

May 3, 1949.

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2,468,845

ALTERNATING ELECTRIC CURRENT RECTIFIER

Filed July 28, 1945

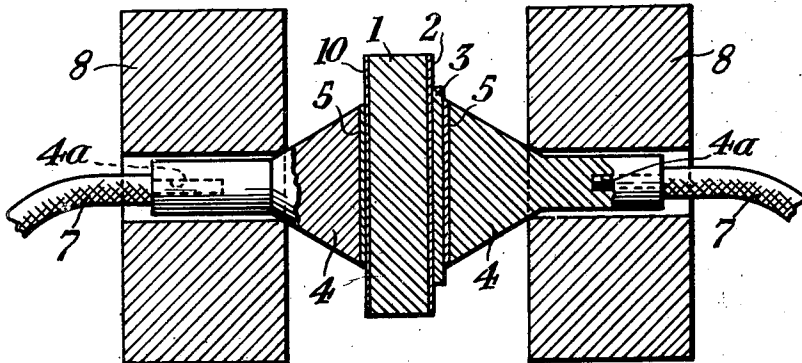


Fig. 1.

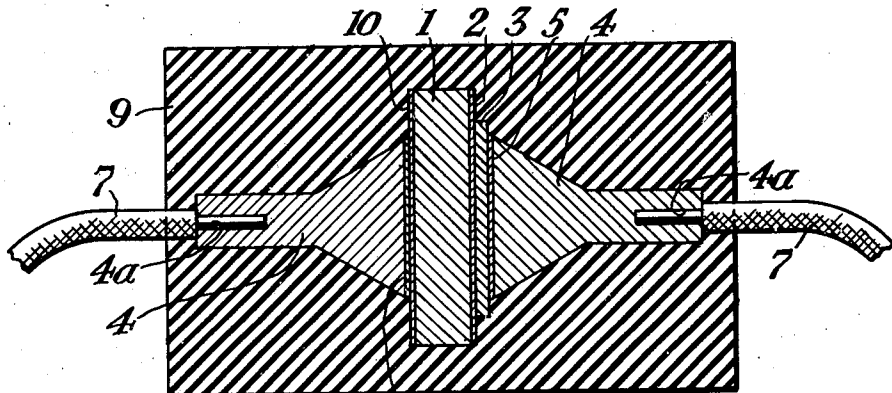


Fig. 2.

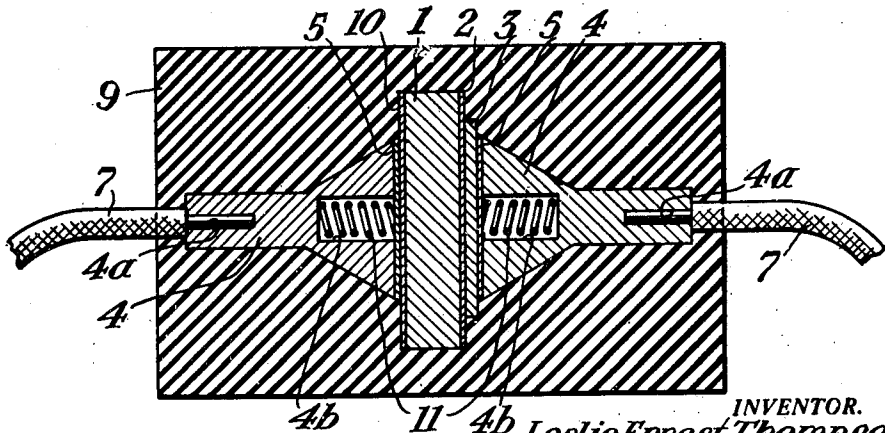


Fig. 3.

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2,468,845

ALTERNATING ELECTRIC CURRENT
RECTIFIER

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Application July 28, 1945, Serial No. 607,617
In Great Britain November 20, 1944

4 Claims. (Cl. 175—366)

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This invention relates to alternating electric current rectifiers of the dry surface contact type and has for its object to provide an improved construction of rectifier of this character which shall be substantially unaffected by surrounding atmospheric or other conditions and protected against mechanical injury so as to be reliable and durable in service.

According to the principal feature of the invention the rectifier elements after manufacture and assembling are completely surrounded by or embedded within a body of suitable plastic material such as a synthetic resin or polymerization or condensation product.

I shall describe one form of alternating electric current rectifier embodying my invention, and shall then point out the novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a transverse sectional view of a rectifier embodying my invention as it appears during one step in the process of manufacture. Fig. 2 is a view similar to Fig. 1 showing the rectifier in its completed form. Fig. 3 is a vertical sectional view showing a modified form of rectifier, also embodying my invention.

Similar reference characters refer to similar parts in all three views.

The invention is more particularly although not exclusively applicable to rectifiers of relatively small capacity and of the selenium type and in order that the nature of the invention may be clearly understood it will be described by way of example as applied to an instrument rectifier of this character.

Referring to the drawings, the rectifier comprises a disc 1 of suitable diameter punched from a strip of relatively thin sheet steel one face of which is coated with a layer 2 of material containing selenium as described in the Specification of my prior Letters Patent of the United States No. 2,307,474. A counter electrode 3 composed of a layer of a tin-thallium alloy is applied by spraying to a circular central area of the coated surface of the disc, the opposite face of which is coated with a layer 10 of tin also applied by spraying.

The electrical connection of the counter electrode and the tin-coated face of the rectifier disc to the external circuit is effected by contact members 4 constructed of brass and of generally conical form, the base of the cone of each contact member being coated with a layer 5 of soft solder. The smaller end of each contact member is provided with an axial cylindrical recess 4a within

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which one end of a terminal conductor or wire 7 is secured in any suitable manner. The rectifier disc and the contact members on the two faces thereof are then assembled under pressure in a suitable clamp or jig 8 and by the application of heat the layers of soft solder on the bases of the conical contact members are melted and united with the tinned rear face of the rectifier disc and with the counter electrode respectively.

Upon cooling the assembled unit thus formed is transferred to a suitable cold mould which is then filled by injection moulding with a suitable thermo-plastic 9 such for instance as that sold under the trade name "Distrene", the rectifier after removal from the mould being electrically formed in the usual manner. The rectifier will then appear as shown in Fig. 2.

Alternatively, the plastic employed may be of the thermo-setting type such as a phenol-aldehyde condensation product in which case the mould must be heated to a temperature of, for example, 170° C. and after the assembled unit is in position the mould is filled with the plastic in the usual form of moulding powder and subjected to pressure and maintained heating. The electrical forming is in this case preferably effected while the rectifier is still hot.

In some cases it is found to be possible to carry out simultaneously the attachment of the contact members by the melting of the solder layers and the moulding of the plastic material.

In some cases the layer of solder on the faces of the coned contact members may be omitted, the pressure exerted by the moulding operation being sufficient to insure satisfactory electrical contact.

Furthermore, as shown in Fig. 3, the contact members may be provided with axial recesses 4b formed in their wider ends and each containing a suitable helical compression spring 11 one end of which abuts against the base of the recess, its other end abutting against the rear face of the rectifier disc or the counter electrode. These springs serve to insure satisfactory electrical contact with the rectifier disc and the counter electrode in the event of the contact members receding for any reason from the surface of the disc and the counter electrode during or subsequent to the moulding operation.

It will be understood that any suitable thermo-plastic or thermo-setting material may be employed instead of that above described, but preferably this material should have a temperature coefficient of expansion such that during cooling the material will contract and bind the com-

ponent elements of the rectifier assembly closely together.

Although I have herein shown and described only two forms of electrical rectifiers embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. A rectifier unit comprising a rectifier element consisting of a layer of selenium applied to a base electrode and a counter electrode layer applied to the outer face of the selenium layer, said base electrode having the side opposite the selenium layer tinned, two conical contact members having their bases coated with a layer of soft solder and secured to the tinned face of said base member and to said counter electrode layer respectively by applying heat and pressure to said contact members, a terminal conductor secured within the smaller end of each contact member, and a body of plastic material moulded around and completely enclosing all of said parts except the projecting ends of said terminal conductors.

2. A rectifier unit comprising a rectifier element consisting of a layer of selenium applied to a base electrode and a counter electrode layer applied to the outer face of the selenium layer, said base electrode having the side opposite the selenium layer tinned, two conical contact members having their bases coated with a layer of soft solder and secured to the tinned face of said base member and to said counter electrode layer respectively by applying heat and pressure to said contact members, a terminal conductor secured within the smaller end of each contact member, an axial recess formed in the wider end of each contact member, a helical compression spring in each recess each having one end abutting against the base of the recess and the other end abutting against the rear face of the rectifier element or the counter electrode, and a body of plastic material moulded around and completely enclosing all of said parts except the projecting ends of said terminal conductors.

3. The process for making a rectifier unit including a rectifier element consisting of a layer of selenium applied to one face of a base electrode and a counter electrode layer applied to the outer face of the selenium layer, and two conical contact members disposed with their bases in electrical contact with the opposite side faces respectively of said rectifier element, which process consists in applying a layer of tin to the outer face of the base electrode, applying a layer

of soft solder to the base of each of said conical contact members, assembling the rectifier element and the contact members under pressure in a clamp or jig in the positions in which the bases of the contact members are engaging the opposite side faces of the rectifier element, applying heat to melt the layers of solder on the bases of the contact members, and then allowing the parts to cool to unite the contact members with the tinned face of the rectifier element and the counter electrode respectively.

4. The process for making a rectifier unit comprising a rectifier element consisting of a layer of selenium applied to one face of a base electrode and a counter electrode layer applied to the outer face of the selenium layer, and two conical contact members disposed with their bases in electrical contact with the opposite side faces respectively of said rectifier element, which process consists in applying a layer of tin to the outer face of the base electrode, applying a layer of soft solder to the base of each of said conical contact members, assembling the rectifier element and the contact members under pressure in a clamp or jig in the positions in which the bases of the contact members are engaging the opposite side faces of the rectifier element, applying heat to melt the layers of solder on the bases of the contact members, then allowing the parts to cool to unite the contact members with the tinned face of the rectifier element and the counter electrode respectively, securing terminal members to the small ends of the contact members, transferring the unit thus formed, to a mould and moulding a layer of plastic around the parts to completely enclose them, and then electrically forming the rectifier element in the usual manner.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,751,360	Ruben	Mar. 18, 1930
1,961,825	Harty	June 5, 1934
2,072,850	Andre	Mar. 9, 1937
2,119,744	Heyman	June 7, 1938
2,359,801	Skinker	Oct. 10, 1944
2,392,311	Christopher	Jan. 8, 1946

FOREIGN PATENTS

Number	Country	Date
290,985	Great Britain	Aug. 21, 1929
550,130	Great Britain	Dec. 23, 1942