Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2237402 C 2004/03/30

(11)(21) 2 237 402

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(86) Date de dépôt PCT/PCT Filing Date: 1996/11/04
(87) Date publication PCT/PCT Publication Date: 1997/05/22
(45) Date de délivrance/Issue Date: 2004/03/30
(85) Entrée phase nationale/National Entry: 1998/05/12
(86) N° demande PCT/PCT Application No.: US 1996/017601
(87) N° publication PCT/PCT Publication No.: 1997/018057
(30) Priorités/Priorities: 1995/11/13 (60/006,575) US;
1996/09/10 (08/707,923) US

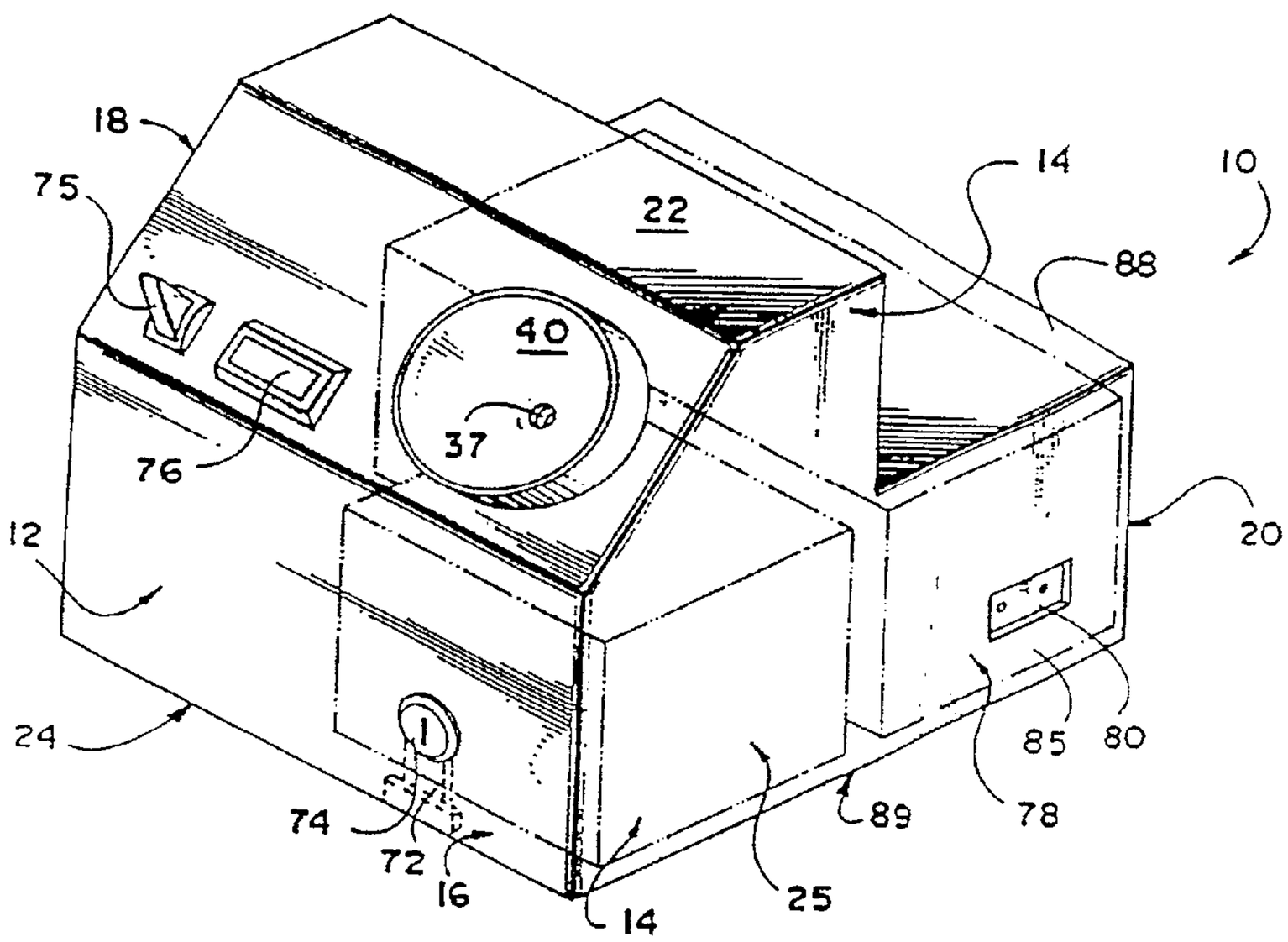
(51) Cl.Int.^{6}/Int.Cl.^{6} B23H 9/00, A61M 5/32, A61L 11/00, B23K 11/22

(72) Inventeur/Inventor:
BUTLER, WILLIAM F., US

(73) Propriétaire/Owner:
Q CARE INTERNATIONAL, LLC, US

(74) Agent: FINLAYSON & SINGLEHURST

(54) Titre : PROCEDE ET DISPOSITIF POUR DETRUIRE ELECTRIQUEMENT UNE AIGUILLE DE SERINGUE
(54) Title: METHOD AND APPARATUS FOR ELECTRICALLY DESTROYING A SYRINGE NEEDLE



(57) Abrégé/Abstract:
After a needle is received in a loading position, the needle carriage (210) is rotated downwardly to a cutoff position. At the cutoff position, two opposing contact blades (220, 230) pinch the needle, which electrically connects the positive and negative terminals of a battery. Current flows through the contact blades (220, 230) and the needle, thereby melting the needle. A slight further rotation of the needle carriage (210) causes the contact blades (220, 230) to shear the needle. The sheared portion of the needle then falls into a waste compartment. When the syringe is removed from the needle carriage (210), the needle carriage (210) rotates upwardly and returns to the loading position. Torsion spring (236) provides constant pressure against a contact blade (230) to maintain the needle carriage (210) in the loading position in the absence of any downward pressure.

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : **B23K 11/22, A61G 12/00, A61M 5/32, B09B 3/00**

A1

(11) International Publication Number: **WO 97/18057**

(43) International Publication Date: 22 May 1997 (22.05.97)

(21) International Application Number: PCT/US96/17601

(22) International Filing Date: 4 November 1996 (04.11.96)

(30) Priority Data:

60/006,575	13 November 1995 (13.11.95)	US
08/707,923	10 September 1996 (10.09.96)	US

(71)(72) Applicant and Inventor: BUTLER, William, F. [US/US]; 680 Atlanta Country Club Drive, Marietta, GA 30067 (US).

(74) Agents: HARTSELLE, William, A. et al.; Jones & Askew, 37th floor, 191 Peachtree Street, N.E., Atlanta, GA 30303-1769 (US).

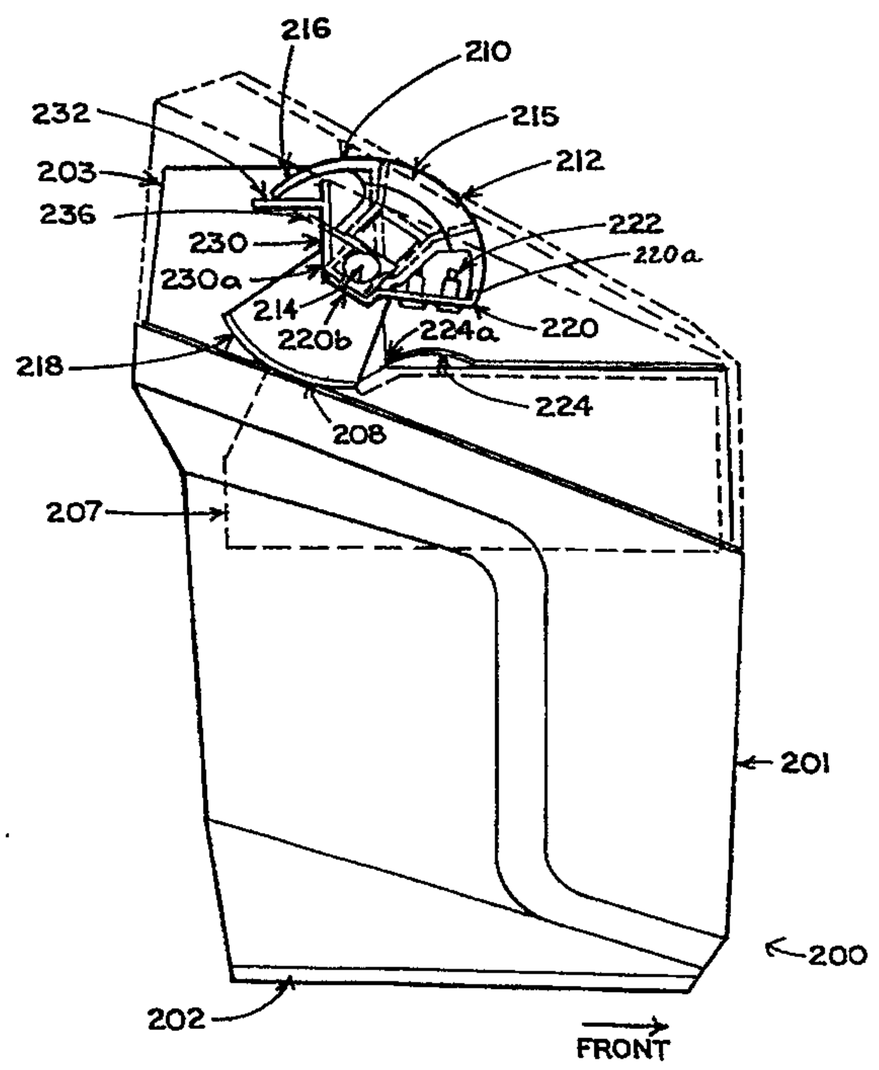
(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: METHOD AND APPARATUS FOR ELECTRICALLY DESTROYING A SYRINGE NEEDLE

(57) Abstract

After a needle is received in a loading position, the needle carriage (210) is rotated downwardly to a cutoff position. At the cutoff position, two opposing contact blades (220, 230) pinch the needle, which electrically connects the positive and negative terminals of a battery. Current flows through the contact blades (220, 230) and the needle, thereby melting the needle. A slight further rotation of the needle carriage (210) causes the contact blades (220, 230) to shear the needle. The sheared portion of the needle then falls into a waste compartment. When the syringe is removed from the needle carriage (210), the needle carriage (210) rotates upwardly and returns to the loading position. Torsion spring (236) provides constant pressure against a contact blade (230) to maintain the needle carriage (210) in the loading position in the absence of any downward pressure.



METHOD AND APPARATUS FOR ELECTRICALLY DESTROYING A SYRINGE NEEDLE

Technical Field

This invention relates to a method and apparatus for destroying the needle portion of a syringe. In particular, the present invention relates to a method and apparatus that heats, sterilizes and severs the needle portion of a syringe after the needle has been used on a patient.

Background of the Invention

The threat of infectious diseases, in particular AIDS and hepatitis B, is very prevalent today in hospitals and doctors' offices as a result of the use of hypodermic syringes. The Centers for Disease Control in Atlanta has extensively studied accidental syringe sticking incidents and have logged where most of the accidents occur and to whom. The Centers' records indicate that nurses experience more incidents than most other medical personnel.

Recovering the needle with the plastic tip cover provided with the syringe after use has not solved the problem because the cover can slip off or a person can be stuck by merely attempting to place the cover on the needle. Other means presently utilized for the disposal of used syringes still leave the steel of the hypodermic needle on the syringe, thereby exposing the waste handlers to the possibility of being pricked. The present syringe disposal systems are also very expensive.

The prior art includes the apparatus disclosed in U.S. Patent No. 4,628,169 which describes an apparatus for melting only the tip of the needle, with the remainder of the metal on the syringe being detached by a separate operation. The remaining metal portion may still be contaminated. That system still leaves the possibility of the person collecting the remaining needle portion being exposed to microorganisms. Also, any infectious fluids are still available to flow out of the now–open plastic portion of the syringe.

U.S. Patent No. 4,877,934 discloses a needle destroying apparatus which utilizes

converging electrodes. The hypodermic syringe is inserted into the apparatus in a vertical orientation and is either slid onto a bottom electrode ramp or an electrode that can slide toward the bottom electrode thereby destroying the needle. However, because of the vertical orientation of the needle as it is inserted into the apparatus, the burnt needle tends to bend away from the ramp and loses contact with the bottom electrode. In addition, because of the vertical orientation, the burnt needle tends to collect on the bottom electrode thereby fouling the surface of the bottom electrode.

What is needed is a needle destruction apparatus that is easy to operate and will reliably destroy the needle efficiently. What is further needed is an apparatus that can be used in the clinic that can be used for long periods of time before it has to be taken apart and cleaned. An apparatus is needed that will treat used syringes to prevent storage of live viruses and other microorganisms in unsealed containers at room temperature, causing unwanted aerosol vapor to contaminate room air breathed by health care workers and patients.

Summary of the Invention

The invention in one broad aspect pertains to an apparatus for removing the needle portion of a syringe comprising a housing, a needle carriage for receiving a needle in a loading position, the needle carriage being rotatably connected to the housing from the loading position to a cut–off position. A first contact blade is connected to the needle carriage and a second contact blade is secured within the housing, wherein the needle carriage and the contact blades are oriented such that when the needle carriage is rotated from the loading position to the cut–off position, the first and second contact blade each contact the needle.

Another aspect of the inveniton provides a method for removing the needle portion of a syringe, comprising the steps of inserting a needle into a needle carriage in a loading position, the needle carriage being rotatably connected to a housing, rotating the needle

carriage from the loading position to a cut–off position, causing a first contact blade and a second contact blade to contact the needle when the needle carriage is in the cut–off position, causing an electrical current to pass through the first contact blade, the needle and the second contact blade to melt the needle and severing a portion of the needle with the first and second contact blades.

More particularly, the present invention is an apparatus for destroying a syringe needle comprising a housing and a rotating needle carriage that receives a needle in a loading position. The needle carriage is rotated downwardly to a cut–off position. At the cut–off position, two opposing contact blades pinch the needle, which electrically connects the positive and negative terminals of a battery. Current flows through the contact blades and the needle, thereby melting the needle. A slight further rotation of the needle carriage causes the contact blades to sever a portion of the needle. The severed portion of the needle then falls into a waste compartment in the bottom of the housing. When the remainder of the needle is removed from the needle carriage, the needle carriage rotates upwardly and returns to the loading position.

Accordingly, the present invention seeks to provide a safe, low cost, efficient and easy to use device for sterilizing and destroying the metal needle of a hypodermic syringe, thereby killing any infectious microorganism that may be present in or on the needle.

Brief Description of the Drawings

Fig. 1 is a perspective view of the present invention.

Fig. 2 is a side view in partial cross–section of the device of Fig. 1.

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

Fig. 4 is a front view of the device of Fig. 1.

Fig. 5 is a perspective view of a first alternative embodiment of Fig. 1.

Fig. 6 is a partial cross-section view of the device of Fig. 5.

Fig. 7 is a perspective view of a second alternative embodiment of the present invention.

Fig. 8 is an enlarged view of a portion of the device of Fig. 7.

Fig. 9 is a cross-sectional view of a third alternative embodiment of the present invention.

Fig. 10 is an enlarged exploded view of a portion of the device of Fig. 11.

Fig. 11 is a perspective view of a fourth alternative embodiment of the present invention.

Fig. 12 is a cross-sectional view of the device of Fig. 11.

Fig. 13 is a partial cross-sectional view of a fifth alternative embodiment of the present invention, with part of the housing removed for detail.

Fig. 14 is a front view of the device of Fig. 13.

Fig. 15 is a partial cross-sectional view of the device of Fig. 13 with the needle carriage in the loading position.

Fig. 16 is partial cross-sectional view of the device of Fig. 13 with the needle carriage in the cut-off position.

Detailed Description

The present invention is a method and apparatus for destroying the needle portion of a hypodermic syringe. The present invention is, in part, an apparatus that is capable of simultaneously sterilizing and destroying the needle portion of a hypodermic syringe and thereby eliminating the risk of infection by a microorganism that may be present in or on the needle.

When a syringe is inserted into the apparatus described herein, the needle is heated to a temperature of at least 1750°C. This temperature is capable of inactivating any virus, bacteria, yeast or other microorganism. In addition to being

heated, the needle is melted so that it is removed from the remaining portion of the syringe. The nub remaining after the needle is melted and sealed so that no fluid can leak from the syringe.

Referring now to Figs. 1 through 4, the numeral **10** denotes generally the present invention which comprises a housing **12**, a burning chamber **14** and waste collection means **16**. The housing **12** can be made of any suitable material, such as metal, plastic or the like so long as the material is capable of maintaining structural integrity if exposed to sparks caused by the melting needle. The housing **12** is generally defined with side surfaces **18**, end surfaces **20**, a top surface **22**, and a bottom surface **24**. It is to be understood that the apparatus according to the present invention can be mounted to a wall or a surface such as the bottom of a wall cabinet or set on a counter.

The burning chamber **14** occupies the forward end of the housing **12** and preferably is constructed of a heat resistant material. The burning chamber **14** is defined by side chamber walls **25**, a chamber top **26**, rear chamber wall **28**, front chamber wall **30** and a preferably non-vertical front face wall **32**. A first electrical contact **33** is mounted on the front face wall **32**. As seen more clearly in Fig. 2, the first electrical contact **33** is a conical shaped port **40** which is mounted to the front face wall **32** of the burning chamber **14** by means of screws **5**. The first electrical contact **33** is connected by wire **51** to a battery **78**. The port **40** tapers downwardly in the outer center surface and has an opening **37** disposed therethrough. The port **40** and opening **37** are dimensional to receive the metal needle portion **42**, the neck portion **44**, shoulder portion **46** and body portion **48** of a hypodermic needle **50**.

A second electrical contact is a block **53** mounted within the burning chamber **14** to the rear chamber wall **28** and top **26** by means of mounting brackets **55** and screws **57**. The block **53** is rectangular in shape with its lower surface **54** aligned perpendicular with the front face wall **32**. The centerline of the

lower surface **54** is coaxial with the centerline of the opening **37** of the port **40**. Wire **52** connects the block **53** with the electrical circuitry within the housing **12** through rear chamber wall **28**. The block **53** is preferably made of carbon.

The diameter of opening **37** can be of such size as to accept conventional 22-, 18-, 14- or any other gauge stainless steel needles therethrough. Additionally, the device **10** may incorporate a plurality of needle receiving means so that a single device **10** may be used to destroy a number of different style and diameter needles, such as, for example, intravenous, butterfly and catheter placement needles.

The optional waste collection means **16** is disposed beneath and in communication with the burn chamber **14** and comprises a tray **70** that is slidably removable from housing **12**, as shown in Fig. 2. The tray **70** receives therein the melted needles that result from the operation of the device **10**.

The tray **70** is retained within the housing **12** by means of a locking arm **72** that is operatively connected to the keylock **74**. The keylock **74** is a safety feature, ensuring that only authorized personnel open the device **10**. By turning a key (not shown), the user turns the key lock **74** and releases the locking arm **72** and allows the tray **70** to be removed.

A toggle switch **75** is mounted to the front face **32** of the housing **12**. An LED light **76** is also positioned on the front face **32** and when switch **75** is moved to the "ON" position the light is illuminated. The power source is normally a 12-volt battery **78** that is rechargeable through charging opening **80** in side surface **18**. The battery **78** is housed on the rear of the burning chamber **14** and is contained by rear chamber wall **28**, battery side walls **85**, battery rear wall **87**, battery top wall **88**, and battery bottom wall **89**. A second LED light, not shown, may be provided to indicate that the charging circuit is in use. A conventional breaker can be used in place of the fuse.

An electric fan **60** shown in Fig. 5 is mounted to one of the side chamber walls **25**, adjacent to the tray **70**. Wire **51**

connects the fan with the electrical circuitry within the housing **12** through the rear chamber wall **28**. Thus, the fan is activated when the switch **75** is moved to the "ON" position.

Operation

To operate the device **10**, the user flips the switch **74** to the "ON" position, which in turn allows electricity to flow from battery **78** to the first electrical contact **33** and to block **53**. The light **76** will also be illuminated, indicating that the device **10** is operative. The fan **60** will also be energized.

The user inserts the needle **50** into the port **40** until the shoulder **46** engages the port. When the length of the needle **50** is enclosed within the burning chamber **14**, the user causes the length of the needle to contact the block **53**. Because the shoulder portion **46** is in contact with the first electrical contact **33**, the needle portion **42** then acts as a jumper between contact **33** and block **53**, closing the circuit and melting the needle portion **42**. The majority of the metal needle portion **46** melts off of the needle **50** and falls into the tray **70**.

Once the needle **50** is sealed, the user withdraws the needle **50** from the device **10**. Another needle **50** may be inserted into the device **10** or the device **10** can be de-energized by turning the switch **75** to the "OFF" position. The light **76** will then go off, indicating that the device **10** is inoperative.

Waste material in tray **70** can be removed by turning the keylock **74** to the "UNLOCK TRAY" position. The contents of the tray **70** are sterile, so they can be disposed of as normal waste materials. The tray **70** will contain no contaminated metal so incidents of infection will be eliminated. The remaining body portion **48** of the needle **50** can be recycled as sterilized plastic.

First Alternative Embodiment

As seen more clearly in Figs. 5 and 6, the first alternative embodiment is similar to the device shown in Figs. 1 through 4 except that the first electrical contact **33** is mounted on

the front face wall **32** of the burning chamber **14** and comprises a fixed plate **36**. A sliding plate **38** is in sliding relation within the fixed plate **36**. A conical shaped port **40** is threadably mounted on the sliding plate **38**. The port **40** tapers downwardly through the sliding plate **38** which exits the face of fixed plate **36**. The fixed plate **36** has an opening **37** centrally disposed therethrough. The port **40** and opening **37** are dimensional to receive the metal needle portion **42**, the neck portion **44**, shoulder portion **46** and body portion **48** of a hypodermic needle **50**. Wire **51** connects the fixed plate **36** with the electrical circuitry within housing **12** through rear chamber wall **28**.

The second electrical contact **52** is a block **53** and is structured in the same manner described above for the device shown in Figs. 1 through 4.

In operation, the first alternative embodiment operates initially similar to the embodiment described above. To operate the device **10**, the user flips the switch **74** to the "ON" position, which in turn allows electricity to flow from battery **78** to the first electrical contact **33** and to block **53**. The light **76** will also be illuminated, indicating that the device **10** is operative. The fan **60** will also be energized.

The user inserts the needle **50** into the port **40** until the shoulder **46** engages the port. When the length of the needle **50** is enclosed within the burning chamber **14**, the user causes the length of the needle to contact the block **53**. Because the shoulder portion **46** is in contact with the first electrical contact **33**, the needle portion **42** then acts as a jumper between contact **33** and block **53**, closing the circuit and melting the needle portion **42**. The majority of the metal needle portion **46** melts off of the needle **50** and falls into the tray **70**.

To seal off any remaining portion of the needle, the user moves the body of the syringe upwardly while shoulder **46** of the needle is flush against the port. This upwardly motion causes the sliding plate **38** to slide within the fixed plate **36**. Any remaining metal on the needle **50** seals as it contacts solid surface

of the fixed plate **36** above the opening **37** and seals the needle. While in operation, the optional fan **60** draws any unpleasant odors and smoke resulting from the molten metal out of the burn chamber and disperses the odors through a filter into the atmosphere.

Second Alternative Embodiment

A second alternative embodiment is shown in Figs. 7 and 8. In lieu of the first electrical contact being an opening **37** on a sliding plate **38**, it is contemplated that alternatively the first electrical contact comprise a pair of opposed, spring-loaded cylinders **90**. Each of the cylinders **90** is mounted within a cylinder housing **91**. The cylinder housing **91** has a chamber **92** that receives a spring **93** and the pin **90**. The cylinder housings **91** are mounted in opposed relation to each other to the front face wall **32**. Wires **56, 58** connect the cylinders **90** with the electric circuitry within the housing **12** through the rear chamber wall **28**. The electric contact is made when pins contact the needle as it passes through the opening **37** and into the burning chamber **14**.

Third Alternative Embodiment

A third alternative embodiment is shown in Fig. 9. The third alternative embodiment is similar to the preferred embodiment discussed above except for the opening **37**. It is contemplated that the opening **37** may be dog-legged. The alternative embodiment in Fig. 9 has a port **40** and a stepped channel **95**. The channel **95** has a first length **96** connected to a second parallel length **97**. The lengths **96, 97** are not coaxial. When the needle **50** is inserted in the port **40**, the needle must pass through both lengths of the channel thus better ensuring electrical contact at that point. It must be noted that the degree of offset between the first **96** and second **97** lengths of the channel **95** cannot be greater than the channel diameter. This is to enable the needle **50** to pass through the channel **95** in a direction

substantially perpendicular with the front face wall **32** and to enable the length of the needle to contact the second electrical contact **52**.

Fourth Alternative Embodiment

A fourth alternative embodiment is shown in Figs. 11-13. This alternative embodiment is directed to the bending of the remaining needle after that majority of its length has melted. The fourth alternative embodiment is similar to the preferred embodiment in that it has a housing **12**, second electrical contact **52**, burning chamber **14**, and battery **78**.

The fourth alternative embodiment however has a different mechanism for receiving the needle and for finishing the needle butt at the end of the melting process. The fourth alternative embodiment includes an inner disc **100** threadably mounted to the front face wall **32** of the burning chamber **14**. An axle **101** extends outwardly from the center of the face of the inner disc **100**. Two pins **102** extend outwardly from opposite halves of the face of the inner disc **100**. A kidney shaped hole **103** is cut from the inner disc **100**. An outer disc **104** is rotatably mounted on the inner disc **100** by means of the axle **101**. An inner sleeve **105** is fixedly mounted to the inner surface of the outer disc **104**. The kidney shaped piece **103** receives the inner sleeve **105** and enables the inner sleeve to rotate over a limited distance. A cup **106** is mounted to the outer surface of the outer disc **104**. The cup supports and receives the syringe shoulder while the needle is inserted into the burning chamber **14**. A pair of small, kidney shaped openings **107** are located on opposite halves of the inner face of the outer disc **104**. The openings **107** receive the pins **102** mounted to the inner disc. The pins **102** provide support and enable the outer disc to rotate over a limited distance relative to the inner disc 100**100**. The distance of rotation for the outer disc **104** is defined by the arc in the openings **107** and the kidney shaped piece **103**.

In operation, the needle **50** is inserted and melted as discussed above for the preferred embodiment. After most of the length of needle has melted, any remaining needle is sealed by rotating the outer disc **104**. This causes the needle **50** to bend as it contacts the outer surface of the inner disc **100**.

It is to be understood that an important part of the present invention is preferred that the needle be inserted in a non-vertical orientation. The angle from the vertical can be between 10° and 90° with the more preferred angle range of between 20° and 75° with the most preferred angle range of approximately 45°.

It will be appreciated that the embodiments discussed above are the preferred embodiments, falling within the scope of the appended claims, and that various other alternative embodiments are contemplated. For example, the angle of the front face wall **32** may be altered to accommodate the user. Moreover, it is contemplated that the battery **78** may be stored below the burning chamber **14** for wall-mounted units.

Fifth Alternative Embodiment

A fifth alternative embodiment of the present invention is described below with reference to Figs. 13-16. In general, this alternative embodiment includes a rotating needle carriage that receives a needle in a loading position. The needle carriage is rotated downwardly to a cut-off position. At the cut-off position, two opposing contact blades pinch the needle, which electrically connects the positive and negative terminals of a battery. Current flows through the contact blades and the portion of the needle between the contact blades, thereby melting the needle and severing the metal needle from the syringe. The severed portion of the needle then falls into a waste compartment under the contact blades. When the syringe is removed from the needle carriage, the needle carriage rotates upwardly and returns to the loading position.

The apparatus **200** of this alternative embodiment of the present invention is shown in Fig. 13. The apparatus includes a housing **201**. The housing preferably includes an essentially flat bottom surface **202**, thus allowing the apparatus to be placed upright on a table, countertop, or other similar surface. As is shown in Fig. 14, located near the upper portion of the apparatus are a left upper side wall **203** and a right upper side wall **204**. A waste compartment **207**, generally comprising a hollow chamber, is located within the housing. The upper portion of the waste compartment **207** is defined by an opening **208**. A needle carriage, generally shown at **210** in Fig. 13, is rotatably connected between the upper side walls **203** and **204**.

The needle carriage **210** includes a generally convex outer surface **212**. Pins **214** rotatably connect the needle carriage to the upper side walls **203** and **204**. A port **215** for receiving a needle is provided in the needle carriage **210**. At the outermost edge of the port **215**, i.e., where the port intersects the convex outer surface **212** of the needle carriage, the port includes a wide opening **215a** (Fig. 14). The wide opening **215a** of the port **215** allows the port to accept the neck and shoulder portions of a hypodermic syringe. The port tapers to a smaller opening **215b** (Fig. 14) dimensional to receive the metal needle portion of a hypodermic syringe.

The needle carriage **210** includes an integrally formed carriage arm **216**. The carriage arm **216** extends from the port **215** toward the rear of the housing **201**. A door **218** is connected to the needle carriage **210** and is situated generally opposite the port **215**. The door **218** is of a dimension as to entirely cover the opening **208** to the waste compartment **207** when the needle carriage is in the loading position shown in Fig. 13 and Fig. 15.

Also attached to the needle carriage is a first contact blade **220**. The first contact blade **220** is formed of electrically conductive material and is secured to the lower end of the needle carriage **210**, preferably by screws **222**. Any other suitable

means of securing the first contact blade **220** to the needle carriage **210** may be utilized instead of screws. The first contact blade **220** includes an outer edge **220a** that extends toward the outer surface of the needle carriage. The first contact blade **220** also includes an inner, sharpened edge **220b** that extends inwardly, away from the outer surface of the needle carriage **210**.

A contact strip **224**, made of electrically conductive material, is connected to a portion of the housing **201** below the needle carriage **210**. The contact strip **224** is located on the housing **201** in such a manner as to allow edge **224a** of the contact strip to be contacted by the outer edge **220a** of the first contact blade **220** when the needle carriage **210** is rotated downwardly, as shown in Fig. 16. The contact strip **224** is electrically connected to a first terminal of a battery (not shown) located within the housing **201**.

A second contact blade **230** is located within the upper portion of the housing **201**. The second contact blade **230** is made of electrically conductive material and is fixedly secured within the housing **201** in a generally vertical orientation. The lower edge **230a** of the second contact blade **230** has a sharpened edge. The second contact blade **230** is electrically connected to a second terminal on the battery (not shown). The second contact blade **230** has a slot (not shown) therein through which one end of a torsion spring **236** may be situated. The location and orientation of the torsion spring **236** is shown in Fig. 15. The other end of the torsion spring **236** is fixedly secured within the housing **201**. The torsion spring **236** provides constant pressure against the second contact blade **230** to maintain the needle carriage **210** in the loading position in the absence of any downward pressure. Connected near the upper edge of the second contact blade **230** is a carriage stop **232**.

In operation, a hypodermic syringe is inserted, needle-first, into the port **215** in the needle carriage **210** with the needle carriage at the loading position, as shown in Fig. 15. The

needle is fully inserted until the neck and shoulder portions of the syringe contact wide opening **215a** of the port **215** and can be inserted no further. When the needle is fully inserted, the needle passes between the sharpened edges **220b**, **230a** of the first and second contact blades **220** and **230**, respectively.

With the needle remaining fully inserted, the syringe is moved downward so that the needle carriage **210** is rotated downwardly to the cut-off position, seen in Fig. 16. Preferably, the angular distance between the loading and cut-off positions is approximately 60 degrees. The torsion spring **236** applies pressure on the needle carriage **210** to maintain it in the loading position. However, rotation of the needle carriage **210** is caused when sufficient downward pressure is exerted on the needle carriage to overcome the resistant force exerted by the torsion spring **236**. Downward pressure is exerted on the needle carriage **210** through the neck and shoulder portions of the syringe by the person holding the syringe in the port. As the needle carriage is rotated downwardly, the needle is prevented from rotating by contact with the sharpened edge **230a** of the second contact blade **230**. Thus, the metal portion of the needle is bent near the base of the needle, as seen in Fig. 16.

When the needle carriage is rotated downwardly to the cut-off position, as seen in Fig. 16, the outer edge **220a** of the first contact blade **220** contacts the contact strip **224** and the inner, sharpened edge **220b** of the first contact blade **220** contacts the needle. Therefore, when the needle carriage is rotated to the cut-off position, an electrical circuit is formed by the battery (not shown), the contact strip **224**, the first contact blade **220**, the metal needle, and the second contact blade **230**. Electrical current flowing from the battery through the circuit is of such an amperage as to melt the metal portion of the needle between contact blades **220** and **230**. A slight additional downward rotation of the needle carriage **210** causes the sharpened edges of the first and second contact blades to pinch the metal needle, shearing the needle at the pinch point.

When the needle carriage **210** is rotated to the cut-off position shown in Fig. 16, the door **218** is rotated away from the opening **208** to the waste compartment **207**. Therefore, when the melted metal needle is sheared by the first and second contact blades, the severed portion of the needle falls downwardly, through the opening into the waste compartment.

After the needle is melted and severed at the pinch point, the hypodermic syringe is removed from the port **215** in the needle carriage **210**. Removing the syringe from the needle carriage removes the downward pressure on the needle carriage. With no downward pressure on the needle carriage, the torsion spring **236** exerts an upward force on the needle carriage. The torsion spring therefore causes the needle carriage **210** to rotate upwardly to the loading position. Rotation of the needle carriage **210** is halted at the loading position by the carriage stop **232**, which contacts the carriage arm **216** to prevent any further upward rotation of the needle carriage. When the needle carriage **210** is at the loading position, the door **218** is situated over the opening **208** to the waste compartment **207**, thereby ensuring that the severed needles remain in the waste compartment.

From the foregoing it will be appreciated that the disclosed embodiments of the present invention overcome the drawbacks of the prior art described hereinabove. From the description of the embodiments herein, equivalents of the elements shown therein will suggest themselves to those skilled in the art and way of constructing other embodiments of the present invention will suggest themselves to practitioners of the art. Therefore, the scope of the present invention is to be limited only by the claims below.

CLAIMS

What is claimed is:

1. An apparatus for removing the needle portion of a syringe comprising:

a housing;

a needle carriage for receiving a needle in a loading position, said needle carriage being rotatably connected to the housing from the loading position to a cut-off position;

a first contact blade connected to the needle carriage; and

a second contact blade secured within the housing;

wherein said needle carriage and said contact blades are oriented such that when said needle carriage is rotated from the loading position to the cut-off position, the first and second contact blade each contact the needle.

2. The apparatus of claim 1 wherein the first and second contact blades sever a portion of the needle when the needle carriage is rotated to the cut-off position.

3. The apparatus of claim 2 further comprising a waste compartment located within the housing for receiving the severed portion of the needle, the upper portion of the waste compartment having an opening located generally beneath the needle carriage.

4. The apparatus of claim 3 further comprising a door connected to the needle carriage, wherein said door is of a dimension to cover the opening to the waste compartment when the needle carriage is in the loading position.

5. The apparatus of claim 4 wherein said door does not cover the opening to the waste compartment when the needle carriage is in the cut-off position.

6. The apparatus of claim 1 wherein the second contact blade prevents the movement of a portion of the needle, thus causing bending of the needle when the needle carriage is rotated from the loading position to the cut-off position.

7. The apparatus of claim 1 further comprising:

an electrically conductive contact strip secured to the housing such that the first contact blade contacts the contact strip when the needle carriage is in the cut-off position; and

a battery, the first terminal of which is connected to the contact strip and the second terminal of which is connected to the second contact blade.

8. The apparatus of claim 7 wherein the battery provides sufficient current to melt a portion of the needle when the needle carriage is in the cut-off position.

9. The apparatus of claim 1 further comprising a torsion spring connected to the housing, wherein the torsion spring provides pressure against the needle carriage to maintain the needle carriage in the loading position in the absence a rotational force applied to the needle carriage.

10. The apparatus of claim 1 wherein the needle carriage includes a port for receiving the neck and shoulder portions of a syringe.

11. The apparatus of claim 1 wherein the angular distance between the loading position and the cut-off position is approximately 60 degrees.

12. A method for removing the needle portion of a syringe, comprising the steps of:

(a) inserting a needle into a needle carriage in a loading position, the needle carriage being rotatably connected to a housing;

(b) rotating the needle carriage from the loading position to a cut-off position;

(c) causing a first contact blade and a second contact blade to contact the needle when the needle carriage is in the cut-off position;

(d) causing an electrical current to pass through the first contact blade, the needle, and the second contact blade to melt the needle; and

(e) severing a portion of the needle with the first and second contact blades.

13. The method of claim 12 further comprising the step of retaining the severed portion of the needle in a waste compartment.

14. The method of claim 13 wherein the opening to the waste compartment is covered by a door connected to the needle carriage when the needle carriage is in the loading position and is not covered by the door when the needle carriage is in the cut-off position.

15. The method of claim 12 wherein, during the rotating step, the second contact blade prevents the movement of a portion of the needle, thus causing bending of the needle when the needle carriage is rotated from the loading position to the cut-off position.

16. The method of claim 12, wherein the electrical current is provided by a battery, the first terminal of which is connected to a contact strip that contacts the first contact blade when the needle carriage is rotated to the cut-off position and the second terminal of which is connected to the second contact blade.

17. The method of claim 12 wherein the needle carriage includes a port for receiving the neck and shoulder portions of a syringe.

18. The method of claim 12 wherein the angular distance between the loading position and the cut-off position is approximately 60 degrees.

19. The method of claim 12 wherein the inserting step includes inserting the syringe needle into a port in the needle carriage such that the neck and shoulder portions of the syringe contact the port.

20. The method of claim 19 wherein the rotating step is performed by exerting downward pressure on the needle carriage through the neck and shoulder portions of the syringe.

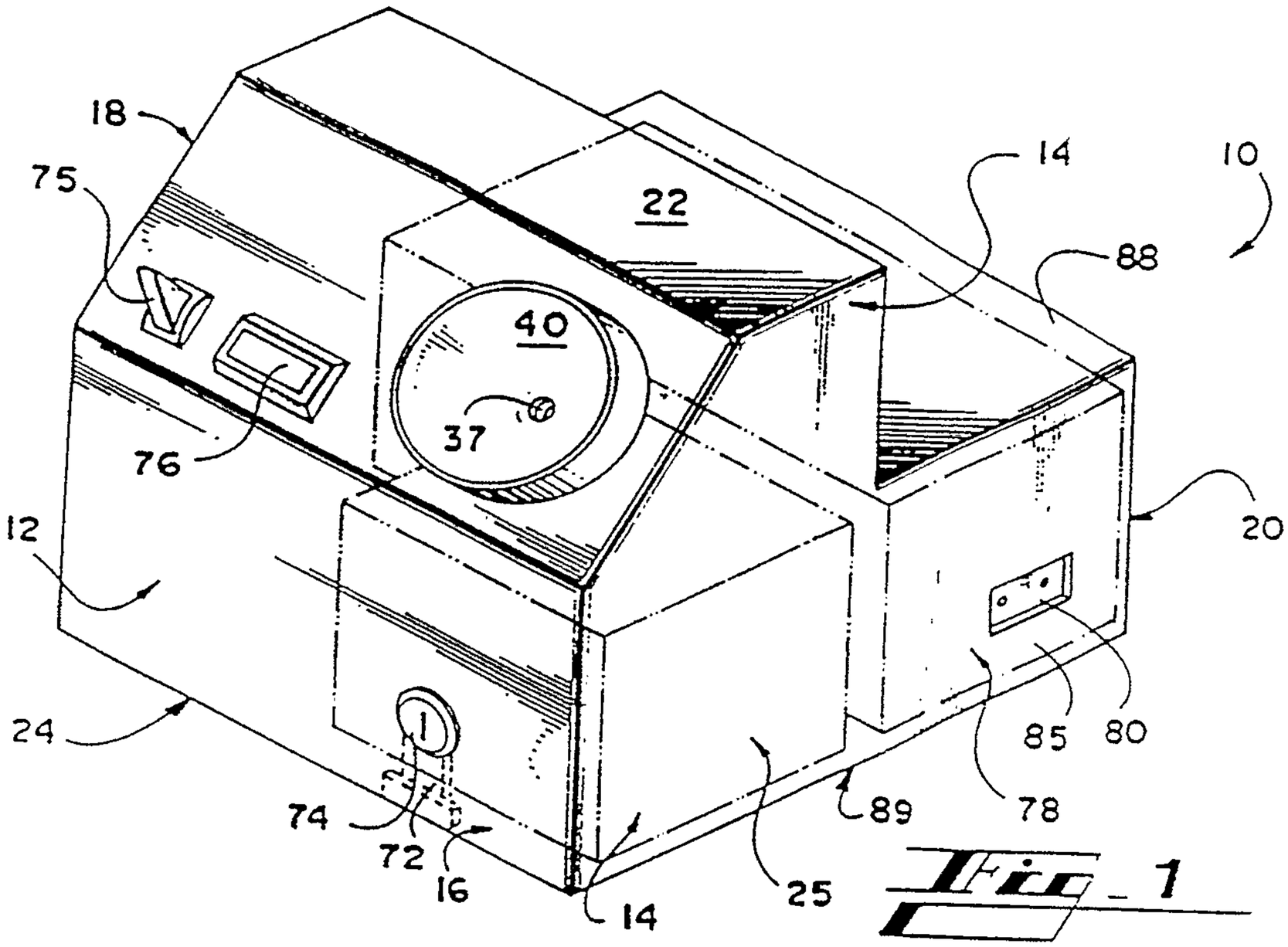

18
75
22
14
10
88
40
37
76
12
20
24
74
72
16
14
25
89
78
85
80

Fig_1

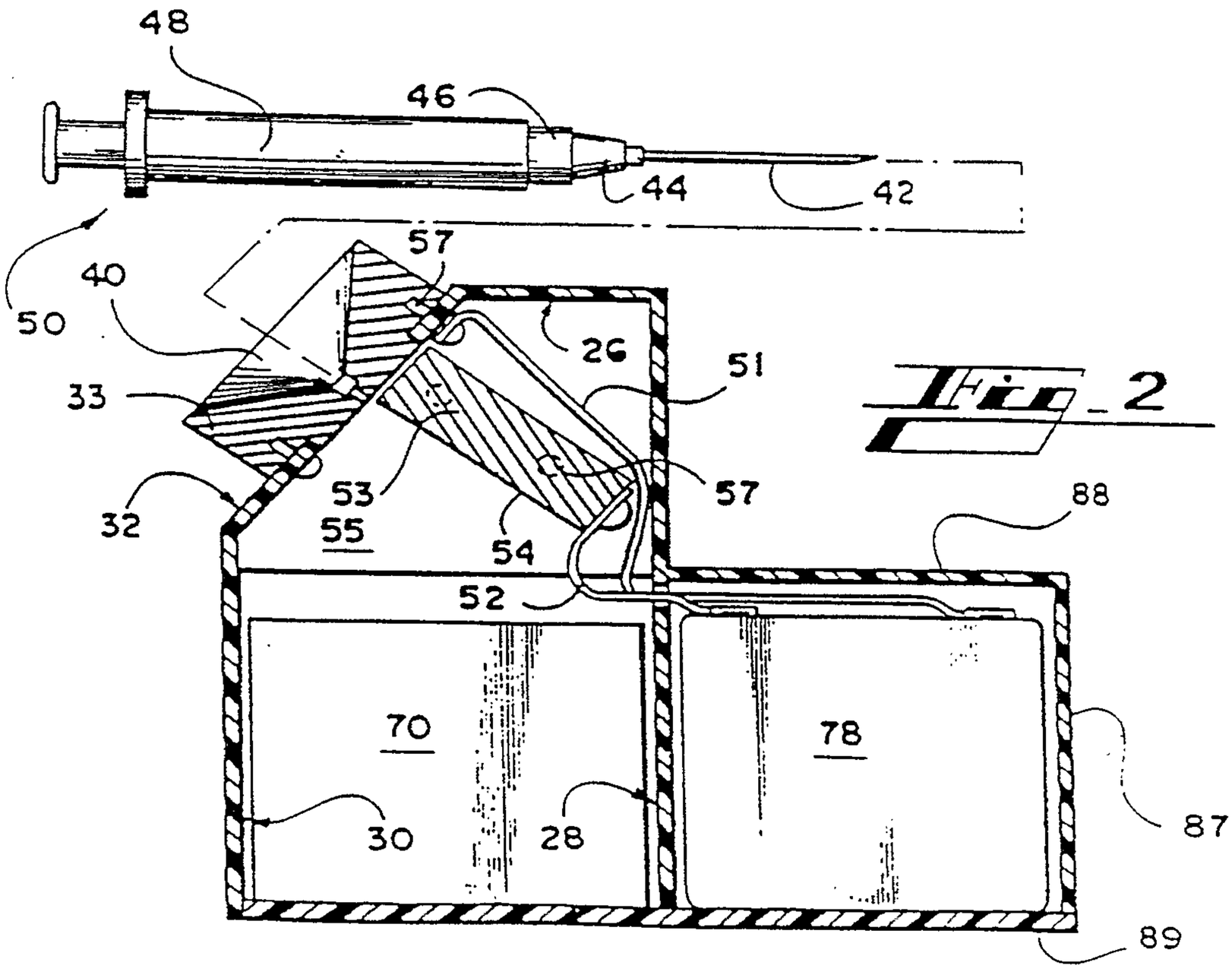

48
46
44
42
57
40
50
26
51
33
53
57
32
55
54
88
52
70
78
30
28
87
89

Fig_2

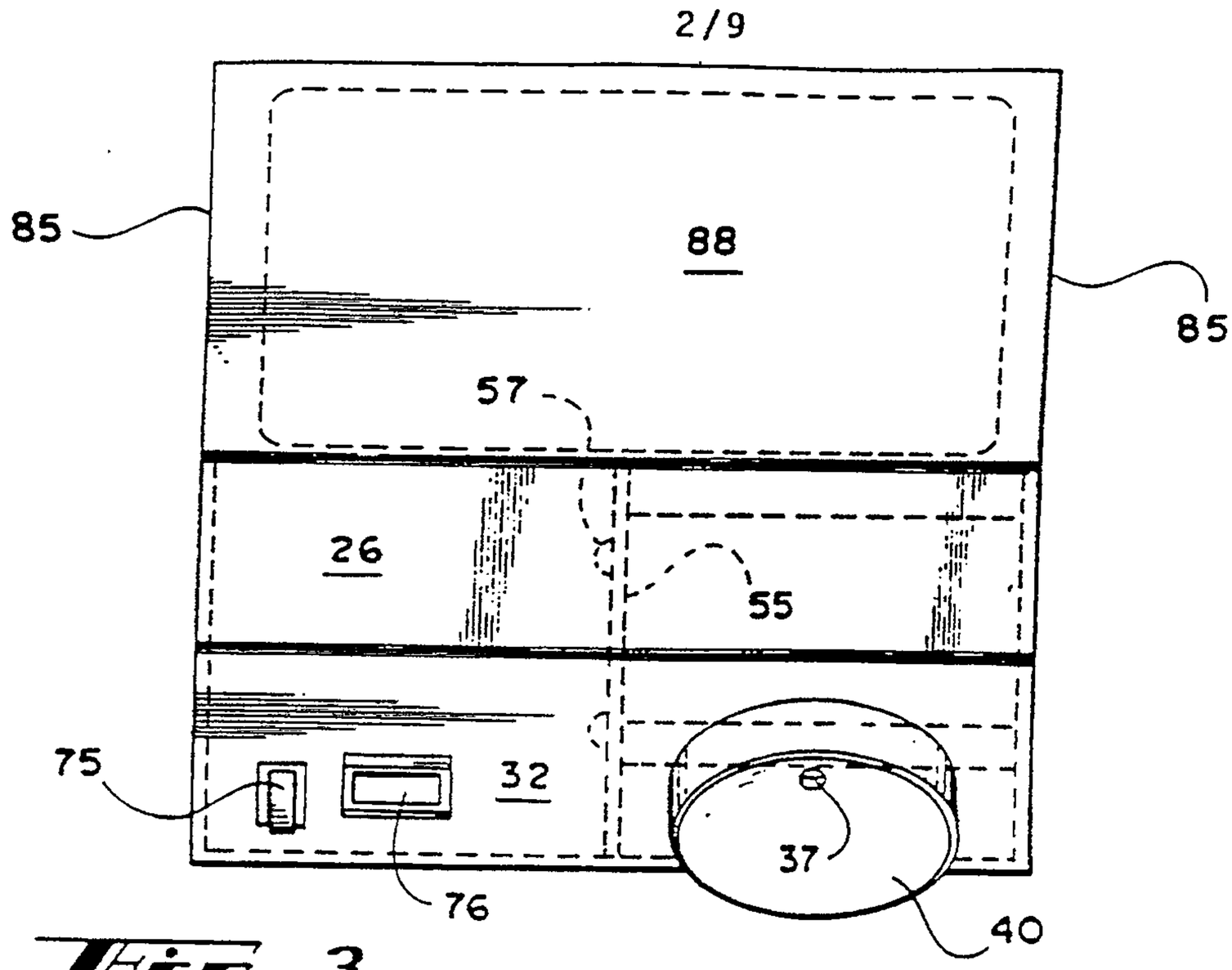


Fig_3

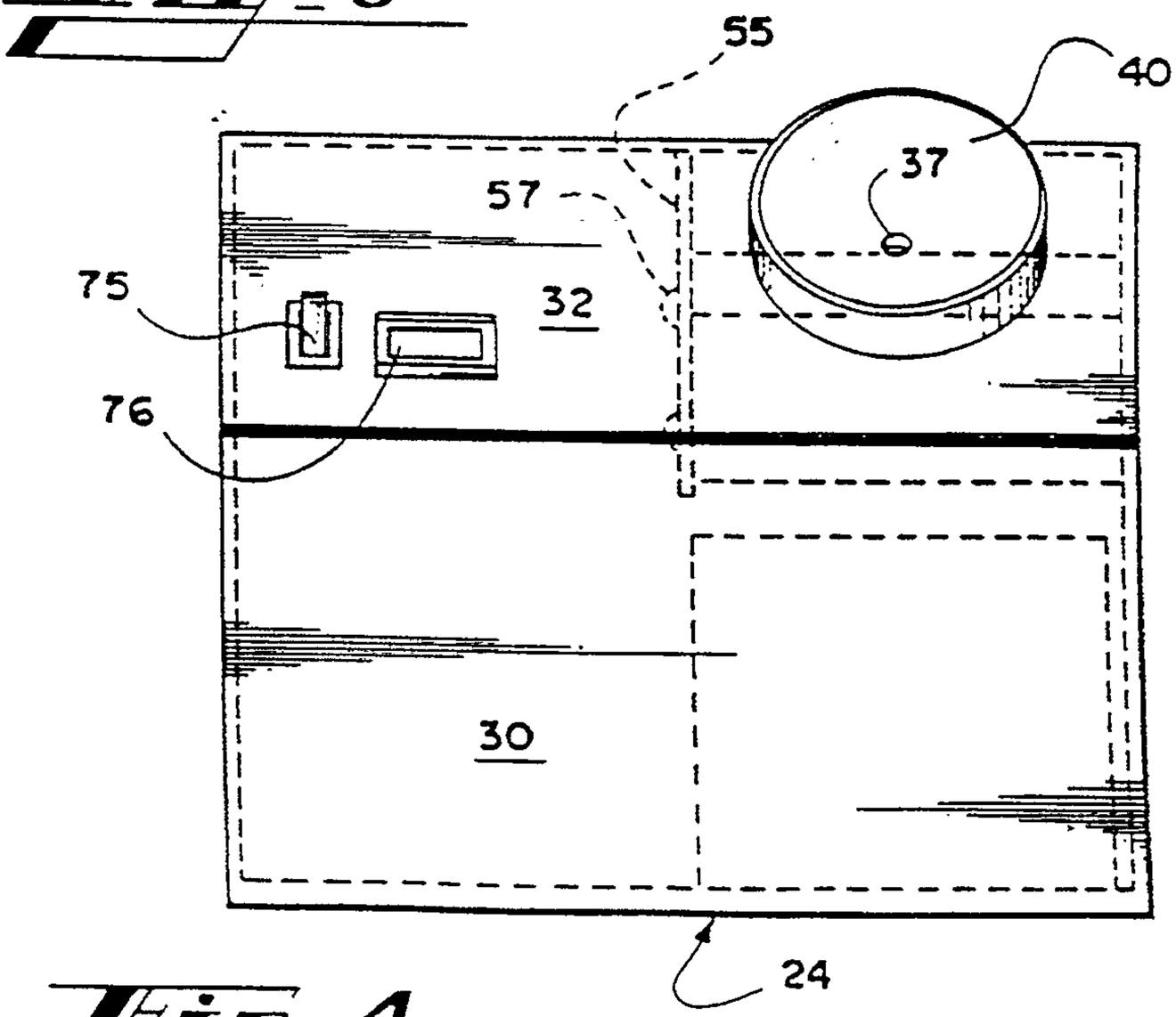


Fig_4

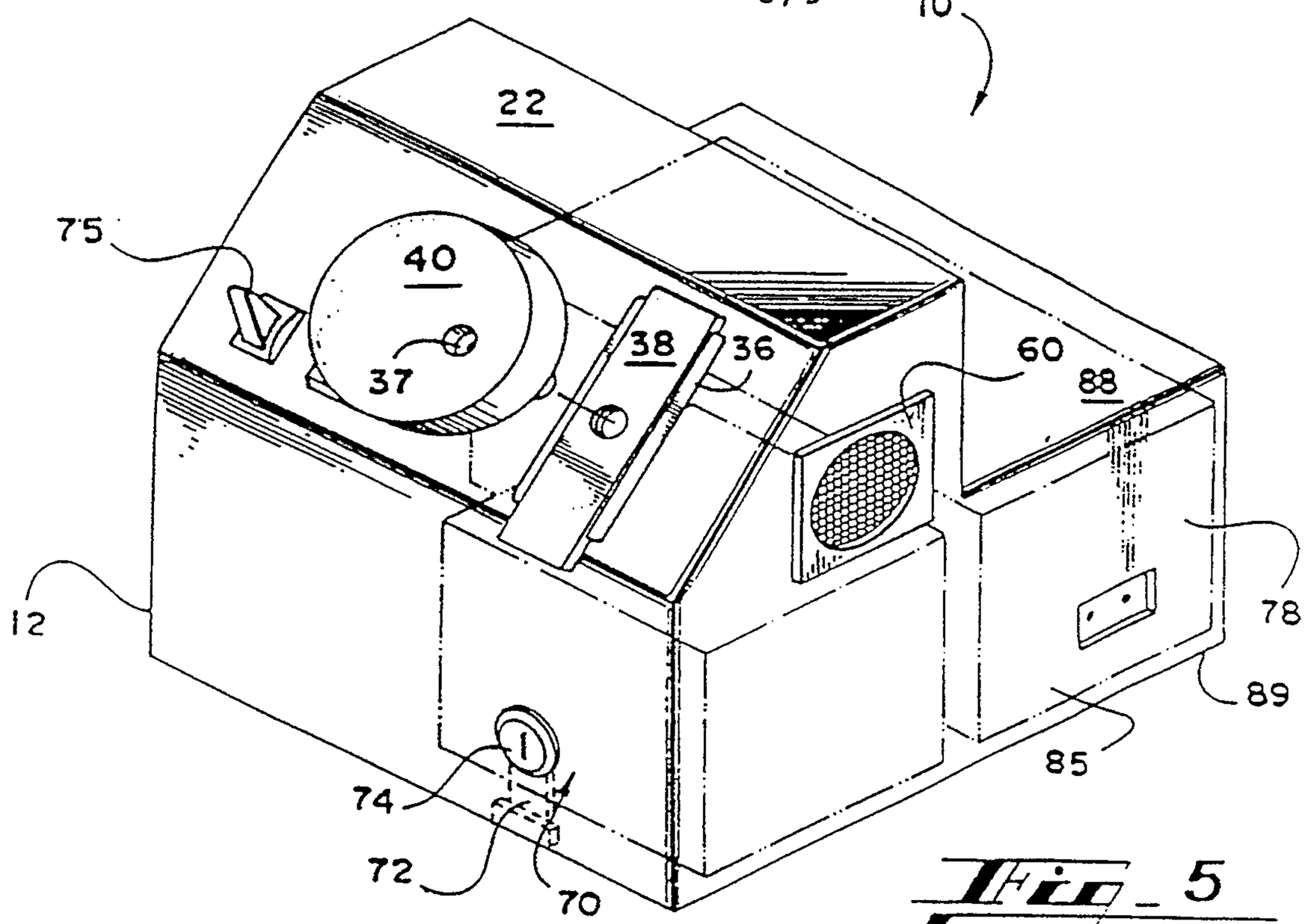

10
22
75
40
37
38
36
60
88
12
78
89
85
74
72
70

Fig_5

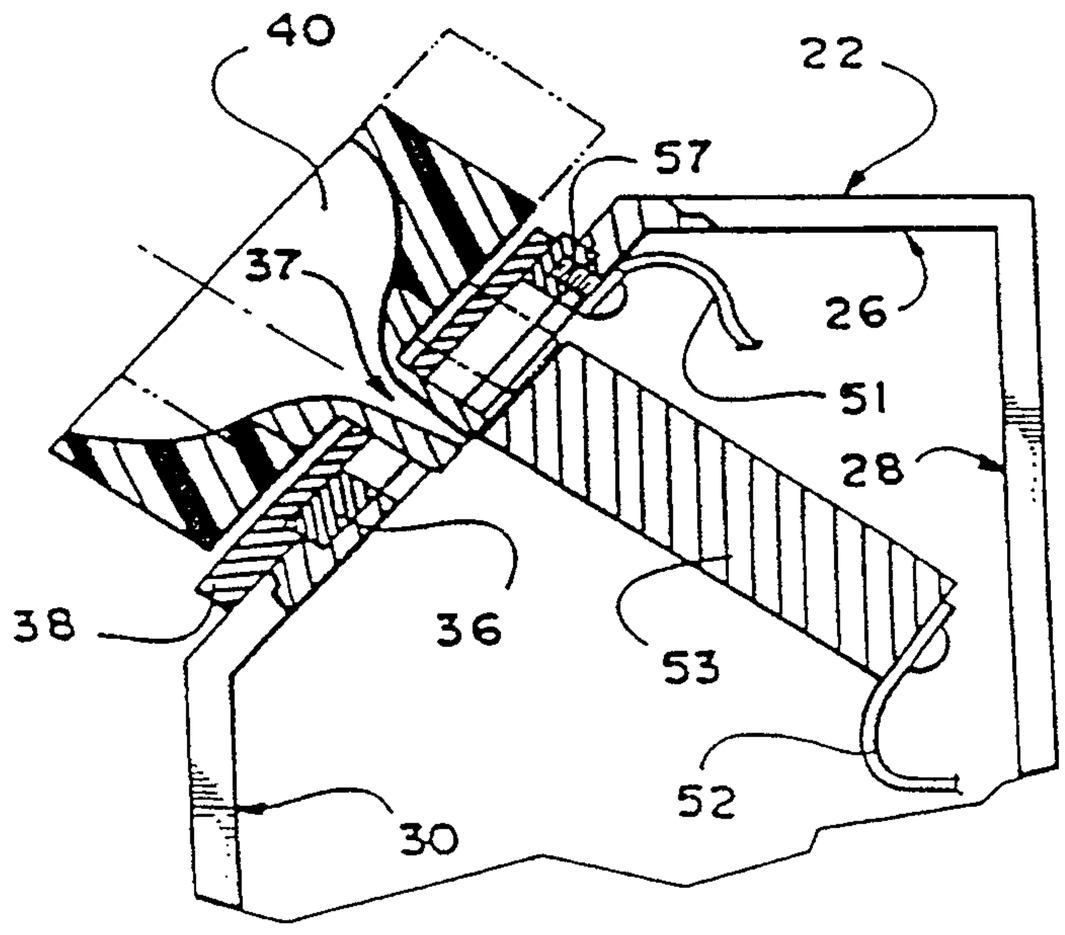
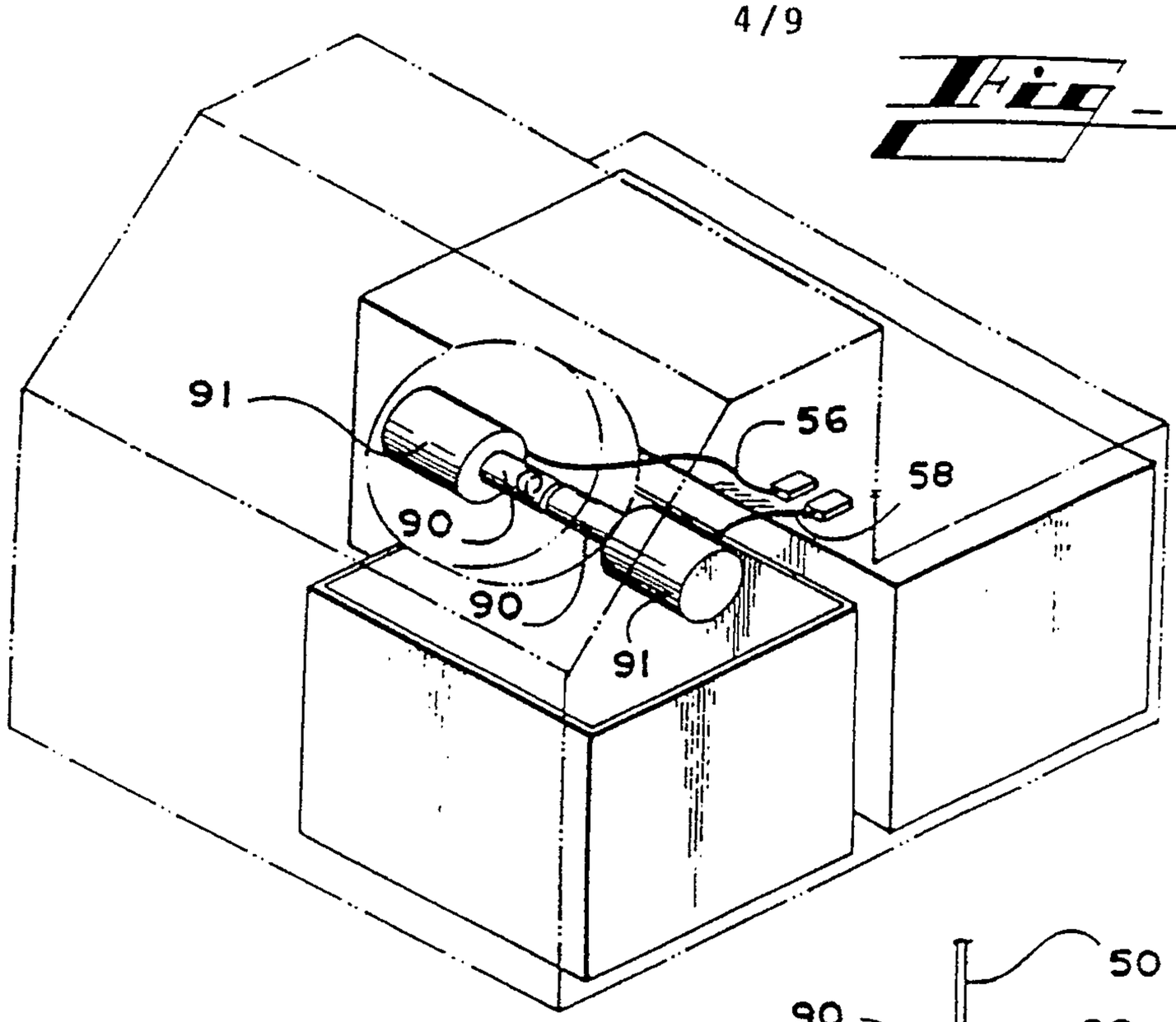

40
22
57
37
26
51
28
38
36
53
52
30

Fig_6

Fig_7



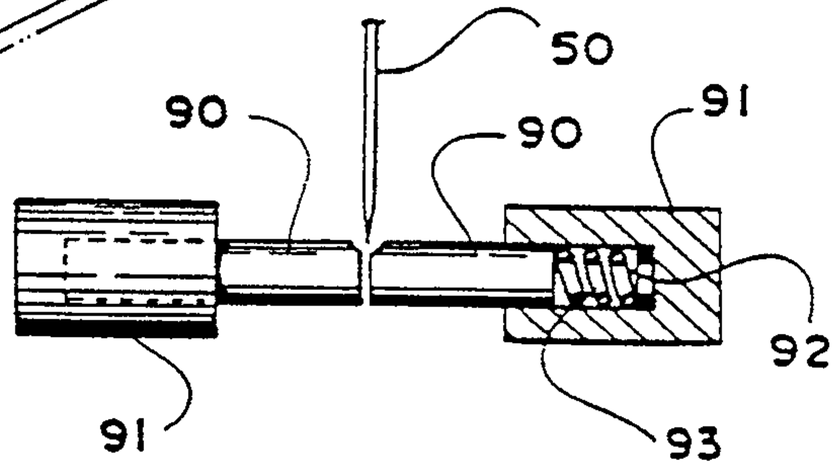


Fig_8

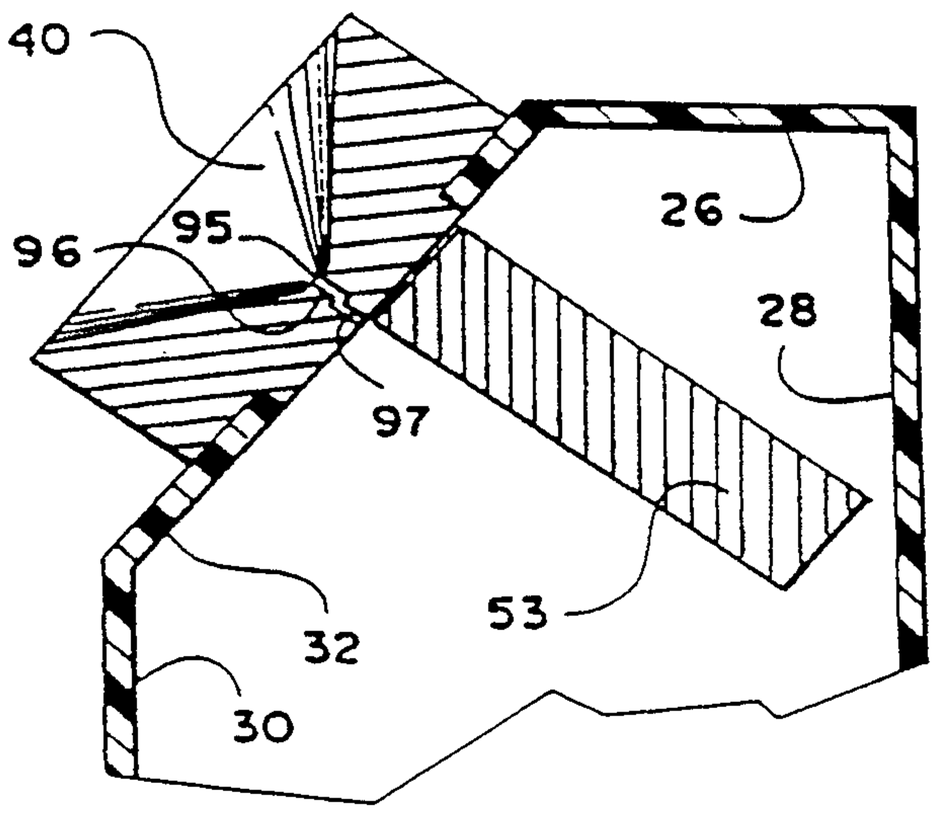


Fig_9

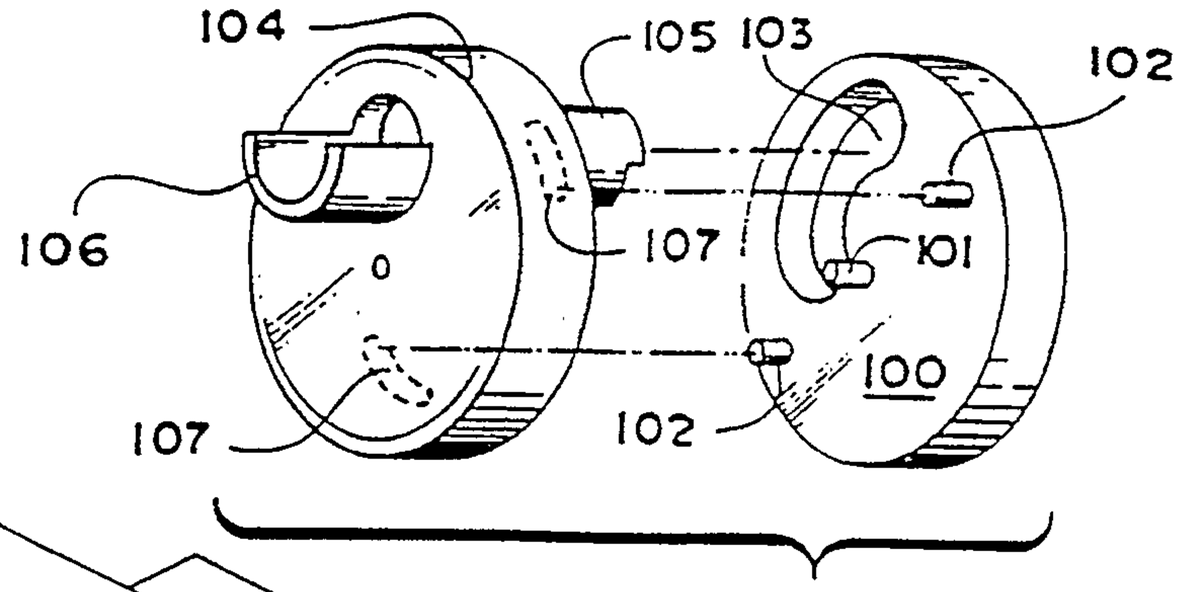


Fig_10

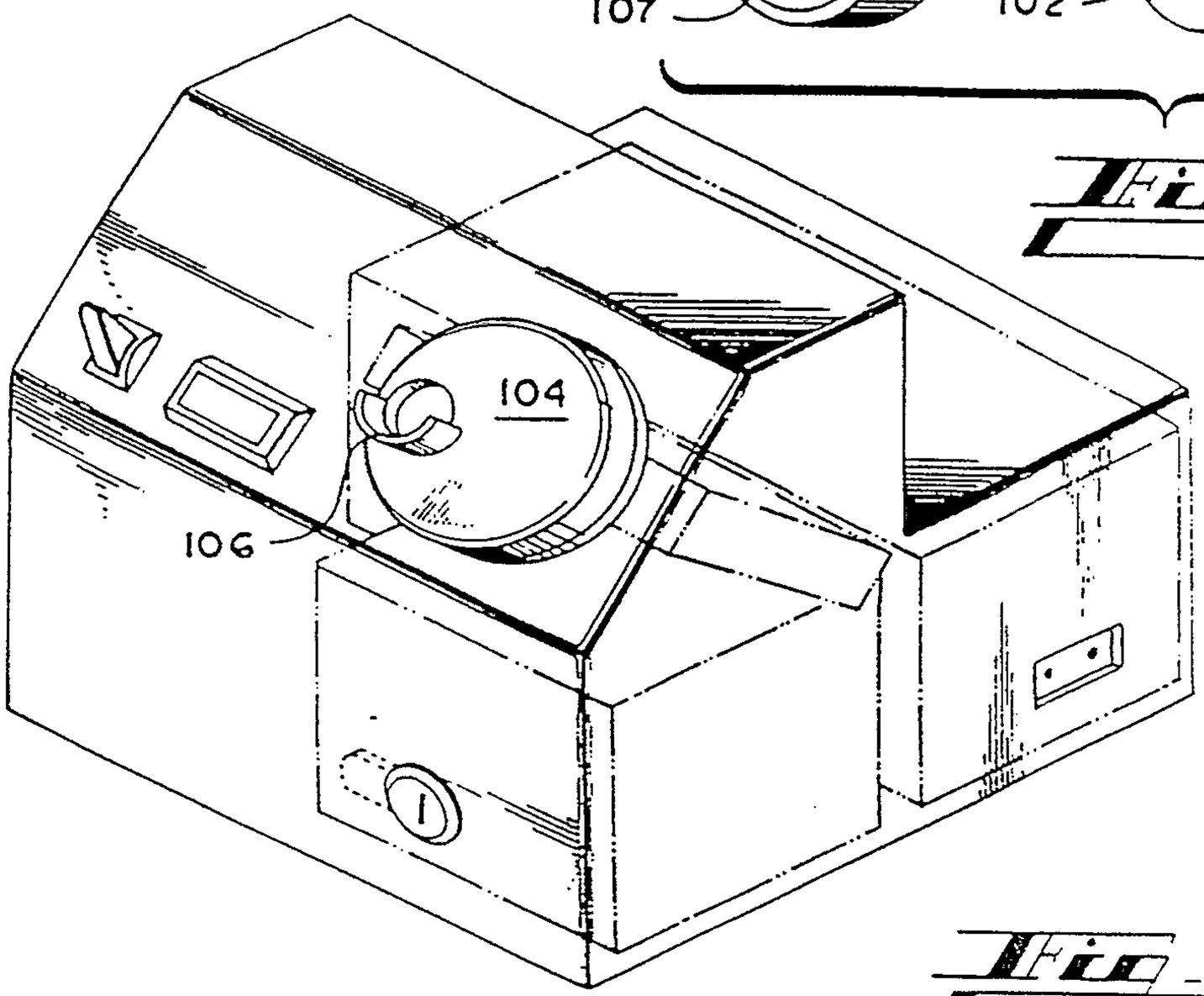


Fig_11

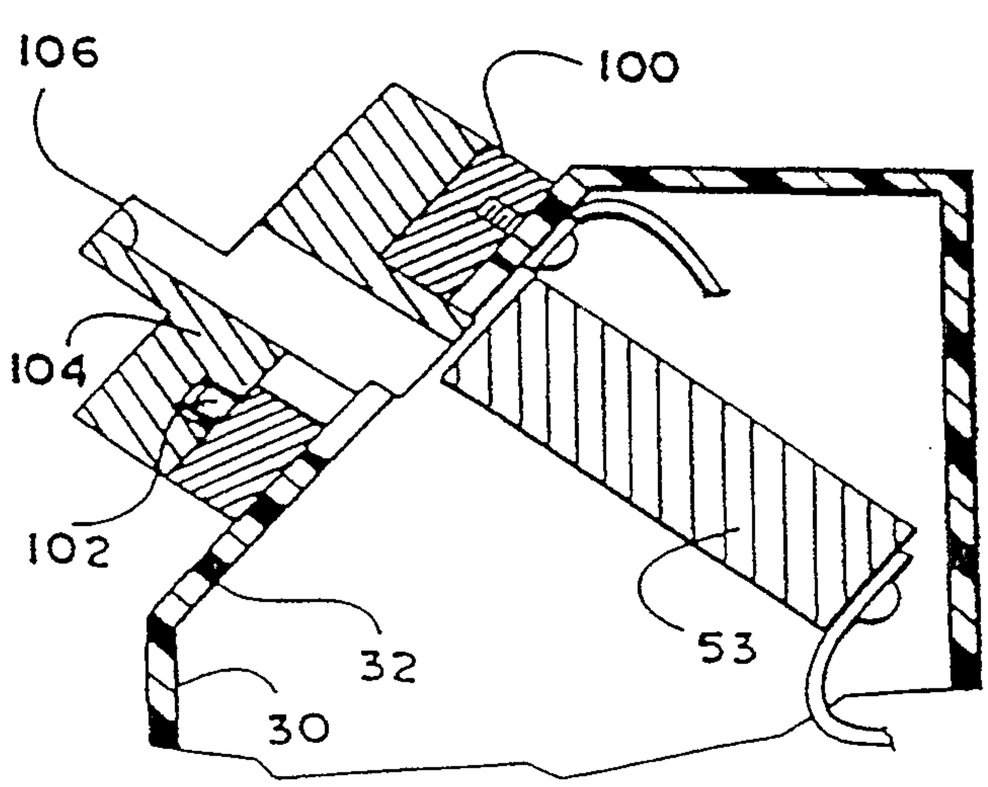


Fig_12

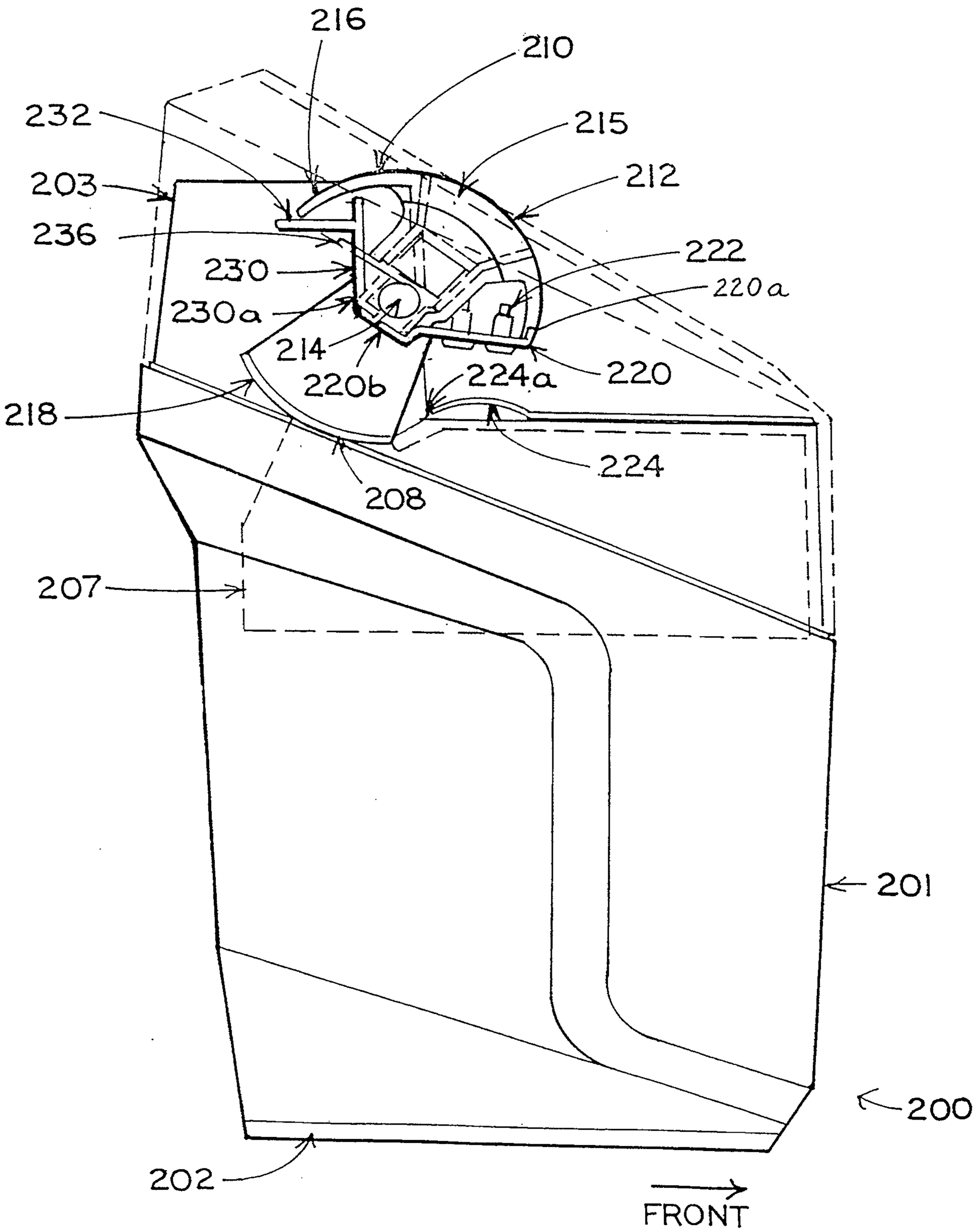

216
210
232
215
203
212
236
222
230
220a
230a
214
220b
224a
220
218
224
208
207
201
200
202
FRONT

Fig. 13

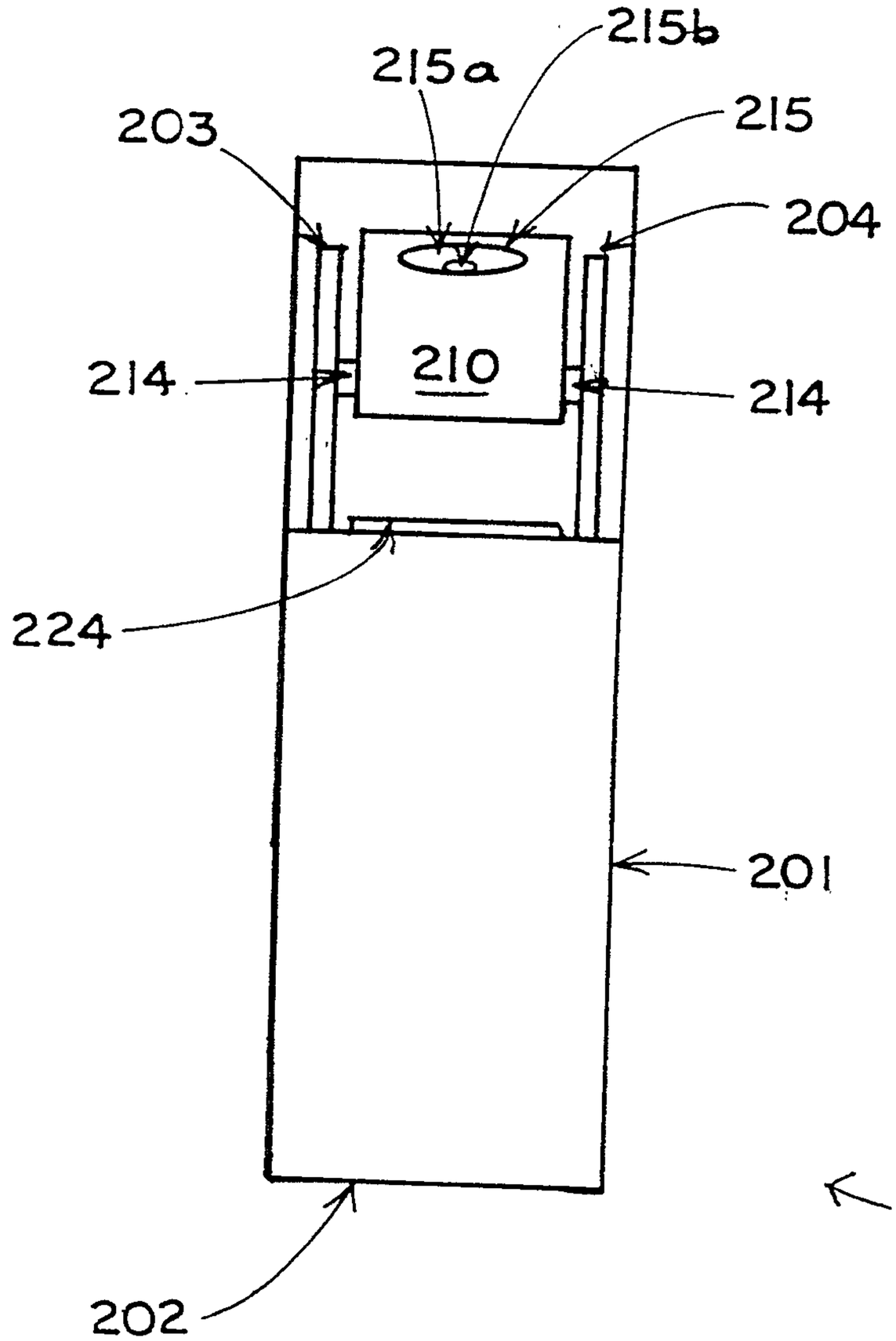


Fig. 14

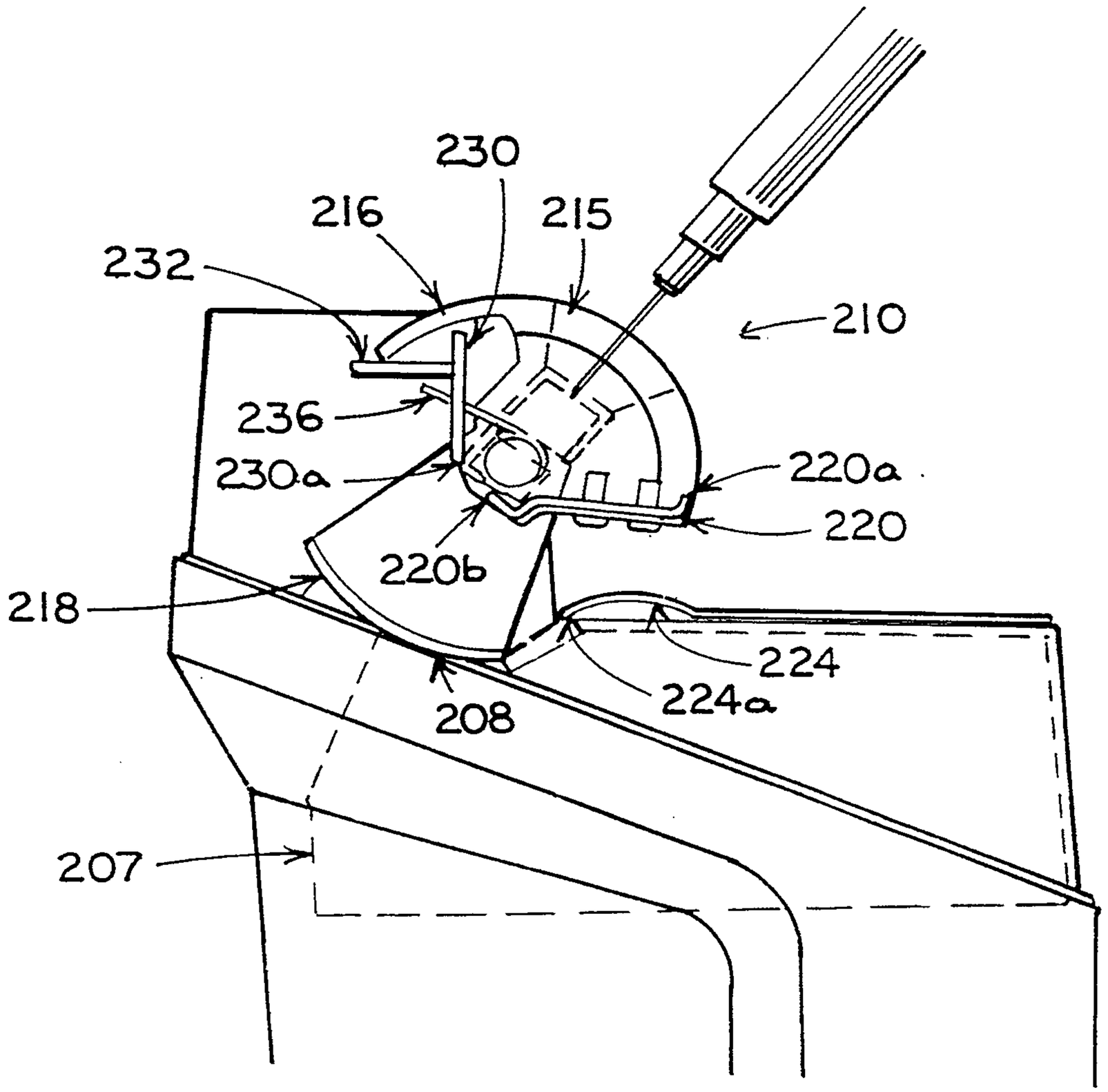


Fig. 15

Loading Position

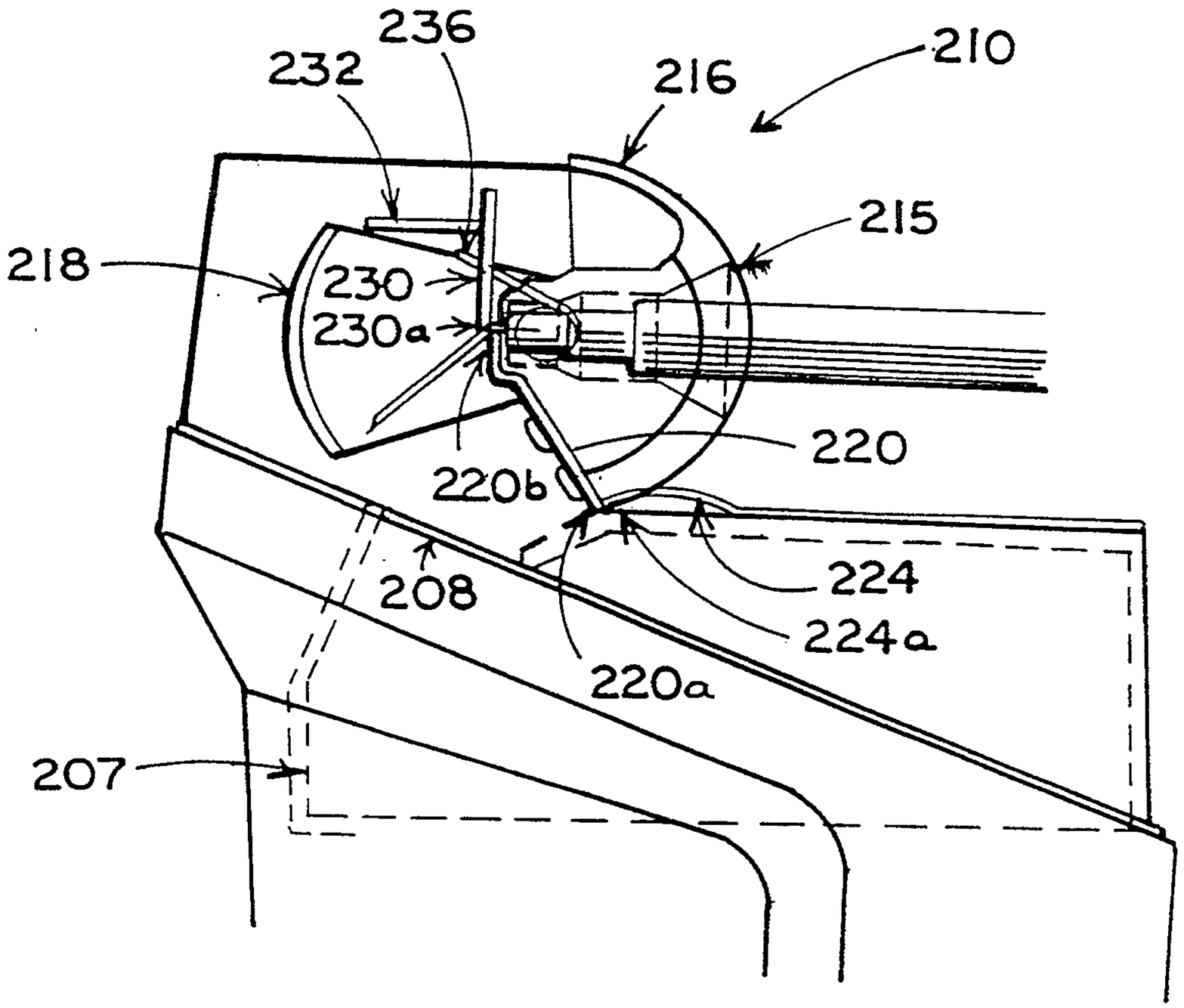
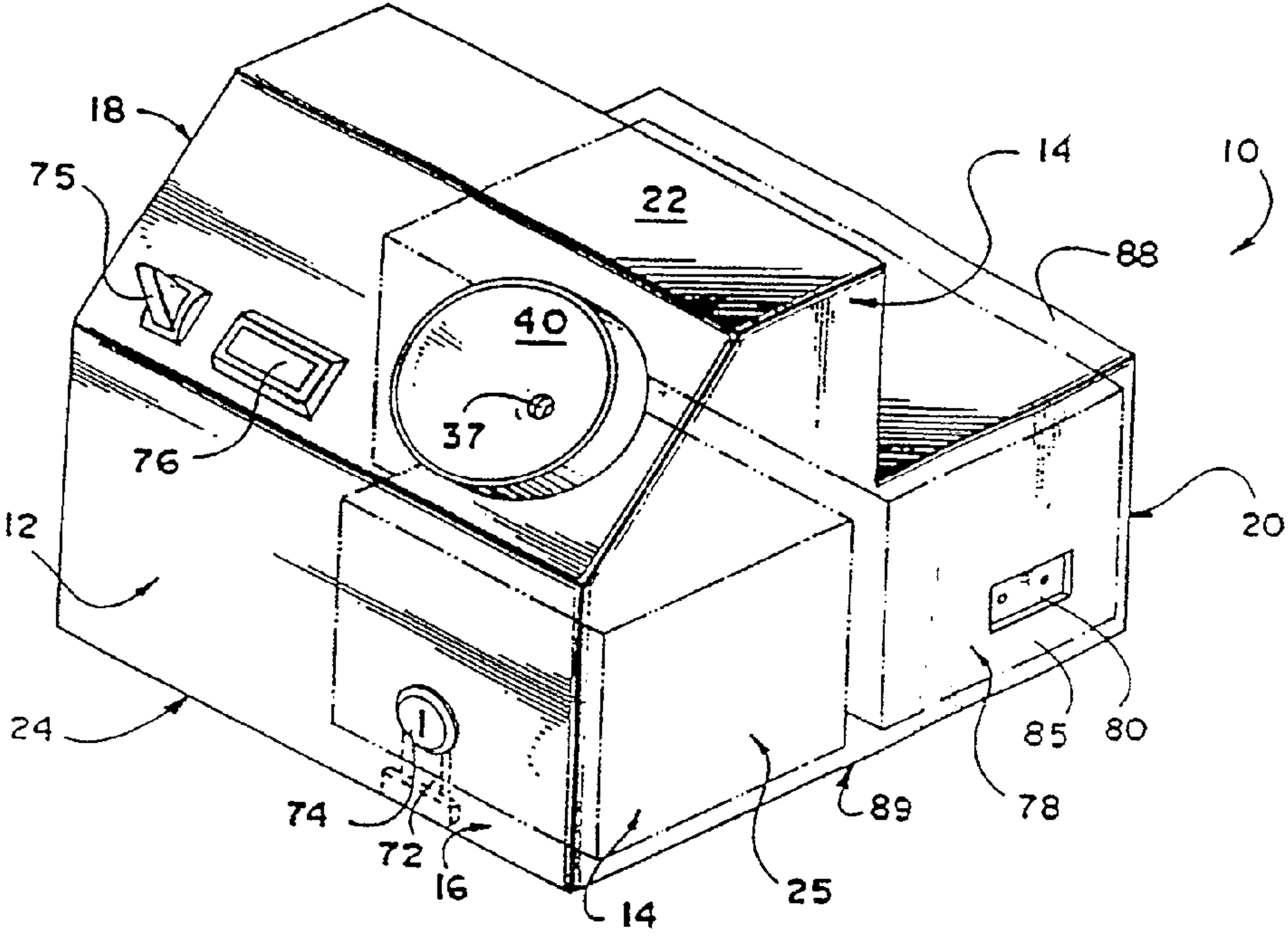


Fig. 16

Cut-Off Position


18
75
22
14
10
88
40
37
76
12
20
24
85
80
74
72
16
89
78
25
14