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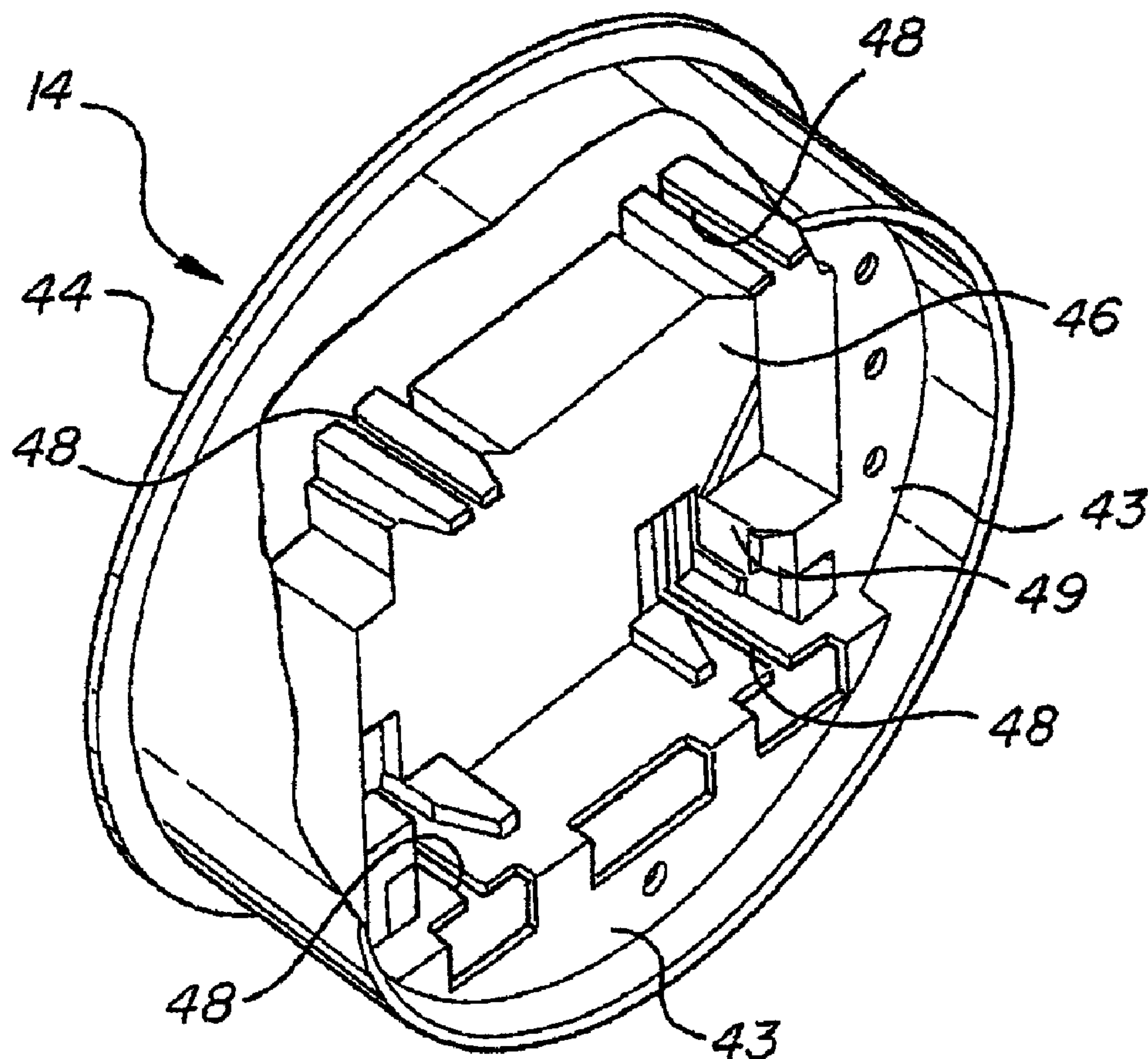
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(54) Title: WATTHOUR METER SOCKET ADAPTER WITH SAFETY SHIELD



(57) Abrégé/Abstract:

A safety shield for a watthour meter socket adapter in the form of an enclosure surrounding the jaw blades of the socket adapter. Latch means are formed on the housing and the enclosure for releasibly mounting the enclosure in the housing in a snap-in



(57) **Abrégé(suite)/Abstract(continued):**

connection. A plurality of legs project from the enclosure and are releasibly engagable through apertures in the housing. Alternately, spring fingers extend inward from surge ground conductors to engage recesses in the safety shield to fixedly mount the safety shield in the socket adapter. A coupler receives a separate jaw contact and a separate blade terminal in a unitary construction while isolating the jaw contact from the blade terminal.

WATTHOUR METER SOCKET ADAPTER WITH SAFETY SHIELD**ABSTRACT OF THE DISCLOSURE**

A safety shield for a watthour meter socket adapter in the form of an enclosure surrounding the jaw
5 blades of the socket adapter. Latch means are formed on the housing and the enclosure for releasibly mounting the enclosure in the housing in a snap-in connection. A plurality of legs project from the enclosure and are releasibly engagable through apertures in the housing.
10 Alternately, spring fingers extend inward from surge ground conductors to engage recesses in the safety shield to fixedly mount the safety shield in the socket adapter. A coupler receives a separate jaw contact and a separate blade terminal in a unitary construction while isolating
15 the jaw contact from the blade terminal.

WATTHOUR METER SOCKET ADAPTER WITH SAFETY SHIELD

BACKGROUND OF THE INVENTION

5 Field of the Invention:

The present invention relates, in general, to electrical watthour meters and, specifically, to watthour meter mounting enclosures or socket adapters.

Description of the Art:

10 Electrical power is supplied to an individual site or service by external electrical power line conductors located above or below ground. In a conventional arrangement, electrical power line conductors are connected to terminals in a watthour meter socket mounted on a building wall. Electrical load conductors are connected to another set of terminals in the meter socket and extend to the electrical distribution
15 network in the building. A watthour meter is connected to both pairs of terminals in the meter socket to measure the electric power drawn through the load conductors.

Due to the current trend toward the use of plug-in watthour meters, A to S type socket adapters have been devised which convert A-base type bottom connected watthour meter sockets to receive plug-in watthour meters. Another type of
20 socket adapter has been devised which allows the installation of other devices between the watthour meter socket and a plug-in watthour meter.

Such socket adapters employ a generally annular base having a shell joined thereto and extending outward from one side of the base. Jaw contacts are mounted in the shell and base. Each jaw contact has a female jaw portion disposed
25 interiorly within the shell and a male blade terminal connected to the female jaw portion and extending outward through the base for plug-in connection to the terminals in the meter socket housing.

In previous watthour meter socket adapters, the jaw contacts were of two different constructions. In one construction, the jaw contacts have a folded over
30 design formed of a base wall fixedly mounted by a fastener to the shell of the socket adapter and two spaced side walls extending therefrom. The outer ends of the side walls are folded over inwardly between the side walls and terminate in parallel end

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flanges which slidably receive a blade terminal of a watthour meter. A blade terminal is usually fixedly connected to the base wall of the jaw contact for connection to jaw contact in a meter socket.

5 In the second construction, the jaw contacts are formed of a generally planar terminal having opposed first and second ends. An angularly bent spring clip is riveted at one end to an intermediate portion of the terminal and extends to a contact edge disposed in separable engagement with the first end of the terminal to form a jaw for receiving the blade terminal of a watthour meter. The spring clip forcibly biases the watthour meter terminal into secure electrical engagement with the terminal. The
10 second end of the blade terminal extends exteriorly from the base of the watthour meter socket adapter for releasable engagement in a socket jaw contact. A cotter pin is inserted through an intermediate aperture in the terminal to fixedly mount the terminal and jaw contact in position in the watthour meter socket adapter.

While it is typical for a watthour meter, once it is installed in a socket
15 or socket and socket adapter, to remain in service for many years, it is still necessary for such meters to be removed for repair or replacement from time to time as well as to temporarily disconnect electrical service to a particular customer. During the installation and removal of the watthour meter from the socket or socket adapter, the electric power line terminals in the socket or socket adapter remain connected to the
20 electric utility power line conductors and carry potential. The utility employee installing or removing the watthour meter may inadvertently touch such contacts thereby raising the possibility of injury. Furthermore, an inadvertent short across the contacts caused by a tool contacting the contacts or a full fault caused by a 90E offset insertion of the meter can cause a spark or flash which could damage the watthour
25 meter installation as well as posing a significant risk of injury to the utility employee.

In U.S. Patent No. 5,577,933, the present Applicants disclosed a unique safety shield for a watthour meter mounting apparatus which completely covered all of the exposed portions of the jaw contacts to prevent inadvertent contact with such contacts by the utility employee or by a tool.

30 One embodiment of this safety shield was in the form of a housing having a unitary sidewall and top wall defining a closed body with an internal recess surrounding the jaw contacts. Narrow apertures or slots were formed in the top wall

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for receiving a blade terminal of a watthour meter therethrough into engagement with a jaw contact disposed immediately below the aperture in the top wall of the safety shield. In another embodiment, a plurality of receptacles extend from a planar wall mountable in the socket adapter, with each receptacle having one or more slots for receiving the meter blade terminals therethrough. The individual receptacles were
5 sized to completely surround at one jaw contact in the socket adapter.

In yet another embodiment, front and back plates surround the jaw contacts, conductors and the bottom mounted terminals. The front and back plates are joined by a number of fasteners or screws as well as two clips on the terminal portions
10 of the plates.

The safety shield disclosed in U.S. Patent No. 5,577,933 has proven to be an effective shield in preventing inadvertent contact with the jaw contacts. However, this safety shield is mounted to the bottom wall of a watthour meter socket adapter by means of fasteners extendable through apertures in the safety shield. This
15 involves an additional assembly step and labor as well as additional components to fixedly mount the safety shield within the socket adapter which increase the cost of the socket adapter.

Thus, it would be desirable to provide an improved safety shield for a watthour meter socket adapter which may be easily mounted in and removed from a
20 watthour meter socket adapter. It would also be desirable to provide an improved safety shield for a watthour meter socket adapter which can be releasably mounted in a socket adapter by means of a snap-in connection.

SUMMARY OF THE INVENTION

25 Accordingly, in one aspect of the present invention there is provided a watthour meter socket adapter having a housing including a base wall and an annular sidewall extending from the base wall, a plurality of electrical contacts mounted in the base wall and releasably receiving blade terminals of a watthour meter and removably insertable into electrical contacts in a watthour meter socket, the socket adapter
30 comprising:

a shield for covering substantially all of the exposed portions of the electrical contacts within the socket adapter, the shield having at least one aperture

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alignable with one electrical contact for receiving a blade terminal into engagement with one electrical contact; and

means, cooperatively formed on the housing and the shield, for mounting the shield in the housing in a snap-in connection, the mounting means including:

a plurality of legs on the shield;

a plurality of apertures in the housing, each receiving one leg;

and

a latch element on one of the legs and the housing adjacent to the aperture releasably engagable with a latch receiver in the other of the housing and the legs.

Each leg cantilevers from a sidewall of the shield.

The latch element is a projection having a latch surface disposed at an angle with respect to each leg.

The shield further comprises a pair of flanges projecting oppositely from the sidewall of the shield and legs projecting from each flange. Each flange extends substantially perpendicular from a sidewall of the shield and each leg extends angularly from each flange. The apertures are formed in the base wall of the housing.

In another aspect, the apertures are formed in the sidewall of the housing spaced from the base wall. At least two apertures are formed in the sidewall of the housing, each having a latch projection formed therein.

At least two legs project from the shield. An aperture formed in each of the two legs is releasably engagable with one latch projection in one aperture in the housing. The four apertures in the housing and the four legs on the shield are arranged two diagonally opposed pairs.

In another aspect, the shield is formed with depending portions which seat on the base of the socket adapter housing. At least one and preferably two surge ground conductors are mounted on the sidewall of the socket adapter housing and include at least one resilient finger which engages a recess formed in the shield in a snap-in connection to fixedly mount the shield in the socket adapter housing. Preferably each surge ground conductors has a pair of spaced fingers formed at opposite ends of each surge ground conductor. Each finger releasably engages one

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recess of a pair of recesses formed on diametrically opposed side edges of the safety shield.

A raised boss is formed on the shield and disposed at east one electrical contact location adjacent to one aperture formed in the shield. At least one portion of the raised boss has a freely movable end cantilevered from an opposite end fixed to the shield enabling the free end to pivot inwardly upon contact with a watthour meter inserted into the watthour meter socket adapter.

In conjunction with pairs of slots formed in the housing, the shield is also formed, in one embodiment, with pairs of slots which are alignable with the pairs of slots in the housing. In this arrangement, the slots in the safety shield engage upper portions of a circuit board extending perpendicularly from the base wall of the socket adapter housing. Further, the peripheral edge of the shield engages an outer edge of the circuit board for both covering and supporting the circuit board within the socket adapter housing.

In another aspect, a safety shield is provided for use with a current transformer rated watthour meter socket adapter having a plurality of potential jaw contacts receiving the potential jaw blades of a watthour meter. The safety shield may employ any of the latch mechanisms described above for fixed mounting in the socket adapter housing without the need for mechanical fasteners.

Also, the present invention includes unique support means formed in the base of the socket adapter for supporting an electrical contact. Spaced support posts are aligned with spaced wall members on the base. Each support post and each wall member includes a recess which receives a mating portion of the electrical contact for supporting the electrical contact on one aligned pair of a support post and a support wall.

Apertures are formed in the base of the socket adapter to receive a potential contact terminal. The electrical contact and the contact terminal, in one aspect, are separate from each other. In another aspect of the present invention, a three fingered electrical blade contact and the blade terminal are formed of a one-piece, unitary member.

In yet another aspect, the inventive shield can be adhesively fixed in the housing.

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According to another aspect of the present invention there is provided a watt-hour meter socket adapter having a housing including a base wall and an annular sidewall extending from the base wall, a plurality of electrical contacts mounted in the base wall and releasably receiving blade terminals of a watt-hour meter and removably insertable into electrical contacts in a watt-hour meter socket, the socket adapter comprising:

a shield for covering substantially all of the exposed portions of the electrical contacts within the socket adapter, the shield having at least one aperture alignable with one electrical contact for receiving a blade terminal into engagement with one electrical contact;

means, cooperatively formed on the housing and the shield, for mounting the shield in the housing in a snap-in connection, the mounting means including:

a plurality of legs on the shield;
a plurality of apertures in the housing, each receiving one leg;
and

a latch element on one of the legs and the housing adjacent to the aperture releasably engagable with a latch receiver in the other of the housing and the legs;

a sidewall of the shield spaced from the adjacent sidewall of the housing and defining an internal cavity; and

means, formed in the housing for supporting a circuit board in substantially perpendicular orientation with respect to the base wall in the internal cavity.

According to another aspect of the present invention there is provided a watt-hour meter socket adapter having a housing including a base wall and an annular sidewall extending from the base wall, a plurality of electrical contacts mounted in the base wall and releasably receiving blade terminals of a watt-hour meter and removably insertable into electrical contacts in a watt-hour meter socket, the socket adapter comprising:

a shield for covering substantially all of the exposed portions of the electrical contacts within the socket adapter, the shield having at least one aperture

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alignable with one electrical contact for receiving a blade terminal into engagement with one electrical contact;

a raised boss formed on the shield at at least one electrical contact location and surrounding each aperture in the shield; and

5 at least one portion of the raised boss having a freely movable end cantilevered from an opposite end contiguous with the shield, the end being pivotal inwardly toward the shield upon contact with a watthour meter inserted into the watthour meter socket adapter.

According to yet another aspect of the present invention there is
10 provided a watthour meter socket adapter having a housing including a base wall and an annular sidewall extending from the base wall, a plurality of electrical contacts mounted in the base wall releasably receiving blade terminals of a watthour meter and removably insertable into electrical contacts in a watthour meter socket, the socket adapter comprising:

15 a shield for covering substantially all of the exposed portions of the electrical contacts within the socket adapter, the shield having an outer wall with at least one aperture for receiving a blade terminal of a watthour meter therethrough to enable engagement of the blade terminal with the electrical contacts; and

at least one surge ground conductor, the one surge ground conductor
20 including means for mounting the one surge ground conductor on the sidewall of the watthour meter socket adapter, and means, carried on the surge ground conductor, for engaging the shield for releasably mounting the safety shield in the housing of the watthour meter socket adapter.

According to still yet another aspect of the present invention there is
25 provided a watthour meter socket adapter having a housing including a base wall and an annular sidewall extending from the base wall, a plurality of electrical contacts mounted in the base wall and releasably receiving blade terminals of a watthour meter and removably insertable into electrical contacts in a watthour meter socket, the socket adapter comprising:

30 a shield for covering substantially all of the exposed portions of the electrical contacts within the socket adapter, the shield having at least one aperture alignable with one electrical contact for receiving a blade terminal into engagement

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with one electrical contact; and

means, cooperatively formed on the housing and the shield, for mounting the shield in the housing in a snap-in connection, the mounting means including:

- 5 a plurality of legs on the shield, each leg including a latch receiver aperture;
- a plurality of apertures in the housing, each receiving one leg;
- and
- a latch element adjacent to each aperture in the housing
- 10 releasably engagable with one latch receiver in one of the legs.

The shield of the present invention includes an easy and quick mounting arrangement for releasible mounting of the shield in the housing of the watt-hour meter socket adapter without requiring mechanical fasteners or additional assembly steps which have heretofore increased the manufacturing cost of a watt-hour meter socket adapter with a shield or the cost of the safety shield itself. The latch elements formed on the legs of the shield and the latch apertures or latch projections in the housing are integrally formed with the shield and the housing to eliminate the need for additional components necessary to mount the shield in the housing. In another aspect, the use of resilient fingers on the existing surge ground conductors to fixedly mount the shield in the housing also eliminates additional mechanical components.

BRIEF DESCRIPTION OF THE DRAWINGS

The various features, advantages and other uses of the present invention will become more apparent by referring to the following detailed description and drawing in which:

Fig. 1 is an exploded, perspective view showing one embodiment of a watt-hour meter socket adapter according to the present invention;

Fig. 2 is a perspective view of the watt-hour meter socket adapter shown in Fig. 1, with the dead front shield portion of the shell removed;

30 Fig. 3 is a partially broken-away, rear, perspective view of the shell of the socket adapter shown in Fig. 1;

Fig. 4 is a partially cross-sectioned, side view of Figs. 1 and 2;

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Fig. 5 is a perspective view of another embodiment of a jaw blade according to the present invention;

Fig. 6 is a partially cross sectioned, perspective view showing the mounting of the jaw blade depicted in Fig. 5 in a watt-hour meter socket adapter extender housing constructed according to the present invention;

Fig. 7 is a perspective view of another embodiment of a safety shield according to the present invention;

Fig. 8 is an enlarged, partial, perspective view of Fig. 7 showing the jaw contact safety shield mounting aperture and latch projection;

Fig. 9 is an enlarged, partial, perspective view of Fig. 7 showing the interlocking of the safety shield with the latch projection depicted in Fig. 8;

Fig. 10 is a perspective view of yet another embodiment of a safety shield according to present invention;

Fig. 11 is a partial, enlarged, perspective view showing the interlocking of the safety shield of Fig. 10 with the socket adapter housing depicted in Fig. 6;

Fig. 12 is a perspective view of another embodiment of a safety shield according to the present invention;

Fig. 13 is a partial, enlarged, perspective view showing the interlocking of the safety shield of Fig. 12 in the socket adapter depicted in Fig. 6;

Fig. 14 is an enlarged, partial, perspective view showing a feature of the safety shields shown in Figs. 7, 10 and 12;

Fig. 15 is a perspective view of another embodiment of a safety shield according to the present invention;

Fig. 16 is a rear perspective view of a safety shield and a surge conductor shown in Fig. 15;

Fig. 17 is a partial, lateral, cross-sectional view showing the mounting of the safety shield and one surge ground conductor of Fig. 16 in the socket adapter shown in Fig. 15;

Fig. 18 is an enlarged, partial, perspective view showing the interconnection of the spring fingers on the surge ground conductor with the safety shield shown in Fig. 15;

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Fig. 19A is a plan view showing one embodiment of circuit board mounts in a socket adapter;

Fig. 19B is a partially cross sectioned view generally taken along line 19B-19B in Fig. 19A;

5 Fig. 20 is a front elevational view of another embodiment of a watt-hour meter socket adapter housing according to the present invention with circuit board mounting means;

Fig. 21A is a perspective view of a printed circuit board mountable in the socket adapter according to the present invention;

10 Fig. 21B is a perspective view of a modified printed circuit board according to the present invention;

Fig. 21C is a perspective view of another embodiment of a printed circuit board according to the present invention;

15 Fig. 22 is a front perspective view showing the mounting of the circuit board of Fig. 21 in a watt-hour meter socket adapter;

Fig. 23 is rear perspective view showing the printed circuit board and timer mounted in the socket adapter;

20 Fig. 24 is a perspective view of another embodiment of a safety shield according to the present invention usable with a current transformer rated watt-hour meter socket adapter;

Fig. 25 is a perspective view of another embodiment of a safety shield usable in a current transformer rated socket adapter;

Fig. 26 is a lateral cross-sectional view generally taken along lines 26-26 in Fig. 25;

25 Fig. 27 is a bottom perspective view of the safety shield shown in Figs. 25 and 26;

Fig. 28 is a front perspective view of the socket adapter shown in Fig. 25, with the safety shield removed;

30 Fig. 29 is an enlarged, perspective view of a portion of the socket adapter shown in Fig. 28 depicting the mounting of potential jaw contacts;

Fig. 30 is a perspective view showing the various jaw contacts, blade terminals and jaw blade terminals mounted in the socket adapter depicted in Fig. 25;

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Fig. 31 is an exploded perspective view of a jaw contact and blade terminal coupler according to the present invention;

Fig. 32 is a perspective view of the assembled jaw contact and blade terminal coupler of Fig. 31 of the present invention taken from a first side of the
5 coupler; and

Fig. 33 is a perspective view of the assembled jaw contact and blade terminal coupler of Fig. 31 taken from a second opposite side.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

10 In order to better describe and appreciate the advantages of the present invention, a description of the conventional construction of an electric watt-hour meter socket adapter or socket extender/adapter, both hereafter referred to as a socket adapter, will be provided with reference to Figs. 1 and 2. A conventional socket
15 adapter 10 includes contacts designed to receive blade terminals of a conventional electric watt-hour meter, not shown, in a releasible connection. The socket adapter 10 includes terminals, described hereafter, which plug into mating contacts in a watt-hour meter socket. The number of contacts and terminals in the socket adapter 10 will vary depending upon the type of electric service at a particular user site, Fig. 1 depicts, by way of example only, a single phase electric service.

20 As shown in Figs. 1, 2, 3, and 4, the socket adapter 10 includes a base portion 12 and a shell portion 14 which are fixedly joined together by suitable means, such as fasteners. The base 12 has a central wall 16 of generally circular shape. A plurality of generally rectangular bosses 18 are formed on the central wall 16. Each of the bosses 18 has a slot 20 formed therein which extends completely through each
25 boss 18 and the central wall 16 to receive a blade terminal therethrough, as described hereafter. A plurality of cylindrical bosses 22 are also formed on and extend outward from one surface of the central wall 16. Through bores are formed in each boss 22 for receiving a fastener to join the shell 14 to the base 12. A plurality of outwardly extending legs 24 are formed on a back surface of the central wall 16 and are provided
30 in an appropriate number and spaced from one of the contacts or blade terminals which extends through the base 12.

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An annular, raised, inner peripheral edge flange 30 is formed on the base 12 and extends outward from one surface of the central wall 16. An outer peripheral edge flange 32 is spaced radially outward from the inner flange 30. A plurality of circumferentially spaced ribs 34 extend radially between the inner and outer peripheral edge flanges 30 and 32.

The inner peripheral edge flange 30 includes an annular seat for receiving a peripheral edge portion of the shell 14 when the shell 14 is engaged with the base 12. The outer peripheral edge flange 32 extends radially outward from the inner peripheral edge flange 30 and forms a mounting flange which mates with the mounting flange on the cover of the watthour meter socket, not shown. A conventional sealing ring, also not shown, is employed to surround and lockingly join the outer peripheral edge flange 32 to the mounting flange on the meter socket.

The shell 14 of the socket adapter 10 is formed with a generally annular sidewall 42. The sidewall 42 terminates in an enlarged diameter exterior end mounting flange 44. The mounting flange 44 is designed to mate with a corresponding mounting flange on a conventional watthour meter, not shown. A sealing ring, not shown, may be employed to encompass and lockingly connect the mounting flange 44 on the shell 14 and the mounting flange on a watthour meter.

The annular sidewall 42 of the shell 14 has an opposed annular edge 45 spaced from the exterior end mounting flange 44. A generally solid wall 46 is integrally connected to the sidewall 42 by a plurality of flanges 43 and is spaced between the exterior mounting flange 44 and the opposed edge 45. The wall 46 projects above the flanges 43 and acts as a dead front or safety shield covering all of the exposed portions of the jaw blades and an optional disconnect switch in a cavity between the base 12 and the shell 14.

The wall 46 has a plurality of raised bosses 47, each of which includes a slot 48 defining an opening for receiving a blade terminal 120 of an electrical device, such as a watthour meter, therethrough as shown in Fig. 11. Each raised boss 47 extends a short distance above the generally planar wall 46 and forms a recess or cavity 49 on the back surface of the wall 46 which receives and locates a jaw blade mounted on the base 12. Each slot 48 extends across the planar wall 46 and down a

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sidewall connecting the planar wall 46 to one flange 43 to permit easy angular insertion and removal of blade terminals through the slots 48.

As shown in Fig. 1, at least one and preferably two identical surge ground conductors 220 are diametrically mounted opposite each other on the mounting
5 flange 44 of the shell 14. Each surge ground conductor 220 is removably mounted in one pair of slots in the mounting flange 44 and includes an arcuate wall portion 222 which conforms to the inner diameter of the annular sidewall 42 of the shell 14.

The arcuate wall portion 222 has an upper edge 224 and a lower edge 226. A pair of radially extending tabs 228 are formed on opposite side ends of the arcuate wall
10 portion 222 generally adjacent the upper edge 224. Each tab 228 seats in the slots on the mounting flange 44 of the shell 14. Each tab 228 has an upper edge disposed slightly above the upper edge of the mounting flange 44. This places the upper edge of each surge ground conductor 220 at a position to electrically engage a ground terminal mounted on the rear surface of a conventional watthour meter.

15 Each surge ground conductor 220, as shown in Fig. 1, has a mounting foot or tab 230 connected to the lower edge 226 of the arcuate wall portion 222. The mounting foot 230 has a generally planar shape with apertures 232 positioned to receive fasteners to secure each surge ground conductor 220 to one of the bosses 22 in the base 12. Each aperture 232 is formed as a stamped threaded aperture so as to
20 receive a threaded screw without need for a nut.

Figures 1-4 depict a jaw blade 64, 66 and a spring clip 100 which are depicted as but one example of a jaw contact or jaw blade assembly which can be employed in the socket adapter 10. Further details concerning the construction and use of the jaw blade 64, 66 and spring clip 100 can be had by referring to U.S. Patent
25 No. 6,152,764.

As shown in Fig. 4, a pair of load blade terminals 68 and 70 each comprise a generally planar member as is conventional in watthour meters and watthour meter socket adapters. One end of each load blade terminal 68 and 70 is connected to two internal bus bars within a disconnect switch 60 shown only by example in Figs. 1, 2
30 and 4. Outer ends 69 and 71 of the load blade terminals 68 and 70 have a length sufficient to enable the outer ends 69 and 71 to project through the

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bottom or central wall 16 of the base 12 exteriorly of the housing of the socket adapter 10 for insertion into mating jaw contacts in a watt-hour meter, not shown.

It will be understood that the following described load jaw blade structure may also alternately be employed for the line jaw blade structure or for both the line and load jaw blade structures in the socket adapter 10.

By way of example, each of a pair of load jaw blades 64 and 66, with only load jaw blade 64 being described in detail hereafter, includes a generally planar bus bar 74 which projects angularly and generally perpendicularly from the top surface of the housing of a switch 60. The planar bus bar 74 has an opposed first and second ends 76 and 78. Further, flange 80 projects angularly above and outward from the generally planar extent of the bus bar 74 to form a blade terminal guide as is conventional in watt-hour meter socket adapters.

The opposed load jaw blade 66 is identical to the load jaw blade 64, but is formed of a mirror image to form a pair of left and right hand jaw blades 64 and 66. However, the spring clip 100 mounted on the load jaw blade 66 is identical to the spring clip 100 used with jaw blade 64.

A remotely controlled disconnect switch 60, shown in Figs. 1, 2, and 4 as an option only, is located at the central wall 16 of the base 12. The disconnect switch 60 may be any commercially disconnect switch which may include an internally movable member and at least one pair of contacts which are electrically connected between one of the pair of line and load jaw blades within the socket adapter 10 and the corresponding one of the pair of line and load blade terminals projecting outwardly from the socket adapter 10 and to certain jaw contacts in a watt-hour meter socket, not shown. The switch 60 may be remotely actuated by means of signals provided on wires 62 which extend exteriorly of the housing of the socket adapter 10.

Referring now to Figs. 5 and 6, there is depicted yet another embodiment of an electrical contact or jaw blade 526. The jaw blade 526 has an elongated shape and is particularly suited for use in a socket adapter extender 528 shown in Fig. 6. The socket adapter extender 528 is similar to the socket adapter 402 described hereafter with several modifications. The housing of the socket adapter extender 528 includes a generally planar base or bottom wall 530 and lower sidewall

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532. The sidewall 532 terminates at a radially outward extending mounting flange 534. The mounting flange 534 has an inward extending, annular shelf 536 disposed interiorly within the socket adapter extender 528 and an outwardly extending flange terminating in a depending lip 538 spaced from the lower sidewall 532. The lip 538 is positioned for receiving a sealing ring to mount the socket adapter extender 528 on a ring-style socket adapter cover, not shown. An upper sidewall 539 extends from the mounting flange 534 and terminates in a mounting flange.

The jaw blade 526 has a unitary, one piece construction formed of a blade terminal end 542 which is offset by an intermediate offset 544 from an elongated jaw contact end 546. A blade terminal edge guide 548 is formed at one end of the jaw contact end 546.

A pair of side flanges 550 and 552 project perpendicularly from opposite side edges of the jaw contact end 546 and extend from an upper end adjacent the blade terminal guide 548 and to an opposite end 554 approximate the intermediate offset 544. The second end 554 of each side flange 550 and 552 seats on the base 530 of the socket adapter extender 528 to prevent sideways movement of the jaw blade 526 relative to the base 530.

A conventional spring clip 558 is fixedly connected to the jaw contact end 546 by two fasteners, such as rivets, not shown, extendible through apertures 559. The upper end of the spring clip 558 angles outwardly to form a mating blade terminal guide 548 on the jaw contact end 546. The end 560 of the spring clip 558 is spaced from the adjacent jaw contact end 546 to define a slot for receiving a watt-hour meter blade terminal in a conventional manner.

Referring now to Figs. 7-9, there is depicted a jaw contact safety shield 580 which is mountable in the socket adapter extender 528. The safety shield 580 is formed of a one piece electrically insulating material, such as a suitable plastic, and is formed of an enclosure which, when the safety shield 580 is mounted in the socket adapter extender 528, completely surrounds all of the line and load jaw blades within the socket adapter extender 528 except for small slots allowing the insertion of a watt-hour blade terminal into engagement with each line and load jaw blade.

The safety shield 580 includes a top or outer

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wall 582 and a plurality of sidewalls all denoted by reference number 584. A plurality of raised bosses 586 are formed in the top wall 582. The bosses 586 are positioned at the normal jaw contact positions of a watt-hour meter socket adapter.

Each boss 586 has an aperture or slot 588 formed therein. Each slot
5 588 has a top wall portion 590 extending parallel to the plane of the top wall 582 and a contiguous sidewall portion 592 forming a continuous L-shaped slot along the top wall 582 and the sidewall 584 of the safety shield 580. The unique provision of the sidewall slot portion 592 simplifies the insertion and removal of a watt-hour meter into and out of the jaw contacts of the socket adapter extender 528 through the safety
10 shield 580.

A peripheral flange 594 extends outward from a lower edge of the sidewall 584 of the safety shield 580. The peripheral flange 594 has a polygonal or square shape, by example only. Other shapes, such as octagonal, round, etc., may also be employed.

15 A plurality of legs 596 project from the peripheral flange 594, generally at each corner of the peripheral flange 594. Each leg 596 has a generally planar configuration with a notched inner surface 598. A slot 600 is formed on the outer side of each leg 596 extending from the peripheral flange 594 to an aperture 602 in each leg 596.

20 Latch means is provided for releasably latching each leg 596 and the entire safety shield 580 in the socket adapter extender 528. The latch means includes a plurality of apertures 604 formed in the lower sidewall 632 of the extender 528 adjacent to the mounting flange 534 as shown in Fig. 8. A latch projection 606 is unitarily formed with the sidewall 532 and projects outwardly therefrom. The latch
25 projection 606 has a flat edge surface 608 for releasable engagement with the aperture 602 in each leg 596 as shown in Fig. 9. As the legs 596 of the safety shield 580 are urged toward each latch projection 606, the outer end of each leg 596, which has an angled end surface 610, rides along the latch projection 606 until the aperture 602 slides over the edge 608 of the latch projection 606 releasably latching the leg 596 to
30 the housing of the extender socket adapter 528. Since the aperture 604 in the sidewall 532 opens outwardly underneath the mounting flange 534, the legs 596 of the safety shield 580 may be released from the latch projection 606 by forcing a tool, such as a

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screwdriver, underneath the lower end of each leg 596 disengaging the leg 596 from the latch projection 606.

In this embodiment, the plurality of legs 622 are also located at the outer corners of the safety shield 620. Each leg 622 terminates in an outwardly
5 extending latch projection 624 which is positioned to engage an inner lip 626 formed in the sidewall 539 adjacent the mounting flange 532 as shown in Fig. 11 to releasably latch the safety shield 620 to the housing of the socket adapter extender 528. The latch projection 624 is accessible from the bottom of the mounting 532 and can be urged radially inward from the mounting flange 532 to disengage the latch projection
10 624 from the lip 626 and enable the safety shield 620 to be removed from the extender 528.

Referring now to Figs. 12 and 13, there is depicted another embodiment of a jaw contact safety shield 630 which is particularly suited for use with a low profile socket adapter, not shown, having a short height sidewall. Again, since
15 the safety shield 630 is similar to the safety shields 580 and 620 described above, like components are depicted by the same reference number. In this embodiment, a pair of spaced end flanges 632 are formed on opposite portions of the sidewalls 584 and project outwardly from the adjacent sidewall 584. Each end flange 632 has a pair of downwardly depending legs 634 extending therefrom, each leg 634 terminating in an
20 outwardly extending latch projection 636. The latch projection 636 on each leg 634 is releasably insertable through an aperture in the base and the adjacent ring of a socket adapter in the same manner as the latch projection 624 engages an aperture in the sidewall 539, as shown in Fig. 11.

As shown in detail in Fig. 13, each latch projection 636 snaps into
25 engagement with an underlying surface 640 on the sidewall of the socket adapter housing to releasably mount the safety shield 630 to the housing. Each latch projection 636 may be released from engagement with the back surface of the base 637 of the socket adapter by means of a sharp tool inserted from behind the base 637.

Figs. 12 and 14 depict a unique feature of the safety shields 630, 580
30 and 620. As shown therein, one leg 640 of the boss 586 adjacent to the slot 588 positioned at the eighth jaw contact position is cantilevered from an outer edge adjacent the sidewall 584. This provides the cantilevered flange 640 with a freely

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movable end 642 which enables the flange 640 to bend inward about the outer edge in a watthour application where a single phase watthour meter has a potential clip at this position. The potential clip engages the flange 640 and bends it inward about the outer end enabling the watthour meter to properly seat in the socket adapter.

5 Referring now to Figures 15-18, there is depicted a modification to the above-described safety shield in which a safety shield 110 is mounted in the socket adapter extender 528 in a unique manner. Further, it will be understood that the safety shield 110 may also be employed in other types of socket adapter housing constructions

10 The safety shield 110 is formed of a one piece, electrically insulating material and has a construction which, when mounted in the socket adapter extender 528, completely surrounds and substantially encloses all of the line and load jaw blades within the socket adapter extender 528 except for small slots allowing the insertion of watthour blade terminals into engagement with each line and load jaw
15 blades or contacts.

The safety shield 110 includes a top or outer wall 112 and a peripheral sidewall 114 depending therefrom. The top wall 112 and the sidewall 114 are depicted by example only as having a generally square configuration. A pair of opposed outwardly extending side edge flanges 116 and 118 project from the lower
20 edges of two opposed sidewalls 114. A pair of laterally extending flanges 120 and 122 project perpendicularly outward from opposed sidewalls 114. An outer end of each lateral flange 120 and 122 communicates with perpendicular, downward depending sides 124 and 126, respectively. The sides 124 and 126 are oriented, when the safety shield 110 is mounted with the socket adapter extender 528, immediately
25 adjacent to the inner wall of the surge ground conductors 128 and 130, respectively.

A plurality of raised bosses 132 are formed in the top wall 112 and are located at the normal jaw contact positions of a watthour meter socket adapter. Each boss 132 has an aperture or slot 134 extending therethrough. As described above, the slots 134 extend over the top wall 112 and along the sidewall 114 to permit easy,
30 angled insertion and/or removal of a watthour meter blade terminal into and out of contact with a jaw contact position behind each slot 132.

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A polygonal or rectangular shaped aperture 136 is formed in each lateral flange 120 and 122 for enabling mounting or access to a current transformer shorting switch 121. The aperture 136 can also serve as a mounting window for any connector, such as a multi-pin connector, also not shown.

5 As shown in Figs. 15, 17 and 18, at least one and preferably two circumferentially spaced receivers or bosses 138 and 140 are formed on the outer edge of each lateral flange 120 and 122 and surround a flat 142 shown in Fig. 18. The flat 142 is positioned approximately in line with one lateral flange 120 and 122. Each boss 138 and 140 and the associated flat 142 form a radially outward opening cavity
10 144.

The surge ground conductors 128 and 130 are identically constructed. The two ground surge conductors 128 and 130 are diametrically mounted opposite each other on the mounting flange 44 of the socket adapter extender 528 in a pair of slots 146 formed in the mounting flange 44.

15 As clearly shown in Fig. 16, each surge ground conductor 128 and 130 includes an arcuate wall 148 which conforms to the inner diameter of the annular sidewall 539 of the socket adapter extender 528. A pair of radially extending tabs 150 are formed on an upper edge 152 of each surge ground conductor 128 and 130 and seat within one of the slots 146 in the mounting flange 44 to support each surge ground
20 conductor 128 and 130 from the mounting flange 44 of the socket adaptor extender 528. The upper edge 152 of each surge ground conductor 128 and 130 overlays a portion of the mounting flange 44 and is in position to electrically engage a ground terminal mounted on the rear surface of a conventional watt-hour meter.

As shown in Fig. 16, each surge ground conductor 128 and 130, has a
25 lower mounting foot 154 which is formed as an extension of the arcuate sidewall 148. The mounting foot 154 has a distal end 156. An aperture 158 is formed within the mounting foot 154 and surrounds a tab 160 which integrally extends from the end 156. In use, the mounting foot 154 is bent generally perpendicularly outward from the arcuate sidewall 148, in a direction opposed to the radially inward extending direction
30 of the tab 160. This bending movement of the mounting foot 156 enables the mounting foot 154 to slide through an aperture formed in the sidewall 539 of the

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socket adapter extender 538 to secure the surge ground conductor 128 or 130 in position on the sidewall 139 of the socket adapter extender 528.

According to a unique feature of the present invention, each surge ground conductor 128 and 130 is formed with at least one and preferably two arcuately spaced fingers 162 and 164. Each pair of the spring fingers 162 and 164 has an angularly bent portion projecting away from the surface of the arcuate sidewall 148. Each of the spring fingers 162 and 164 is spaced from opposite sides of the arcuate sidewall 148 as shown in Fig. 16. The distal end of each of the spring fingers 162 and 164 is positioned to engage the cavity 144 formed by the boss 140 and the flat 142 in the lateral flanges 120 and 122 of the safety shield 110 to securely retain the safety shield 110 in position within the interior of the socket adapter 110. In this mounting position shown in Fig. 17, the bottom edge of the arcuate sidewalls 148 directly seats on the interior ring of the socket adapter extender 528. This mounting arrangement eliminates the use of any separate mechanical fasteners to fixedly mount the safety shield 110 within the interior of the socket adapter extender 528. At the same time, the safety shield 110 can be easily removed by merely urging the distal ends of each of the spring fingers 162 and 164 radially outward until the distal ends of each spring finger 152 and 164 disengage from the flats 132 on the lateral flanges 120 and 122 in the safety shield 110.

Referring now to Figs. 19, there is depicted a socket adapter 400 which has means for mounting or supporting auxiliary components, such as generally planar circuit boards 653, adjacent to or preferably on the base 402. The mounting means comprises at least one pair and, preferably, a plurality of pairs of posts 650 which are arranged in diametrically opposed pairs. Each post 650 is formed at the juncture of the base 402 and the ring 406 of the socket adapter 400 and extends upward therefrom. A U-shaped channel 652 is formed in each post 650. The U-shaped channel 652 in one post is linearly aligned with a U-shaped channel of a post 650 in one adjacent pair of posts 650 as shown in Fig. 19. This arrangement forms a pair of channels 652 adjacent to the inner surface of the sidewall 412 of the socket adapter 400.

Although the peripheral flange 594 of the shield 620 may be cut out or shortened to allow the circuit boards 653 mounted within the pairs of posts 650 to extend upward along side of the sidewall 592 of the shield 620, in a preferred

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embodiment, as shown in Figs. 31 and 32, a U-shaped slot 654, one wall of which is shown in Figs. 31 and 32, is integrally formed adjacent to opposite side edges of each leg 622 of the shield 620 and engage the upper end of a circuit board 653 disposed adjacent to each slot 654. In this manner, the circuit board 653 is mounted in the
5 channels 650 and slots 654 and is seated against the peripheral flange 594 of the shield 620.

Also shown in Fig. 19 is further modification to the socket adapter 400, or more preferably, the socket adapter 528, in which at least four and preferably more standoffs 656 are mounted on the base 402 of the socket adapter 400 for securing a
10 circuit board, not shown, in a horizontal orientation between the line and load jaw blades 416 and 418. Screws are insertable through apertures into the circuit board into the stand offs 656.

Fig. 20A shows a further modification to the socket adapter 400 in which the socket adapter 400 is devised for carrying one or more circuit boards 653 at
15 various positions inside of the sidewall 412. Although Fig. 20A depicts the pairs of posts 650 generally arranged in two diametrically opposed pairs, it will be understood that the embodiment shown in Fig. 20A need not necessarily include such posts 650

The auxiliary support members may take a variety of forms as shown by the different support members 658, 660 and 662. The support members 658, 660
20 and 662 all include at least one or more U-shaped slots 664. The support members 658, 660 and 662 are arranged in opposed pairs, as shown in Fig. 20A, by example only, such that one slot in one support member linearly aligns with one slot in an opposed support member. The pairs of aligned slots are thus capable of supporting opposite edges of a circuit board 653 oriented perpendicularly with respect to the base
25 402 of the socket adapter 400. This enables many circuit boards 653 to be housed within the socket adapter 400 between the jaw contact ends of the line and load jaw blades 416 and 418. The support members 658, 660 and 662 may also be provided outside of the shield 620 to support a circuit board between the sidewall 412 and the sidewall 594 or the shield 620.

30 Another aspect of the present is shown in Fig. 20B which depicts a printed circuit board 653 mounted between two aligned support members 650 and extending laterally across all of the line blade terminal receiving slots 404 in the base

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of the socket adapter 400. An electrically conductive spring tab 655 is soldered or otherwise fixedly mounted on the printed circuit board 653 in electrical communication with conductive members of the circuit board 653. The tab 655 extends outward from the printed circuit board 653 to a position which intersects with
5 a line blade terminal 657 inserted through the slot 404 in the base of the socket adapter 400. The tab 655 enables line power from the line blade terminal 657 to be applied to the printed circuit board 653 to power electrical components mounted on the printed circuit board 653.

In addition to mounting circuit boards in a vertical, orientation between
10 aligned pairs of slots along the periphery of the interior sidewall and base of the socket adapter extender 528, one or more circuit boards may also be mounted between any two blade terminal apertures. A circuit board 168, shown in Figs. 21A, 22 and 23, is mounted through the slots 170 and 172 in the base 530 which normally receive the fifth and sixth terminals of a watt-hour meter socket adapter, if present in a particular
15 meter.

It will be understood, however, that the circuit board 168 could also be mounted between any pair of line and load contact receiving slots as described hereafter.

As clearly shown in Fig. 21A, the circuit board 168 has a conventional
20 planar circuit board shape with at least one and, preferably, a pair of depending terminal portions 174 and 176 which are sized to be slidably inserted through the slots 170 and 172 in the base 530. Apertures 178 may be formed in each terminal end for receiving a cotter pin or other fastener to securely retain the printed circuit board 168 in position. Electrically conductive pads or terminals 179 such as a copper foil pad
25 bonded to the circuit board, are carried on the legs 174 for connection to an electrical circuit or component external to the socket adapter 528 by a jaw connection, connector, solder or clamp connection.

The printed circuit board 168 may be used as a mounting surface for any electrical, electromechanical or electronic component or circuit which is used in a
30 watt-hour meter socket adapter.

In addition to the use of fasteners or cotter pins extending through the aperture 178 in the terminal ends 174 and 176, the circuit board 168 may also be

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secured in position by means of an engagement with the bent tab 160 on each surge ground conductor 128 and 130 shown in Fig. 16. The tabs 160 are designed to slid into arcuate shaped notches 121 formed in opposed side edges of the printed circuit board 168 as shown in Fig. 21A.

5 In one example of an application or use of the printed circuit board 168, as shown in Figs. 22 and 23, a timer 182 is mounted on the circuit board 168. The timer 182 includes a face plate or dial 184, shown in Fig. 23 which is visible thorough an aperture 186 formed in the base 530 of the socket adapter extender 528. A time display 188 as well as individual pushbuttons or switches 190 and 192 are also
10 mounted on the dial 184 for controlling operation of the timer 182, such as setting the current time, resetting the time. Event times may also be programmed via the switches 190. An output signal from the timer 182 at one event time may energize one or more relays mounted on the circuit board 168 to control components within the socket adapter extender, such as a power disconnect switch, service limiter, etc., to
15 break the circuit between the line and load contacts to shed loads, such as a hot water heater, at a preprogrammed time.

Referring now to Fig. 21B, there is depicted a modified circuit board 710. The circuit board 710 can be mounted between any aligned pair of apertures in the base of a socket adapter, such as between the fifth and sixth terminal positions, or
20 between any pair of line and load terminal positions. In this embodiment, the circuit board 710 is provided with a two pairs of apertures, not shown, located near the upper edge of the circuit board 710. A conventional socket adapter jaw contact 712 is mounted to the circuit board 710 by means of fasteners extendable through apertures in the jaw contact 712 and the apertures in the circuit board 710. Thus, the jaw
25 contacts 712 can comprise a three finger jaw contact as shown in Fig. 30, and described hereafter. By way of example only, the jaw contact 712 comprises a pair of contact clips 714 which are mounted on opposite sides of the circuit board 710 in an aligned pair. Each of the clips 714 includes apertures alignable with the apertures in the circuit board 710 for receiving mechanical fasteners, such as rivets, therethrough to
30 affix the contact clips 714 to the circuit board 710. The contact clips 714, on at least one side of the circuit board 710, are electrically connected to conductive traces 716 conventionally formed in the circuit board 710. A spring clip 718 is mounted on each

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contact clip 714 and has an end portion which biases the contacting portions of each contact clip 714 toward the opposed contact clip 714 to provide a secure electrically connection between the contact clip 714 and an inserted electrical terminal.

5 The contact clip 714 as well as the spring clip 716 may be formed as a one piece member having a single end portion. Alternately, as shown in Fig. 21B, each contact clip 714 and each spring clip 716 may be soldered to form two end portions. Further, the end portions of each contact clip 714 may be provided at different lengths to provide a staggered electrical terminal insertion force.

10 As also shown in Fig. 21B, the conductive pads 179 mounted on the terminal end portions 174 and 176 of the circuit board 710 are also electrically connected to conductive traces 720 carried on the circuit board 710. Any electrical circuit or electrical component may also be mounted on the circuit board 710 and electrically connected to the conductive traces 716 and 720 in a conventional manner.

15 Fig. 21C depicts a further modification to the circuit board 710. In this aspect of the invention, each jaw contact clip 724 is mounted directly on the circuit board 710 such that the contact fingers of each contact clip 724 are spaced from a conductive pad 726, such a copper foil pad, bonded or otherwise mounted on the circuit board 710. In this aspect of the invention, each jaw contact clip 724 and opposed conductive pad 726 form a single jaw contact for receiving a blade terminal
20 therebetween in electrical connection.

Further, the terminal end portions of the circuit board 710, in this embodiment, may be formed solely by flat, electrically conductive plates 728, such as copper-tin plates which are fixedly mounted to the circuit board 710 by means of fasteners, such as rivets mounted through aligned apertures in each plate 728 and the
25 lower portion of the circuit board 710. It is also feasible, in the present invention, to directly overlay the conductive plates 728 on the terminal portions 174 and 176 extending from the main portion of the printed circuit board 710.

One or more relays may be mounted on the printed circuit board 710, each relay including at least one switchable contact which is movable between a
30 normally open and a normally closed position. The contact terminals can be electrically connected by separate wires or conductors or by means of conductive traces on the circuit board 710 between one jaw contact 712 and one plate terminal

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portion 179 in the embodiment shown in Fig. 21B or between one jaw contact 724, 726 and one conductive terminal plate 728 in the embodiment shown in Fig. 21C. The relay(s) can serve as a power disconnect or service limiter such that in normal operation, the relay contacts are closed allowing electrical current to flow between one
5 jaw contact and one associated conductive plate or blade portion. However, when the relay(s) are activated, the contacts switch positions to an open position thereby opening or breaking the circuit between each jaw contact and blade terminal pair to disconnect electrical power to the use site.

Referring now to Fig. 24, there is depicted a safety shield 400 which is
10 specifically designed for use in a current transformer rated watt-hour meter socket adapter 402. In general, the safety shield 400 is similar to the safety shield 580 described above and shown in Fig. 7 in that it includes a top wall 403, a plurality of depending sidewalls 404, and a peripheral flange 406 projecting generally perpendicularly outward from each sidewall 404. A plurality of raised bosses 408
15 extend upward a slight distance above the surface of the top wall 403 and carry individual slots 410 opening to the interior of the shield 400 and providing access to jaw contacts mounted on the base of the socket adapter 402. The top wall 403 is also formed with a plurality of laterally spaced dividers or walls 412 which form laterally spaced apertures 414 between adjacent dividers 412. Further, in a centrally located,
20 raised portion 416, a plurality of laterally spaced slots 418 are formed to provide access to current transformed rated jaw contacts mounted within the socket adapter 402, as described hereafter.

The safety shield 400 may be securely or fixedly mounted to the socket adapter 402 by any of the mounting or latch means described above for the safety
25 shields 580 and 620.

Figs. 25 and 26 depict a modified safety shield 420 which is similar to the safety shield 400 in that it includes raised bosses 408 extending from a top wall 403, slots 410 formed in each boss 408, spaced dividers 412 forming laterally spaced apertures 414, and a raised portion 416 carrying laterally spaced slots 418. However,
30 in this embodiment, the top wall 403 has a greater lateral extent so as to closely conform to the inner sidewall of the socket adapter 402. A polygonal shaped aperture

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422 is formed along one lateral side edge of the top wall 403 for receiving a current transformer shorting switch, or electrical pin connector, not shown.

Opposed pairs of raised bosses 424 formed along lateral opposed side edges of the top wall 403 and form recesses designed to receive spring fingers 162 and 164 on the surge ground conductors 128 and 130 in the same manner as described above and shown in Figs. 15-18. In this manner, the spring fingers 162 and 164 on the surge ground conductors 128 and 130 fixedly, yet releasably mount the safety shield 420 within the interior of the socket adapter 402.

The safety shield 420 is formed with a pair of spaced arcuate sidewalls 428 and 430 which are diametrically opposed on opposite sides of the safety shield 420. The arcuate sidewalls 428 and 430 are disposed adjacent to the arcuate wall portions 148 of the surge ground conductors 128 and 130.

As shown in Fig. 27 which depicts a rear or bottom view of the safety shield 420, a rectangular frame 432 formed of four interconnected sidewalls projects from the rear surface of the top wall 403 of the safety shield 420. The dividers 412 extend from the top to the bottom of the frame 432 and between opposed elongated sidewalls of the frame 432. The frame 432 and spaced dividers 412 form a plurality of pairs of cavities, including the cavities 414 opening through the top wall 403 of the safety shield 420 and a plurality of interior cavities 434 opening to the slots 428 in the top wall 403 and defining a jaw contact mounting area.

The frame 432 also includes a first laterally extending wall 436, a spaced second laterally extending wall 438 and a plurality of intermediate short walls 440 which extend between each of the dividers 412. An enlargement 442 having a tapered or angled edge 444 on one side thereof facing the cavity in the frame 432 opening to the slots 418. The angled or tapered surface 444 acts as a guide for urging the potential jaw contacts into the proper location within the cavity in the frame 432 into alignment with the slot 418 so as to be positioned to receive a blade terminal of a watt-hour meter inserted through the slot 418.

Figs. 28 and 29 depict interior views of the socket adapter 402, with the shield 400 removed. As shown in Fig. 28, the socket adapter 402 includes the generally planar base 450 and an annular sidewall 452 projecting therefrom. A plurality of line and load watt-hour meter blade terminal receiving slots 454 are formed

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in the base 450 at the normal watt-hour meter blade terminal positions. In order to support auxiliary electrical contacts on the base 450, a plurality of posts 456 are integrally formed with the base 450 and project generally perpendicularly therefrom. The posts 456 are disposed between the line and load jaw blade receiving slots 454.

5 The posts 456 have a generally square cross section extending from a common lower portion 458 and are laterally spaced across the base 450.

An aperture 460 is formed in the top end of each post 456 for receiving a fastener or screw as described hereafter. Also, a notch 462 is formed in the outer end of each post 456 and has a configuration for receiving a planar flange on an
10 electrical contact as described hereafter.

A barrier 464 is also formed on the base 450 and is spaced from the posts 456. The barrier 464 also extends laterally across the base 450 and has a plurality of laterally spaced recesses 466 which divide the barrier into a plurality of walls 468. Each wall 468 has a top edge 470 and a stepped recess formed on one side
15 facing the posts 456. The recess is formed with a first shallow notch 472 and a second, adjacent, deeper notch 474.

A pad 476 is formed on the base 450 of the socket adapter 402 and extends between one post 456 and one wall 468. A generally rectangular slot 478 is formed between two adjacent pads 476. The slots 478 open through the base 450 of
20 the socket adapter 402 and are sized to receive one end of a conventional blade terminal, as described hereafter.

Although each of the safety shields 110, 400 420, 580, 620 and 630 have been described above as being releasably mountable in a watt-hour meter socket adapter housing by a snap-in connection, it will be understood that each safety shield,
25 instead of the snap-in connection, or in combination with the snap-in connection, may be more fixedly mounted in the housing of a socket adapter by applying adhesive between adjoining portions of each safety shield and adjacent wall surfaces of the socket adapter housing, or the wall portion 148 of the surge ground conductor 128 shown in Fig. 17. While referring briefly to Fig. 17, adhesive can also be applied to
30 the bottom edge of the safety shield 110 and the upper surface of the ring or collar formed on the inner surface of the sidewall 539 of the socket adapter 528.

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Before describing mounting of the electrical contacts on the posts 456 and walls 468, a brief description of the construction of several configurations of electrical contacts will be provided.

One embodiment of an electrical contact 480 is shown in Figs. 29 and 30. The electrical contacts 480 are identical to the three finger jaw contacts disclosed in U.S. Patent No. 5,853,300, assigned to the Assignee of the present invention.

In general, each contact 480 has a three finger jaw-type contact design formed of first and second outer legs 482 and 484 which extend linearly from a generally planar base 486. Each of the legs 482 and 484 terminates in a angularly bent outer end portion, both of which extend in the same direction to one side of the base 486. An intermediate leg 488 is disposed between the outer legs 482 and 484 and has a generally curved shape extending from the base 486 to an opposite side of the base 486 from the outer ends of the outer legs 482 and 484. The outer ends of the intermediate leg 488 also curves or bends outward from one side of the base 486 to form, in conjunction with the legs 482 and 484, a jaw contact which receives a blade terminal extending outward from the base of a watt-hour meter, not shown.

A wire crimp collar 490 formed of two angularly disposed, bendable flanges, extends from one end of the base 486. The two flanges of wire crimp collar 490 are bendable into registry with one end of an external conductor, not shown, to electrically connect one end of the external conductor to the contact 480. Alternately, solder may be used to connect the external conductor to the flanges of the wire crimp collar 490.

A support flange 492 is formed contiguous with the base 486 and extends generally perpendicularly from an opposite end of the base 486. A threaded aperture 494 is formed in the support flange 492 and is alignable with the aperture 460 on the top edge of one post 456. A screw fastener, not shown, threadingly engages the aperture 494 on the support flange 492 and the aperture 460 in the post 456 to fixedly mount the jaw contact 480 on the base 450 of the socket adapter 402. An external conductor, not shown, may also be connected to the support flange 492 by connecting the external conductor to the screw fastener extending through the aperture 494 in the support flange 492. A washer may be interposed between the head of the screw

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fastener in the support flange 492 for secure electrical engagement of the external conductor with the support flange 492.

Finally, a mounting tab 496 extends perpendicularly from an outer end of the support flange 492. The mounting tab 496 provides a separate connection to another external electrical conductor, not shown, such as a conventional fast-on or quick connector which is fixedly attached to one end of an electrical conductor and slidable engaged over a complimentary formed mounting tab 496 to connect the external conductor to the contact 480.

Referring again to Figs. 29 and 30, one jaw contact 480 is mounted on one aligned pair of a post 456 and a wall 468. One end of the base 486 projecting downward from the wire crimp collar 490 is seated in the deeper notch 474 in the wall 468. Since the notch 474 extends only a short distance along the wall 468 from the top edge 470, one end of the contact 480 is located such that the wire crimp collar 490 seats on the top edge 470 of the wall 468 and the support flange 492 rests on the top edge of the post 456, with the end portion of the base 486 seated within the notch 462 in the post 456.

A planar blade terminal 500 is associated with the contact 480. The blade terminal 500 has a generally planar extent with intermediate shoulders 502 designed to seat on the base 450 of the socket adapter 402, with the lower portion of the blade terminal 500 extending through one slot 478 in the base 450. The blade terminal 500 is secured in position within the socket adapter 402 by means of a cotter pin, not shown.

Referring briefly to Figs. 24-27, when the contact 480 is in the mounting position shown in Fig. 29, the legs 482, 484 and 486 defining the contact itself are aligned with one slot 418 in the shield 400 thereby allowing a blade terminal from the watt-hour meter to be inserted through the slot 418 in the safety shield 400 into contact with the jaw contact legs 482, 484, and 486. At the same time, the support flange 492 as well as the fast-on tab 496 are accessible through the aperture 418 in the shield 400 to allow electrical connections with external electrical conductors.

Referring again to Figs. 29 and 30, there is depicted another embodiment of an electrical contact or blade terminal 504 which can be mounted in

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the socket adapter 402. The jaw blade terminal 504 has a one-piece construction which combines the three finger jaw contact structure of the jaw contact 480 with an integral blade terminal similar to the separate blade terminal 500. The three legs 482, 484, and 486 are shown in Fig. 30 at one end of the elongated, planar bar 506 which is part of the jaw blade terminal 504. Shoulders 502 are formed adjacent the blade terminal end of the jaw blade terminal 502 and seat on raised portions 508 extending between adjacent tabs 476 on the base 450 of the socket adapter 402. One side edge of the upper portion of the planar bar 506 seat in the shallow notch 472 on the wall 468. The opposite side edge of the upper portion of the planar bar 506 rests against the sidewall of a post 456 to position the jaw contact 504 between one post 456 and one wall 468 and to enable the jaw contact end of the jaw blade terminal 504 to be positioned below and accessible through one slot 418 in the shield 400 as shown in Fig. 26.

Finally, a coupler 750 is depicted in Figs. 31-33 for joining an electrical contact 752 with a planar blade terminal 752 into a unitary construction which may be mounted as a unitary jaw blade terminal in the socket adapter 402 in the same manner as the jaw blade terminal 504. The coupler 750 is formed of an electrically insulating material, such as a plastic, to electrically isolate the jaw contact 752 from the blade terminal 754.

The jaw contact 752 is a modified version of jaw contact 480 and is essentially the same as the jaw contact 480 except that jaw contact 752 does not include the support flange 492 and fast-on tab 496. For convenience, the three legs 482, 484 and 488 forming the jaw portion of the jaw contact 752 are given the same reference numbers as the corresponding legs in the jaw contact 480. Likewise, a wire crimp collar 490 projects from one end of a base 496.

The coupler 750 is exemplary formed as a one piece, unitary body having a first elongated sidewall 756, and an opposed shorter sidewall 758 which are interconnected by upper and lower center walls 760 and 762, respectively, which are spaced apart along the length of the sidewalls 758 and 760.

The upper center wall 760 has a generally U-shape formed of a center portion 764 which is offset or spaced from a pair of base flanges 766 and 768 projecting from the sidewalls 756 and 758, respectively, as well as a pair of side

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flanges 770 and 772 which also project from the sidewalls 756 and 758, respectively, to form a slot which receives the base 486 of the jaw contact 752. The base flanges 766 and 768, the side flanges 770 and 772 as well as the center portion 764 of the upper center wall 760 interact along with a slot 778 formed between a pair of spaced
5 projections in the upper end of the sidewall 756 to securely support the jaw contact 752 in the coupler 750. The slot 778 engages an outwardly projecting side edge 780 on the leg 482 of the jaw contact 752.

The jaw contact 752 is also retained in place in the coupler 50 by means of a projection 782 which is formed on one end of a cantilevered, resilient arm
10 784 which projects from one end of the center wall 764 into an opening formed in the center portion 764 as shown in Fig. 31. The projection 782 engages an aperture 785 in the base 486 of the jaw contact 752.

The lower center wall 762 is spaced from inwardly projecting side flanges 788 and 790 formed on one end of the sidewalls 756 and 758, respectively, to
15 form openings which slidably receive the planar blade terminal 754 therein. A pair of raised dimples 792 spaced from one end of the blade terminal 754 snap over the center wall 762 of the coupler 750 to slidably trap the blade terminal 754 between an upper edge of the lower center wall 762 and inwardly facing projections on the sidewalls 756 and 758. A cotter pin or other fastener may be inserted through an aperture 794 in the
20 blade terminal 754 to more securely retain the blade terminal 754 in the coupler 750.

Referring briefly to Figs. 27 and 31-33, a plurality of U-shaped channels 796 project from the back surface of the top wall 403 of the safety shield 420. The U-shaped channels 796 are formed adjacent to one lateral leg of the frame 432 at one end of certain slots 410 in the safety shield 420. The U-shaped channels
25 slidably receive the upper end 798 of the sidewall 756 of the coupler 750 to accurately mount the coupler 750 with respect to one slot 410 in the safety shield 420.

In summary, there has been disclosed a unique safety shield for use with a watt-hour meter socket adapter or socket adapter extender which provides a dead front to isolate all current carrying components of the socket adapter from contact
30 while still enabling the blade terminals of a watt-hour meter to be easily inserted through apertures in the safety shield into engagement with jaw contacts mounted within the socket adapter. The safety shield of the present invention is mounted in the

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socket adapter by means of snap-on clips and projections thereby eliminating the need for separate mechanical fasteners to simplify the assembly of the socket adapter and safety shield as well as reducing material costs. In one aspect, the safety shield is held within a fixed position within the socket adapter housing by means of spring fingers
5 formed on the surge ground conductors to again eliminate the need for separate mechanical fasteners needed to fixedly mount the safety shield in the socket adapter.

A unique safety shield is disclosed for use with a current transformer rated socket adapter. The current transformer rated socket adapter is provided with mounting supports for accurately positioning potential jaw contacts and blade
10 terminals to receive the potential blade terminals of the watthour meter and to interconnect with potential jaw contacts in a watthour meter socket.

In another aspect of the invention, the use of the one-piece coupler provides isolation of the jaw contact from the blade terminal while coupling the jaw contact and blade terminal into a unitary one-piece construction for ease of
15 installation, reduced assembly steps and labor in mounting the jaw contact and blade terminal in a socket adapter. The coupler provides easy separate connections to the jaw contact and blade terminal for interconnection to a fuse, relay, etc., to provide special control features in the socket adapter. In addition, the coupler slides into the housing and does not require fasteners for mounting in the housing in the socket
20 adapter or special mounting features on the jaw contact and blade terminal.

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What is claimed is:

1. A watthour meter socket adapter having a housing including a base wall and an annular sidewall extending from the base wall, a plurality of electrical
5 contacts mounted in the base wall and releasably receiving blade terminals of a watthour meter and removably insertable into electrical contacts in a watthour meter socket, the socket adapter comprising:
 a shield for covering substantially all of the exposed portions of the electrical contacts within the socket adapter, the shield having at least one aperture
10 alignable with one electrical contact for receiving a blade terminal into engagement with one electrical contact; and
 means, cooperatively formed on the housing and the shield, for mounting the shield in the housing in a snap-in connection, the mounting means including:
15 a plurality of legs on the shield;
 a plurality of apertures in the housing, each receiving one leg;
 and
 a latch element on one of the legs and the housing adjacent to the aperture releasably engagable with a latch receiver in the other of the housing and
20 the legs.

2. The watthour meter socket adapter of claim 1 wherein the latch element is a projection having a latch surface disposed at an angle with respect to each leg.

25 3. The watthour meter socket adapter of claim 1 wherein each leg cantilevers from a sidewall of the shield.

4. The watthour meter socket adapter of claim 1 wherein the shield further comprises:
30 a pair of flanges projecting oppositely from a sidewall of the shield;
 and
 the legs projecting from each flange.

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5. The watthour meter socket adapter of claim 4 wherein:
each flange extends substantially perpendicularly from the sidewall of
the shield; and
5 each leg extends angularly from each flange.
6. The watthour meter socket adapter of claim 5 wherein the apertures are
formed in the base wall of the housing.
- 10 7. The watthour meter socket adapter of claim 1 wherein:
the shield has four contiguous sidewall portions connected at
interjoined corners; and
one leg is disposed on and projecting from each corner.
- 15 8. The watthour meter socket adapter of claim 1 wherein the apertures are
formed along the sidewall of the housing and spaced from the base wall.
9. The watthour meter socket adapter of claim 8 further comprising:
at least two apertures formed in the sidewall of the housing, each
20 having a latch projection formed therein; and
at least two legs projecting from the shield, the latch element being a
latch aperture formed in each of the at least two legs releasably engagable with one
projection in one aperture in the housing.
- 25 10. The watthour meter socket adapter of claim 9 wherein the at least two
apertures and the at least two legs comprise:
four apertures formed in the sidewall of the housing and four legs
projecting from the shield.
- 30 11. The watthour meter socket adapter of claim 10 wherein the four
apertures in the housing and the four legs on the shield are arranged in diagonally
opposed pairs.

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12. The watthour meter socket adapter of claim 9 further comprising:
an annular mounting flange extending exteriorly from the sidewall of
the housing and spaced from the base wall;
5 a cavity formed between the mounting flange and the sidewall; and
the apertures mounted in the sidewall in communication with the
cavity.
13. A watthour meter socket adapter having a housing including a base
10 wall and an annular sidewall extending from the base wall, a plurality of electrical
contacts mounted in the base wall and releasably receiving blade terminals of a
watthour meter and removably insertable into electrical contacts in a watthour meter
socket, the socket adapter comprising:
a shield for covering substantially all of the exposed portions of the
15 electrical contacts within the socket adapter, the shield having at least one aperture
alignable with one electrical contact for receiving a blade terminal into engagement
with one electrical contact;
means, cooperatively formed on the housing and the shield, for
mounting the shield in the housing in a snap-in connection, the mounting means
20 including:
a plurality of legs on the shield;
a plurality of apertures in the housing, each receiving one leg;
and
a latch element on one of the legs and the housing adjacent to
25 the aperture releasably engagable with a latch receiver in the other of the housing and
the legs;
a sidewall of the shield spaced from the adjacent sidewall of the
housing and defining an internal cavity; and
means, formed in the housing for supporting a circuit board in
30 substantially perpendicular orientation with respect to the base wall in the internal
cavity.

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14. The watthour meter socket adapter of claim 13 wherein the supporting means comprises:

a pair of spaced slots formed in the housing for supporting opposite ends of the circuit board.

5

15. The watthour meter socket adapter of claim 13 wherein the supporting means comprises:

a plurality of pairs of slots formed in the housing in a plurality of internal cavities formed between the shield and the sidewall of the housing.

10

16. The watthour meter socket adapter of claim 14 wherein the legs of the shield have a slot formed therein, the slot in each leg alignable with one of the pair of slots in the housing for engagement with a circuit board.

15

17. The watthour meter socket adapter of claim 13 wherein:

the shield has a peripheral flange projecting angularly from the sidewall of the shield, the peripheral flange engaging an edge of a circuit board mounted in the supporting means.

20

18. A watthour meter socket adapter having a housing including a base wall and an annular sidewall extending from the base wall, a plurality of electrical contacts mounted in the base wall and releasably receiving blade terminals of a watthour meter and removably insertable into electrical contacts in a watthour meter socket, the socket adapter comprising:

25

a shield for covering substantially all of the exposed portions of the electrical contacts within the socket adapter, the shield having at least one aperture alignable with one electrical contact for receiving a blade terminal into engagement with one electrical contact;

30

a raised boss formed on the shield at at least one electrical contact location and surrounding each aperture in the shield; and

at least one portion of the raised boss having a freely movable end cantilevered from an opposite end contiguous with the shield, the end being pivotal

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inwardly toward the shield upon contact with a watthour meter inserted into the watthour meter socket adapter.

19. A watthour meter socket adapter having a housing including a base
5 wall and an annular sidewall extending from the base wall, a plurality of electrical contacts mounted in the base wall releasably receiving blade terminals of a watthour meter and removably insertable into electrical contacts in a watthour meter socket, the socket adapter comprising:

a shield for covering substantially all of the exposed portions of the
10 electrical contacts within the socket adapter, the shield having an outer wall with at least one aperture for receiving a blade terminal of a watthour meter therethrough to enable engagement of the blade terminal with the electrical contacts; and

at least one surge ground conductor, the one surge ground conductor
including means for mounting the one surge ground conductor on the sidewall of the
15 watthour meter socket adapter, and means, carried on the surge ground conductor, for engaging the shield for releasably mounting the safety shield in the housing of the watthour meter socket adapter.

20. The watthour meter socket adapter of claim 19 wherein the shield has
20 depending portions disposed adjacent to the base wall of the housing of a watthour meter socket adapter.

21. The watthour meter socket adapter of claim 19 further comprising:
a receiving portion formed in the shield; and
25 a finger cantilevered from the surge ground conductor and releasably engagable with the receiving portion to lock the shield in the housing of a watthour meter socket adapter.

22. The watthour meter socket adapter of claims 19 further comprising:
30 another surge ground conductor disposed diametrically opposite from the one surge ground conductor on the sidewall of the housing;
a recess formed in the shield and having a closed end; and

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at least one resilient finger cantilevered from the another surge ground conductor and releasably engagable with the recess to lock the shield in the housing.

23. A watthour meter socket adapter having a housing including a base
5 wall and an annular sidewall extending from the base wall, a plurality of electrical contacts mounted in the base wall and releasably receiving blade terminals of a watthour meter and removably insertable into electrical contacts in a watthour meter socket, the socket adapter comprising:
- 10 a shield for covering substantially all of the exposed portions of the electrical contacts within the socket adapter, the shield having at least one aperture alignable with one electrical contact for receiving a blade terminal into engagement with one electrical contact; and
- means, cooperatively formed on the housing and the shield, for mounting the shield in the housing in a snap-in connection, the mounting means
15 including:
- a plurality of legs on the shield, each leg including a latch receiver aperture;
- a plurality of apertures in the housing, each receiving one leg;
- and
- 20 a latch element adjacent to each aperture in the housing releasably engagable with one latch receiver in one of the legs.

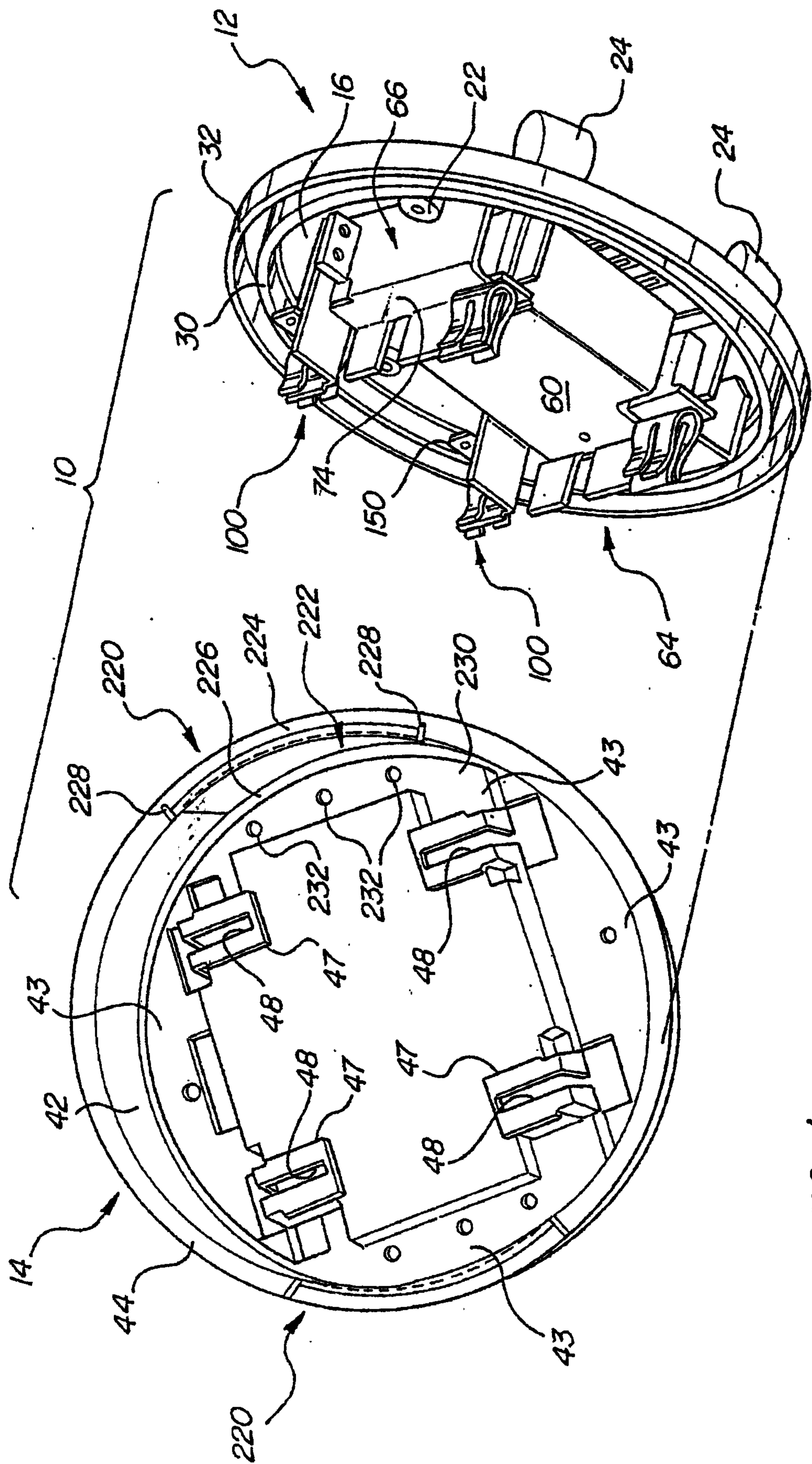
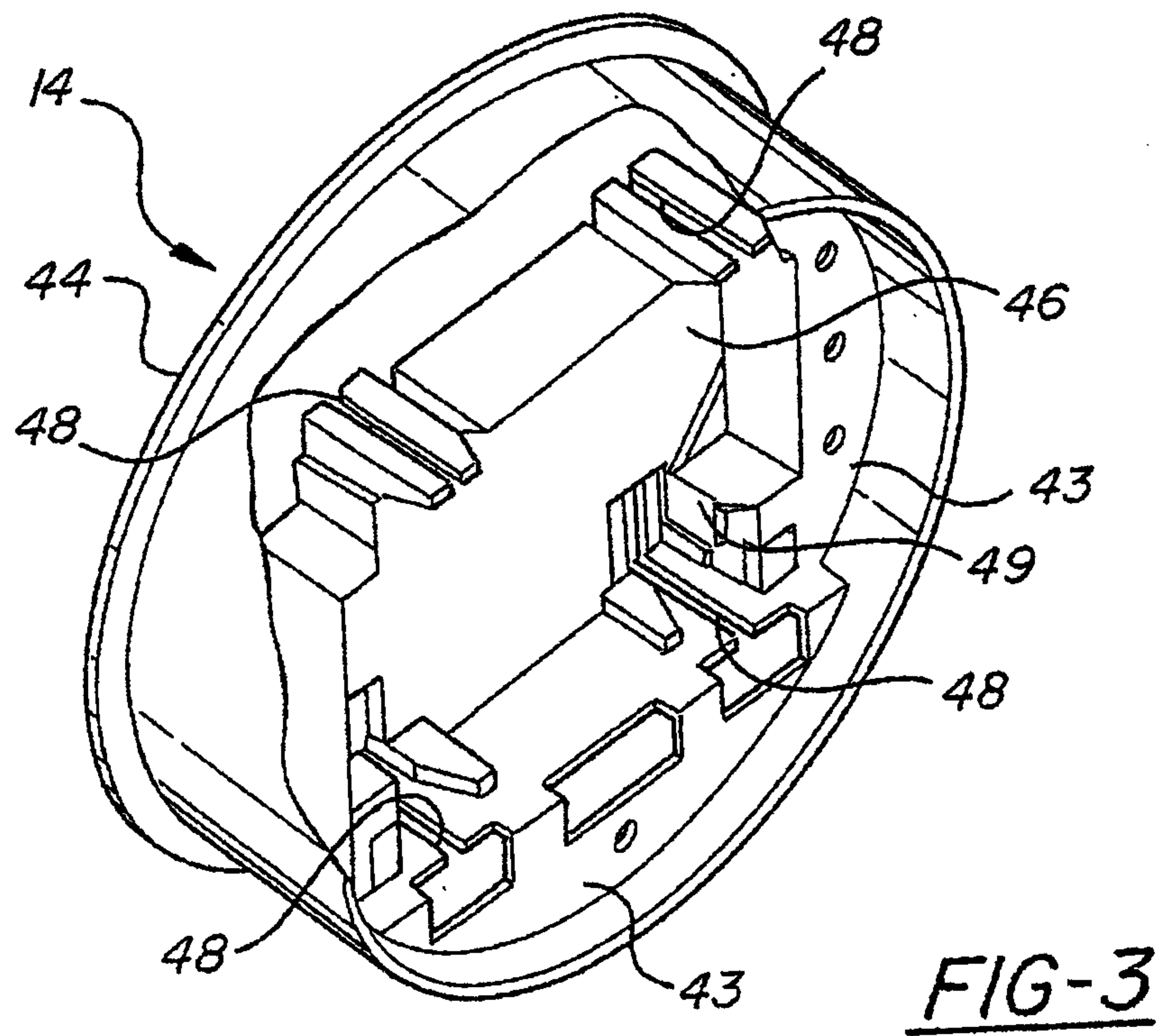
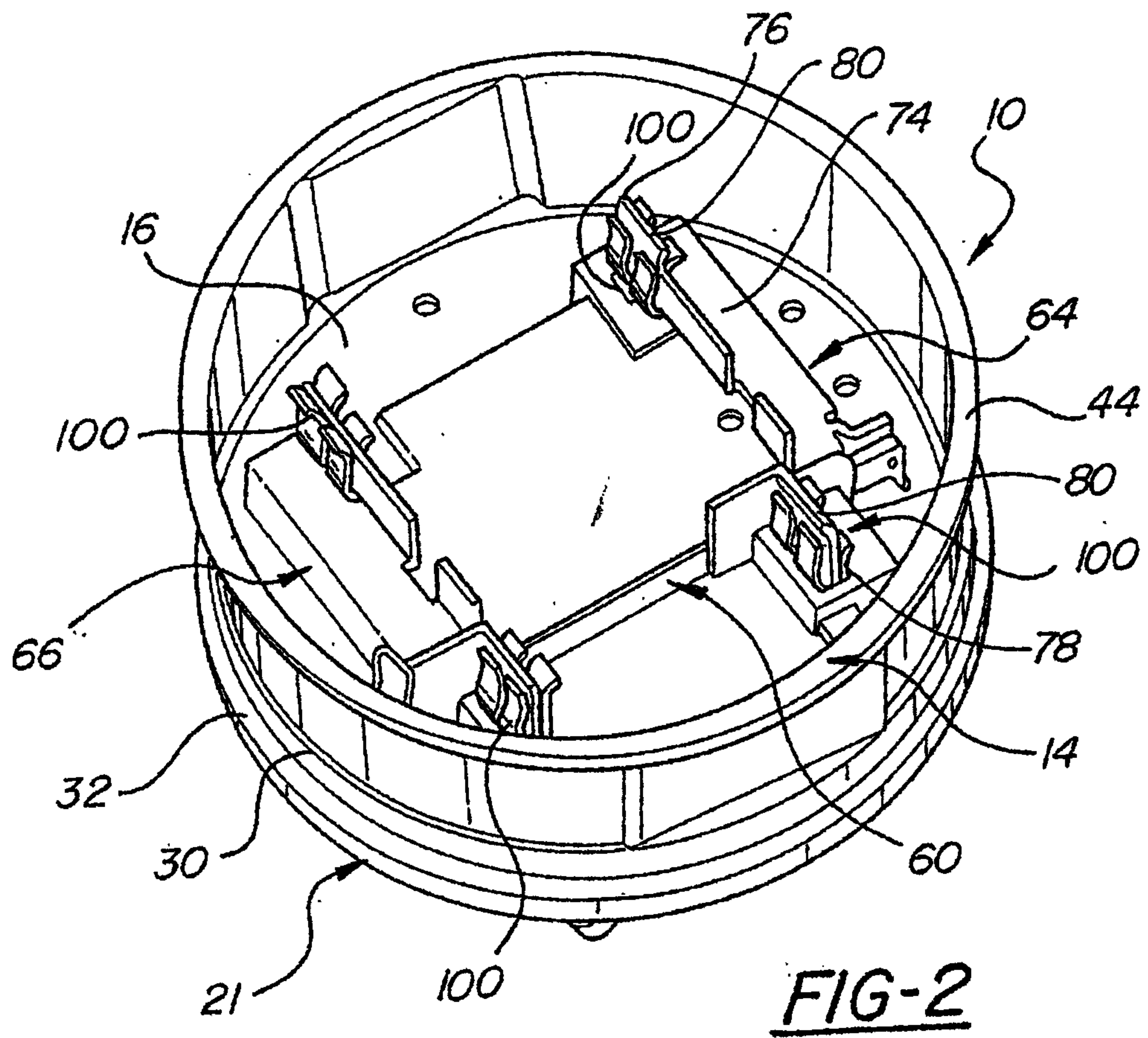


FIG-1



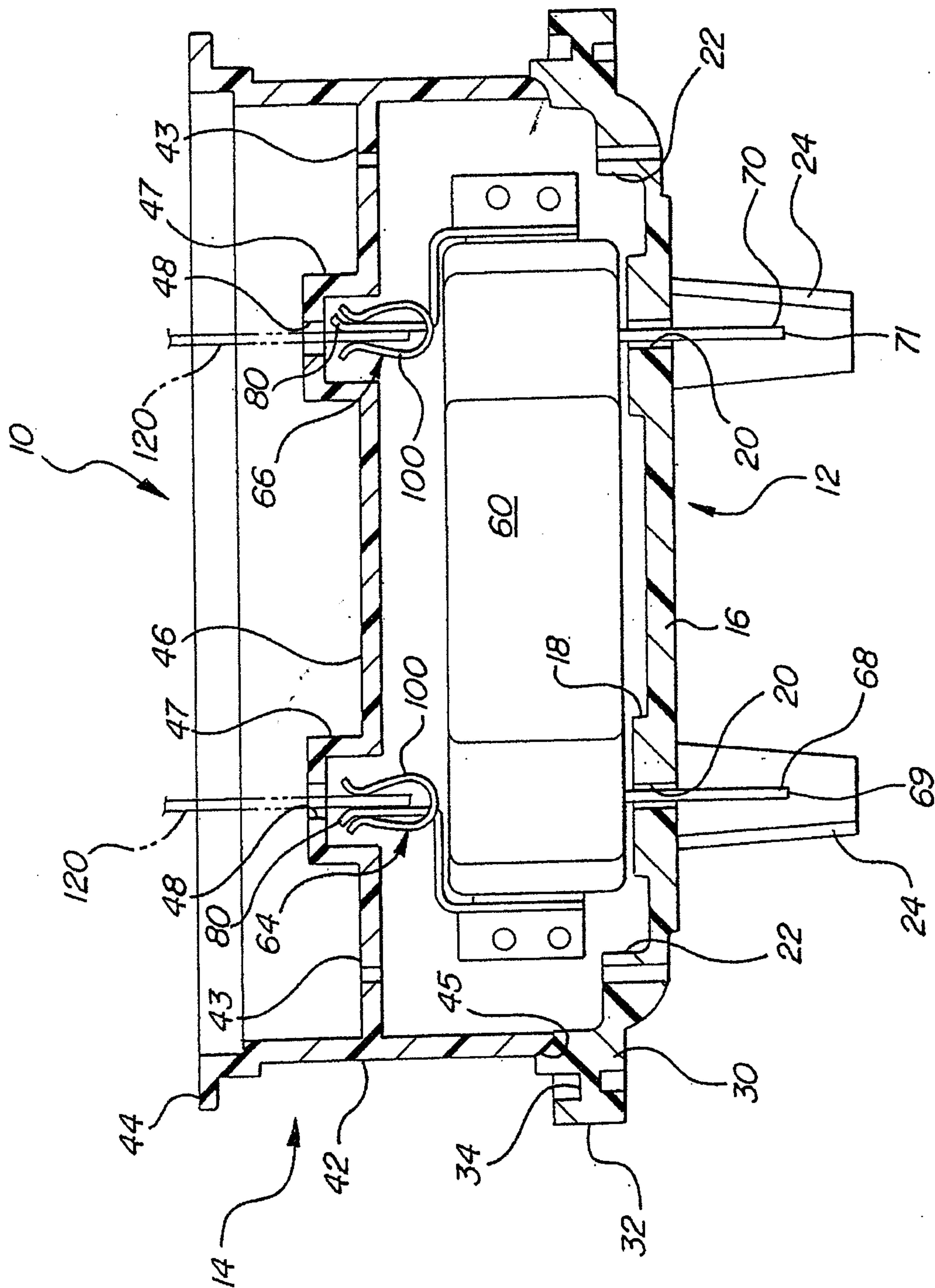
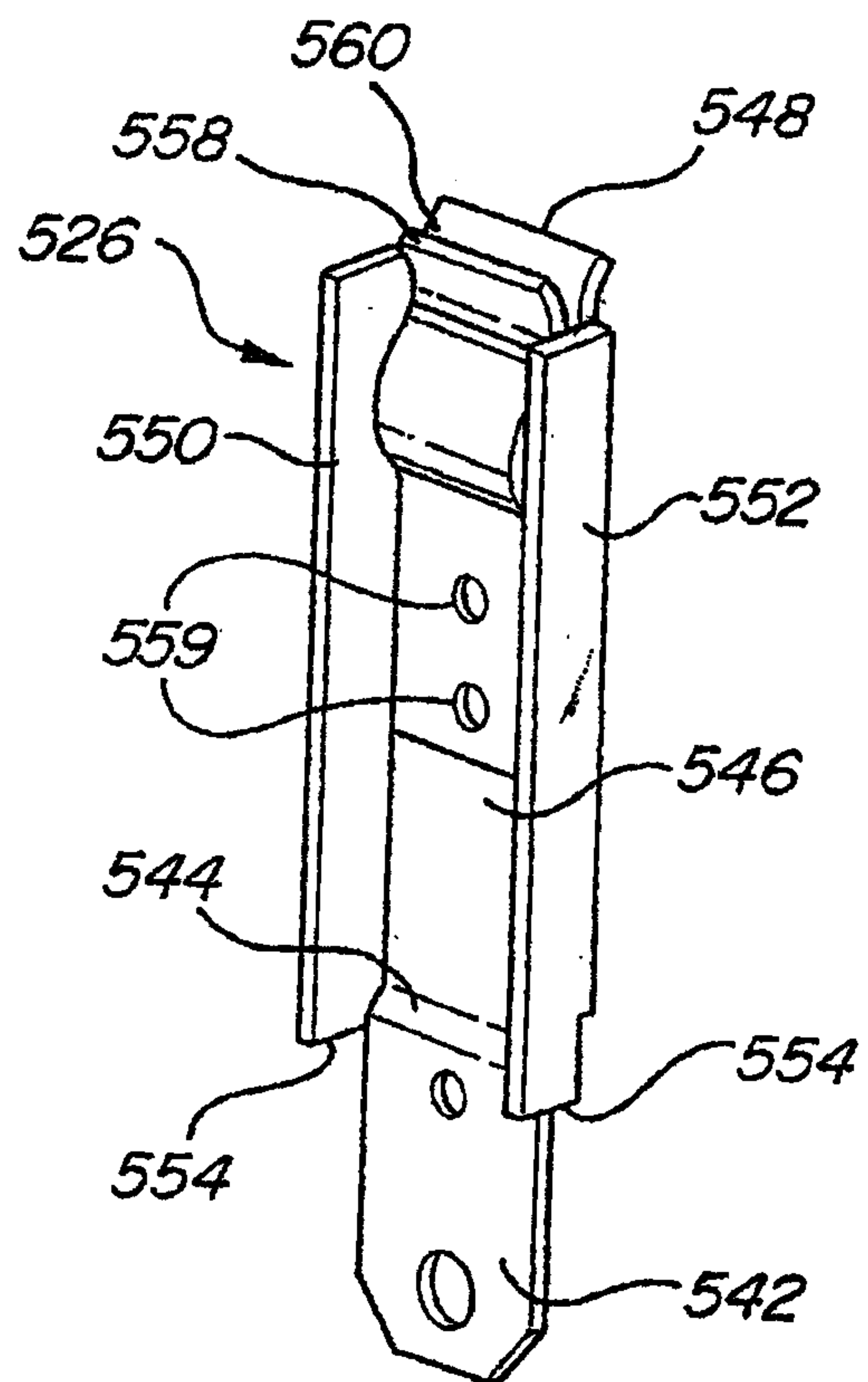
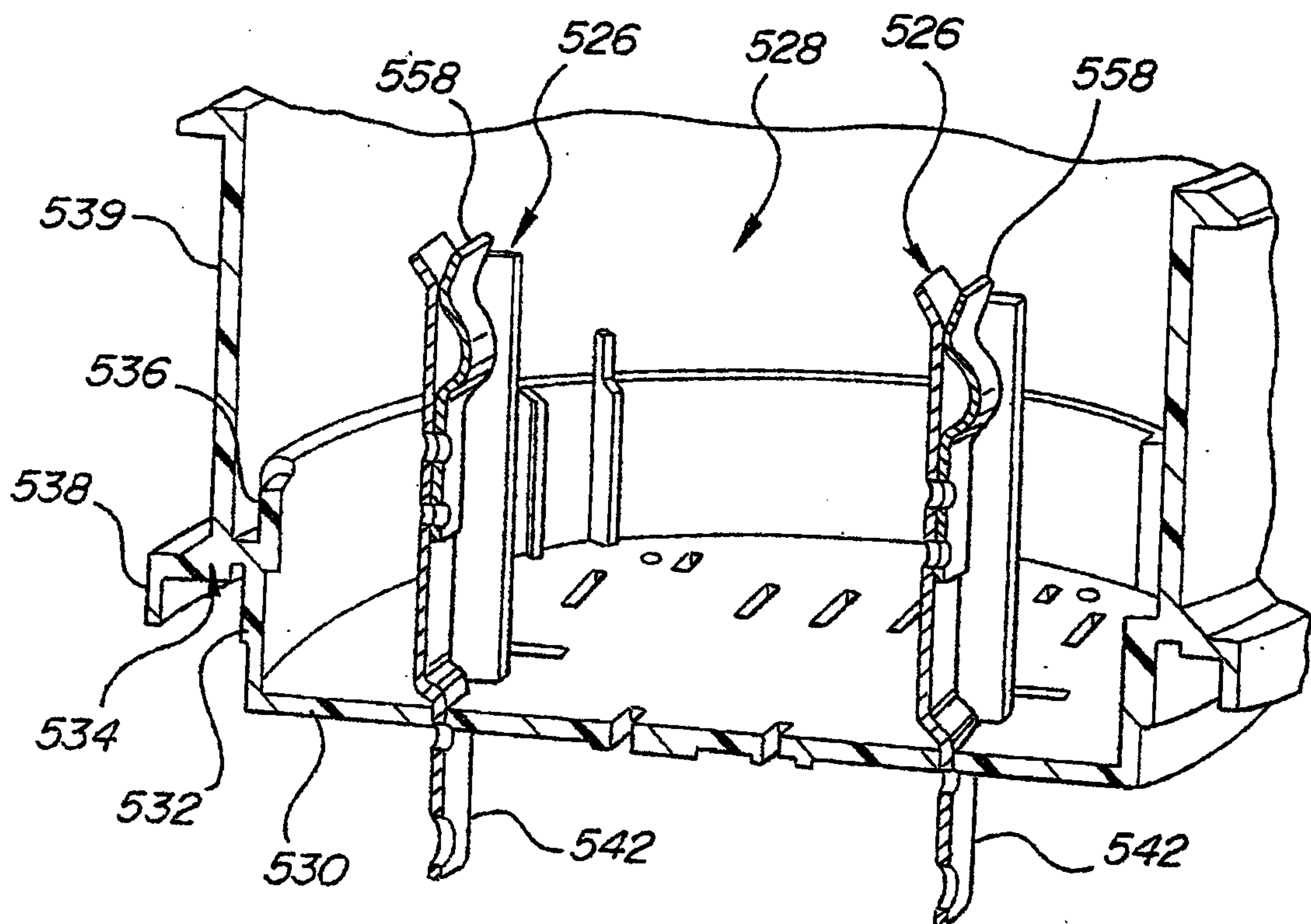
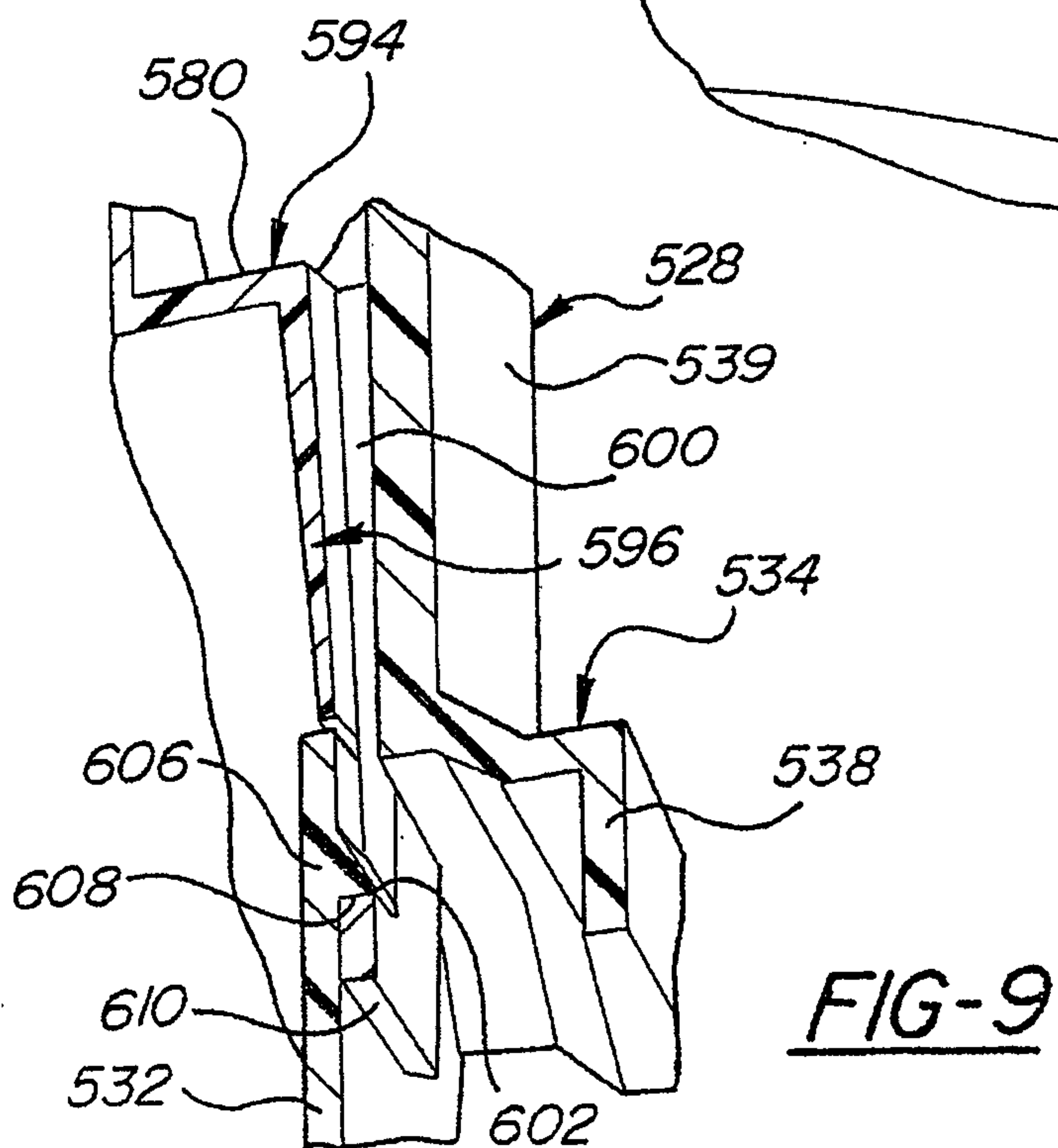
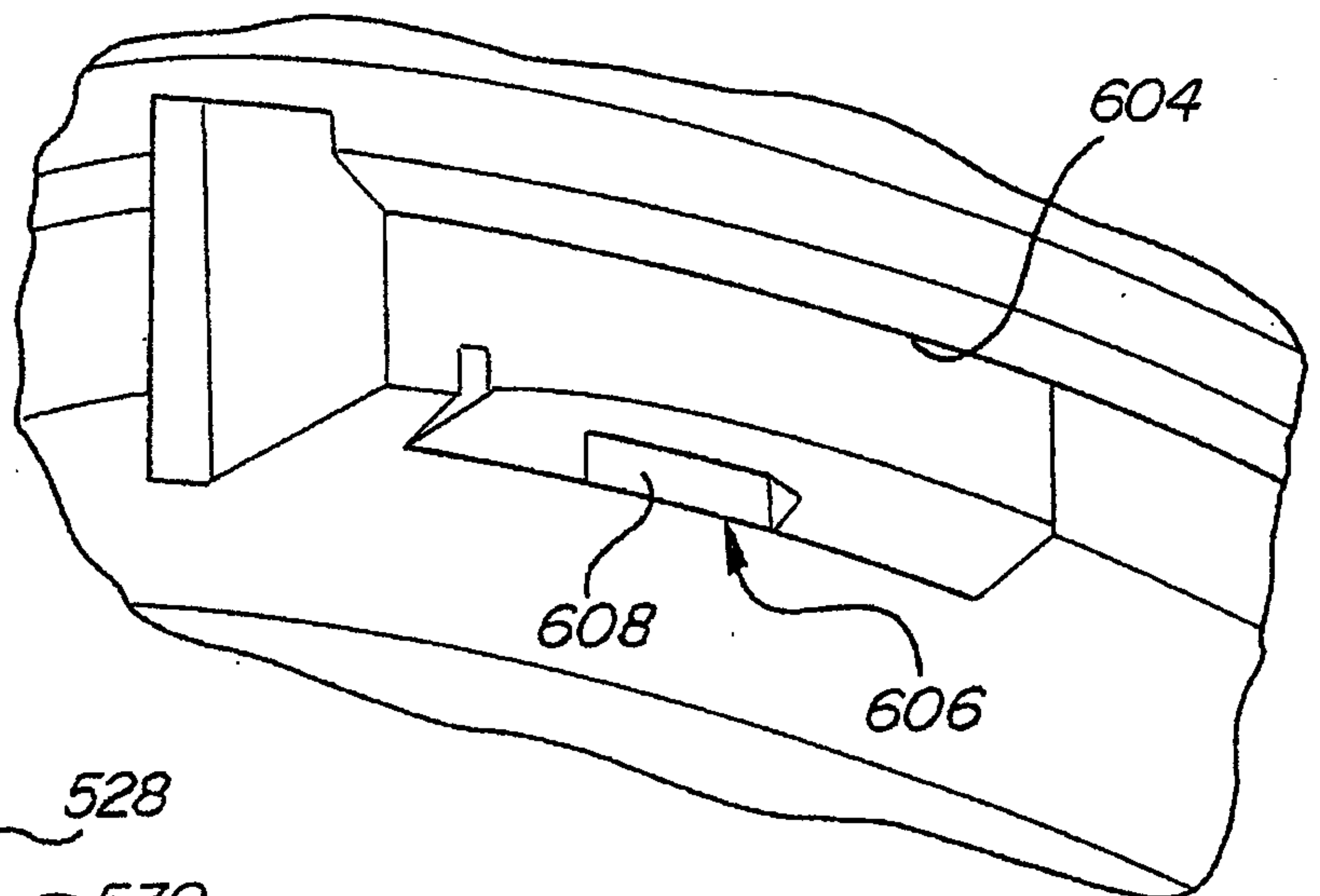
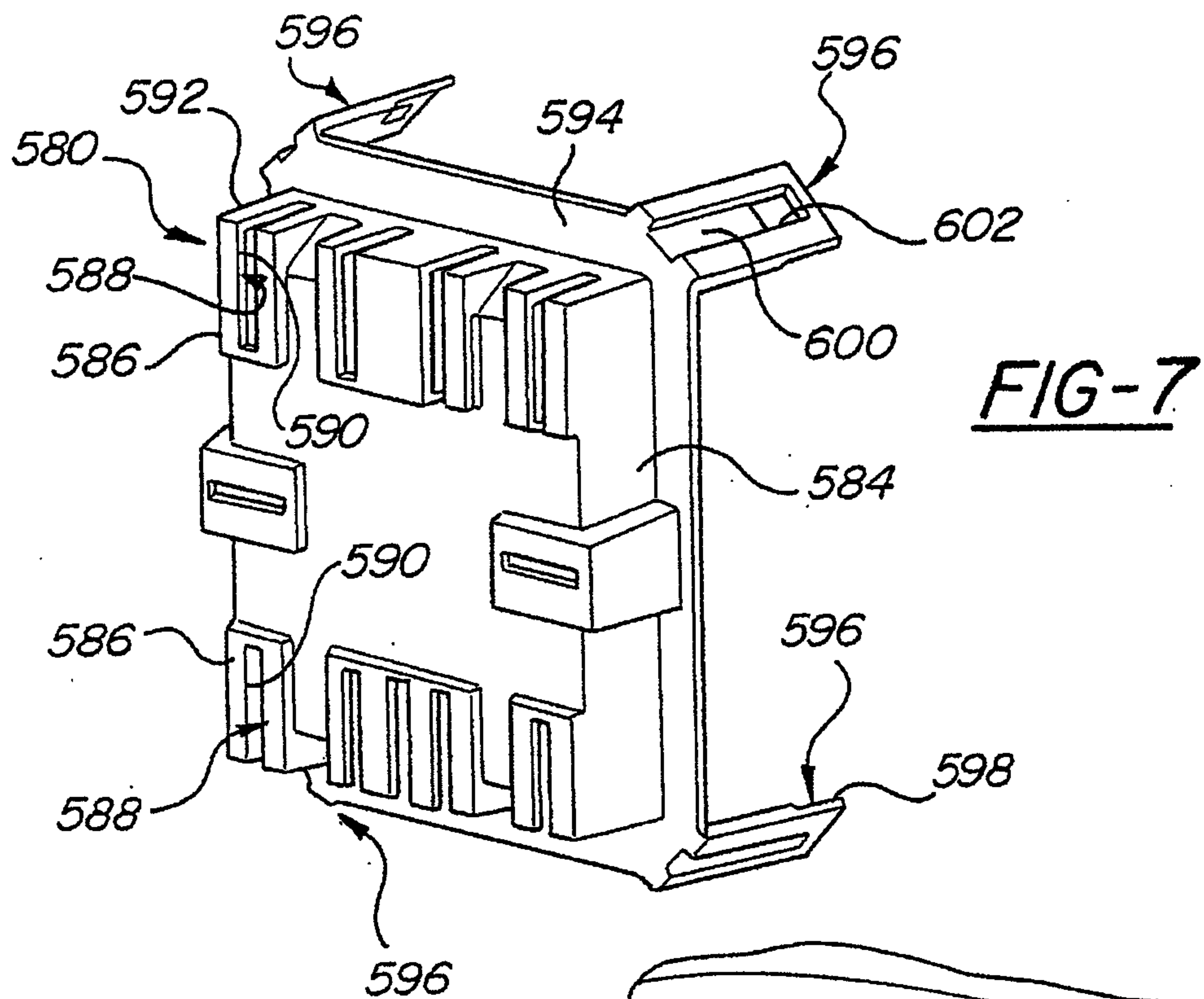


FIG-4

FIG-5FIG-6



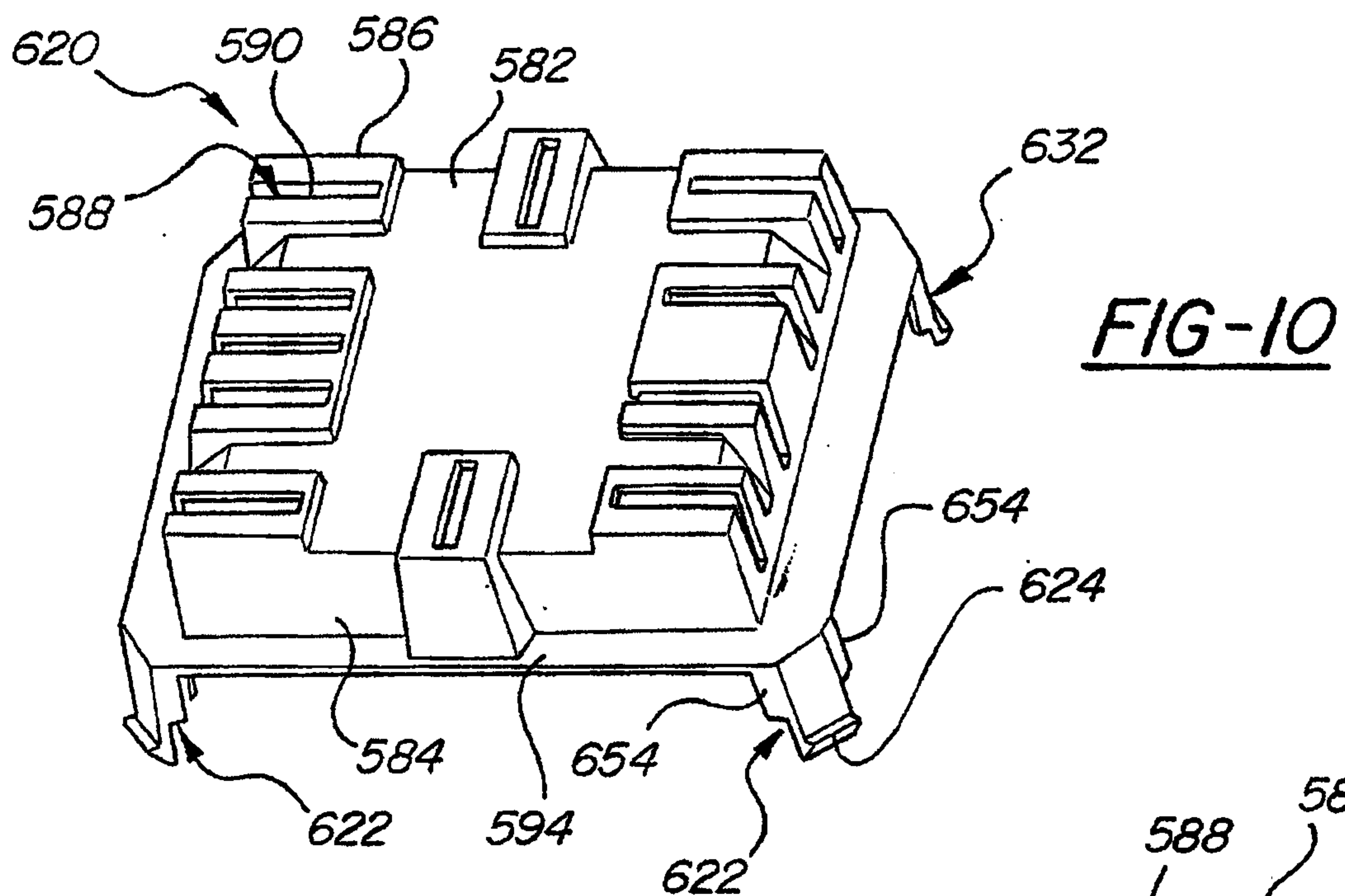
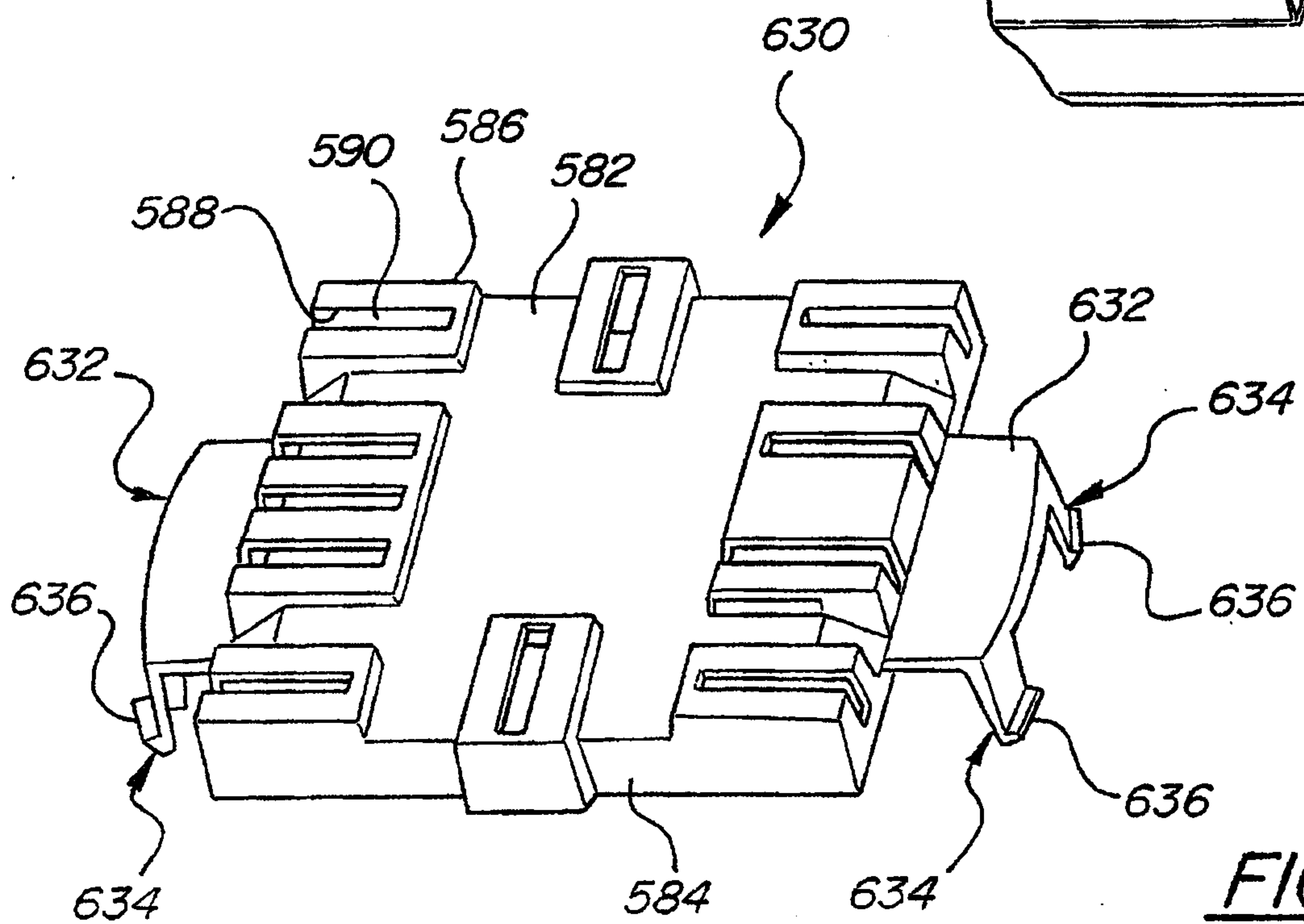
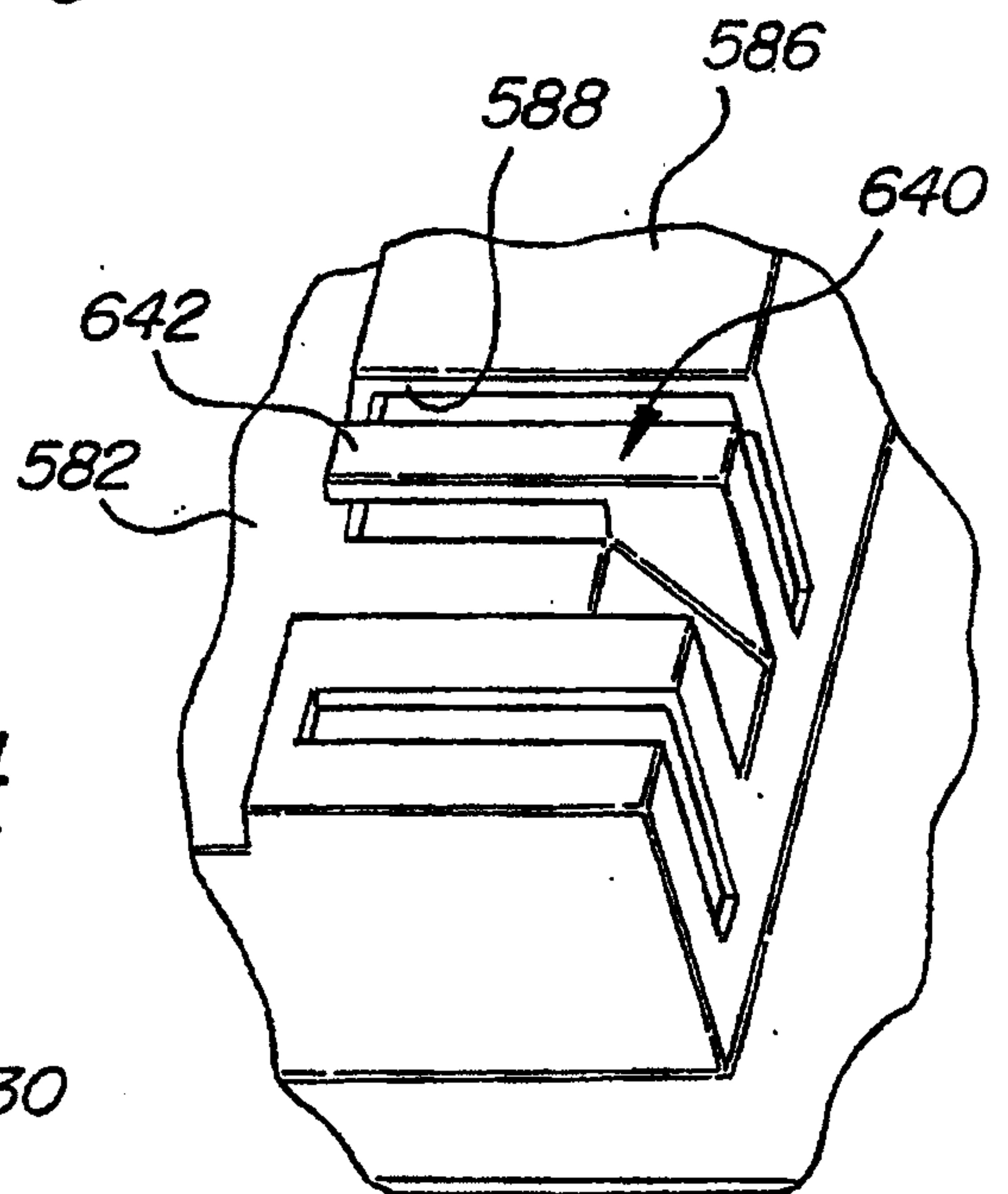


FIG-14



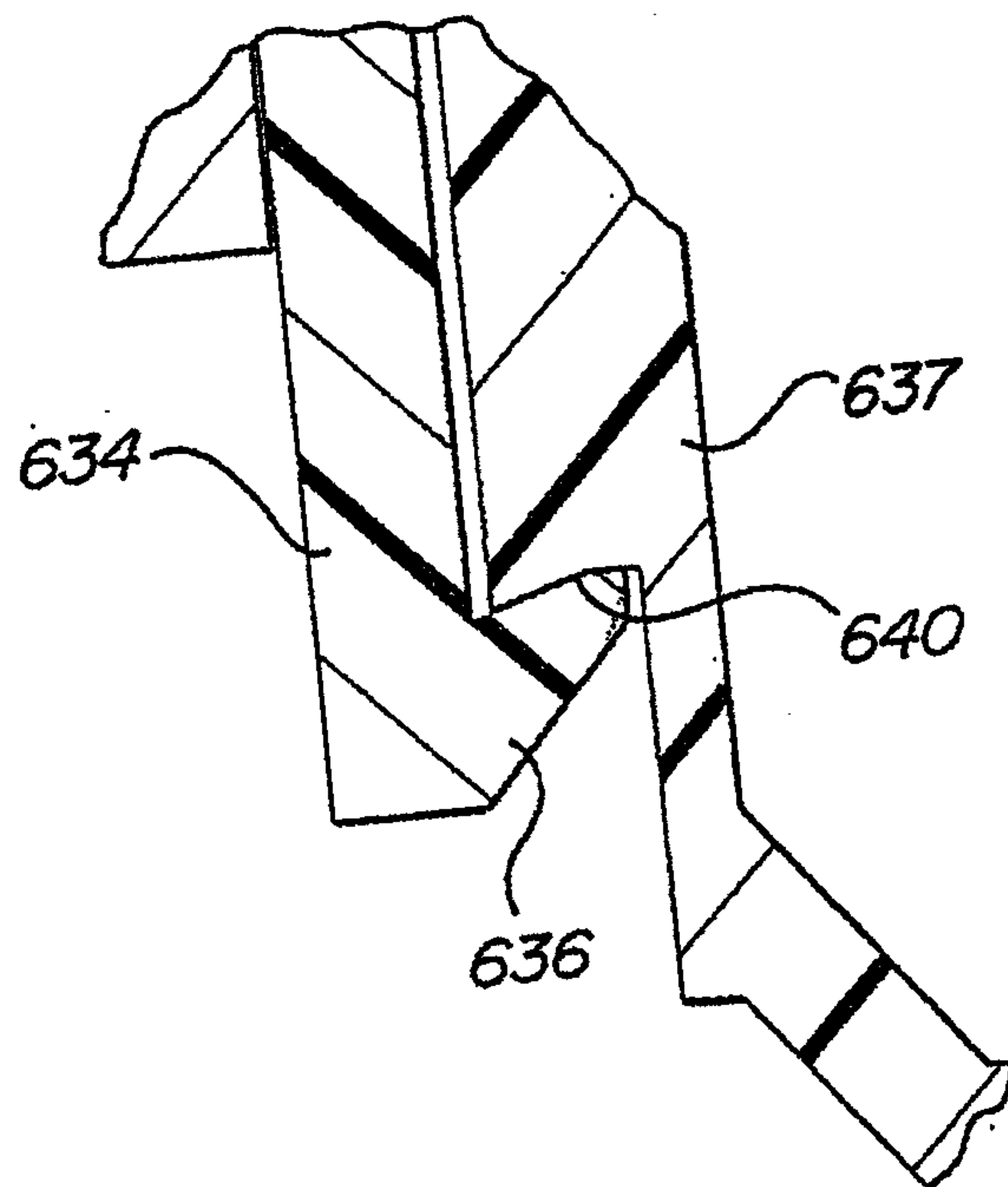


FIG-13

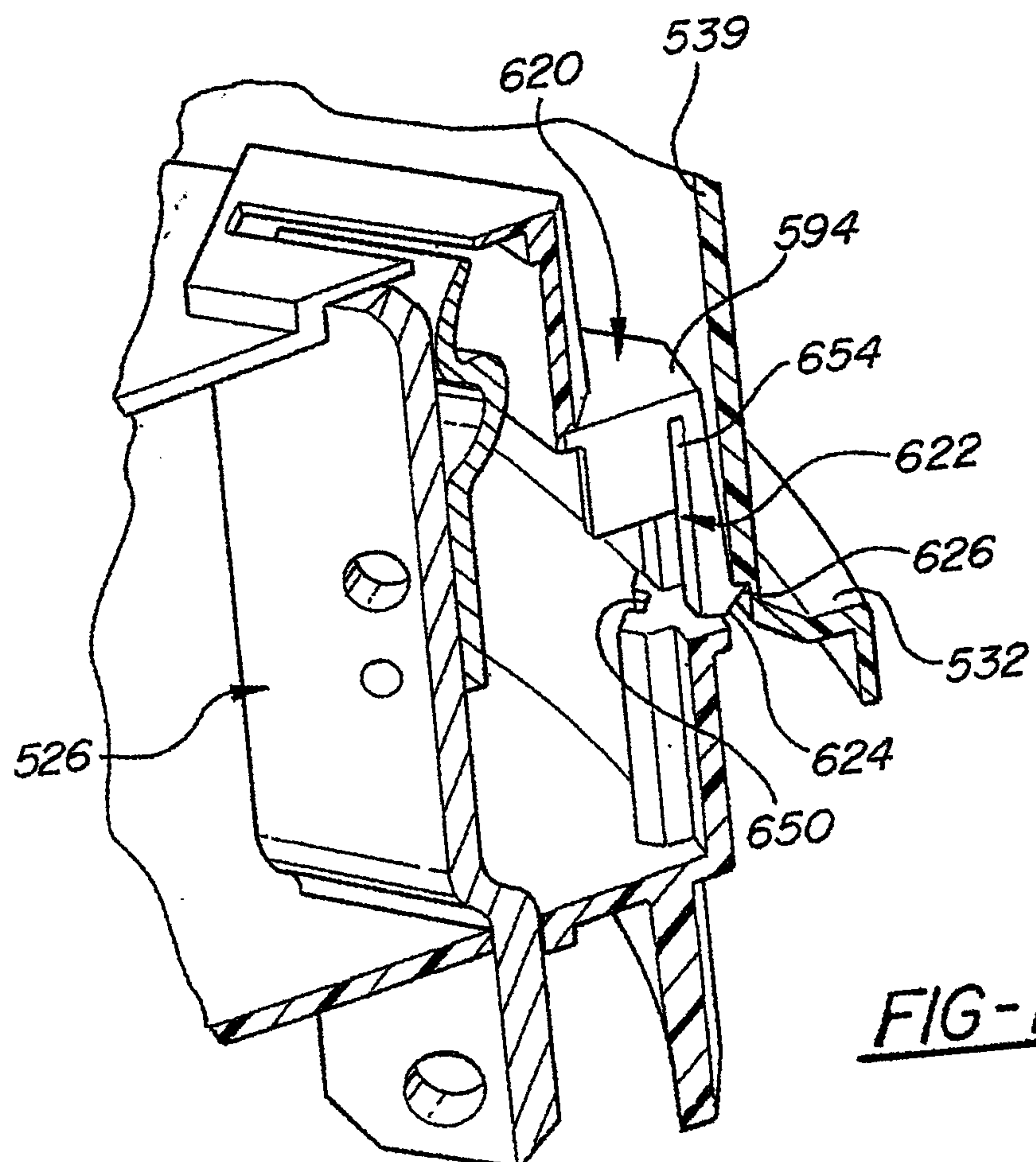
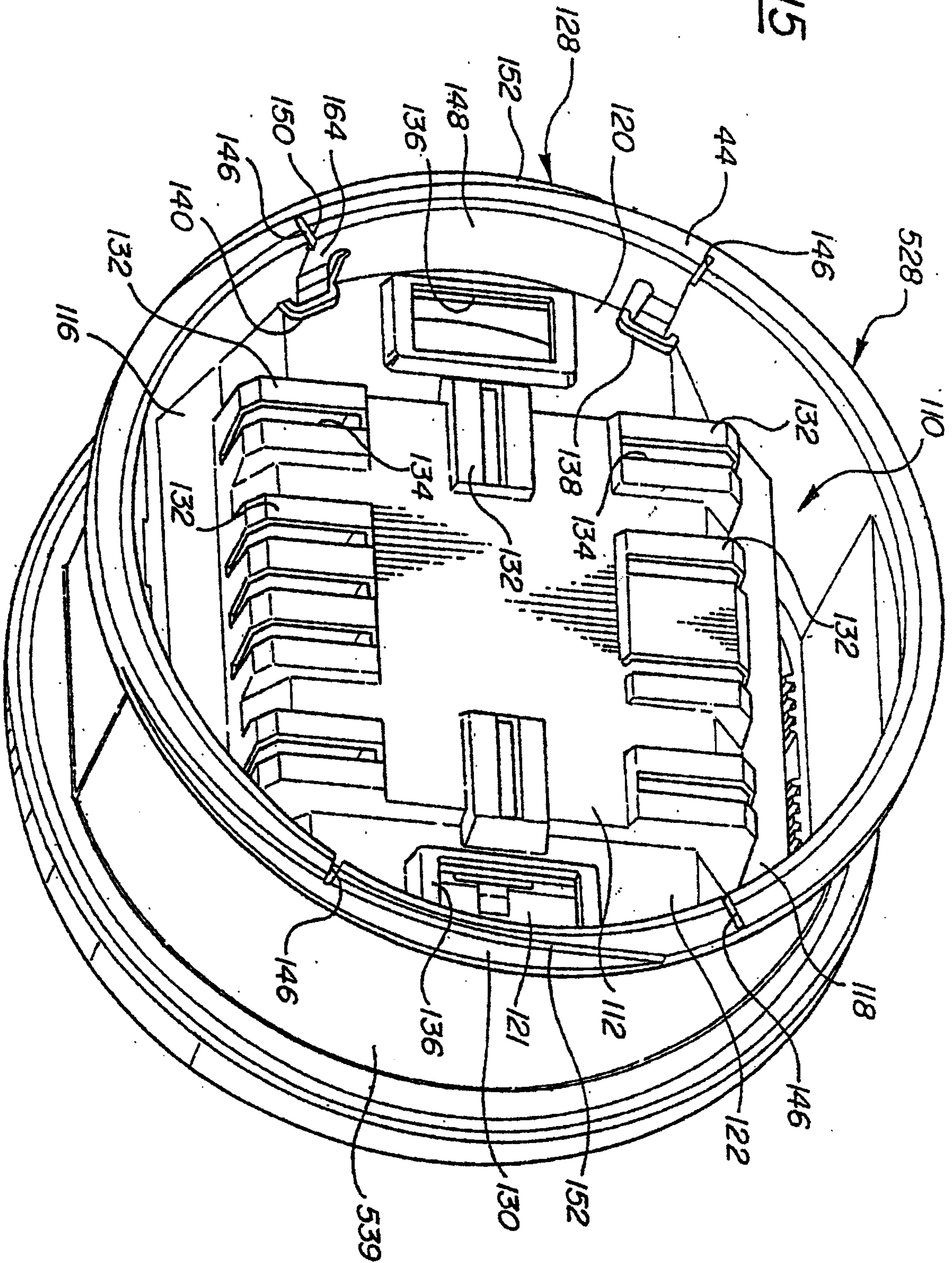
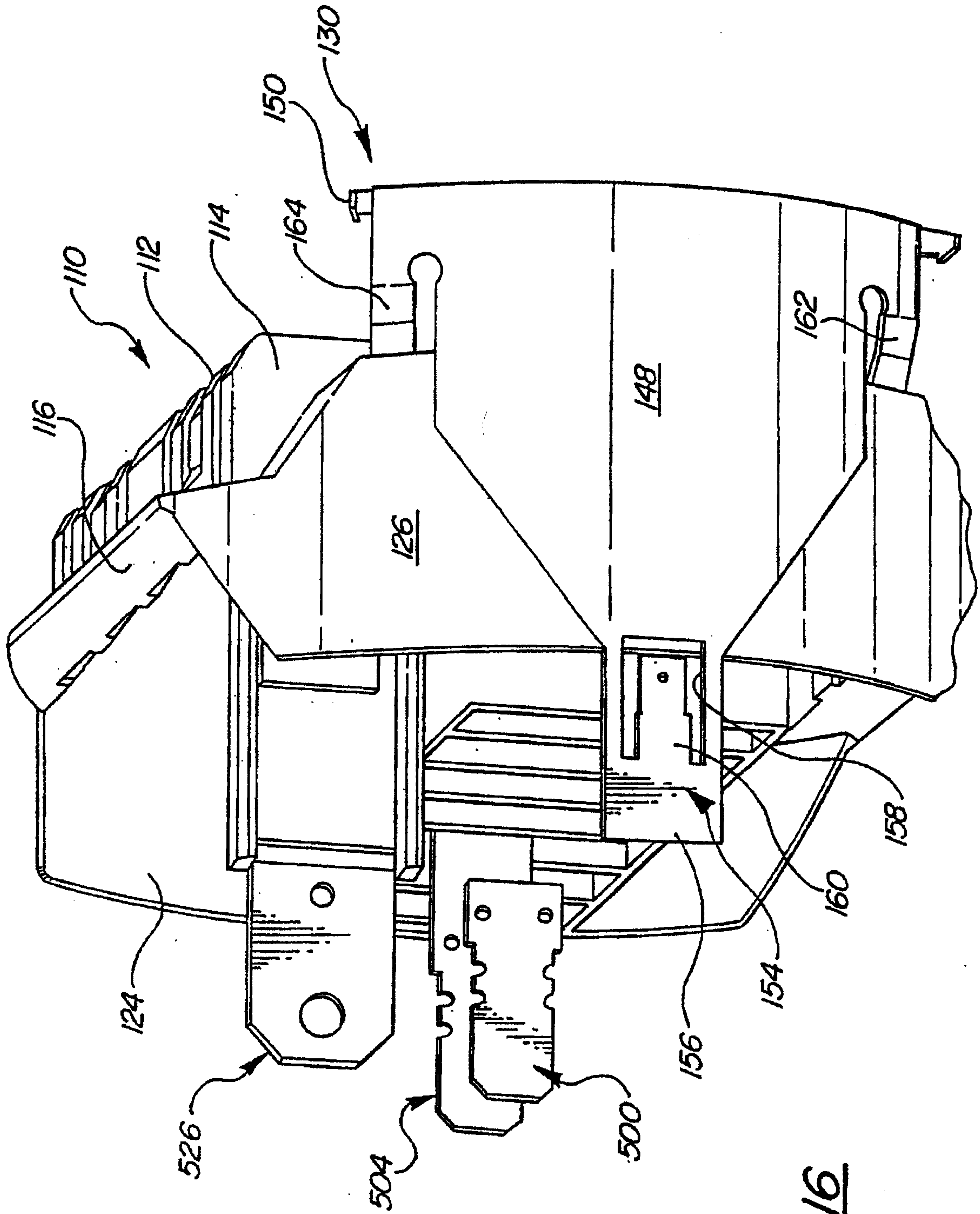
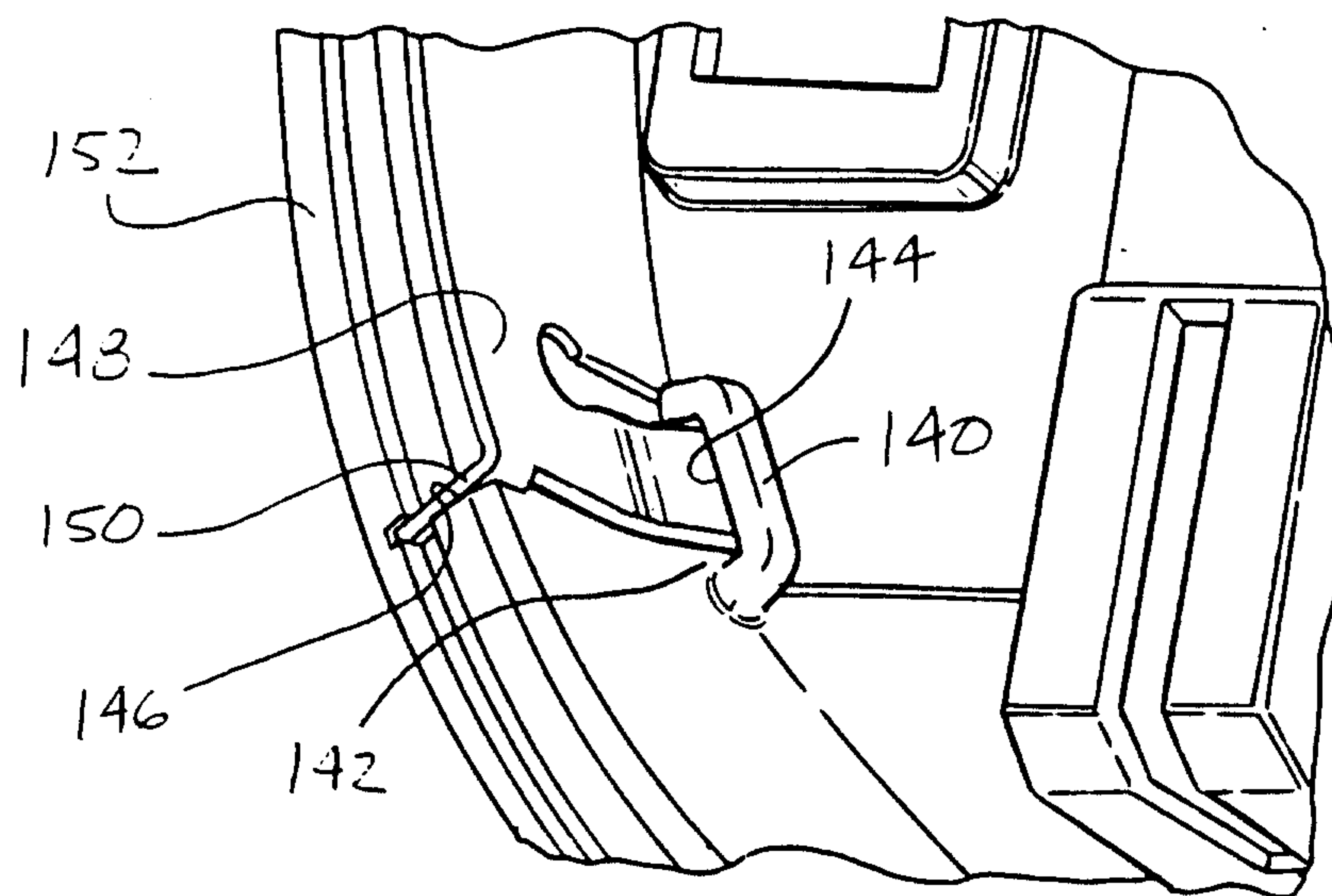
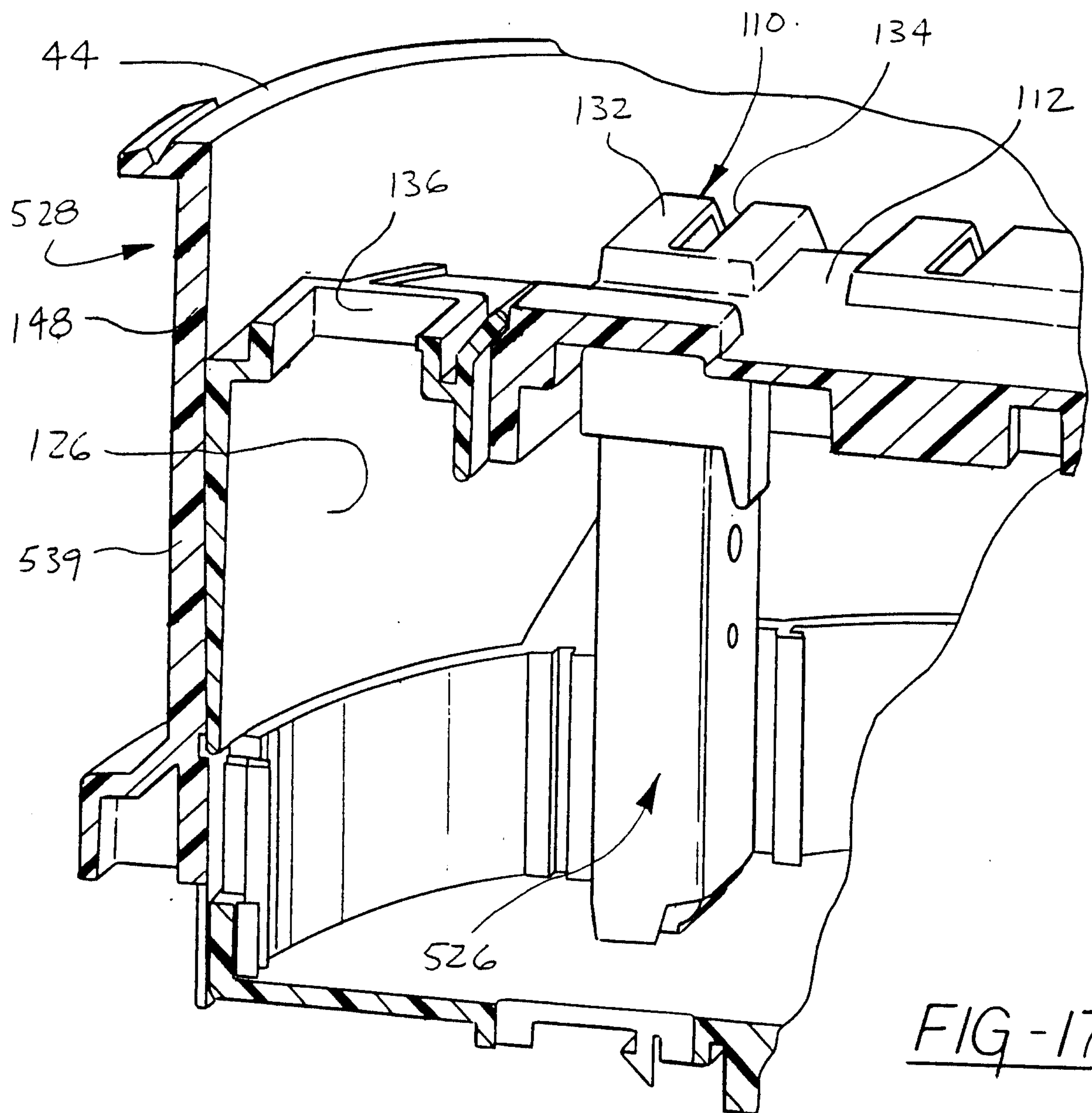


FIG-11

FIG-15





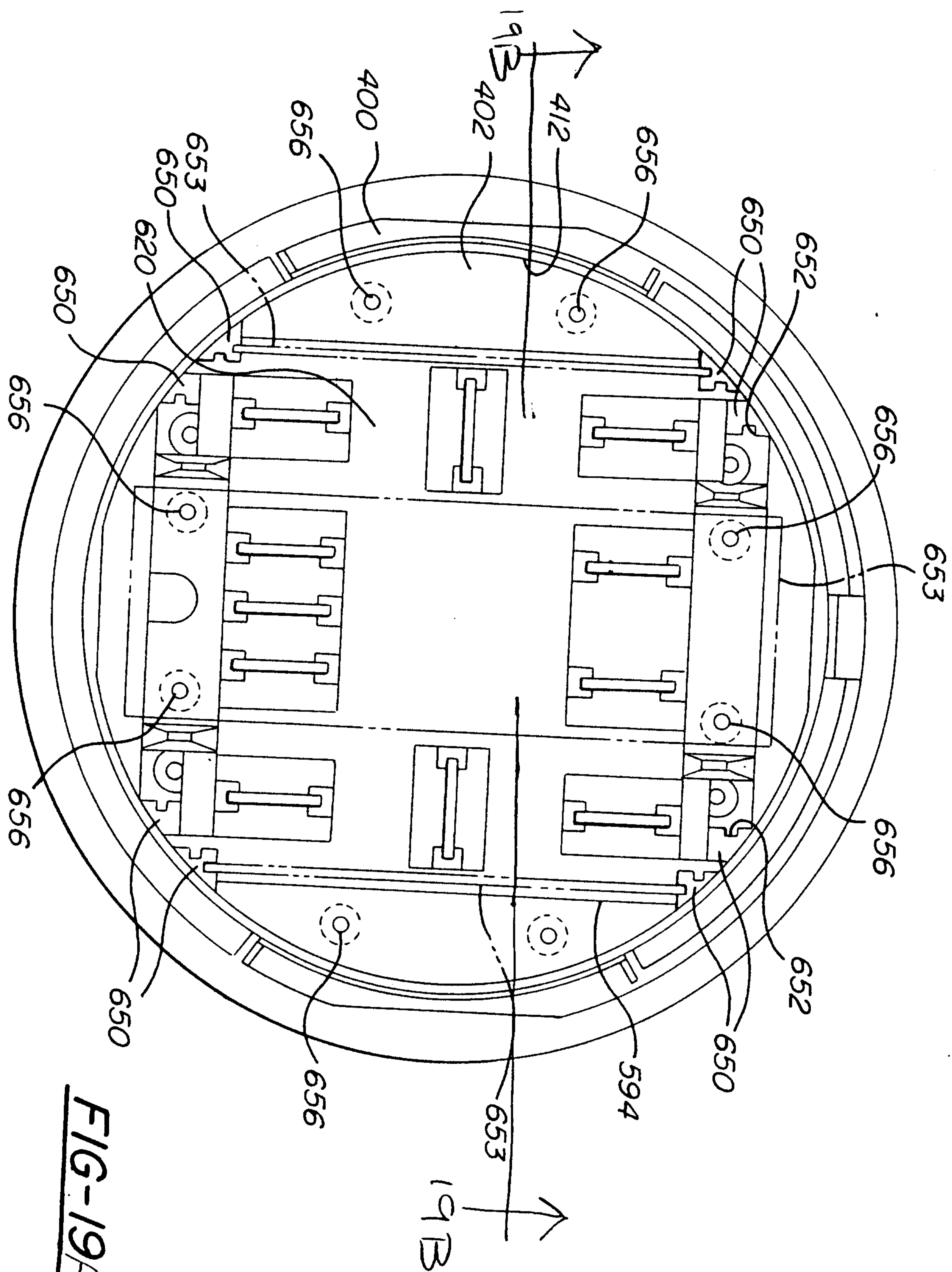


FIG-19A

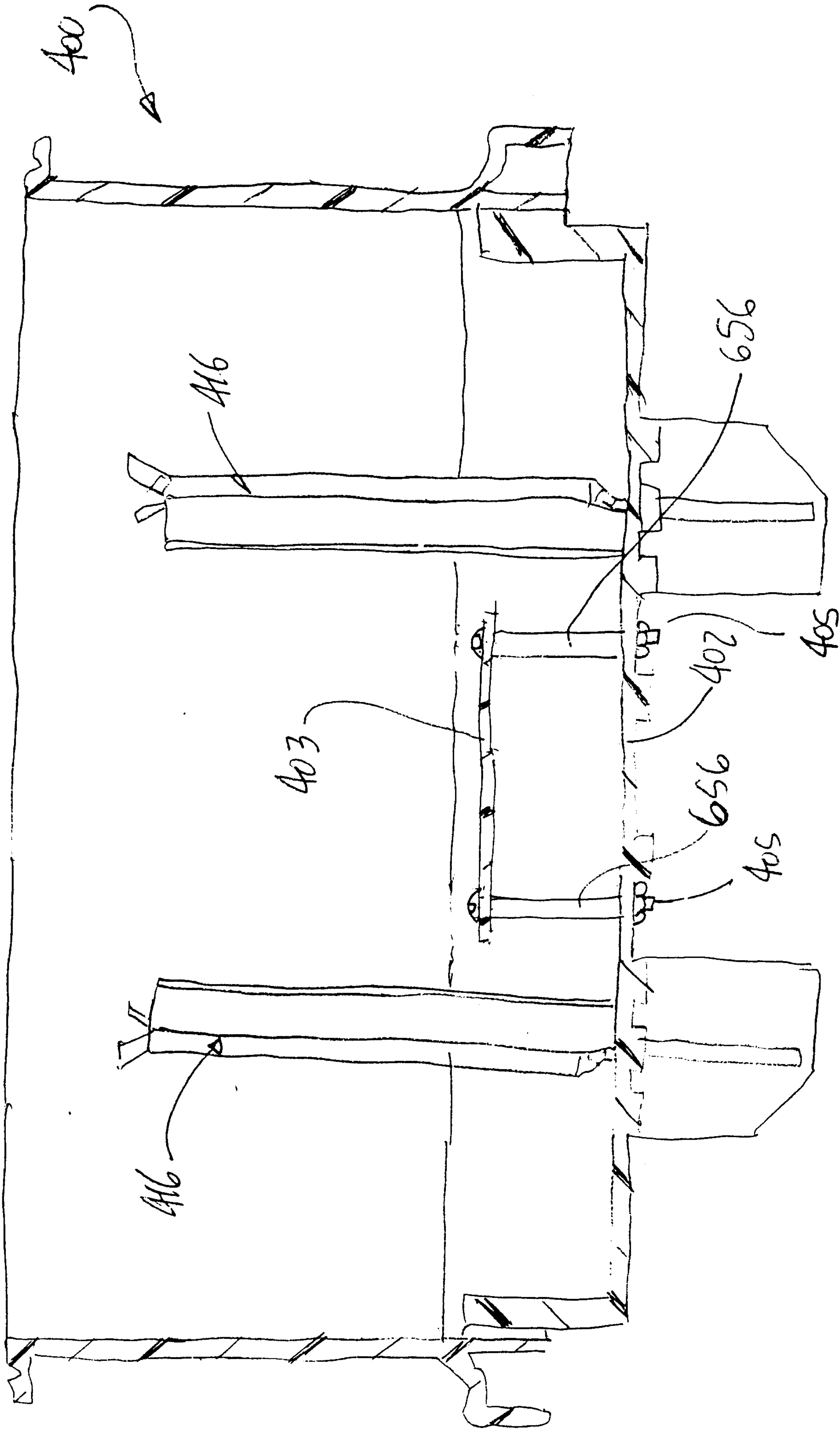


FIG 19B

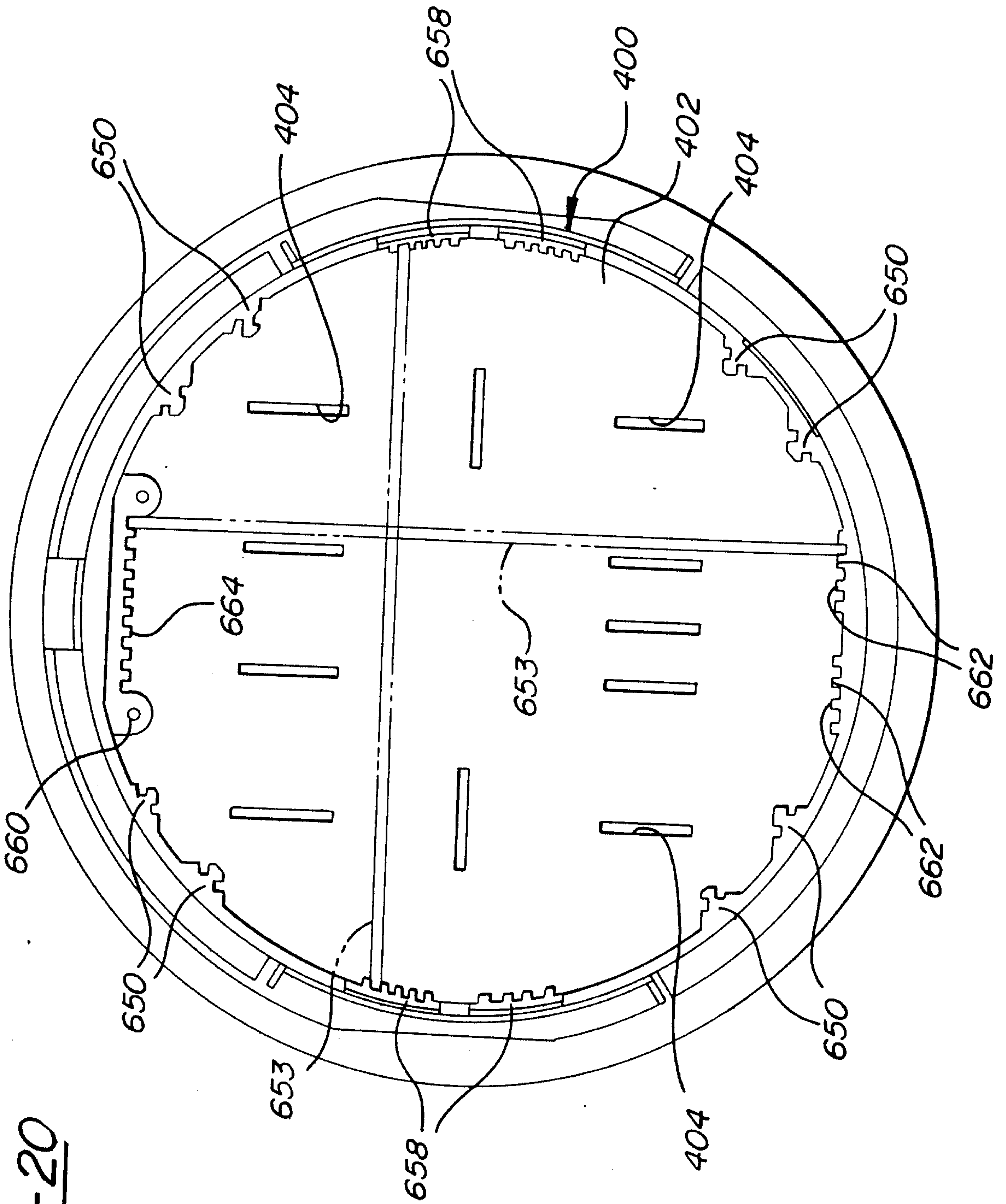
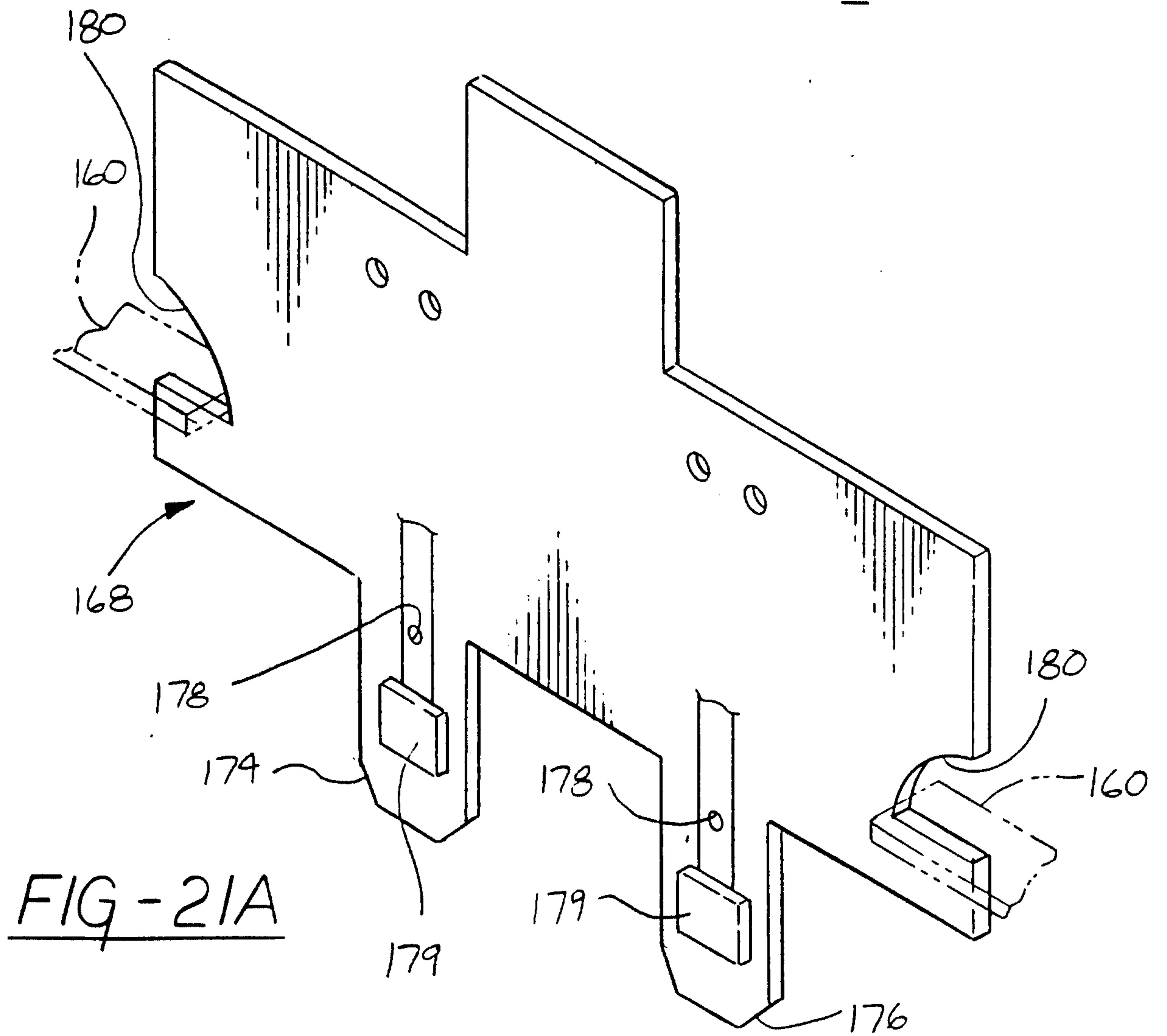
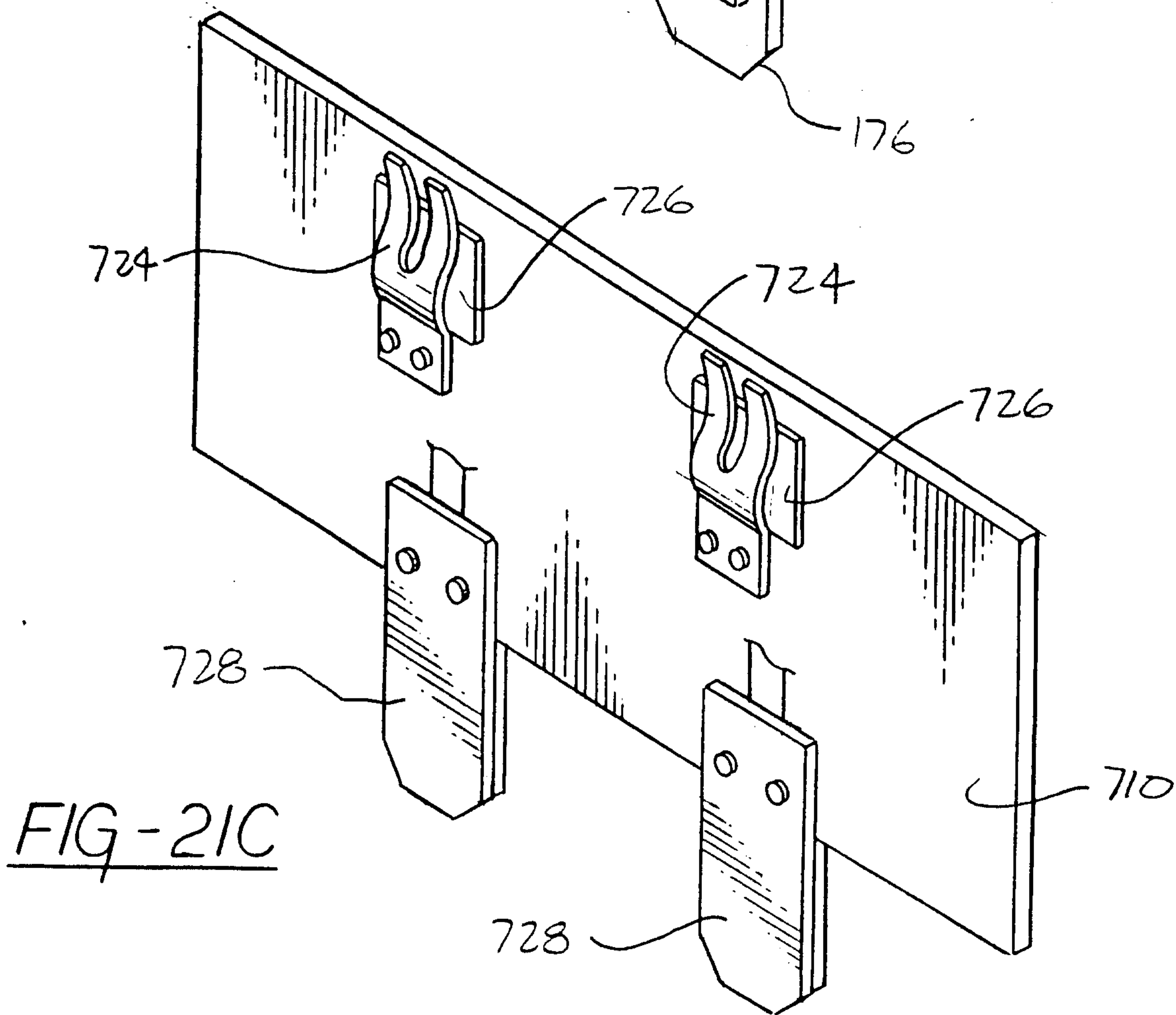
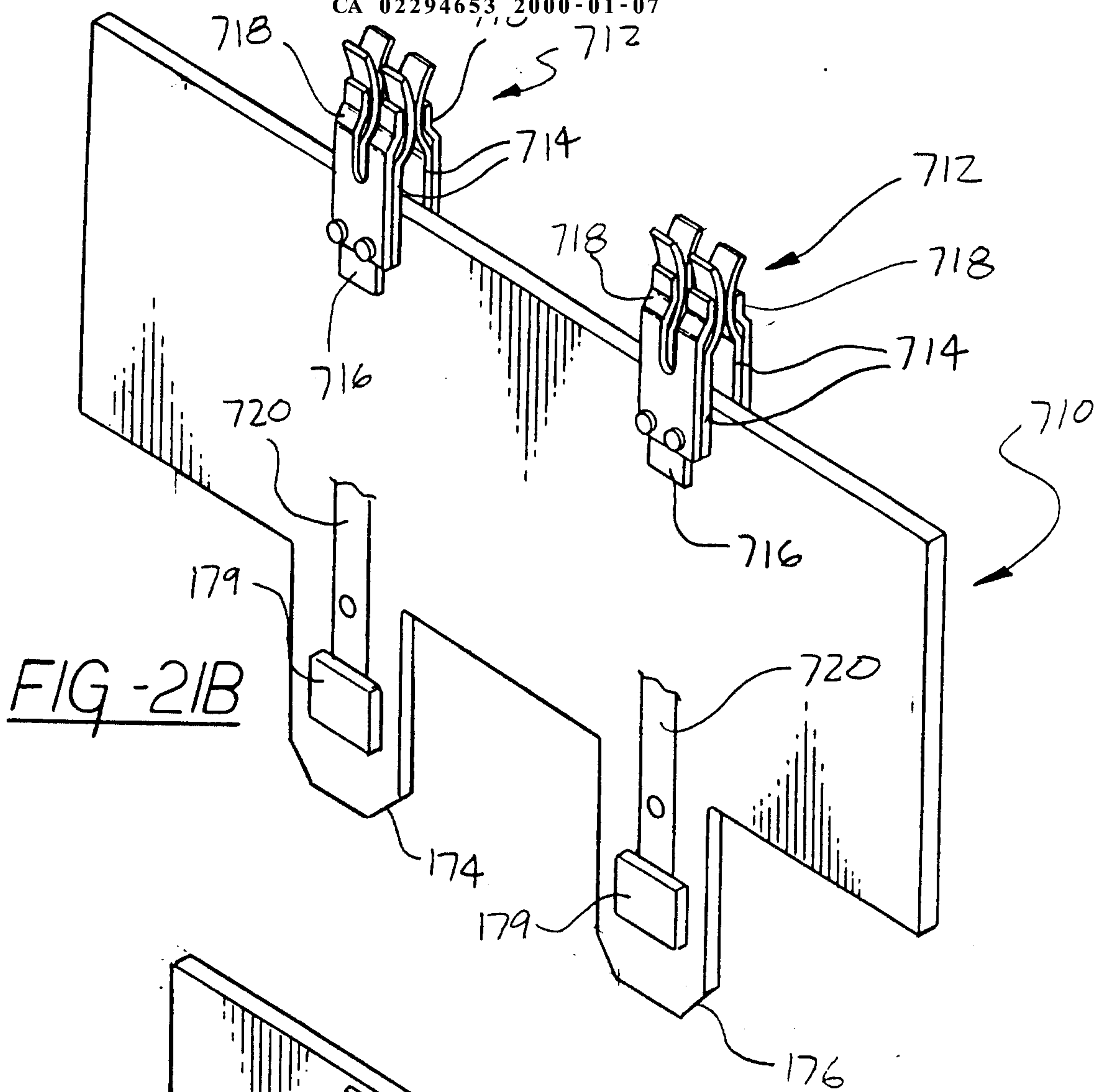


FIG-20





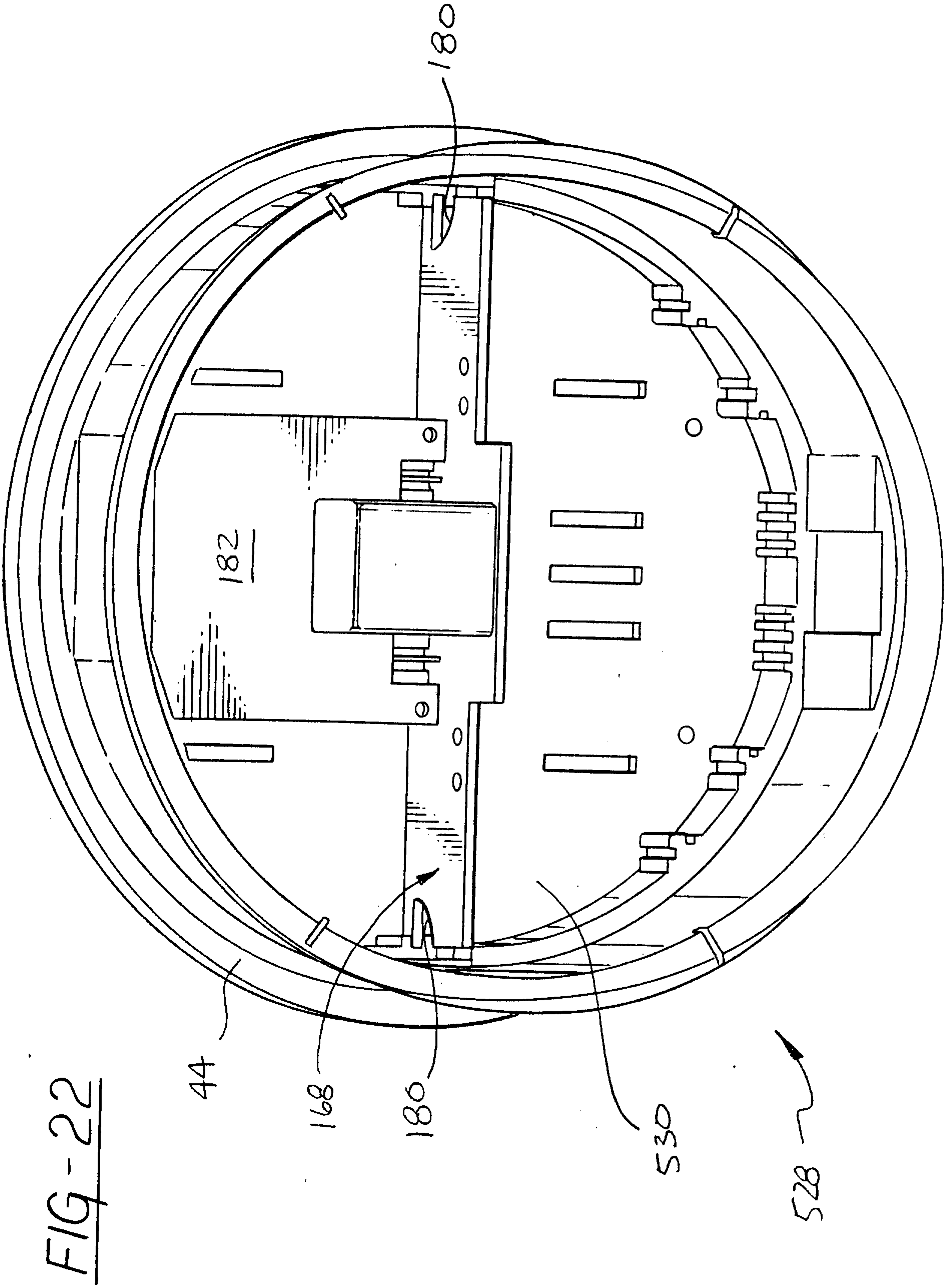
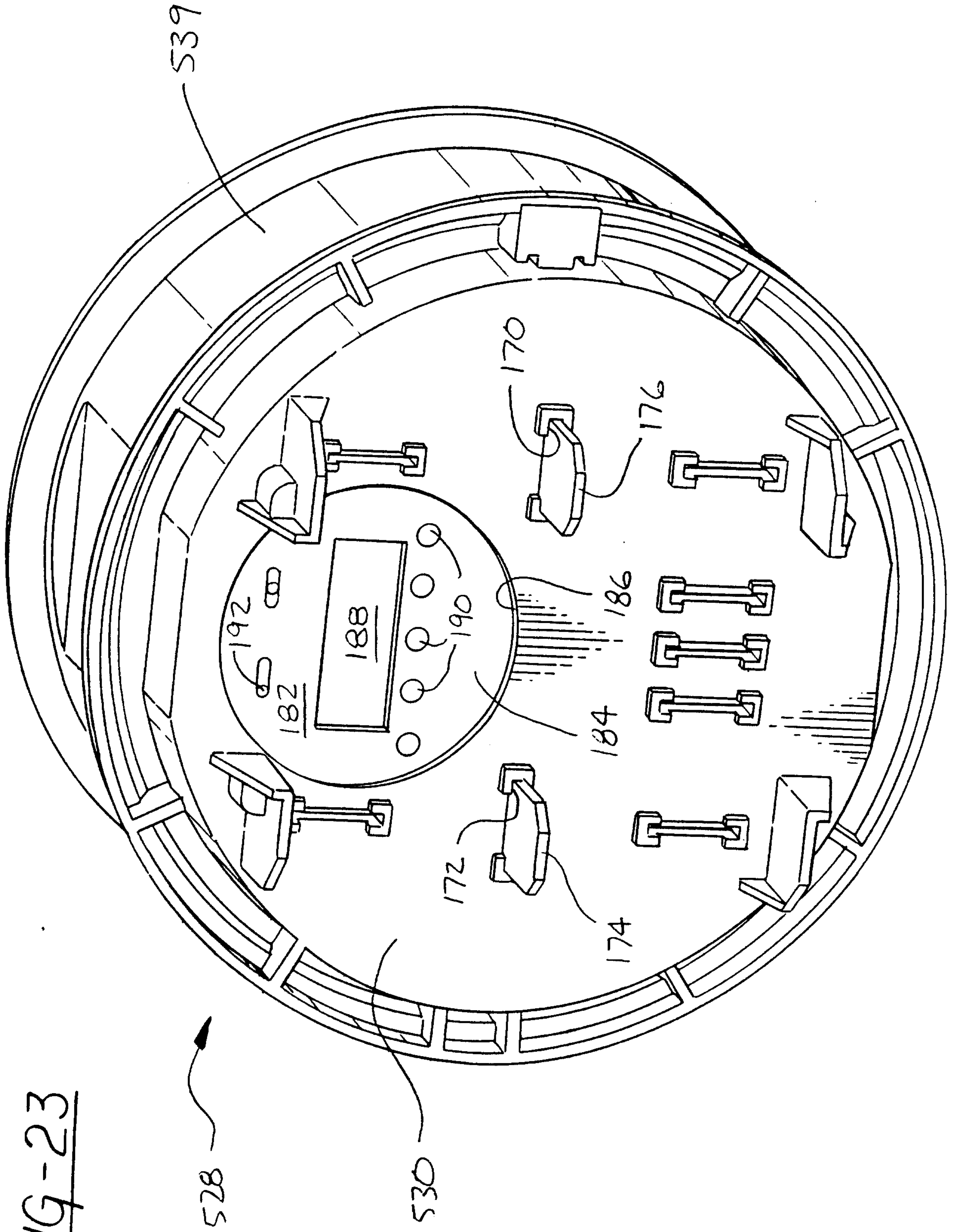
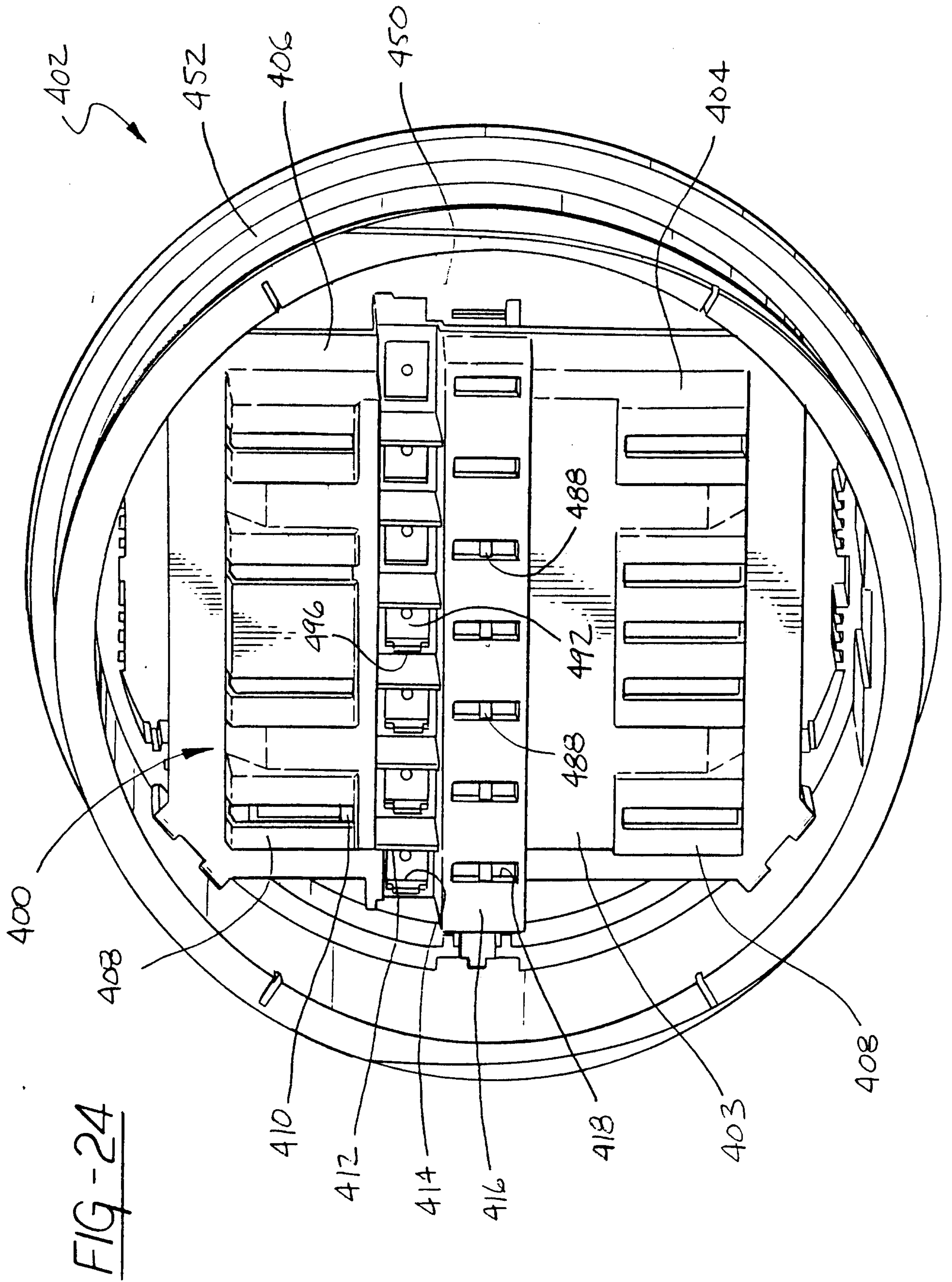
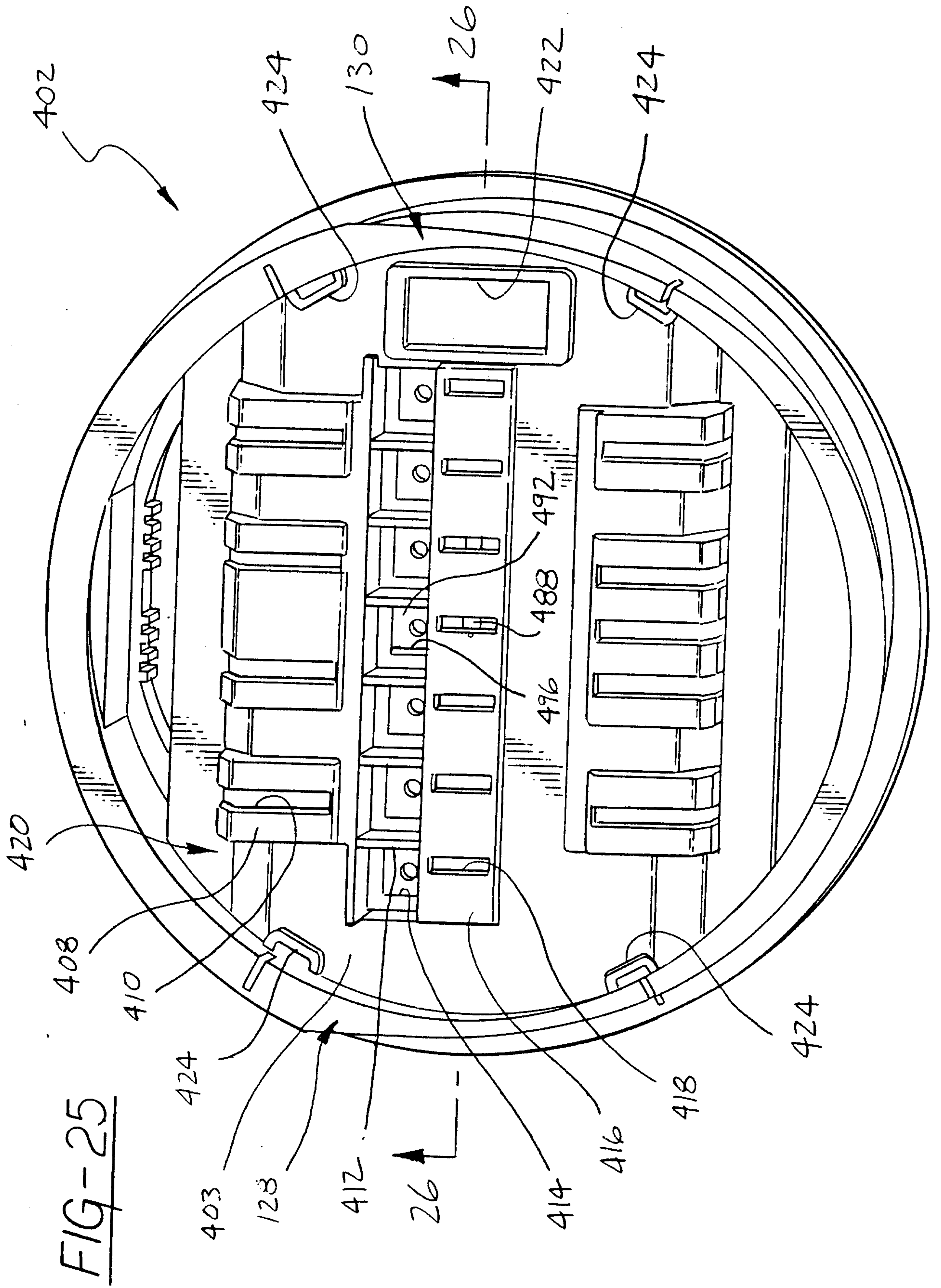
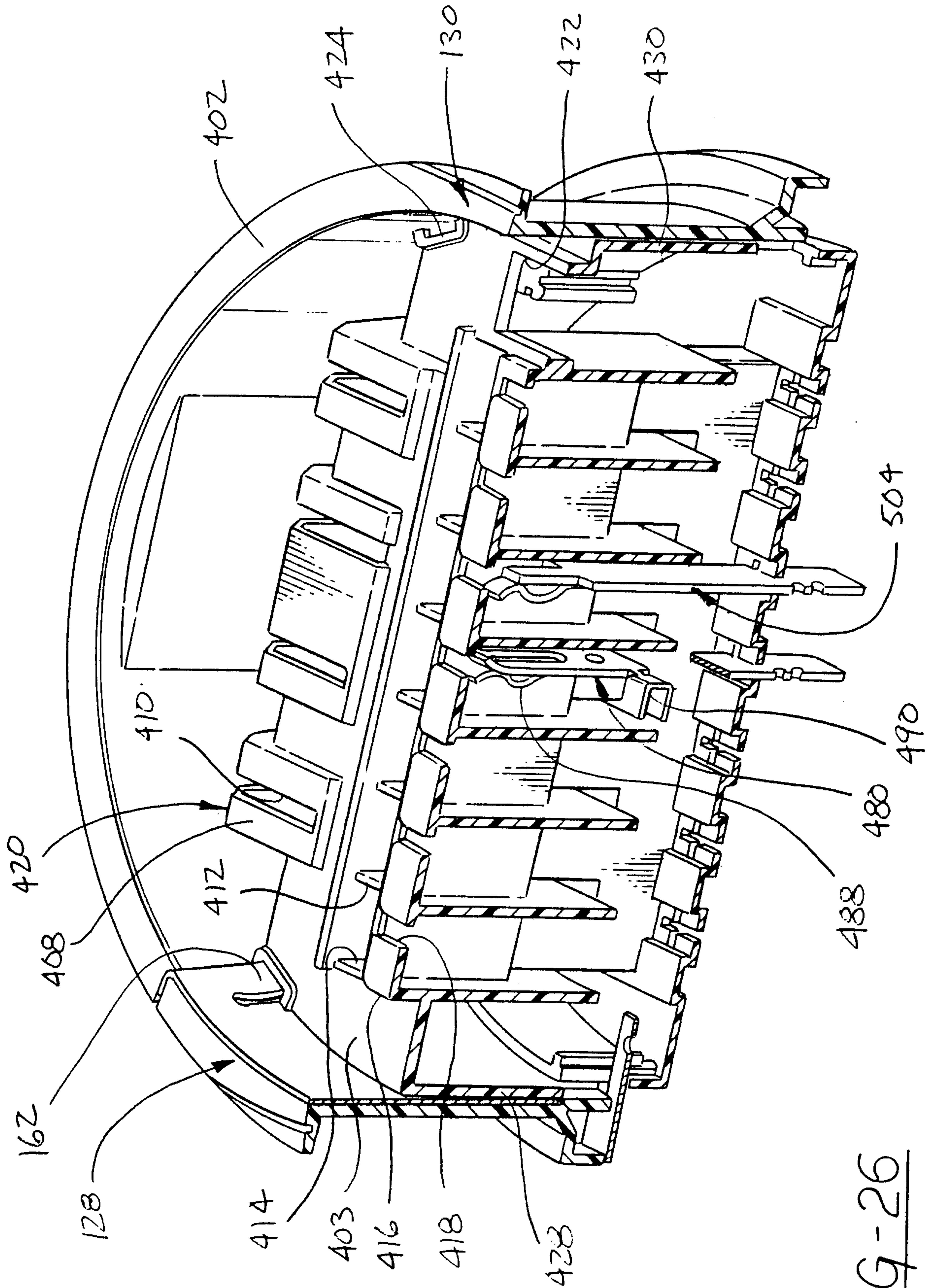


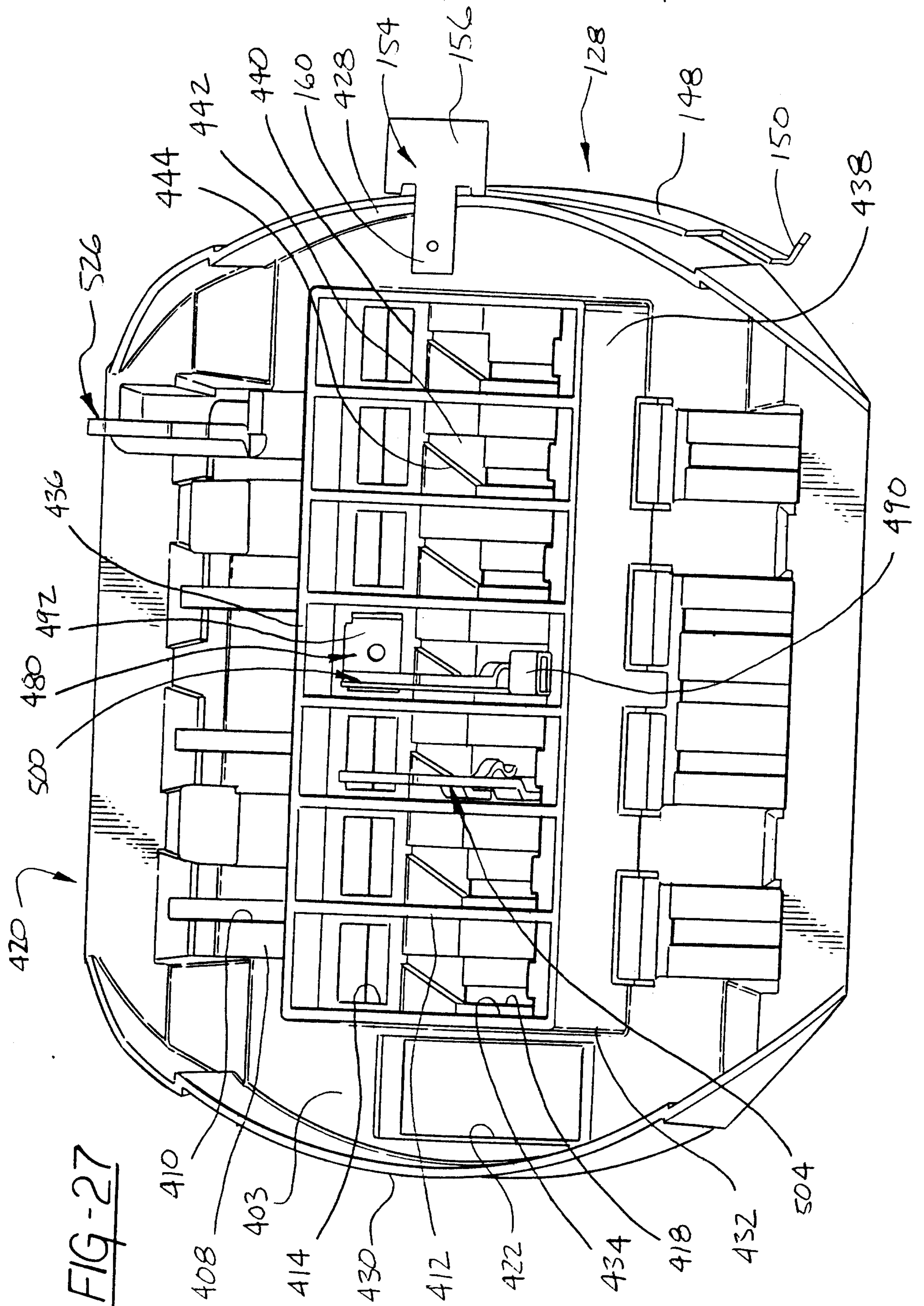
FIG-23











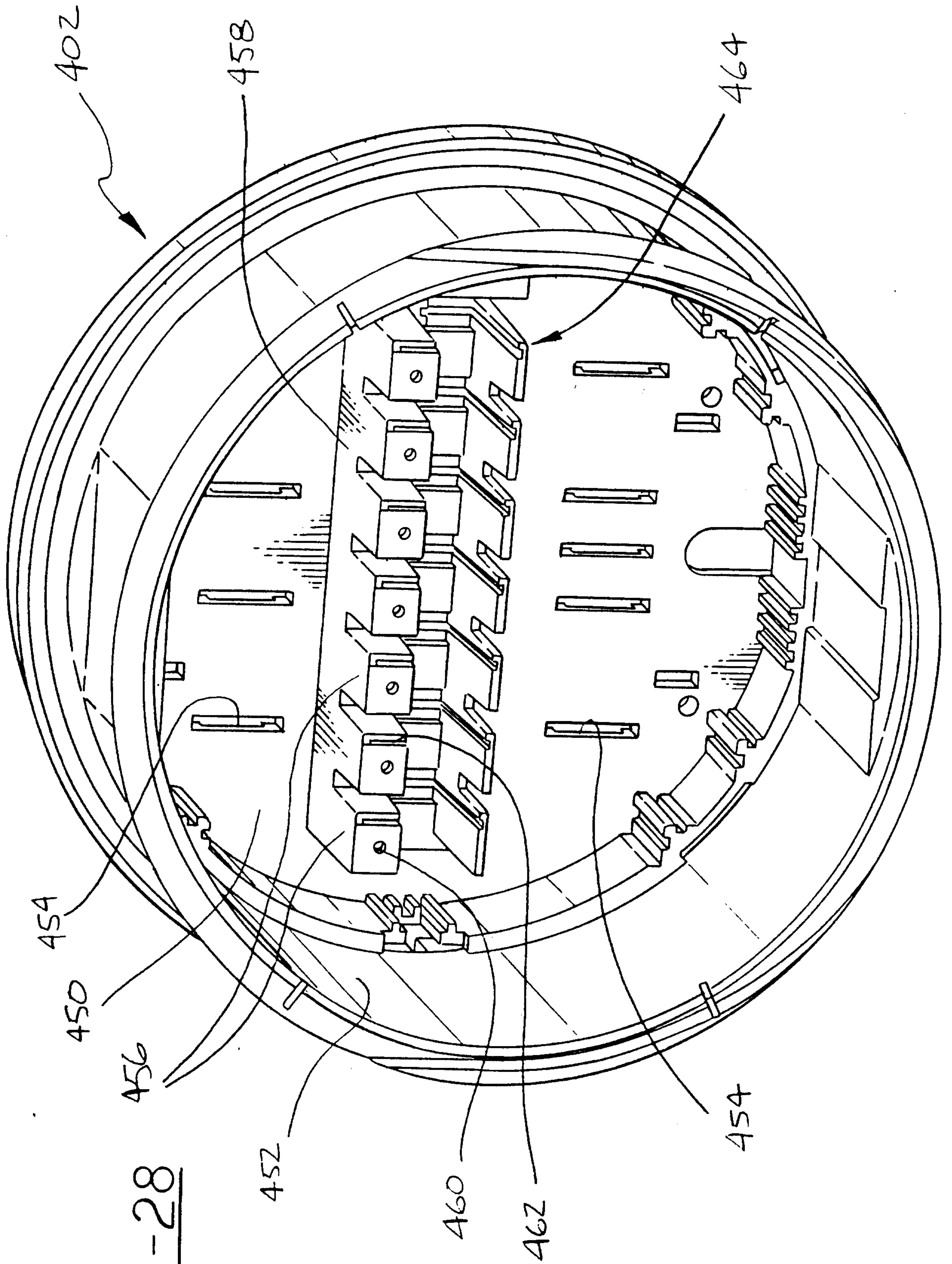


FIG-28

FIG-29

