separate transformers for serving designated groups of said electrodes, means by which the electrodes of each group are divided into sub-groups which are successively served by one transformer and means for successively energizing the primaries of the transformers each time a shift is made to provide energy for one sub-group of electrodes.

4. In a welding apparatus, transformers each including a plurality of separate secondaries, each secondary including a pair of spot welding electrode sets alternately active and non-active and having a plurality of relatively shiftable contacts, the said electrodes all contacting the work at the same time, means for shifting the contacts to multiply the number of electrodes that may be served by one transformer and automatic means for operating said shifting means after the transformers have all been energized.

5. In a spot welding apparatus, the combination of a multiplicity of electrodes, separate transformers for serving designated groups of said electrodes, shifting means by which the electrodes of each group are divided into sub-groups which are successively served by one transformer, all the electrodes contacting the work at the same time, means for successively energizing the primaries of the transformers each time a shift is made to provide energy for one sub-group of electrodes and automatic means operating in conjunction with said last mentioned distributing means for successively energizing the primaries for shifting from one sub-group to another for active connection with the transformer.

6. In a spot welding apparatus, the combination of a plurality of transformers, each transformer having a plurality of independent secondary circuits, a plurality of electrodes sets associated with each secondary circuit and arranged to all contact the work at one and the same time, each of the said secondary circuits having shiftable contacts, the said contacts of all the transformer secondaries being simultaneously shiftable to bring a different group of electrodes into active relation with each transformer, means for successively energizing the primaries of the transformers and automatic means coordinated therewith for shifting the contacts from one group of electrodes to another group of electrodes after each energization of all the primaries.

7. In a spot welding apparatus, the combination of a plurality of transformers, each transformer having a plurality of independent secondary circuits, a plurality of electrode sets associated with each secondary circuit and arranged to all contact the work at the same time, each of the said secondary circuits having contacts, the said contacts of all the transformer secondaries being simultaneously shiftable to bring a different group of electrodes into active relation with each transformer and means for successively energizing the primaries of the transformers.

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