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K. L. HENDERSON ET AL

2,672,580

SEMICONDUCTING DEVICE

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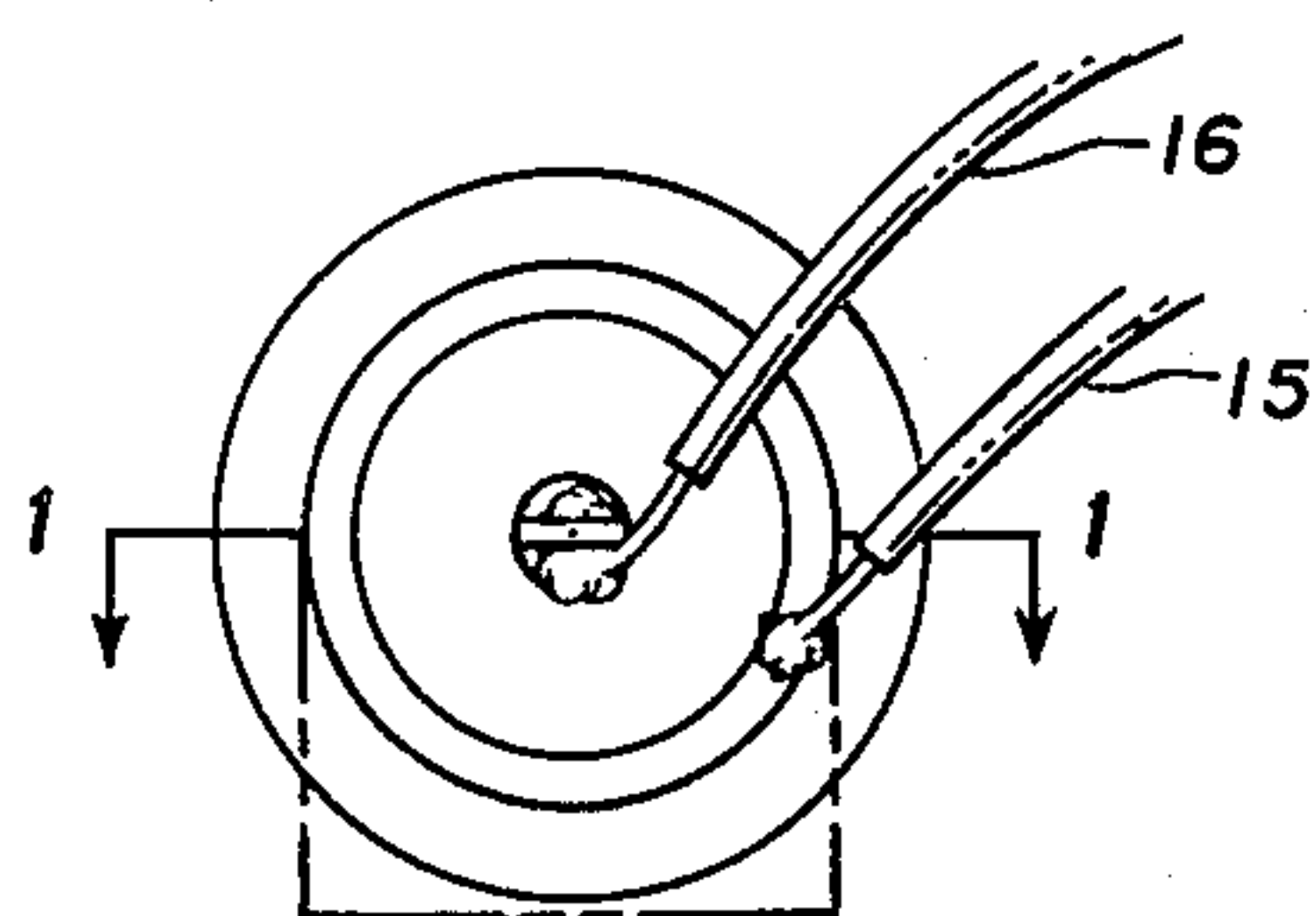


FIG. 3

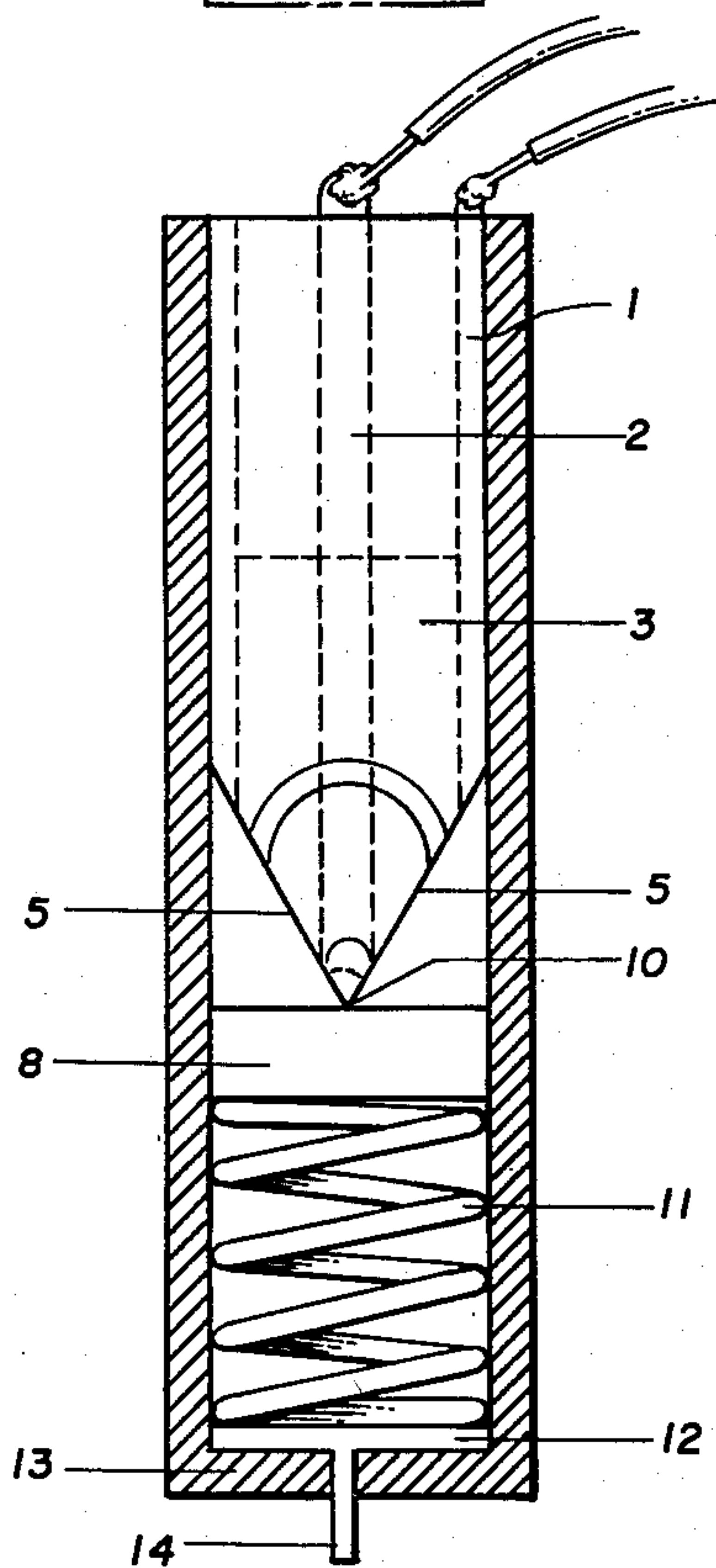


FIG. 1

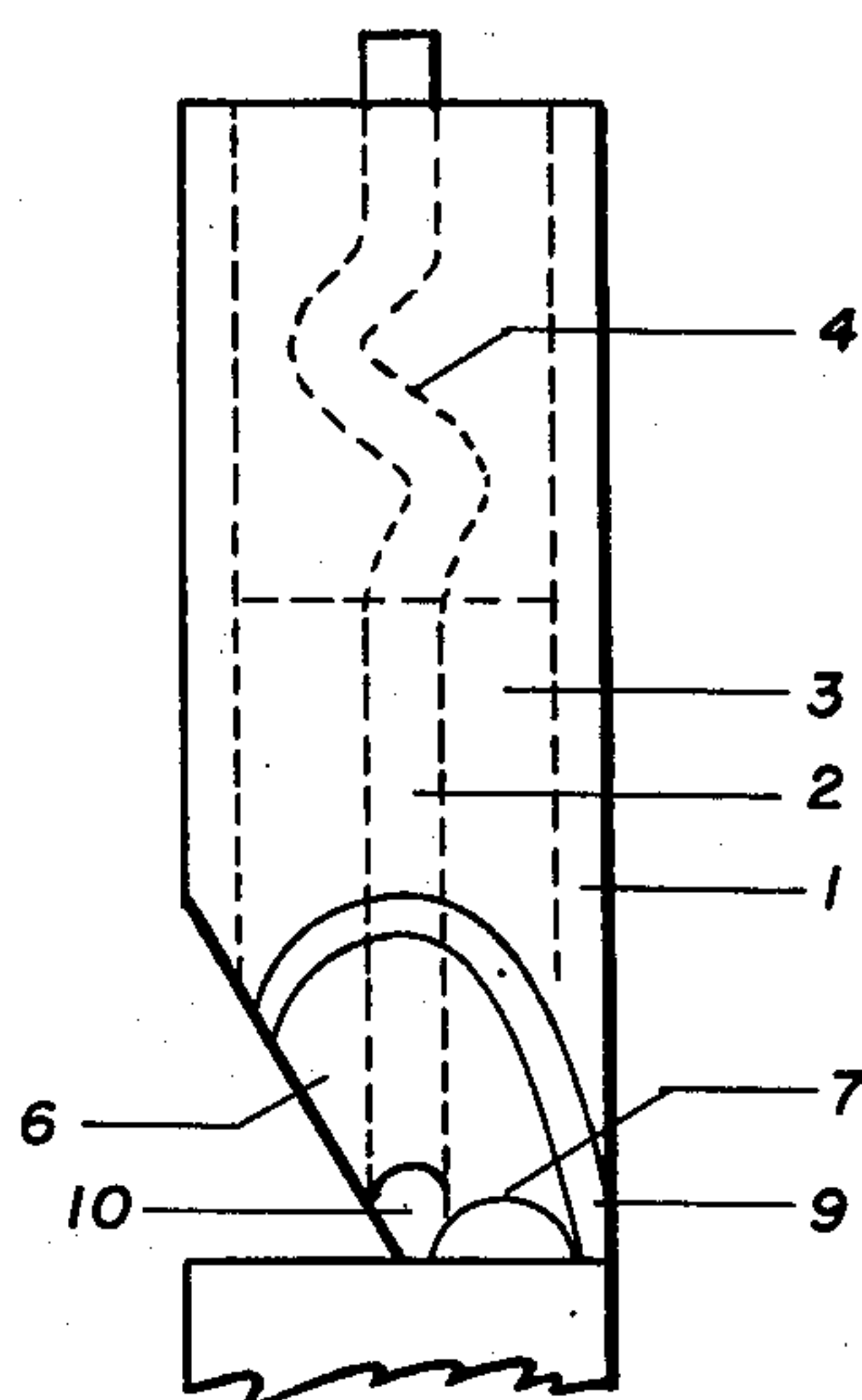


FIG. 2

INVENTORS
NEWTON H. ODELL
KENNETH L. HENDERSON
BY *Philip D. Schmidt*
AGENT

UNITED STATES PATENT OFFICE

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SEMICONDUCTING DEVICE

Kenneth L. Henderson, Rochester, N. Y., and
Newton H. Odell, Bethlehem, Pa., assignors to
Stromberg-Carlson Company, a corporation of
New York

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5 Claims. (Cl. 317-235)

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Our invention relates to semi-conducting devices, and more particularly to semi-conducting devices of the point-contact type.

Point-contact semi-conducting devices known before our invention generally comprise a pair of sharp-ended electrodes engaging, in close proximity to each other, the surface of a semi-conducting body. This type of assembly, because of the small dimensions involved, has proved to be both difficult and costly to manufacture, and the resulting product is relatively fragile.

It is accordingly an object of our invention to provide a semi-conducting device of the point-contact type which is rugged.

It is another object of our invention to provide a semi-conducting device of the point-contact type which may be assembled relatively easily and quickly.

It is yet another object of our invention to provide a point-contact semi-conducting device in which the electrodes may be automatically and precisely located relative to each other in the process of assembly.

Further objects and advantages of our invention will become apparent as the following description proceeds and the features of novelty which characterize our invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In general, we accomplish these and other objects of our invention by making one of the electrodes in a tubular configuration, and by supporting a second electrode within the first electrode. The supporting means may be any insulating material of suitable characteristics. This contact assembly is provided with the requisite sharp portions on corresponding ends of the electrodes by forming the assembly with a wedge-shaped end and undercutting the latter.

For a better understanding of our invention, reference may be had to the accompanying drawing in which

Fig. 1 is a front elevation, partially in section, of a point-contact semi-conducting device according to our invention;

Fig. 2 is a side elevation view of a portion of the embodiment of Fig. 1; and

Fig. 3 is a top view of the embodiment of Fig. 1.

In the embodiment of our invention shown in the drawing, a first electrode is designated by reference numeral 1 and a second electrode by reference numeral 2. First electrode 1 is of generally tubular configuration, preferably of circular cross-section, although cross-sections of other

shapes are likewise usable. Similarly, second electrode 2 is preferably of round cross-section, although other cross-sections may be used. Electrode 2 may have the generally elongated, wire-like shape illustrated. The major axes of electrodes 1 and 2 are preferably substantially parallel.

Electrode 2 is secured in place relative to electrode 1 by means of a plug 3 of suitable insulating material. The tolerance of the fit of electrodes 1 and 2 relative to plug 3 is preferably such as to allow axial adjustment of the position of electrode 2 relative to that of electrode 1 through the application of appreciable force, the force required to make this adjustment being greater than any normally encountered in use of the semi-conducting device. We prefer to provide a serpentine configuration 4 in second electrode 2 above plug 3, in order to accommodate this axial movement.

To provide the relatively sharp portions on the ends of electrodes 1 and 2 required for operation of a semi-conductor device of the type illustrated, we prefer to provide a wedge-shaped portion on one end of the point-contact assembly. This wedge-shaped portion is preferably provided by cutting the assembly away along the plane surfaces indicated by reference numerals 5. Further sharpening is produced by undercutting this wedge-shaped portion along plane 6, and also undercutting the portion between the lowermost (in the drawing) parts of the assembly, as indicated at 7. It will be appreciated by those skilled in the art that other configurations for the contact end of the contact assembly may be provided without departing from the spirit of our invention; it is necessary only that at least one relatively sharp portion be provided for each electrode. Likewise, the use of electrodes 1 and 2 for emitter and collector electrodes respectively, or vice versa, is immaterial to our invention.

We prefer that the point-contact electrode assembly be held relatively fixed, and that a body of semi-conducting material be resiliently biased into contact therewith. We accordingly show semi-conducting body 8 in contact with relatively sharp ends 9 and 10 of electrodes 1 and 2, respectively. Body 8 is held against points 9 and 10 by means of a resilient biasing means, such as coil spring 11. The thrust of spring 11 is taken against contact plate 12, which in turn rests against a container 13. The latter is preferably made of a suitable insulating material having a cross-section dimensioned to secure the outer surface of electrode 1 in place through tightness

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of fit. A base contact may be made to plate 12 by means of a terminal portion 14, while connection may be made to electrodes 1 and 2 by any convenient means, such as soldering wires 15 and 16 to the upper ends thereof.

From the foregoing explanation, it will be apparent to those skilled in the art that we have provided, according to our invention, a simple and rugged point-contact assembly for a semi-conducting device in which the axial position of one electrode may be quickly and easily adjusted relative to the other, yet which at the same time provides for rapid and easy assembly.

While we have shown and described our invention as applied to a specific embodiment thereof, other modifications will readily occur to those skilled in the art. For example, we have shown second electrode 2 in a position substantially coaxial with first electrode 1. Other positions of one electrode relative to the other are, of course, possible. We consequently do not desire our invention to be limited to the specific arrangement shown and described, and we intend in the appended claims to cover all modifications within the spirit and scope of our invention.

What we claim is:

1. In a semi-conductor device, the combination of a semi-conducting body, a point-contact electrode assembly comprising a first electrode of generally tubular configuration and a second electrode of generally elongated shape having its major axis substantially parallel to the major axis of said first electrode, said first electrode having one end contoured with a relatively sharp portion, said second electrode having an end corresponding to said contoured end of said first electrode also contoured with a relatively sharp portion, means resiliently biasing said body against said sharp portions of both said first and second electrodes, and means for making base contact with said body.

2. In a semi-conductor device, the combination of a semi-conducting body; a point-contact electrode assembly comprising a first electrode of generally tubular configuration, a second electrode of generally elongated shape, and insulating means for securing said second electrode substantially coaxially with respect to said first electrode; said assembly having a wedge-shaped end undercut to provide relatively sharp portions on the corresponding ends of said first and second electrodes; means resiliently biasing said body against said sharp portions of both said first and second electrodes; and means for making base contact to said body.

3. In a semi-conductor device, the combination of a semi-conducting body; a point-contact electrode assembly comprising a first electrode of generally tubular configuration, a second elec-

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trode of generally elongated shape, and insulating means for securing said second electrode substantially coaxially with respect to said first electrode; said assembly having a wedge-shaped end undercut to provide relatively sharp portions on the corresponding ends of said first and second electrodes; means resiliently biasing said body against said sharp portions of both said first and second electrodes; said resilient biasing means also serving to make base contact with said body.

4. In a semi-conductor device, the combination of a semi-conducting body, a first electrode of generally tubular configuration, insulating means seated within said first electrode, and a second electrode passing through said insulating means in a direction substantially coaxially with said first electrode; said assembly having a wedge-shaped end undercut to provide relatively sharp portions on the ends of said first and second electrodes; said second electrode having a serpentine contour at the end of said insulating means opposite said sharp-portioned end of said second electrode, said serpentine contour serving to provide axial flexibility of said second electrode; means resiliently biasing said body against said sharp portions of both said first and said second electrodes; and means for making base contact with said body.

5. The method of making a semi-conductor device which comprises the steps of mounting an insulating member within a generally tubular electrode member; inserting a second electrode through said insulating means substantially coaxially with respect to said first electrode; contouring one end of the assembly formed by said first and second electrodes and said insulating means into a two-sided wedge; undercutting said wedge-shape to provide at least one relatively sharp portion on the corresponding ends of each of said first and second electrodes; positioning resilient biasing means to bias a body of semi-conducting material against said sharpened portions of said first and second electrodes; securing said assembly, said semi-conductor block and said resilient biasing means into fixed relationship relative to each other; and making contact to each of said electrodes and making base contact to said semi-conducting body.

KENNETH L. HENDERSON.
NEWTON H. ODELL.

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