

[54] **PLUG-IN TYPE SOCKETS FOR TESTING SEMICONDUCTORS**

[75] Inventor: Edwin G. Millis, Irving, Tex.
 [73] Assignee: Textool Products, Inc., Irving, Tex.
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[52] U.S. Cl. 339/75 M
 [51] Int. Cl. H01r 13/54
 [58] Field of Search 339/75-79, 176

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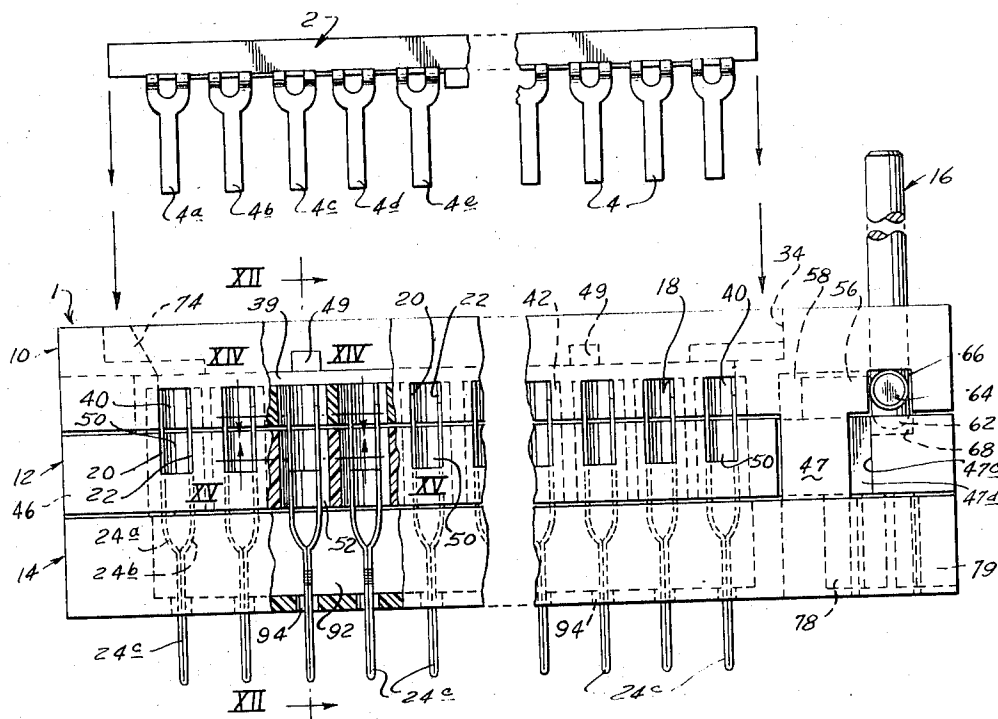
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Primary Examiner—Joseph H. McGlynn
 Attorney—Howard E. Moore et al.

[57] **ABSTRACT**

A plug-in type socket for making a temporary electrical connection between a plurality of leads on a semiconductor and contacts of a suitable test circuit without applying substantial insertion pressure. Spaced resilient contacts are urged into gripping engagement with a lead on a semiconductor by movable concave surfaces, allowing deflection of the contact after engagement by the lead to assure that each of a plurality of leads is firmly gripped between a plurality of sets of contacts.

18 Claims, 25 Drawing Figures



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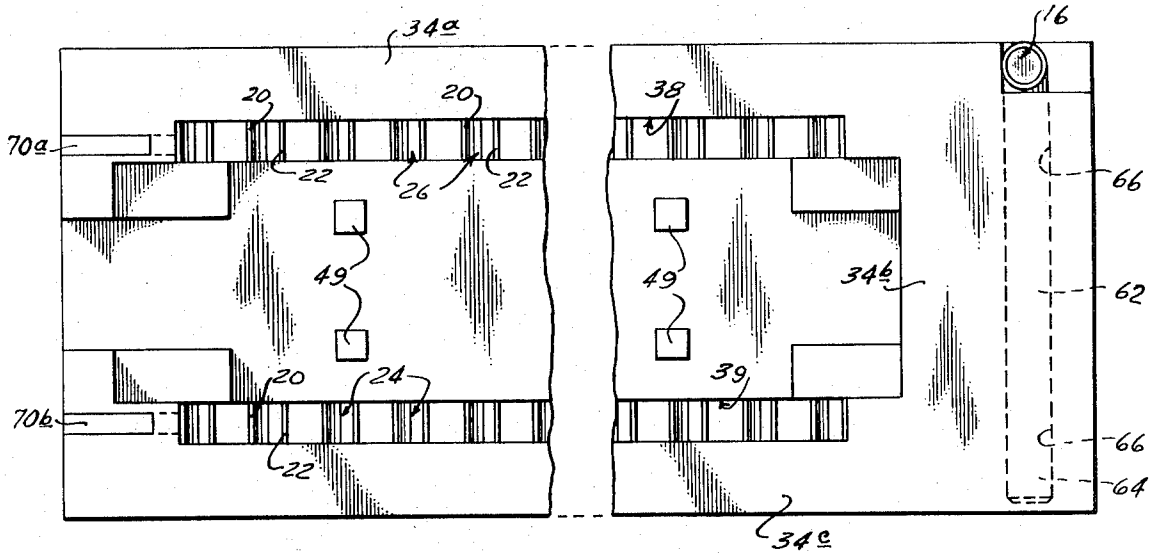


Fig. II

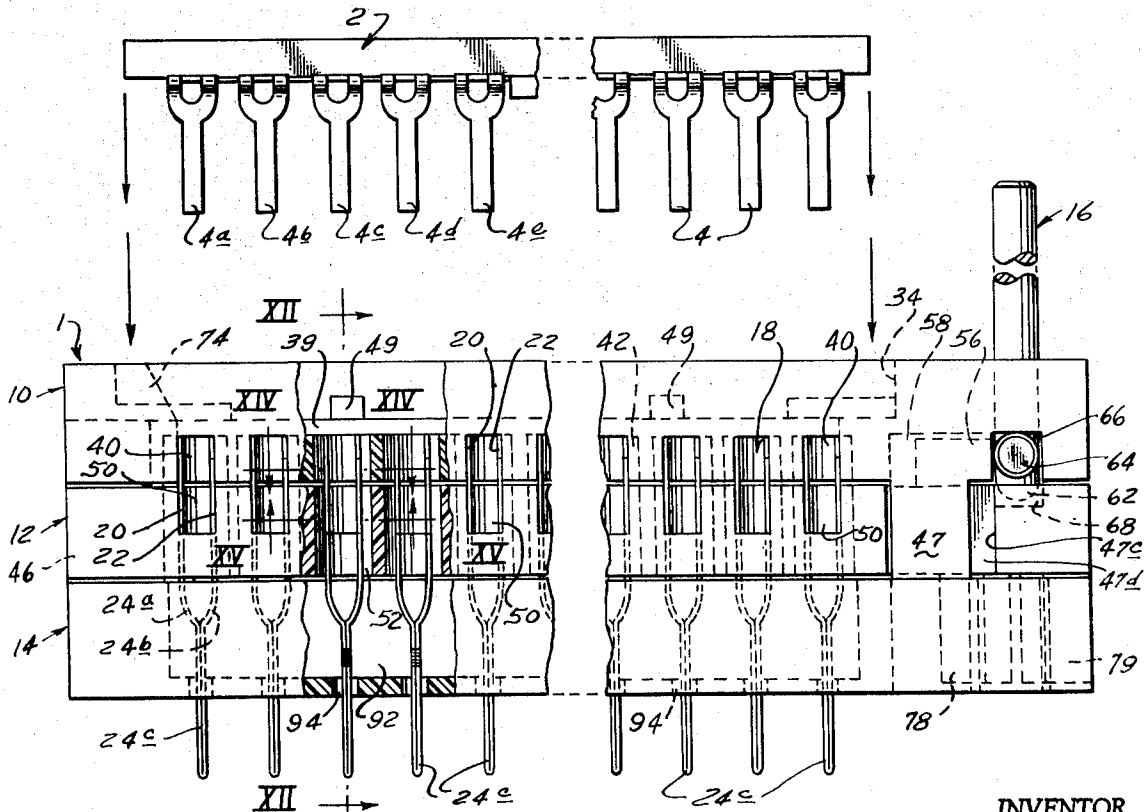


Fig. I

INVENTOR

Edwin G. Millis

Howard E. Moore

Gerald B. Crutsinger

ATTORNEYS

BY

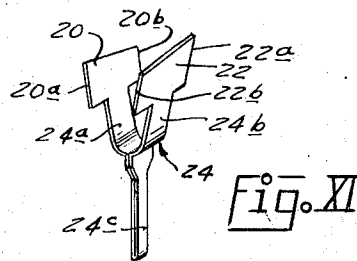
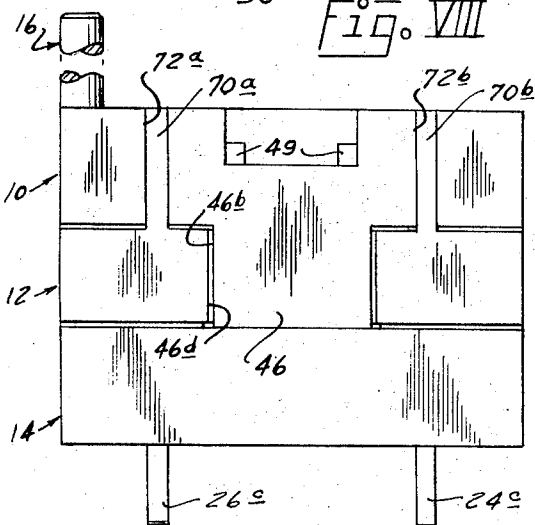
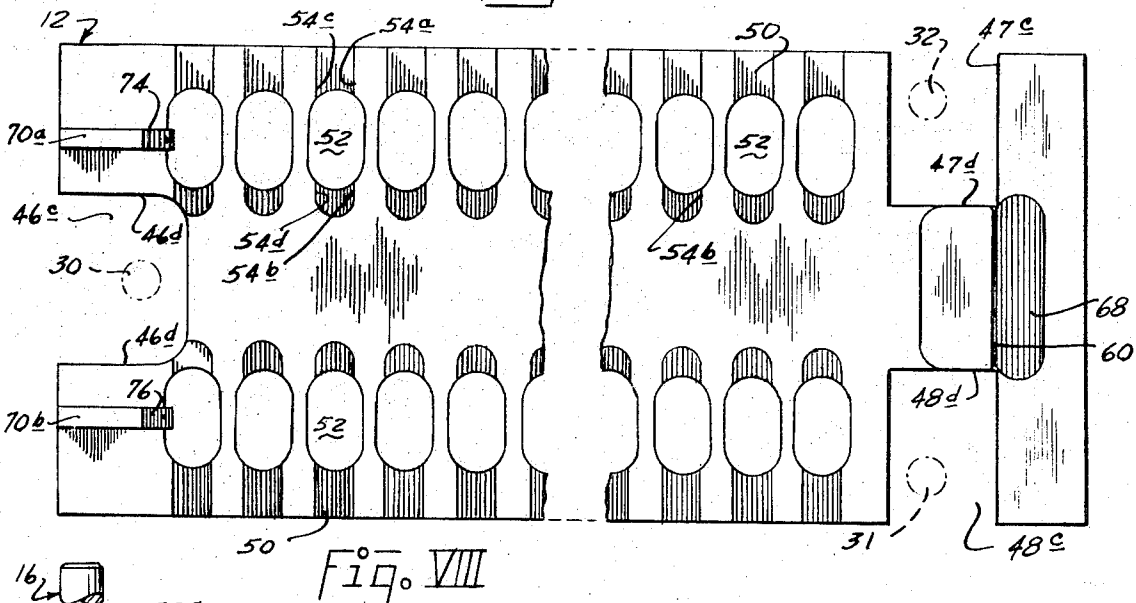
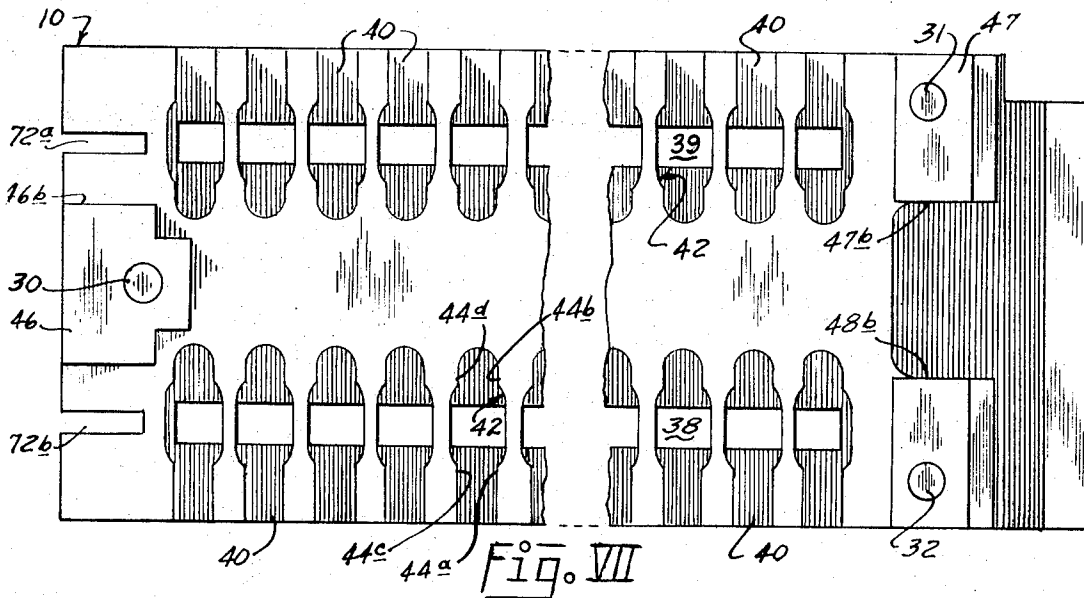


Fig. III

BY

INVENTOR
Edwin G. Millis
Howard E. Moore
Gerald O. Crutsinger
ATTORNEYS

Patented Oct. 2, 1973

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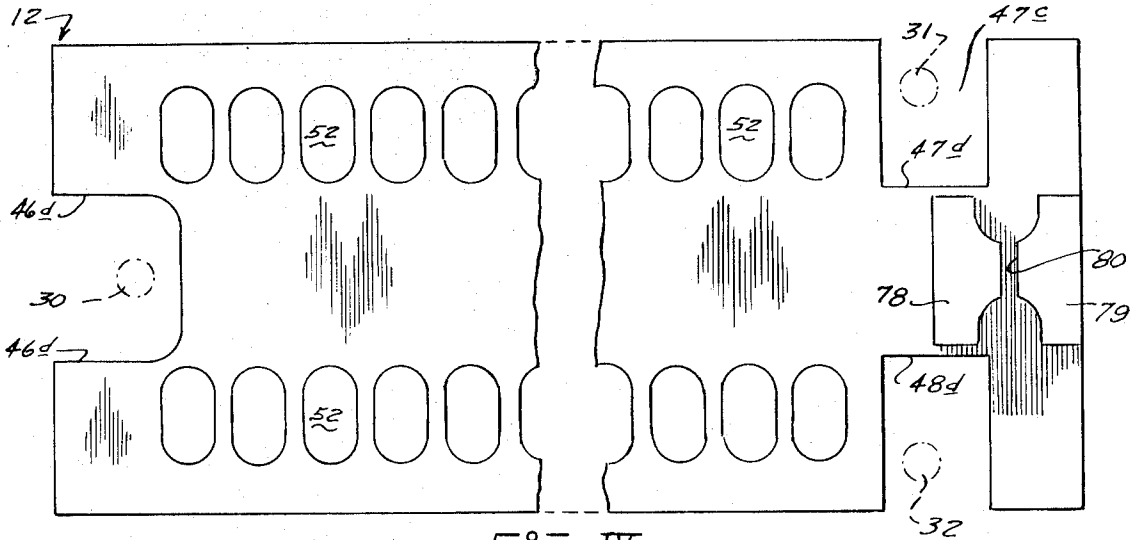


Fig. IX

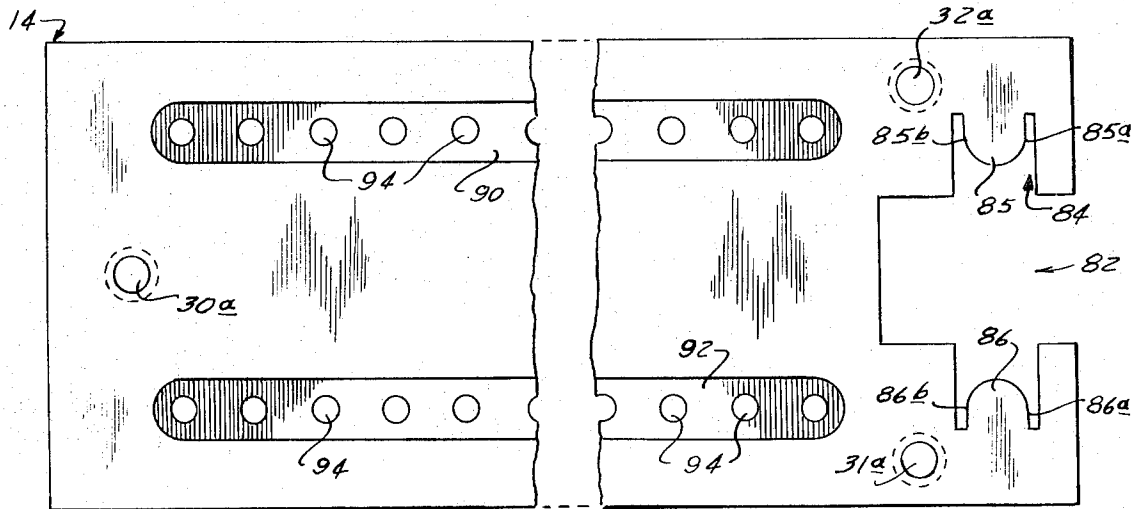


Fig. X

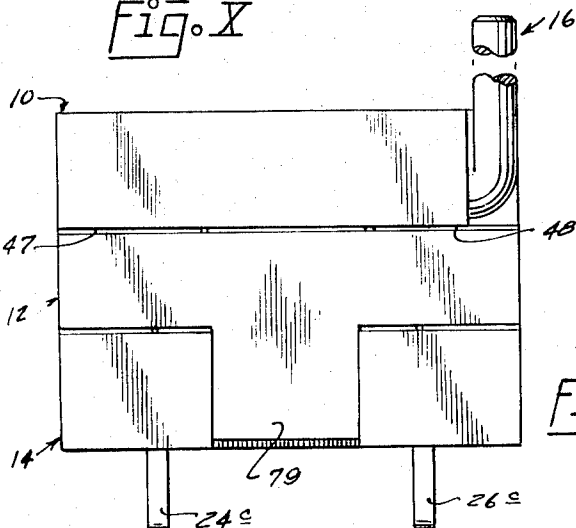


Fig. IV

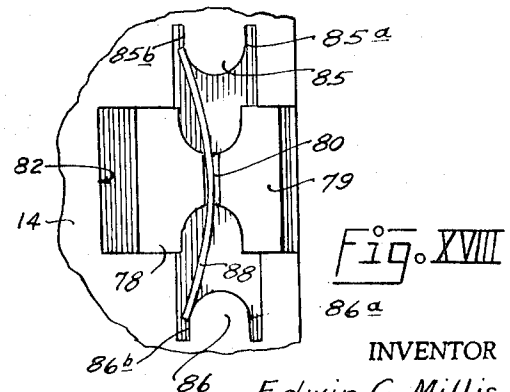


Fig. XVIII

INVENTOR

Edwin G. Millis

Howard E. Moore

Gerald Y. Crutsinger

ATTORNEYS

BY

Patented Oct. 2, 1973

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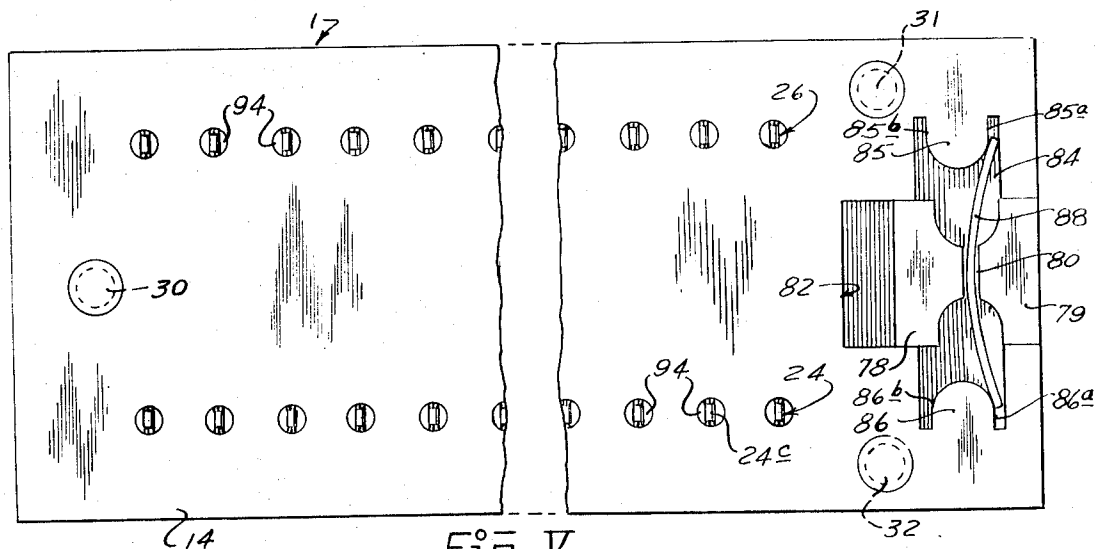


Fig. V

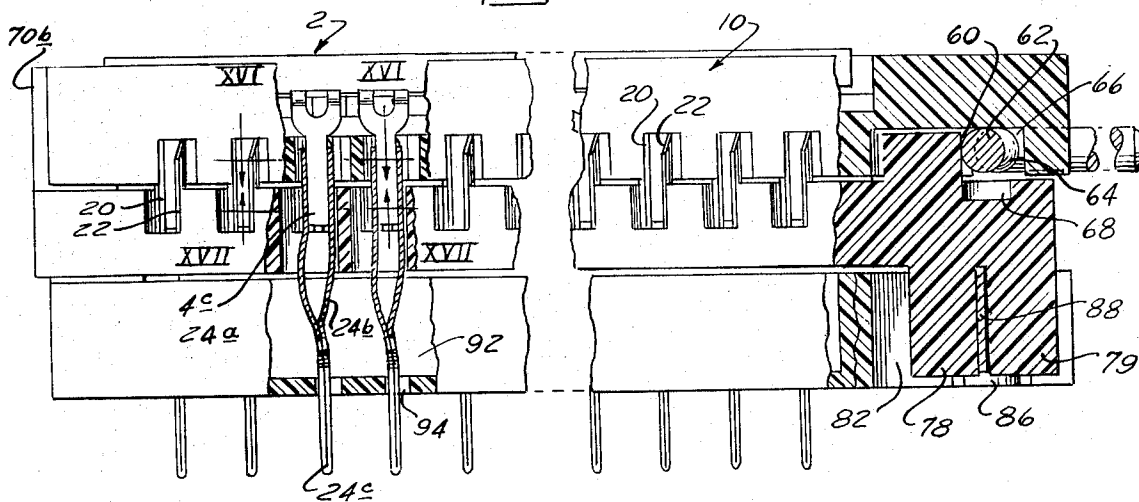


Fig. XIII

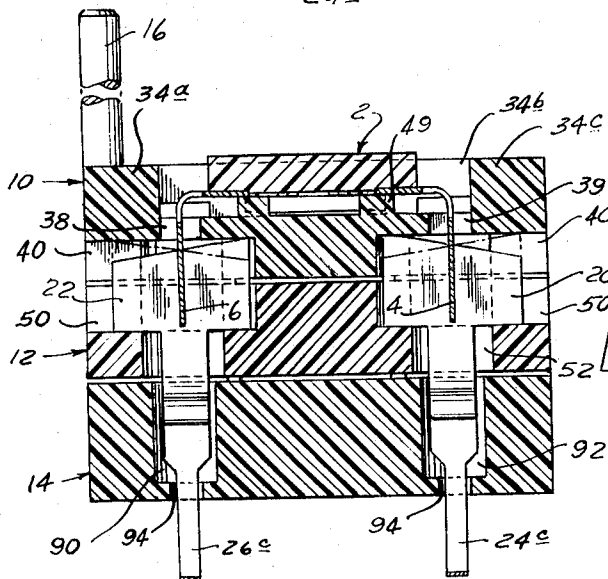


Fig. XII

BY

INVENTOR

Edwin G. Millis

Howard E. Moore

Gerald S. Crutsinger

ATTORNEYS

Patented Oct. 2, 1973

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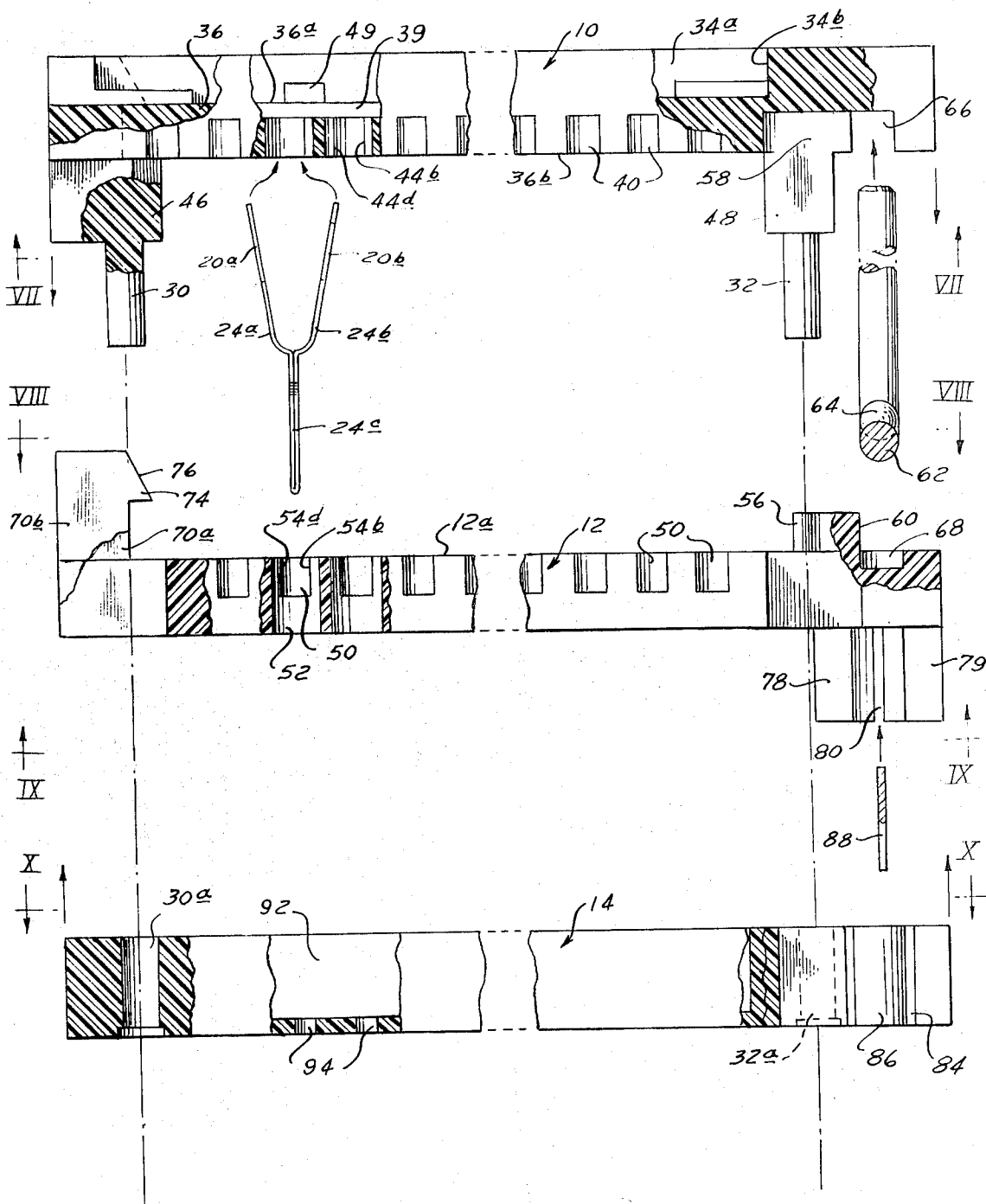


Fig. VI

INVENTOR

Edwin G. Millis

Howard E. Moore

BY

Gerald D. Crutsinger
ATTORNEYS

Patented Oct. 2, 1973

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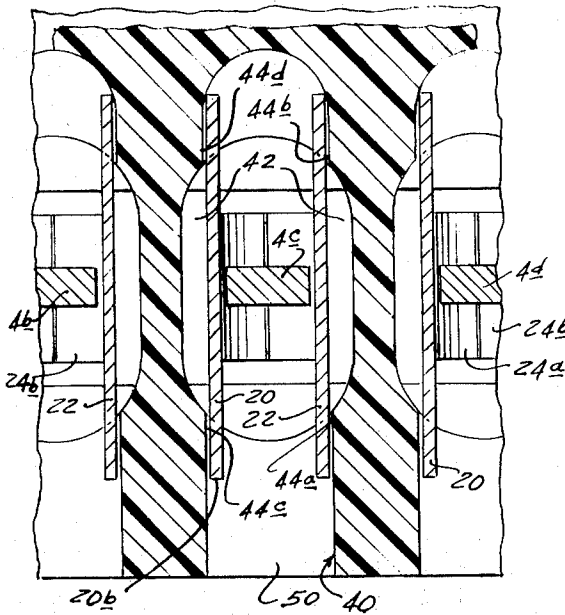


Fig. XIV

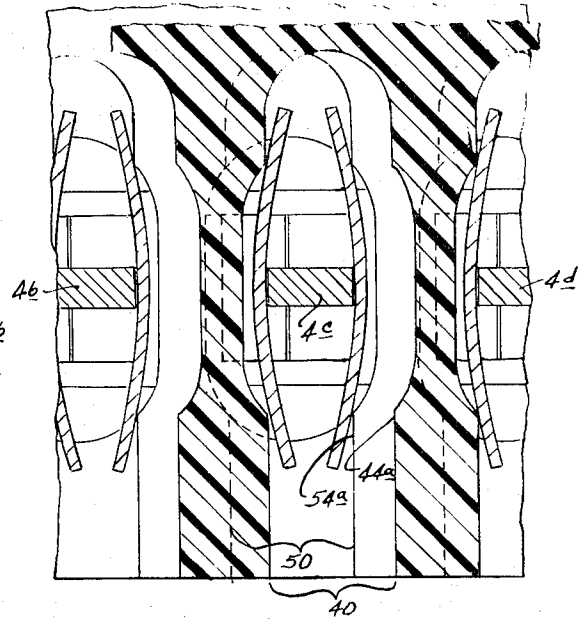


Fig. XVI

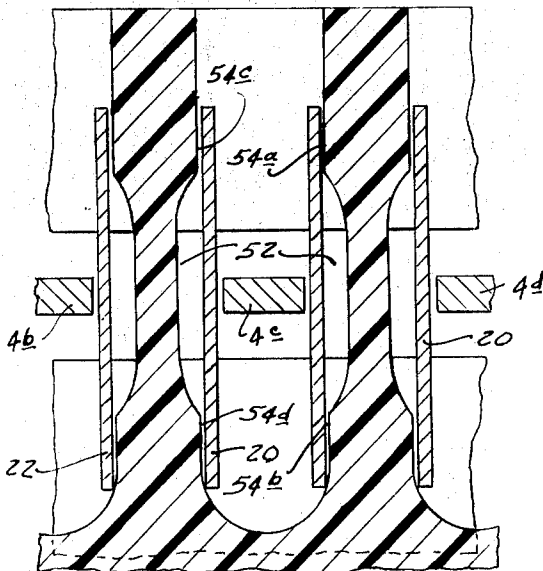


Fig. XV

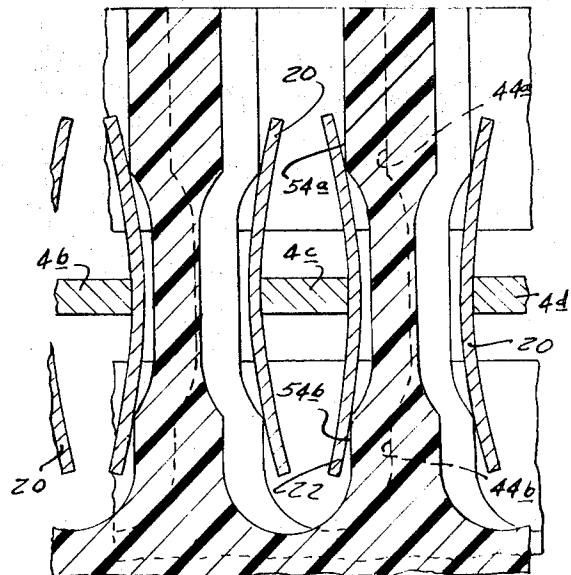


Fig. XVII

INVENTOR

Edwin G. Millis

Howard E. Moore

BY

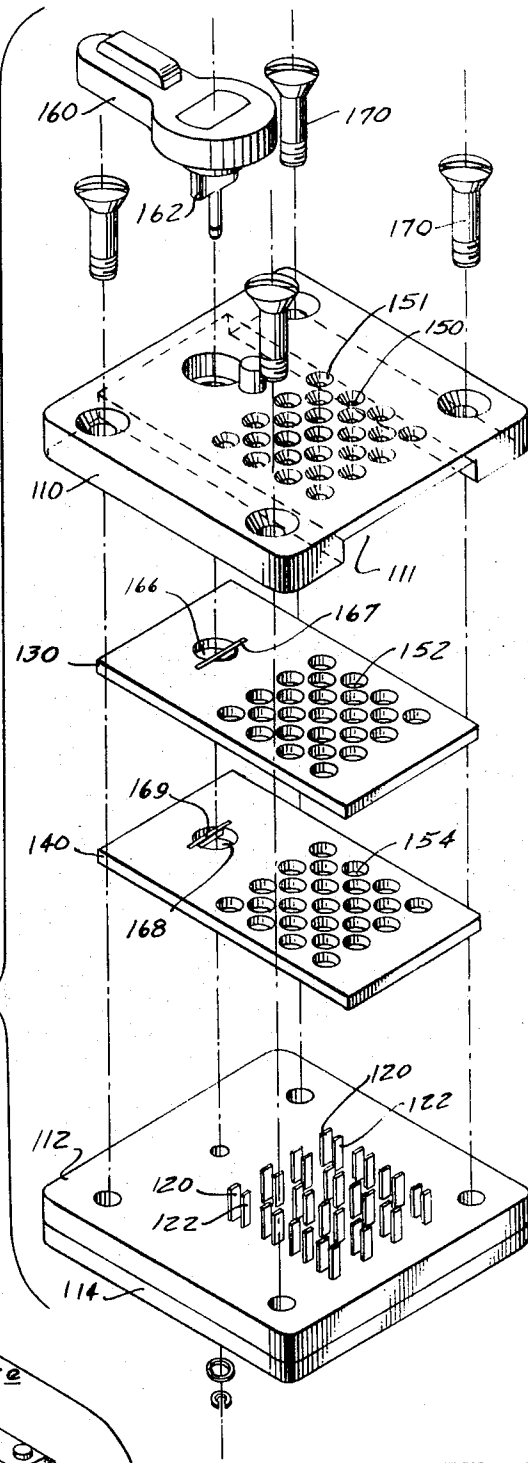
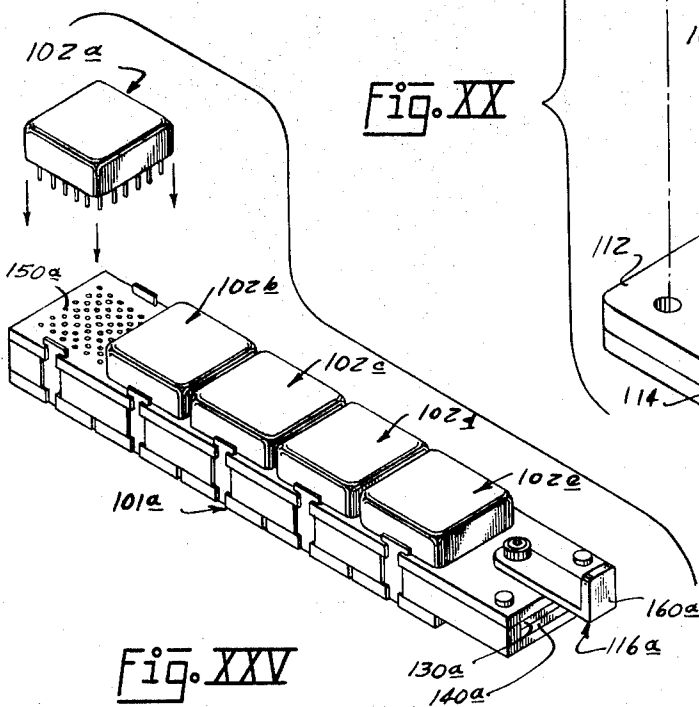
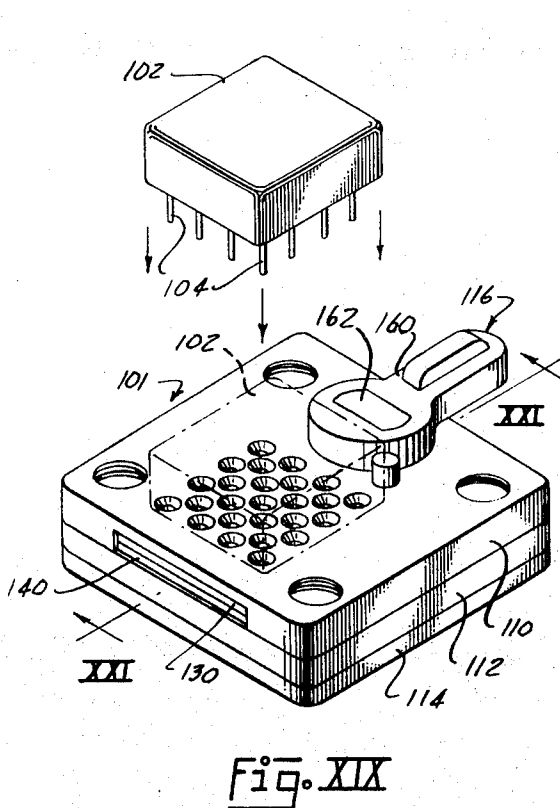
Gerald D. Crutinger

ATTORNEYS

Patented Oct. 2, 1973

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INVENTOR

Edwin G. Millis

Howard E. Moore

Gerald H. Crutsinger
ATTORNEYS

BY

Patented Oct. 2, 1973

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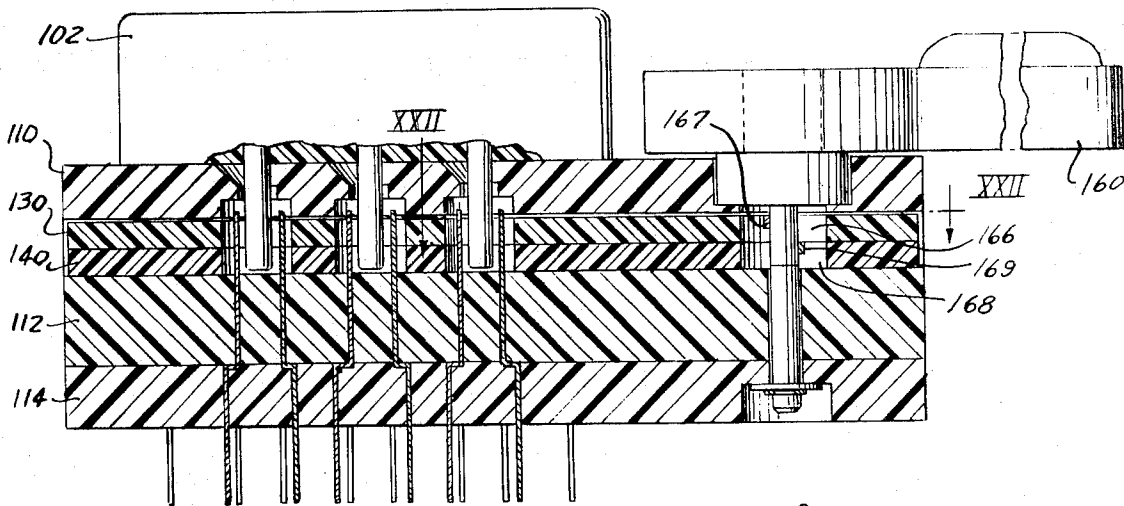


Fig. XXI

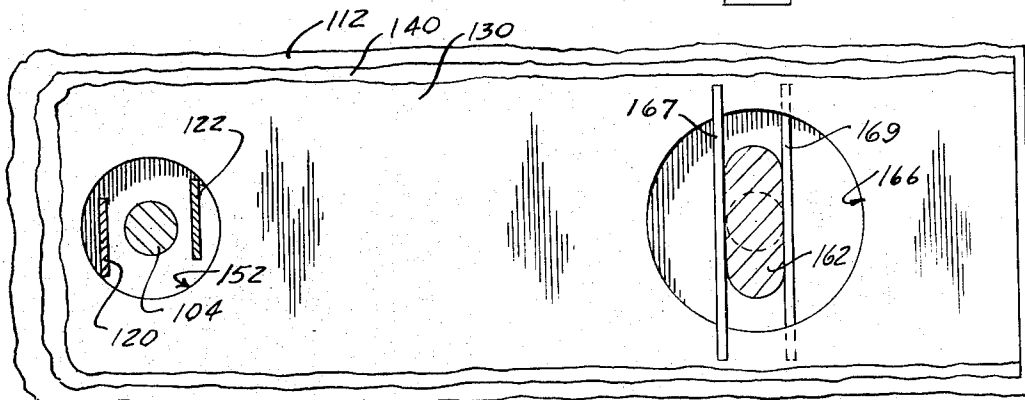


Fig. XXII

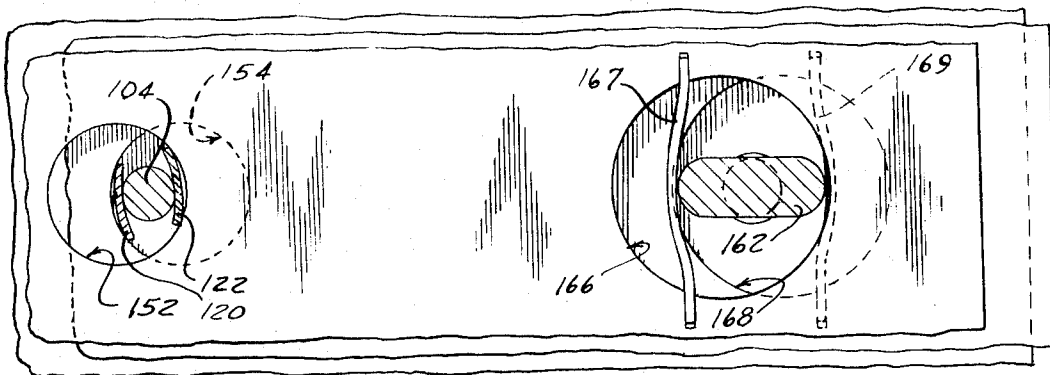


Fig. XXIII

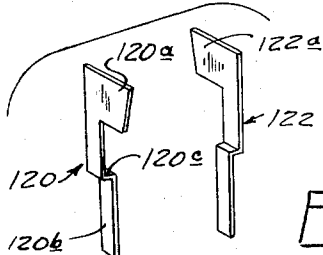


Fig. XXIV

INVENTOR

Edwin G. Millis

Howard E. Moore

Gerald S. Crutsinger
ATTORNEYS

BY

PLUG-IN TYPE SOCKETS FOR TESTING SEMICONDUCTORS

BACKGROUND OF INVENTION

Testing and evaluating semiconductor devices, such as integrated circuits, for determining whether or not a device will perform a specified function with a specified degree of reliability becomes increasingly difficult as the number of leads or terminals on the device increases. The usual manner of testing semiconductor devices involves forcing leads on the device into a receptacle having spring loaded contacts which are connectable to suitable test circuitry. To assure good electrical conduction between each contact in the receptacle and the lead associated therewith, receptacles heretofore devised have required exertion of substantial pressure for connecting leads with the contacts.

The necessity for the exertion of a substantial insertion pressure is objectionable when the semiconductor device has a large number of terminals because difficulty is encountered to plug and unplug the semiconductor device into the receptacle and because the probability that the semiconductor device will be damaged by bending or breaking the leads is high.

Manufacturers of sockets and receptacles heretofore devised have attempted to reduce the force biasing the contacts into pressure relation with leads on the semiconductor device for reducing pressure required for inserting leads into the socket. However, the reduction in force biasing the contacts against the leads resulted in unreliable electrical conduction between the contacts and the leads.

Sockets have been devised heretofore which reduce pressure required for insertion of leads thereinto. However, such devices have been complicated and have been so expensive as to render the use thereof in general manufacturing operations economically impractical.

SUMMARY OF INVENTION

I have developed a socket for use in testing and evaluating semiconductor devices, such as integrated circuits, having spaced contacts connectable to suitable electrical circuitry. The contacts are biased by resilient means away from a lead on a semiconductor device positioned therebetween. Actuating means is operably associated with at least one of the contact elements for moving same relative to the lead on the semiconductor device for positioning the spaced contact elements in pressure relation with the lead. The actuating means is adapted to allow relative movement between the associated contact elements and the actuating means after the contact elements have been positioned in pressure relation with the lead positioned therebetween. Therefore, actuation of a plurality of contact elements by a single actuating means is permitted to provide substantially uniform pressure between each set of contacts and the associated lead even though the leads may have different dimensions or configurations.

The contacts, biased away from the lead positionable therebetween, are spaced apart a distance exceeding the dimension of a lead allowing insertion of a plurality of leads between a plurality of contacts without exerting any substantial insertion pressure.

A primary object of the invention is to provide a socket for temporarily connecting a semiconductor device having a large number of leads to an electrical cir-

cuit without application of force to leads of the semiconductor device of a magnitude which could bend or otherwise damage the leads.

A further object of the invention is to provide a socket for testing semiconductor devices, having a large number of leads, which is provided with guide surfaces allowing the semiconductor device to be positioned above the socket and released, the guide surfaces being adapted to direct the leads between appropriate contacts in the socket, the only force being exerted thereon being the force of gravity.

A further object of the invention is to provide a socket for testing semiconductor devices offering low insertion pressure which is particularly adapted for mass production at a low cost per socket, making use thereof economically feasible for general use by manufacturers of semiconductor devices.

Other and further objects of the invention will become apparent upon referring to the detailed description hereinafter following and the drawings annexed hereto.

DESCRIPTION OF DRAWINGS

FIG. I is a partially sectionalized side elevational view of a first embodiment of the socket particularly adapted for use with a dual-in-line integrated circuit package;

FIG. II is a plan view of the socket illustrated in FIG. I;

FIG. III is an end view looking in the direction of arrows along line III—III of FIG. I;

FIG. IV is an end view looking in the direction of arrows along line IV—IV of FIG. I;

FIG. V is an elevational view of the bottom of the socket illustrated in FIG. I;

FIG. VI is a side elevational view similar to FIG. I, sections of the socket being exploded and parts thereof being broken away to more clearly illustrate details of construction;

FIG. VII is an elevational view of the bottom of the upper section of the socket, as viewed when looking in the direction of the arrows along line VII—VII of FIG. VI;

FIG. VIII is a plan view of the center section of the socket, looking in the direction of the arrows along line VIII—VIII of FIG. VI;

FIG. IX is an elevational view of the bottom of the center section of the socket, looking in the direction of the arrows along line IX—IX of FIG. VI;

FIG. X is a plan view of the lower section of the socket, looking in the direction of the arrows along line X—X of FIG. VI;

FIG. XI is a perspective view of contacts employed in conjunction with the socket illustrated in FIG. I;

FIG. XII is a cross-sectional view taken substantially along line XII—XII of FIG. I;

FIG. XIII is a cross-sectional view taken substantially along line XIII—XIII of FIG. II, illustrating the position of parts when contacts are moved into pressure relation with a lead;

FIG. XIV is an enlarged cross-sectional view taken substantially along line XIV—XIV of FIG. I;

FIG. XV is an enlarged cross-sectional view taken substantially along line XV—XV of FIG. I;

FIG. XVI is an enlarged cross-sectional view taken substantially along line XVI—XVI of FIG. XIII;

FIG. XVII is an enlarged cross-sectional view taken substantially along line XVII—XVII OF FIG. XIII;

FIG. XVIII is a fragmentary view similar to FIG. V illustrating means to bias contacts of the socket toward a closed position;

FIG. XIX is a perspective view of a second embodiment of the socket particularly adapted for use with a multi-pin type integrated circuit package;

FIG. XX is an exploded perspective view of the socket illustrated in FIG. XIX;

FIG. XXI is a cross-sectional view taken substantially along line XXI—XXI of FIG. XIX;

FIG. XXII is a cross-sectional view taken substantially along line XXII—XXII of FIG. XXI, the socket being in an open position;

FIG. XXIII is a cross-sectional view similar to FIG. XXII the socket being in a closed position;

FIG. XXIV is a perspective view of contacts employed in conjunction with the socket illustrated in FIG. XIX; and

FIG. XXV is a perspective view of a modified form of the socket illustrated in FIG. XIX adapted to simultaneously receive a plurality of semiconductor devices.

Numeral references are employed to designate parts in the drawing and like numerals designate like parts throughout the various figures of the drawings.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIG. I of the drawing, the numeral 1 generally designates a socket for testing a semiconductor device 2 having dual-in-line leads 4 and 6.

Socket 1 comprises an upper section 10, a center section 12, and a lower section 14. Upper section 10 and lower section 14 are secured together in spaced apart relation and center section 12 is movable longitudinally therebetween by suitable means such as crank 16, as will be hereinafter more fully explained.

Socket 1 has a plurality of receptacles 18 formed therein for receiving upper portions 20 and 22 of contacts 24 and 26 (FIG. XI), as will be hereinafter more fully explained.

As best illustrated in FIGS. I, II, VI, and XII—XIV, the upper section 10 of socket 1 preferably comprises a single piece of molded thermoplastic material, for example, polysulfone, having means thereon connectable to lower section 14. In the embodiment illustrated in FIG. VI downwardly extending projections 30, 31 and 32 extend into openings 30a, 31a, and 32a in lower section 14 of socket 1 such that the upper and lower sections can be heat sealed together. However, it should be appreciated that other means such as screws 170 in FIG. XX may be employed.

The upper surface of upper section 10 of socket 1 has upwardly extending shoulders 34a, 34b and 34c arranged in a substantially U-shaped configuration about a central support surface 36 having rectangular openings 38 and 39 extending therethrough.

As best illustrated in FIG. VII, the bottom surface 36b of upper section 10 of socket 1 has a plurality of outwardly directed channels 40 formed therein, said channels intersecting rectangular openings 38 and 39. Widened portions 42 are formed in each channel 40, forming shoulders 44a, 44b, 44c and 44d in each channel 40.

It should be readily apparent that channels 40 having shoulders 44a, 44b, 44c and 44d formed therein form receptacles 18 into which upper ends 20 and 22 of con-

tact elements 24 and 26 extend. Spacer elements 46, 47 and 48 extend downwardly from the lower side of upper section 10 of socket 1 for spacing upper section 10 and lower section 14 apart a distance substantially equal to the thickness of center section 12. Spacer elements 46, 47 and 48 have lower surfaces which engage the upper surface of lower section 14.

Stand-off elements 49 extend upwardly from the upper surface 36a of upper section 10 to provide air circulation around semiconductor 2 when inserted into the socket, to facilitate removal of the semiconductor from the circuit and to space leads 4 and 6 in desired relation relative to contacts 24 and 26.

As best illustrated in FIGS. VI, VIII, IX and XIII, the central section 12 of socket 1 comprises a substantially flat rectangular plate having transversely extending channels 50 formed in the upper surface 12a thereof, said channels 50 and channels 40, formed in the lower surface 36b of upper section 10, being similarly spaced allowing positioning of said channels in overlying substantially coinciding relationship. As best illustrated in FIG. I and XIII, channels 50 have a depth substantially equal to one-half the thickness of the rectangular plate of which center section 12 is constructed.

Openings 52, having a width greater than the width of channels 50, extend through center section 12 and are positioned to form an enlarged portion in each of the channels 50, providing shoulders 54a, 54b, 54c and 54d arranged for vertical alignment below shoulders 44a, 44b, 44c and 44d, respectively, formed in channels 40 of upper section 10.

Central section 12 has cutout portions 46c, 47c and 48c through which spacer members 46, 47 and 48, extending downwardly from upper section 10 of socket 1, extend. It should be noted that openings 46c, 47c, and 48c are wider than spacer members 46, 47 and 48, respectively, allowing movement of central section 12 relative to upper section 10 from the position illustrated in FIG. I to the position illustrated in FIG. XIII.

Sides 46d of opening 46c are disposed in sliding engagement with surfaces 46b on spacer member 46 preventing lateral movement of upper section 10 relative to central section 12. It should also be appreciated that surfaces 47b and 48b on spacers 47 and 48 are disposed in sliding engagement with surfaces 47d and 48d in openings 47c and 48c, respectively.

A lug 56 extends upwardly from the upper surface 12a of central section 12 of socket 1 and is positioned between surfaces 47d and 48d. Lug 56 extends into recess 58 (see FIG. XIII) formed in the lower surface 36b of upper section 10 and has a surface 60 which is engageable with crank portion 62 of shaft 64 which is rotatably disposed in passage 66 extending transversely across the lower surface of upper section 10.

A cavity 68 is formed in the upper surface of central section 12 adjacent upwardly extending lug 56.

It should be appreciated that when socket 1 is in the open position, illustrated in FIG. I, crank portion 62 of shaft 64 is positioned in cavity 68. However, upon rotation of shaft 64 in groove 66 the crank portion 62 urges surface 60 of lug 56 and consequently central section 12 of socket 1 to the position illustrated in FIG. XIII.

Tabs 70a and 70b extend upwardly from the upper surface of central section 12 and are disposed in sliding relation with slots 72a and 72b extending through upper section 10 of the socket 1. Tabs 70a and 70b have extension members or hooks 74 disposed on the

upper ends thereof and positioned to extend over and engage the upper surface of support member 36 on upper section 10 of socket 1 to limit vertical movement of central section 12 relative to upper section 10.

Extension members 74 have beveled upper surfaces 76 inclined for guiding semiconductor device 2 into a position substantially centering leads 4 and 6 between upper ends 20 and 22 of contacts 24 and 26, respectively.

Spaced retainer elements 78 and 79 (FIG. VI) are disposed in spaced apart relation forming a slot 80 therebetween and extend downwardly from the lower surface of central section 12 of socket 1.

As best illustrated in FIGS. V and X, the bottom section 14 of socket 1 has transversely disposed openings 82 and 84 formed therein, retainer elements 78 and 79 being slidably disposed in longitudinally extending slot 82. The transversally extending slot 84 intersects longitudinally extending slot 82 and has projections 85 and 86 extending inwardly from opposite ends thereof.

As best illustrated in FIGS. V and XVIII, the resilient spring member 88 is positioned to extend through slot 80 between retainer elements 78 and 79 secured to central section 12. Opposite ends of said spring member 88 are positioned against surfaces 85a and 86a for biasing central section 12 toward the position illustrated in FIGS. I and V, corresponding to the open position. However, if it is deemed expedient to bias central section 12 toward a closed position, illustrated in FIG. XIII, ends of resilient member 88 may be positioned in engagement with surfaces 85b and 86b of projections 85 and 86, respectively, as illustrated in FIG. XVIII.

The upper surface 14a of lower section 14 (FIG. X) of socket 1 has spaced longitudinally extending grooves 90 and 92 formed therein, each of said grooves having a plurality of spaced apertures 94 disposed therein.

As best illustrated in FIGS. XI and XII, contacts 24 and 26 are of identical construction and preferably comprise a strip of resilient material formed to provide a substantially U-shaped upper section comprising diverging resilient upwardly extending legs 24a and 24b having resilient contact elements 20 and 22 secured thereto. It should be noted that contact elements 20 and 22 are of a width exceeding the width of legs 24a and 24b. Thus, application of inwardly directed forces adjacent edges 20a and 20b, and 22a and 22b causes legs 24a and 24b to deflect, allowing contacts 20 and 22 to move toward each other. As contacts 20 and 22 engage the lead 4, positioned therebetween, movement of central portions of contacts 20 and 22 is terminated. However, because of the shape and resilience of the contact elements, edges 20a and 20b, and 22a and 22b will continue to move deflecting contacts 20 and 22 about a substantially vertical axis until application of a force sufficient to overcome the spring action of the contacts is removed.

Pins 24c extend downwardly from the substantially U-shaped upper portions of contacts 24 and extend through apertures 94, as best illustrated in FIGS. I and XII of the drawing. It should be noted that the edge 20a of contact element 20 is substantially equal to the combined depth of channels 40 and 50 formed in the upper section 10, and central section 12 of socket 1 and when positioned as illustrated in FIG. XII restricts vertical movement of each of the contacts 24 and 26. Legs 24a and 24b of the contact elements extend downwardly

through opening 52 in central section 12 and into grooves 90 and 92 formed in lower section 14.

OPERATION

The operation and function of the zero insertion pressure, dual-in-line type socket generally designated by the numeral 1 is as follows:

When the locking crank 16 is in the position illustrated in FIG. I, spring 80, positioned as illustrated in FIG. V, applies a resilient force sliding the central section 12 of the socket 1 to a position wherein channels 40 in upper section 10 are positioned directly above channels 50 formed in central section 12. The upper ends 20 and 22 of each row 24 and 25 of contact elements are spaced apart a distance greater than the width of leads 4 and 6 on semiconductor device 2.

To plug leads of the semiconductor device 2 into the socket, the semiconductor device is merely positioned above socket 1, as illustrated in FIG. I, wherein leads 4 and 6 are positioned above receptacles 18, in which the contact elements are disposed. The semiconductor device is then dropped allowing entry of leads 4 and 6 into the receptacles 18.

Application of force on handle 16 imparts rotation to shaft 64 and consequently crank 62, applying a force to surface 60 of lug 56, causing movement of central section 12 of the socket to the left, as viewed in FIG. I, toward the position illustrated in FIG. XIII.

Referring to FIGS. XIV and XV, it should be noted that when the contacts are in the open position, as viewed in FIG. I, shoulders 44a, 44b, 44c and 44d formed in channel 40 of upper section 10 are positioned vertically above shoulders 54a, 54b, 54c and 54d, respectively formed in channels 50 of central section 12 of the socket device. However, as viewed in FIGS. XVI and XVII, movement of central section 12 toward the position illustrated in FIG. XIII imparts movement of channels 40 and 50 laterally relative to each other. This results in application of forces adjacent edges 20a and 20b, and 22a and 22b of the contact elements 20 and 22 resulting in deflection of leg elements 24a and 24b until contact elements 20 and 22 move into pressure relation with lead 4c of semiconductor device 2.

When contact elements 20 and 22 engage opposite sides of lead 4c of semiconductor device 2 the forces exerted through shoulders 44c and 44d in channel 40 and through shoulders 54a and 54b in channel 50 adjacent edges of the contact elements 20 and 22, result in deflection of elements 20 and 22 about a substantially vertical axis, causing the respective elements to tend to wrap around the lead 4c.

It should be appreciated that central sections of elements 20 and 22 which engage opposite sides of lead 4c move into the concave enlarged portions 42 and 52 of channels 40 and 50, respectively. The configuration of channels 40 and 50, having enlarged portions 42 and 52, allows elements 20 and 22 of each row of contacts 24 and 26 to move into substantially uniform pressure in relation with each of the lead elements 4 and 6, even though the lead elements might vary slightly in dimension and configuration.

It should be also appreciated that the configuration of channels 40 and 50, allowing deflection of contact elements 20 and 22 as described above, greatly reduces the required accuracy of dimensions of component parts of socket 1 thereby greatly reducing manufactur-

ing costs while providing substantially equal pressure between a large number of contact elements and a large number of leads on a semiconductor.

DESCRIPTION OF A SECOND EMBODIMENT

A modified form of the zero insertion pressure socket, hereinbefore described, is illustrated in FIGS. XIX—XXIV of the drawing. Contact elements of the second embodiment are arranged to engage leads 104 of a multi-pin type semiconductor package.

A socket generally designated by the numeral 101 comprises an upper section 110, a central section 112 and a lower section 114.

Upper section 110 has a slot 111 formed in the lower surface thereof through which cam plates 130 and 140 are slidably disposed.

As best illustrated in FIG. XX, upper section 110, cam plate 130 and cam plate 140 have overlying openings 150, 152 and 154, respectively, formed therein. Guide surfaces 151 are formed around the periphery of each opening 150 and upper section 110 for guiding leads 104 into openings 150.

As best illustrated in FIG. XXIV, contacts 120 and 122 comprise substantially L-shaped members having a substantially horizontally disposed leg 120a and a substantially vertically disposed leg 120b. The vertically disposed leg 120b has an offset 120c formed therein.

As best illustrated in FIG. XXI, central section 112 and lower section 114 of socket 101 have offset openings formed therein through which lower portions of contact elements 120 and 122 extend. It should be noted that offset portions 120c of each contact element is captured between the lower surface of central section 112 and the upper surface of lower section 114 thereby restricting vertical movement of contact elements 120 and 122.

Upper ends 120a and 122a of contacts 120 and 122 extend into openings 152 and 154 of cam plates 130 and 140, said contact elements being spaced apart a distance greater than the greatest dimension of lead 104 of semiconductor device 102.

Actuating means 116 comprises a crank 160 connected to a cam element 162 which extends through aligned openings 164, 166 and 168 of upper section 110, cam plate 130 and cam plate 140, respectively. Aperture 166 in cam plate 130 has slots formed on opposite sides thereof for supporting opposite ends of spring member 167. Opening 168 has slots formed in opposite sides thereof for supporting opposite ends of spring element 169. As best illustrated in FIGS. XXI and XXII spring elements 167 and 169 are spaced apart a distance substantially equal to the width of cam element 162. Rotation of handle 160 imparts rotation to cam element 162 exerting force through spring elements 167 and 169 for shifting cam plates 130 and 140 to the position illustrated in FIG. XXIII.

Movement of cam plate 130 relative to cam plate 140 causes openings 152 and 154 to be moved away from the concentric overlying relationship, illustrated in FIG. XXII to the nonaligned relationship illustrated in FIG. XXIII.

Resilient contacts 120 and 122 pivot about a substantially horizontal axis until the contacts move into pressure relation with lead 104. Continued movement of cam plates 130 and 140 after initial engagement between contacts 120 and 122 and lead 104 results in de-

flection of portions 120a and 122a of contact elements 120 and 122 about a substantially vertical axis thus allowing movement of each set of contacts 120 and 122, in each receptacle 118, into pressure relation with terminals 104 associated therewith.

Sections 110, 112 and 114 of socket 1 are locked together by suitable connector means such as screws 170.

To prevent disengagement of cam element 162 from socket 1, aligned apertures are formed through central section 112 and lower section 114 through which the cylindrical lower end of cam element 162 extends. Suitable locking means such as spring washer 172 are secured to the lower end of cam element 162, restraining vertical movement thereof relative to socket 101.

It should be appreciated that spring elements 167 and 169 bias cam plates 130 and 140 toward the position illustrated in FIG. XXII.

As best illustrated in FIG. XXV, if it is deemed expedient to do so, a plurality of semiconductor devices 102, 102b, 102c may be tested simultaneously by merely changing the configuration of the elements of the socket illustrated in FIG. XIX or by connecting a plurality of sockets together and employing elongated cam plates 130a and 140a so as to simultaneously actuate contacts into pressure relation with leads on a plurality of semiconductors by rotating handle 160a.

It should also be appreciated that socket 1, hereinbefore described as the preferred embodiment could be similarly modified, or actuating handles 16 of a plurality of separate sockets 1 may be connected by suitable means, such as a mechanical linkage allowing simultaneous actuation of contacts of a plurality of sockets by applying a single actuating force.

From the foregoing it should be readily apparent I have developed an improved socket for testing semiconductor devices, such as integrated circuits, comprising actuating means for simultaneously moving a plurality of contacts into engagement with a plurality of leads by a very simple actuating means 16 or 116. Since substantial clearance is provided between surfaces of contacts and semiconductor leads positioned relative thereto, slightly bent leads on semiconductor devices may be inserted between the contacts providing substantial reduction in time required for manufacturing and testing semiconductor devices. Provision of contacts moved relative to a lead positioned therebetween by shoulders adjacent opposite edges of a concave surface provides a simple structure wherein substantially uniform pressure is obtained between each set of contacts and each lead increasing the reliability of data obtained when the semiconductor device is tested.

It should be appreciated that other and further embodiments of the socket hereinbefore described may be devised without departing from the basic concept of my invention.

Having described my invention I claim:

1. A socket for positioning a lead in electrically conductive relation with a conductor comprising, first and second actuating members having openings formed therein, at least one of said openings having a concave surface formed therein; means to movably secure said actuating members together, said openings being positionable in overlying relationship; a resilient conductor positioned to extend into said openings; a substantially flat upper portion on said conductor having edges adjacent spaced portions of said concave surface; and means to move spaced portions of said concave surface

into engagement with spaced edges of said conductor such that upon engagement with a lead a central portion of the conductor deflects toward the portion of the concave surface intermediate the spaced portions thereof which engage edges of the conductor.

2. The combination called for in claim 1 with the addition of resilient means secured between the first and second members for biasing said members toward a position wherein openings in the respective members are disposed in overlying relationship.

3. The combination called for in claim 1 wherein the openings in the first and second members comprise transversely extending channels, and wherein the concave surface comprises a recess formed in a side of at least one of the channels, forming spaced shoulders adjacent opposite sides of the recess which are engageable with spaced portions of the conductor.

4. The combination called for in claim 1 wherein the conductor comprises a resilient member having legs arranged in a substantially U-shaped configuration; a contact element on each leg, said contact elements being wider than the legs; and bearing surfaces adjacent opposite sides of the concave surface in the opening in the actuating member, said bearing surface being engageable with portions of the contact element adjacent edges thereof such that initial movement of the actuating members deflects the legs inwardly to move the contact elements into engagement with the lead positioned therebetween, and additional movement deflects central portions of the contact elements toward the concave surface between the bearing surfaces.

5. The combination called for in claim 1 with the addition of surfaces on the conductor engageable with surfaces on the actuating members to limit longitudinal movement of said conductor relative to said openings in the actuating members.

6. The combination called for in claim 1 wherein the means to impart relative movement between the first and second actuating members comprises, actuating means rotatably disposed relative to the first member; and a protrusion on said actuating means movable into engagement with a surface on the second member for moving the openings in the first and second members out of coinciding relationship.

7. The combination called for in claim 6 wherein the actuating means comprises a shaft and the protrusion comprises an offset section formed in said shaft.

8. The combination called for in claim 6 wherein the projection comprises a cam; first resilient means secured to the first member; second resilient means secured to the second member; means to secure the cam for rotation relative to the first and second resilient means to exert forces against said first and second resilient means to move the first and second members in opposite directions.

9. The combination called for in claim 1 wherein said first and second actuating members have a plurality of openings formed therein positionable in coinciding relationship.

10. The combination called for in claim 9 wherein the openings are arranged in a pattern corresponding to the array of leads on a semiconductor device.

11. In a socket for making a disengageable connection between leads on a semiconductor device comprising, an electrical conductor having resilient legs arranged in a substantially U-shaped configuration; a contact element on each of said legs, said contact ele-

ments being wider than the legs; and actuating means adapted to exert inwardly directed forces adjacent edges of the contact elements for deflecting the resilient legs to move the contact elements into engagement with a lead positioned therebetween, and for deflecting the contact elements about the longitudinal axis of the lead.

12. The combination called for in claim 11 wherein the actuating means comprises first and second actuating members; means for mounting the first and second actuating members in sliding relation; bearing surfaces on said first and second actuating members engageable with said contact elements adjacent edges thereof for applying force thereto; and means for moving the first actuating member relative to the second actuating member.

13. A socket for making electrical connections to each of a plurality of leads on a semiconductor device comprising, a first member having spaced rows of substantially parallel outwardly extending channels formed in the lower surface thereof, said member having a plurality of spaced apertures extending therethrough, each of said apertures intersecting a central portion of one of said channels; a second member having channels formed therein substantially coinciding with the position of channels formed in said first member, passages through said second member intersecting each channel formed therein; spaced shoulders adjacent at least one side of each channel in said second member; a pair of resilient legs extending through each of said passages in said second member; resilient contacts in the channels of the first and second members, said contacts being secured to ends of the legs; means secured between the legs for urging said legs apart to bias said contacts secured thereto into engagement with said shoulders formed in the channels of the second member; and actuating means engageable with the first and second members for imparting relative movement therebetween to move the channels in the first member relative to the channels in the second member, causing the shoulders in the respective channels to engage spaced portions of the contacts for urging said contacts into pressure relation with a lead positioned therebetween.

14. A socket comprising, upper and lower sections disposed in spaced apart relation; means to secure the upper section relative to the lower section; a central section positioned between said upper and lower sections, said upper and central sections having a plurality of receptacles formed therein; a plurality of electrical conductors communicating with said receptacles; walls in said receptacles adapted to form concave surfaces; means to move the central section of the socket relative to the upper section of the socket urging spaced portions of said concave surfaces against edges of the conductors to position said conductors against terminals inserted into said receptacles and to permit movement of said central section a distance relative to the upper section which is greater than the distance the conductors move to engage the terminals.

15. A socket for positioning a lead in electrically conductive relation with a conductor comprising, first and second actuating members having openings formed therein, at least one of said openings having a concave surface formed therein; means to movably secure said actuating members together, said openings being positionable in overlying relationship; resilient means secured between the first and second actuating members

for biasing said members toward a position wherein openings in the respective members are disposed in overlying relationship; a resilient conductor positioned to extend into said openings; and means to impart relative movement between the first and second actuating members for initially moving said conductor into pressure relation with a lead extending into said openings and to subsequently bend the conductor around a portion of the surface of the lead, said conductor being deformed toward the concave surface.

16. A socket for positioning a lead in electrically conductive relation with a conductor comprising first and second actuating members having openings formed therein, at least one of said openings having a concave surface formed therein; means to movably secure said actuating members together, said openings being positionable in overlying relationship; a resilient conductor positioned to extend into said openings; actuating means rotatably disposed relative to the first actuating member; a cam on said actuating means; first resilient means secured to the first actuating member; second resilient means secured to the second actuating member; means to secure the cam for rotation relative to the first and second resilient means to exert forces against said first and second resilient means to move the first and second actuating members in opposite directions and for initially moving said conductor into pressure relation with a lead extending into said openings and to subsequently bend the conductor around a portion of the surface of the lead, said conductor being deformed toward the concave surface.

17. A socket for positioning a lead in electrically conductive relation with a conductor comprising, first and second actuating members having openings formed therein, at least one of said openings having a concave surface formed therein; means to movably secure said actuating members together, said openings being positionable in overlying relationship; a resilient conductor positioned to extend into said openings; and means to

impart relative movement between the first and second actuating members for initially moving said conductor into pressure relation with a lead extending into said openings and to subsequently bend the conductor around a portion of the surface of the lead, said conductor being deformed toward the concave surface; wherein the conductor comprises a resilient member having legs arranged in a substantially U-shaped configuration; a contact element on each leg, said contact elements being wider than the legs; and bearing surfaces adjacent opposite sides of the concave surface in the opening in the actuating member, said bearing surface being engageable with portions of the contact element adjacent edges thereof such that initial movement of the actuating members deflects the legs inwardly to move the contact elements into engagement with the lead positioned therebetween, and additional movement deflects central portions of the contact elements toward the concave surface between the bearing surfaces.

18. A socket for testing semi-conductors having multiple leads comprising, a first plate having circular openings formed therein; a second plate having passages extending therethrough; means to position the first and second plates such that the openings and the passages are in coinciding relationships; a plurality of electrical conductors each having a substantially flat portion positioned in coinciding openings and passages in the first and second plates, said flat portion of each of said conductors having edges adjacent spaced portions of said circular opening; and means to move the first plate relative to the second plate to urge spaced surfaces in the circular opening into engagement with edges of the flat conductor such that the central portion of the conductor will deflect toward the surfaces of the circular opening intermediate said spaced surfaces upon engagement with a semi-conductor lead extending into the passage and the opening.

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