Oct. 5, 1954 C. H. PARSONS ET AL 2,691,144

ELECTROFORMING APPARATUS FOR RECTIFIER DISKS

Filed July 12, 1952 2 Sheets-Sheet 1

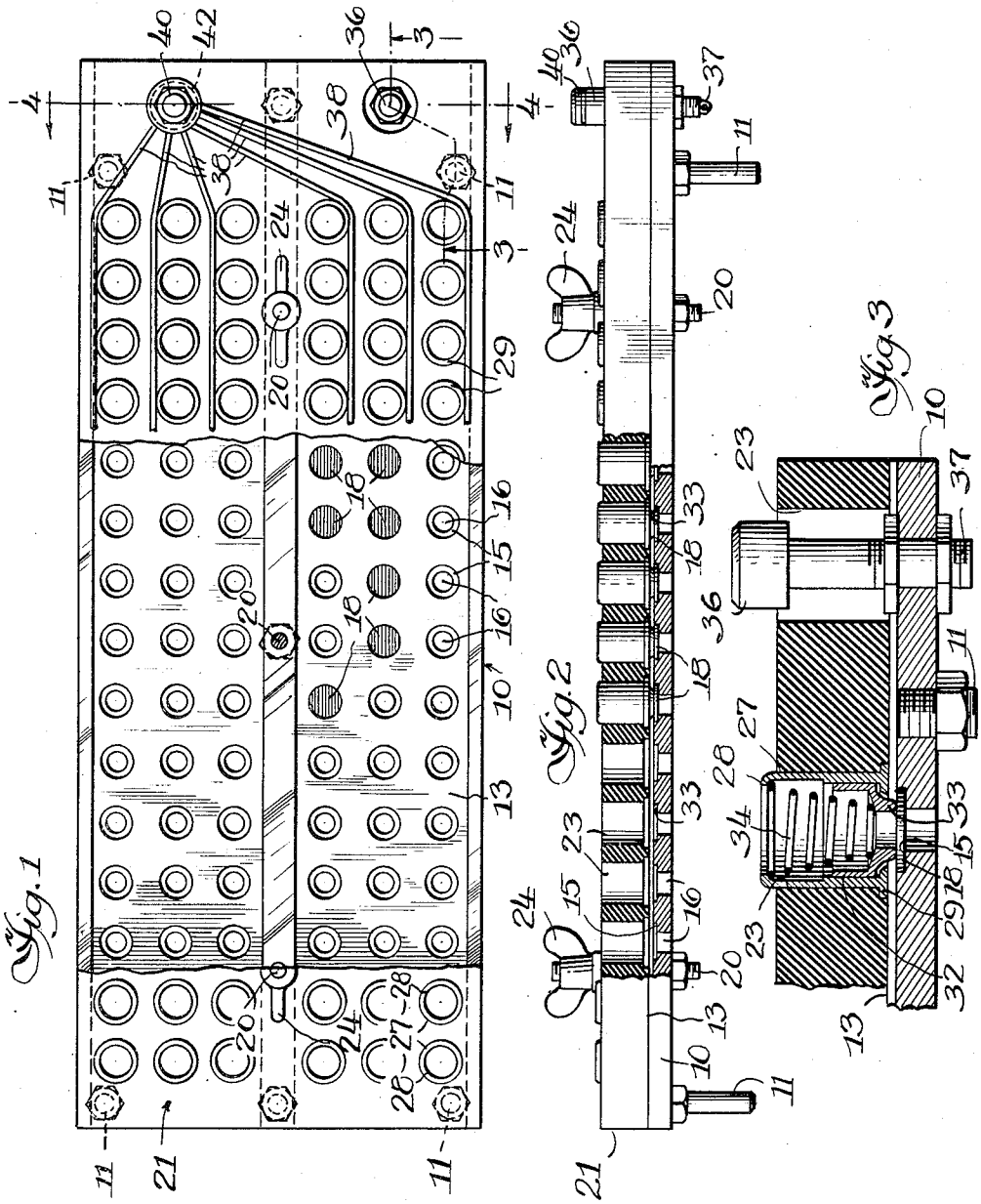


Fig. 1

Fig. 2

Fig. 3

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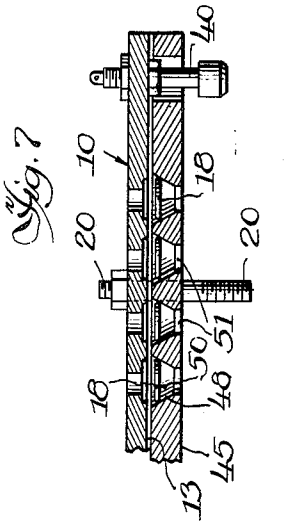


Fig. 7

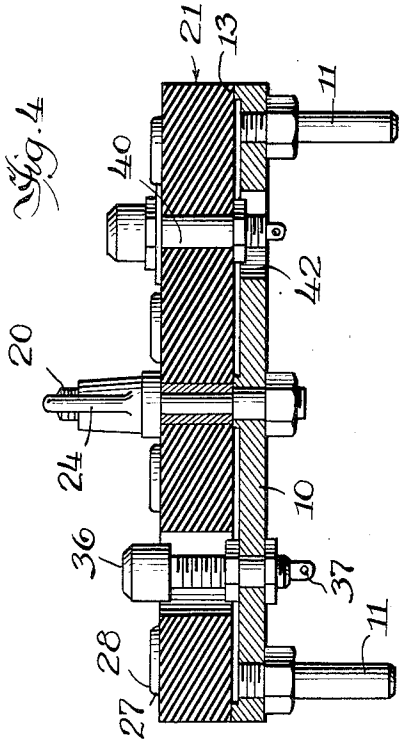


Fig. 4

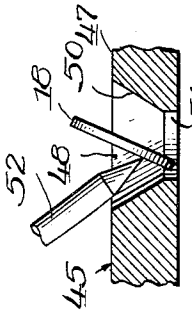


Fig. 8

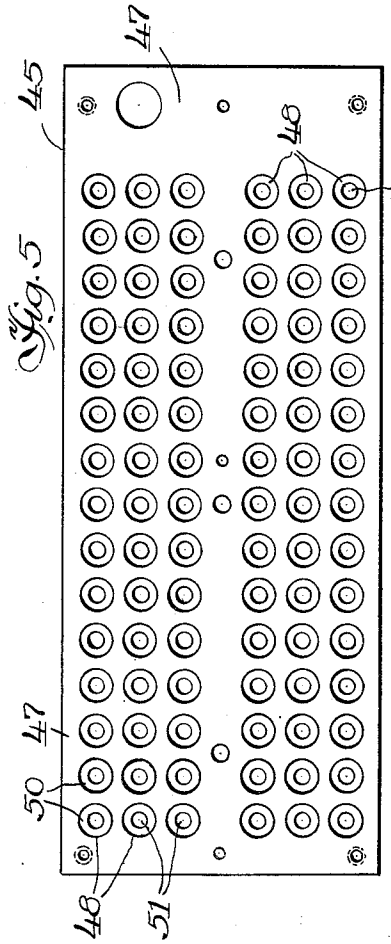


Fig. 5

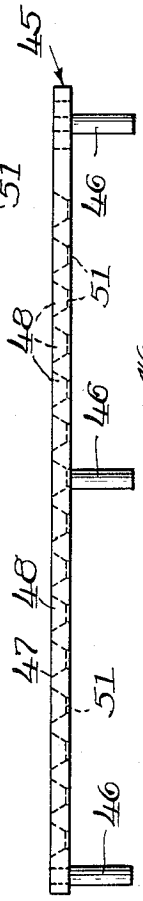


Fig. 6

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ELECTROFORMING APPARATUS FOR RECTIFIER DISKS

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Application July 12, 1952, Serial No. 298,648

4 Claims. (Cl. 339—147)

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This invention relates to an electroforming apparatus for rectifier discs.

In electroforming rectifier discs, particularly of selenium, it is necessary that the discs be connected in an electrical circuit so that current may flow through the discs for a predetermined time under desired conditions; in the handling of large quantities of discs, difficulties have been encountered in disposing rectifier discs in a simple and convenient manner in circuit so that the discs may electroform in desired fashion. Inasmuch as the current passing through the disc may reach comparatively high values, it is important that the discs be maintained in good electrical contact in the electroforming apparatus and that the discs have adequate ventilation to dissipate heat.

The apparatus embodying this invention is characterized by simplicity and efficiency and makes it possible to handle simultaneously a large number of rectifier discs and electroform them under desired conditions.

In order that the invention may be understood, it will be described in connection with the preferred embodiment shown in the drawings, with the understanding that variations in construction are possible without departing from the spirit of the invention. Referring therefore to the drawings:

Figure 1 is a plan view, with certain parts broken away, of an apparatus for electroforming rectifier discs, said apparatus embodying the present invention;

Figure 2 is a side elevation of the apparatus shown in Figure 1, certain parts being broken away to show the contact members pressing upon the rectifier discs;

Figure 3 is a sectional detail upon broken line 3—3 of Figure 1, this view showing the construction of one spring-pressed contact device used in connection with the rectifier disc;

Figure 4 is a sectional detail upon line 4—4 of Figure 1;

Figure 5 is a top plan view of a loading jig for use in connection with the electroforming apparatus;

Figure 6 is a side elevation of the jig shown in Figure 5;

Figure 7 is a sectional detail of a part of the loading jig cooperating with a part of the electroforming apparatus so that the latter may be loaded with rectifier discs;

Figure 8 is a detail of a part of the loading jig showing how a rectifier disc may be reversed to be in proper position in the loading jig.

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Referring first to Figures 1 to 4 inclusive, the electroforming apparatus has bottom plate 10 of any desired shape and size supported upon legs 11. Plate 10 is made of metal having good electrical conductivity and having low contact resistance, such metal being preferably of copper. However, plate 10 may be made of brass, if desired. The nature of legs 11 is not important and these legs may be either of metal or of insulating material.

Plate 10 has a thickness which is substantially greater than the thickness of the rectifier discs to be formed and the plate should also be strong enough to withstand the operating loads to which it is normally subjected. Plate 10 has top face or surface 13 and has a number of disc-retaining recesses or counterbores 15 formed throughout the extent of the plate. These counterbores may be formed in any desired number and pattern and, as shown here, are arranged in a number of rows to utilize a substantial portion of the area of surface 13 of plate 10. Disc-retaining counterbores 15 are comparatively shallow, being just deep enough to accommodate a rectifier disc. Concentric with each counterbore is bore 16. Each disc-retainer counterbore 15 accommodates a single rectifier disc 18 (see Fig. 8), said disc consisting of the usual carrier electrode, barrier layer and counter-electrode of any well known construction. During electroforming, bore 16 in plate 10 permits dissipation of heat from the lower face of the rectifier disc.

Plate 10 carries a number of bolts 20 extending upwardly therefrom, these bolts being adapted to aid in the disposition and retention of a cover assembly upon plate 10. This cover assembly, generally indicated by numeral 21, consists of a plate of insulating material having a number of counterbored apertures 23 therethrough. Counterbores 23 are arranged in plate 21 so that when plate 21 is superposed on plate 10 in proper relation, each counterbored aperture 23 will register with a corresponding counterbore 15.

Insulating plate 21 is apertured at suitable locations so that bolts 20 from plate 10 may pass through the same when plates 10 and 21 are in proper position. Wing nuts 24 on bolts 20 are provided for clamping the two plates together.

Insulating plate 21 has a spring-pressed contact member press-fitted into each of counterbores 23. Since the spring contact members are alike, a description of one only is necessary. Referring to Figure 3, each spring-pressed contact member has metal shell 27 having inturned shoul-

der 28 at one end thereof. Shell 27 has the other end shaped to a generally T-shaped section 29. The outer portion of the T engages the walls of the counterbore, whereas the inner part thereof forms an inwardly extending stop shoulder. Slidable within shell 27 is annular member 32 having contact portion 33 which may project outwardly beyond the T end of the shell. Disposed within shell 27 is tapered helical spring 34 so that the large end of the spring is retained against the inside of shoulder 28 while the small end of the spring is braced within slidable member 32. Spring 34 presses slidable member 32 so that contact part 33 is urged beyond the T end of the shell. Preferably, slidable member 32 is small enough in diameter so that the entire device may be assembled from the shouldered end 28 of the shell. The shell wall near the T end is thick enough for a snug sliding fit for annular member 32.

The entire spring-pressed contact device so far described is available in the trade for oilers in connection with motors and other devices. The various parts of the spring contactor, with the exception of the spring itself, are preferably made of brass or copper. The spring is preferably made of steel or may be made of phosphor bronze. In general, however, the conductivity of the spring is of no great importance.

The various parts of the contactor are so designed, as regards thickness and dimensions, that when insulating plate 21 is disposed over conducting plate 10, as shown in Figure 2, and the two pressed tightly together, conducting part 33 will engage an annular region in the top surface of the rectifier disc. Thus a constant and low resistance electrical contact will be assured between the contacting member and a face of the rectifier disc. It will be noted that the open nature of the spring contact permits access of air to the top face of the rectifier disc, thus making ready dissipation of heat possible.

Bottom plate 10 has contact terminal post 36 rigidly attached thereto, said terminal having suitable part 37 for providing a detachable connection to a source of electric current. Inasmuch as plate 10 is of metal having excellent conductivity, it will be apparent that terminal post 36 will be electrically connected to every one of the rectifier discs within the counterbore in plate 10. Instead of having plate 10 of conducting metal, it is possible to make this plate of insulating material and have cups or rings of copper rigidly secured in the plate. These various rings may be connected by wire to terminal 36.

The spring-pressed contactors carried by plate 21 are electrically connected by wires 38, soldered to the outside of the metal shell of the contactors, to terminal 40. Terminal 40 is carried by insulating plate 21. This terminal may be bolted to the plate. Both terminals 36 and 40 are constructed in such fashion as to provide for ready connection or disconnection to a circuit. A conventional screw-type terminal, bayonet-plug or other of well-known terminals may be provided. Bottom plate 10 has clearance 42 which is adapted to register with terminal 40 to prevent short circuiting of the entire apparatus.

In order to load the electroforming apparatus, the jig shown in Figures 5 and 6 may be used. This jig comprises plate 45 of any suitable rigid material. Plate 45 has legs 46 and top surface 47 of the plate is provided with countersunk apertures 48 arranged to register with the counterbored apertures 15 in plate 10. The arrangement

of apertures in plate 45 is the mirror image of the arrangement of apertures in plate 10 for a purpose which will be apparent later.

Referring to Figure 8, an enlarged view of one aperture in table 45 is shown. Top surface 47 has conical countersinking 50 extending downwardly from the face of the plate. The bottom of countersinking 50 merges with aperture 51, this being small enough so that rectifier disc 18 cannot pass through the aperture. With the loading jig shown in Figures 5 and 6 standing on its legs, a number of rectifier discs may be passed across the top face of the jig table. Assuming that every aperture in the jig will have one rectifier disc, it will be apparent that some of the discs may be in inverted position while others will be in a correct position. The countersinkings are so proportioned that no more than one disc can remain at any one countersinking. However, in case of a disc being disposed in reverse position in any one countersinking, a pointed instrument 52 like a pencil, for example, may be used for turning a rectifier disc into correct position.

Assuming that the loading jig now has its full complement of rectifier discs all correctly disposed, table 10 is now turned upside down over table 45. Apertures in table 45 are provided to register with bolts 20 so that table 10 may be disposed directly in face to face relation with plate 45. This is shown for a portion of each of the two plates in Figure 7. Now, with the two plates tightly in face to face relation, they may be turned over so that plate 10 is now at the bottom. The rectifier discs will fall into counterbore recesses 15 in plate 10. Loading jig plate 45 may now be removed from plate 10 to leave plate 10 fully loaded with rectifier discs all correctly disposed. Thereafter, the top assembly consisting of insulating plate 21 and the various connectors carried thereby, are disposed in registering and cooperative relationship to plate 10.

With plates 21 and 10 in position, as shown in Figures 1 and 2, proper circuit connections are made to the terminals and the individual rectifier discs may thus be electroformed. During the use of the two assemblies, as shown in Figures 1 and 2, the wing nuts may be disposed on bolts 20 to lock the entire apparatus into a single operative unit. A large number of rectifier disc units may be electroformed under identical and desired conditions with the assurance that every rectifier disc is being fed desired currents and is being operated under desired conditions. The electroforming apparatus as a whole may be hung or supported in any position and disposed in a blast of air so that the heat generated during electroforming may be dissipated.

We claim:

1. An electroforming apparatus for rectifier discs, said apparatus comprising a plate having a number of recesses therein for accommodating rectifier discs, one recess accommodating one rectifier disc, the plate material at least around the recess being of electrically conductive material and providing an annular contacting and support region for one side of said disc at a peripheral portion thereof, means for electrically connecting the material around the various recesses to one common terminal, a second plate of insulating material, said second plate having apertures therethrough registering with the recesses in the first plate when said second plate is disposed in face to face relation to said first

plate, a spring-pressed contactor disposed in each aperture in said second plate, said spring-pressed contactor having an annular contacting portion for engaging the other side of said disc at a peripheral portion thereof extending beyond a face of the second plate so that when the second plate is disposed against the said first plate in registering position, a spring-pressed contactor will engage a rectifier disc, means for connecting all of said spring-pressed contactors to a terminal and means for maintaining said two plates in tightly pressed relationship so that the spring-pressed contactors press against the contact discs whereby a number of rectifier discs may be electroformed.

2. The apparatus according to claim 1, wherein said two plates have counterbored apertures, the recesses in said first named plate being the counterbore and wherein spring-pressed contactors are seated in the counterbored apertures in said second plate, said spring pressed contactors having an open construction to permit ready dissipation.

3. The construction according to claim 1 wherein each spring-pressed contactor comprises a metal shell having an end inturned to form a stop, means for securing said shell to said second plate so that the shell axis is perpendicular to the plate, an annular contact member within said shell, said contact member having a reduced contact portion adapted to project beyond the shell end with the main body of the annular contact member engaging the inturned end of the shell to limit the movement, a coil spring within the shell urging said annular contact member toward an extreme position, said contact portion being adapted to engage an annular part of a rectifier disc when the two plates are disposed in face to face relation.

4. An electroforming apparatus for rectifier discs, said apparatus comprising a first plate of electrically conductive material, said plate having a number of counterbores therein, the counterbore portion thereof being just large enough

to accommodate one rectifier disc and providing an annular contacting and supporting part for a peripheral portion of one side of said disc, a second plate of insulating material, said second plate having counterbores adapted to register with the counterbores in the first plate when the two plates are disposed in face to face relation, a spring-pressed contactor for each of the counterbored apertures in the second plate, each contactor comprising a metal shell having one end thereof provided with outwardly and inwardly directed rim portions, the outwardly directed rim portion cooperating with the counterbore for seating the contactor shell in the recess, the inwardly directed rim part functioning as a stop, a coil spring and annular contact member disposed within a shell, the annular member having a sliding fit within said shell and being stopped by the inwardly directed rim part and having a reduced portion which may project beyond the one end of said shell for engaging a peripheral portion of the disc on the other side thereof when said annular member is pressed by said coil spring, means for connecting said shells to a common terminal on said second plate and means for maintaining said two plates tightly in face to face relation, said first plate being adapted to have a rectifier disc in each counterbore, the movable contactor part being adapted to engage a corresponding rectifier disc when said two plates are pressed together, said rectifier disc making good electrical contact with the parts of the two plates on opposite sides thereof so that said discs may be electroformed.

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