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(71) Demandeur/Applicant:
LOVELESS, CAL, CA

(72) Inventeur/Inventor:
LOVELESS, CAL, CA

(74) Agent: ADAMS, THOMAS

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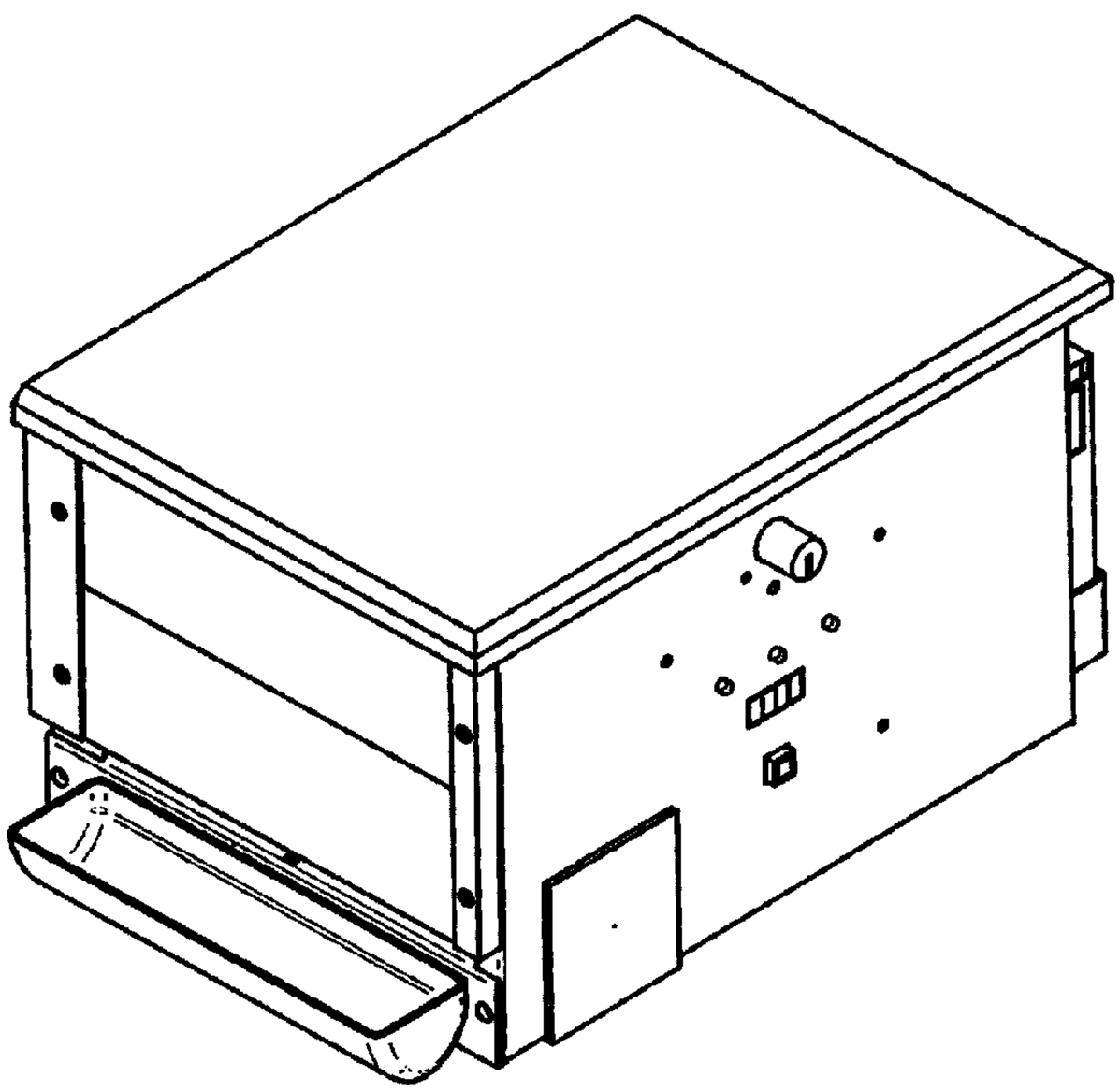


(57) Abrégé/Abstract:
This document describes a twenty eight cell, dosett which works in conjunction with a modified, existing Automatic Prescription Pill Dispensing System protected under Canadian patent 2217220 granted May 2001. It is a locked device in which prescription drugs are pre-loaded, by a pharmacist, according to the user's medication regime. This tamper proof device can only be unlocked by a pharmacist using a specially designed loading dock or by inserting the dosett into the user's Automatic Prescription Pill Dispensing System. This prescription pill dosett approach not only simplifies the loading of the Automatic Prescription Pill Dispensing System but more importantly, removes from the caregiver, the responsibility of having to handle prescription drugs. This pill dosett approach reduces the size of the original Automatic Prescription Pill Dispensing System by 50%, making it a more acceptable product. To summarize, this Dosett Loaded Automatic Prescription Pill Dispensing System not only meets all the practical pill dispensing needs of the user and caregiver, but is easy and safe to load, easy to operate, flexible and incorporates a comprehensive safety capability.

ABSTRACT

DOSETT LOADED AUTOMATIC PRESCRIPTION PILL DISPENSING SYSTEM

This document describes a twenty eight cell, dosett which works in conjunction with a modified, existing Automatic Prescription Pill Dispensing System protected under Canadian patent 2217220 granted May 2001. It is a locked device in which prescription drugs are pre-loaded, by a pharmacist, according to the user's medication regime.

This tamper proof device can only be unlocked by a pharmacist using a specially designed loading dock or by inserting the dosett into the user's Automatic Prescription Pill Dispensing System.

This prescription pill dosett approach not only simplifies the loading of the Automatic Prescription Pill Dispensing System but more importantly, removes from the caregiver, the responsibility of having to handle prescription drugs.

This pill dosett approach reduces the size of the original Automatic Prescription Pill Dispensing System by 50%, making it a more acceptable product.

To summarize, this Dosett Loaded Automatic Prescription Pill Dispensing System not only meets all the practical pill dispensing needs of the user and caregiver, but is easy and safe to load, easy to operate, flexible and incorporates a comprehensive safety capability.

DOSETT LOADED

AUTOMATIC PRESCRIPTION PILL

DISPENSING SYSTEM

BACKGROUND OF THE INVENTION

The need for an Automatic Prescription Pill Dispensing System for the ill or elderly has been well documented in the teachings. Numerous novel approaches have been advanced. Large, complex and costly systems have been devised to meet the needs of an institution type environment, namely hospitals and nursing homes. None, to my knowledge, address all the needs of people requiring medication in their homes. The need to focus on this application is becoming more apparent as the trend continues towards home care and away from institutional care. A device that meets all the essential requirements for home use should have the characteristics listed below.

- The ability to reliably dispense a plurality of types, sizes and number of pills at a plurality of predetermined time intervals.
- The ability to dispense prescription drugs for fourteen days or optionally seven days.
- The ability to alert the user by visual and audible means when these time intervals occur.
- The ability to not alert the user at times when there are no pills to be dispensed.
- Provide the capability for the removal of pills from the accessible part of the unit to a user inaccessible storage bin if the user does not retrieve the pills within a reasonable waiting period.

- Provide access to one day's supply of medication, in the event that the user is away from the dispenser for a part of the day or if the system is waiting repair, with the appropriate safeguards.
- To transport the user's medications, from pharmacy to user's residence, using a tamper proof seven day dosett filled by a pharmacist.
- Incorporate a seven day dosett which can be safely, easily and quickly loaded into the dispenser by a family member or caregiver.
- Relieve the caregiver from having to handle prescription pills.
- Provide a Help Me capability through which the user can summon a quick response simply by pressing a button on a pendant or bracelet.
- Give extensive attention to safety mechanisms and ease of use procedures in keeping with the fact that this Dosett Loaded Automatic Prescription Pill Dispensing System is for home use and is operating outside the control of an institution and trained medical staff.
- Provides a remote reporting system. Seven call types supported.
- Telephone line monitored for disconnect and extended off hook.
- Telephone line seizure capability even if line is off hook.
- External control of a failed system to remove user pills before the system is removed from user's residence.

The preferred embodiment of this invention meets all these characteristics.

The present invention describes an improved dosett loaded version of the Automatic Prescription Pill Dispensing System described in Canadian patent 2217220 granted May 2001. In the course of marketing that product, numerous enhancements were made in order to develop the present dosett loaded version of the Automatic Prescription Pill Dispensing System. These enhancements will be presented in detail in the following sections.

Distributors and caregivers continued to have concerns about manually loading pills into the dispenser. Although the need for a pharmacist filled dosett was realized and described in my 1997 patent, pharmacists at that time were not interested in filling large dosetts. It was not until 2002 that pharmacists became

more open to filling large 28 cell dosetts. At that time, I decided to change my approach from a caregiver filled dispensing system back to a pharmacist filled dosett so that caregivers would not have to handle pills but would only be required to insert a locked dosett into the dispenser.

In addition, modifying the dispenser to accept a dosett results in a dispenser of about half the size of the earlier patented dispenser.

The eject mechanism was changed from a pull tab operation in the earlier patented device to an automatic system activated by pushing an eject button in the present invention.

One enhancement involved the removal of the On Demand function present in my original patent. This feature allowed the user to access non-prescription types of pills, at any time, as opposed to prescription pills at specific time intervals. The On Demand feature evolved with so many safety conditions, that it's value as an on demand feature was eroded. The advantages of it's removal far out weighed it's value as a feature as shown below.

- The elimination of four on demand rows, allowed the cells in the four remaining rows to be doubled in size, allowing for a larger number of larger pills as well as the elimination of the possibility of pill hang up. This could be done without having to increase the overall size of the dispenser.
- Reliability is increased through the reduction of mechanical parts and control circuitry.
- A substantial cost saving is realized.

A further enhancement involved the removal of the user code setup procedure and replaced it with a unit code. Both serve the same function. This code allows the operator to identify a particular user's call, on their pager, from the many users that the pager is serving. The change was made to eliminate a setup task and reduce hardware. The unit code is a simple software change. Now, instead of setting a user code when a system is installed, each dispenser comes with its own identification number.

The additional enhancement involved re-partitioning of hardware and software to improve accessibility for assembly, testing and repair.

All these reasons to change the design plus the fact that I wanted to add a Life Line capability, culminated in the Dosett Loaded Automatic Prescription Pill Dispenser of the present invention.

PRIOR ART

A number of types of pill dosetts exist in the market. They are small soft plastic cells with snap down lids. They come in a variety of configurations ranging from a one cell device that holds a number of pills for once a day, all the way up to seven day devices for once a day, to seven day devices for twice a day, to more recently, a seven day, four times a day version (twenty eight cell device). There are a few wind up types with audio indicators that dispense a number of pills 2-3 times a day. All of these devices are designed for loading by the user. I do not know of any dosetts on the market that are tamper proof.

SUMMARY OF THE INVENTION

The present invention relates to a Dosett Loaded Automatic Prescription Pill Dispensing System designed for controlling the prescription drug regimes of an individual in his/her home.

This invention dispenses a plurality of types, sizes and quantity of pills at four selected time periods through out a day and repeats this sequence for fourteen days as predetermined by the user's medication regime. The dispenser can be programmed for seven days but the preferred time is fourteen days.

The fourteen day mode of operation can be increased, without repeating the reload procedure, by inserting a third dosett after the second dosett has transferred it's pills and before the second dosett reaches the seventh day. This feature does not apply to a seven day mode of operation.

The choice of two time intervals for every time period provides flexibility to the user to fit with his/her life style.

Both visual and audible alert mechanisms are used to signal the presence of pills. Also, the dispenser is enabled to allow the user access to an illuminated eject button mounted on the front panel.

As a safety feature, this invention will remove pills from the active part of the device and place them in the inactive part of the device, if not accessed after a twenty eight minute waiting period. This prevents possible overdosing. The pills, in the catch bin, can be retrieved at the next reloading, sorted and reused if positively identified or otherwise disposed of.

This dosett approach to medication delivery greatly improves the reliability of pill handling by caregivers of the elderly who want to remain in their residences. The caregiver has the dosett(s) filled by a pharmacist as, is traditionally done with pill bottles, and returns the dosett(s) to the user's residence where it (they) are easily inserted into the pill dispenser. The caregiver sets a few controls to tailor the system to the user's life style, closes and locks the lid. The dispenser is set to automatically deliver prescription pills four times a day for fourteen days or seven days.

This dispenser resolves the issue of supplying medication to the user in the instances when the user is away from the dispenser for part of a day or for that period of time that the main dispenser is waiting for repair, should it fail. This is achieved by a portable automatic dispenser referred to in this document as a Day Away. This device supplies one day's allotment of critical medicine as prescribed.

This invention supports an automatic reload function which is activated when the operator initiates the reload button. This action occurs when it is time to reload the dispenser with a filled dosett. The function is detailed in a later section.

This invention contains a number of safety features including a remote fault reporting mechanism that, through a paging system, automatically informs the carrier of the pager of the user and the dispenser's status.

This invention supports a Help Me capability which allows the user to send a call for help by pushing a button on a pendant or bracelet. A Code 1 is sent to the operator via the pager.

To summarize, the goal of this invention is to develop a Dosett Loaded Automatic Prescription Pill Dispensing System that meets all the practical pill dispensing needs of the user and caregiver. It should be easy and safe to load, easy to operate, flexible, incorporate a comprehensive safety capability and be economical. I believe that this invention achieves this goal.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A is an ISO perspective of the preferred embodiment of the external features of a locked twenty eight cell prescription pill dosett

FIG. 1B is an ISO perspective of a dosett linker

FIG. 2A is a ISO perspective of the dosett with covers removed to view the locking mechanism

FIG. 2B is a ISO perspective of the locking mechanism parts

FIG. 3 is a illustration of the dosett locking and linker mechanism

FIG. 4 is a ISO perspective of the pill array

FIG. 5A is a ISO perspective of the array slider carrier with 4 array sliders with linkers

FIG. 5B is a ISO perspective of the array slider carrier with sliders removed

FIG. 5C is a ISO perspective of a slider

FIG. 6A is a ISO perspective of the right and left remove sliders with linkers

FIG. 6B is a ISO perspective of the right and left eject sliders with linkers

FIG. 7 is a ISO perspective of the dispenser with remove sliders and eject sliders mounted

FIG. 8 is a ISO perspective of the left side enclosure with top sliding portion in place

FIG. 9 is a illustration of how a dosett is inserted/removed into/from the dispenser

FIG. 10 is a front cut-away elevation view of the dispenser frame showing the stack of pill dispensing modules, the slider movement and drive mechanism

FIG. 11 is a ISO perspective of the pharmacist's loading dock.

FIG. 12 is a ISO perspective of the dispenser with the access slider, dosett and pill array exploded

FIG. 13 is a ISO perspective of the Day Away

FIG. 14 is a illustration of the control panel

FIG. 15 is a ISO perspective of the external appearance of the dispenser

FIG. 16 is a ISO perspective of the trolley printed circuit board showing the 10 magnetic latches and the optical reader.

DETAILED DESCRIPTION OF THE DOSETT LOADED AUTOMATIC PRESCRIPTION PILL DISPENSING SYSTEM

Canadian patent 2217220 granted May 2001 for an Automatic Prescription Pill Dispensing System describes a device which dispenses pills at preset intervals over the course of seven or fourteen days. The present invention describes an improved, dosett loaded version of that Automatic Prescription Pill Dispensing System.

With the exception of the new dosett function and the changing of the mechanical mean of ejecting pills to an external tray, the general pill dispensing apparatus and the pill transport mechanism are the same as in patent 2217220,

and are described below. The following is an overall description of the location, relationship and function of the components that make up this pill dispensing system. This will give the reader a general understanding of the operation of this Automatic Prescription Pill Dispensing System. Additional detail will be given on key components and setup procedures below.

As shown in Figure 12, the system in general terms consists of a lockable unit **62**, having a top lid which may be opened to allow access to the interior. The lid has been removed in Figure 12 to view the interior. On the left side, is the external tray **26** into which ejected pills fall. On this same side, is a removable slider **25** called the access slider which is trapped in place by the lid when it is closed. When the lid is open, this access slider **25** can be lifted upwards and out, exposing the left end of the dosett **1** and the pill array **18** which sits directly under the dosett **1**. In Figure 12, this access slider **25** has been removed to expose the left sides of the dosett **1** and pill array **18**. Also revealed is tab **56** which allows the dosett, pill array combination to be pulled to the left two inches, clearing the dosett from under the face plate **61**. Figure 9 also shows the dosett being lifted up and out of the dispenser. When the dosett is in it's operating position, in the dispenser, the top face of the dosett locking mechanism **4A,** as seen in Figure 9, slides under the face plate **61** at the leading edge **15.** This traps the dosett in place. Also, the forward position of the dosett is controlled by the leading edge of the dosett's plastic cover **3** pressing against the front edge **15** of the face plate **61.** Figure 9 shows the slot **20** on the internal frame **27** in which the pill array **18** slides. The pill array is free to slide horizontally in slot **20** in the frame **27**, guided by screws **24,** fixed to the pill array, on the front and back side of the frame. Figure 9 shows the front screw **24** up against the end of slot **20** thereby limiting the distance that the pill array can be pulled to the left.

As viewed from the top, in Figure 12, the dosett **1** can be seen on the left hand side. The face plate **61** fills the remaining space on the top right hand side. The main control panel **60** and the operating instructions are on this face plate

61. Refer to Figure 14 for a description of the visual indicators and controls on this control panel **60**.

On the front of the dispenser, as seen in Figure 12, is an access panel **71** to the catch bin **42** and, as seen in Figure 10, the catch bin resides on a shelf in the dispenser **41**. This catch bin serves as a storage unit for any pills which are not taken by the user within predetermined time limits, thereby removing these pills from further access by the user. Also on the front, as seen in Figure 12, is the front visual panel **63**. This panel has only the visual indicators and control that are necessary to be seen or accessed when the dispenser lid is closed and locked. The indicators are: Power **64**, phone jack monitor **65**, pager off **66**, time display **67** and illuminated eject button **68**.

Also, seen in Figure 12, on the right hand side of the dispenser, is the Day Away holder **70** with a Day Away **50** mounted in it. The system supports two Day Aways.

Figure 1A shows the dosett **1** which is a rigid rectangular structure made from high impact plastic. In one sample embodiment, the unit is 5.0 inches long, 8.23 inches wide and 1 inch deep. Each cell is 1.77 inches long, 0.612 inches wide and 1.0 inch deep for a volume of 1.08 cubic inches **2**. These sizes were chosen to allow for most medication regimes to be accommodated within any cell. Both the dosett **1** and the pill array **18** have the same geometry and consist of four rows of seven cells to a make twenty eight cell device. The top side **3** of the dosett is enclosed by a clear, permanently attached acrylic plastic cover on which the rows are labeled Morning, Noon, Afternoon and Evening and the columns are numbered 1 through 7. The labeling is repeated on the bottom side of the dosett. This labeling aids the pharmacist during the filling process and the caregiver during the setup process. As seen in Figures 1A and 3, the bottom side of the dosett is enclosed by two sliding panels **5**. Each panel covers two rows and runs the length of the device. These panels are locked in place when the dosett leaves the pharmacy and unlocks only when the dosett is inserted into

the pill dispenser. This prevents unauthorized access to the pills. The sliders are equipped with two linkers **8,** as seen in Figure 1B. The two sliders always move in tandem. The sliders also have holes **13** which are used in the slider locking mechanism. More details will be given below.

Located directly beneath the removable dosett **1**, as shown in Figure **4**, is a pill array **18** which consists of a rectangular array of receptacles or cells for holding pills. In the embodiment shown, the pill array has the same geometry as the dosett. Each cell of the pill array **18** is aligned with the corresponding dosett **1** cell above. Therefore, when the dosett transfers pills to the pill array below, the pills in each cell in the dosett are transferred to the corresponding cell in the pill array below. The seven days supply of pills reside in the pill array until called for.

Located directly beneath the pill array **18**, as seen in Figures 9 and 10, is the array slider carrier **19.** It is fixed to the frame **27** by 2 screws **35** on each side of the array slider carrier. As seen in Figures 5A and 5B, this array slider carrier consists of a floor **31** which does not cover the entire unit but has an opening **34** at it's left end. Five vertical members **23** are mounted on this floor **31**. The top edges of these vertical members **23,** as shown in Figure 5B, have groves **23A** on both sides (only one side can be seen) in which the array sliders **33A,B,C** and **D** are free to slide. Figure 5A shows the four horizontal sliders **33A,B,C** and **D** sitting in their groves. Each slider is located under one of the horizontal rows of cells of the pill array **18** above. This slider carrier **19** enables the sliders to be slid back and forth by a trolley mechanism **48** to be described below. When the sliders are fully closed (to the left as shown in Figure 5A), any pills in each cell are retained in each cell by the sliders which form the bottom of the cells.

Each such slider **33A,B,C** or **D** is independently capable of being retracted or slid from a fully closed position as shown in which each cell in the row has a bottom, to a fully open position in which the cells have no bottom, thereby allowing any pills within any given cell to fall downward. By selecting any one of

the four sliders **33A,B,C** or **D** and controlling the degree of retraction of the slider, any given cell may thereby be emptied of its contents.

At one end of each of the sliders as shown in Figure 5C, is a small vertical rectangular member or paddle **7** which projects downward and stops just short of the top surface of the slider carrier floor **31**. When a slider is being moved to a fully closed position from a partially opened one, this paddle in cooperation with the top surface of the slider carrier floor **31** and side walls **23** protruding upward from the floor on each side of each slider, allows the slider **33** to push forward any pills which have fallen from a cell above along the surface of the slider carrier floor **31** until they fall through an opening **34** in the slider carrier floor **31** on the left end of the slider carrier **19**, into a remove slider repository area **37A**, as shown in Figure 6A.

At the opposite end of each of the sliders **33A,B,C** and **D** another vertical rectangular member or linker **32A** projects downward. Each linker has an armature **10** made of a ferrous metal, as shown in Figure 5C, such that it may be magnetically held by a electromagnetic latch. The electromagnetic latches **16A,B,C** and **D** are attached to a printed circuit board **17,** as shown in Figure16. This printed circuited board **17** is in turn mounted on a movable trolley plate **48** thereby permitting a slider to be retracted to the desired position.

NOTE: When referring generically to electromagnetic latches and array carrier sliders, I will use the reference without the letter, i.e. **16** or **33** and will use the specific lettered reference, i.e. **A,B,C** etc. when referring to a specific part.

Mounted below the slider carrier **19** are two remove sliders **36A** and **36B** as seen in Figure 6A. These two remove sliders have a combined width equal to the width of the overlying four slider carrier rows, and are similarly equipped with downward projecting linkers **32B** whose armatures **10** allow the remove sliders to be retracted. At each end of these sliders are box like structures which have no bottoms called repositories **37A** and **37B**. This is where pills are placed in

advance of the time they are required. The two remove sliders always move in tandem.

Below the remove sliders are the eject sliders **38A** and **38B** as seen in Figure 6B . The two eject sliders are the same size as the remove sliders **36A** and **36B** above and form the bottoms of the repositories **37A** and **37B** of the remove sliders. At the other ends of the eject sliders are apertures **39A** and **39B**. These apertures are located directly over the catch bin **42**. Pills in the repositories **37A** and **37B** are directed to the external tray **26** if the eject sliders **38A** and **38B** are moved two cell positions to the right. Or if the pills are not taken within 28 minutes, the remove sliders **36A** and **36B** move two cell positions to the right and the pills are dumped through the apertures **39A** and **39B** into the catch bin **42** below. The two eject sliders always move in tandem.

As shown in Figure 7, the structure that supports the remove sliders and the eject sliders is called the dispenser **41**. The eject sliders **38A** and **38B** slide in slots in the walls of the dispenser. The remove sliders **36A** and **36B** slide in groves on the top members of the dispenser. In the dispenser, under the repositories, are two structures **41A** that slope downward at 45 degrees. These structures are shown dotted in Figure 10 since they are behind the walls of the dispenser **41**. These structures direct pills dropped from the repositories above to the external tray **26** shown in Figure 12.

The movable trolley drive mechanism is located below and to the right side, as seen in Figure 10. It is composed of a trolley plate **48** which rides on two stainless steel rods **52** and is moved to the right and back by an electrically powered lead screw **47** which is attached to the trolley plate **48** by a lead nut. The lead screw is driven from a large pulley **54** connected to a small pulley **45** which is fixed to a 3000 RPM motor **55**. The large to small pulley arrangement produces a 5:1 speed reduction and the lead screw has 28:1 turns per inch ratio. Under these conditions and with a cell width of 0.67 inches, the trolley travels a distance of one cell position in 2.0 seconds.

Mounted on the trolley plate **48** is a printed circuit board **17** called the transport PCB. The ten electromagnetic latches **16** and supporting electronics is mounted on this PCB, see Figure 16.

These electromagnetic latches **16A,B.C** or **D** are independently controlled by the micro-controller. Two of these ten latches **16A** and **16B** are positioned on the trolley PCB so as to engage and magnetically hold the two dosett **1** linker mechanisms **8**. Four of these ten latches **16C,D,E** and **F** are positioned on the trolley PCB so as to engage and magnetically hold the four array slider carriers **33A,B,C** and **D** linker mechanisms **32A**. Two of these ten latches **16G** and **16H** are positioned on the trolley PCB so as to engage and magnetically hold the two remove sliders **36A** and **36B** linker mechanisms **32B**. Two of these ten latches **16I** and **16J** are positioned on the trolley PCB so as to engage and magnetically hold the two eject sliders **38A** and **38B** linker mechanisms **40.**

By this means, the micro-controller selectively activates any of the four functions purge, transfer dosett pills, remove or eject, engaging their associated electromagnetic latches **16**, causing the trolley to move to the right by the appropriate number of cell positions, retracting the corresponding slider(s) as it moves, permitting pills to drop to their appropriate location.

NOTE: In all following descriptions, "Trolley" will be used when referring to the drive mechanism.

For example, transferring pills from the pill array **18** to the repositories **37A** and **37B** for the next time interval, say the morning array carrier slider **33A** is magnetically linked to the morning electromagnetic latch **16C** by the micro-controller, then the micro-controller commands the Trolley to move say, six cell positions to the right (sixth day of operation). The pills in the sixth cell are dropped onto the top of the array slider carrier floor **31**. The Trolley is then reversed by the micro-controller, causing the paddle **7** of the morning slider **33A** to push the pills which have dropped onto slider carrier floor **31** toward the aperture **34** in the floor **31**. The pills then drop through this aperture **34** into the

repositories **37A** and **37B** where they wait to be taken or removed automatically as the case may be. A more detailed description of this operation is given below.

PILL ARRAY EXTENDER

The pill array extender **77** can be seen in its storage location under the catch bin **42**, as shown in Figure 10. It is an inverted "L" shaped plastic device with a 2 inch top and a 1.5 inch vertical part. It is used when a second or third dosett is installed.

This device serves as a base for the pill array **18** when the loaded pill array is extended two inches to remove the empty first dosett in preparation for installing the second full dosett. If this device was not installed, the pill in the first two columns of the pill array would fall out. The installation procedure is as follows: With the access panel **25** removed, the pill array extender **77** is removed from it's storage location under the catch bin **42** and inserted into slots on the walls of the lower left hand member **78,** see Figure 8. The device fits firmly in the wall slots on top of member **78** with it's top section projecting outward to the left. It's top surface is flush with the bottom surface of the pill array above thereby forming a bottom for the pill array.

DOSETT ADVANTAGES

The dosett **1** is a removable, tamper proof, prescription pill transport device. It is filled by a pharmacist according to the user's prescription drug regime, delivered to the user's residence and inserted into the Automatic Prescription Pill Dispensing System by a qualified operator. It is the removable dosett that makes this invention work commercially. The use of a dosett cuts the size of the overall unit in half, making it more practical. The unit has a smaller footprint, is more attractive to have in the home and is lighter in weight. More importantly, the dosett is now filled by a pharmacist as opposed to a caregiver loading individual pills in the user's home. It removes the responsibility of the caregiver from handling pills. Legally, only family members or qualified persons may handle prescription pills. This way, non-certified people may load the dispenser

and in a highly secure fashion. This makes the unit more attractive to distributors because of legal liability issues.

From a distributor's point of view, profit is not only in the leasing of the dispenser to the user, but also in the filling of the dosett. Therefore, pharmacies that act as distributors of this invention gain both from leasing as well as refilling the dosett , since the caregiver must go back to the pharmacy that supports the dosett invention.

A further advantage is that it will reduce costs to the user, since it is advantageous to have many different pill prescriptions filled at once per dosett at a flat rate, as opposed to charging user dispensing fees per pill prescription. For example, if a user has 10 different pill prescriptions, the user would pay 10 dispensing fees. Instead, pharmacists can afford to make more money by simply charging a flat monthly rate for refilling dosetts. This advantage has proven to be highly attractive to pharmacies.

DOSETT LOCKING MECHANISM

As seen in Figure 2A, on the body of the dosett, at the opening end, are two blocks **4** that house the panel locking mechanism. On the panels **5,** at the opening end, are two blocks **6** on which the linkers **8** are mounted. Figure 1B shows the dosett linker **8** with its spring **9** and armature **10**. The dosett armatures **10** contact the dosett electromagnetic latches **16A** and **16B** when the dosett is in place. The dosett **1** has three holes **21** on its underside, only one can be seen in the side view of Figure 9. These holes mate with three pins **22** mounted on the top of the pill array **18**. Only one can be seen in Figure 9. All three pins **22** can be seen in Figure **4**. This interlocking arrangement holds the dosett in place directly over the pill array **18**.

Figures 2A, 2B, 3 and **4** identifies the locking feature of the dosett. The dosett locking blocks **4** have their covers removed in Figure 2A to show the locking mechanisms. There are two locking mechanisms, one for each sliding panel **5.** Figure 2B is an enlarged view of the block **4** showing the cavity in which the

locking spring **11** and the rare earth dosett magnet **12** sits. The spring **11** is composed of a ferrous material and is fixed in the cavity above the magnet **12.** This spring serves two purposes. First, it prevents the magnet **12** from falling out of the cavity and second, it is adjusted to put a downward force on the magnet forcing it into hole **13** in sliding panel **5,** as seen in Figure 3, thereby locking the panel in place. The panels can only be unlocked by the pharmacist using a docking unit **30,** see Figure 11, which will be described later, or by inserting the dosett **1** onto the pill array **18**.

The pill array **18** has similar magnets **29,** see Figures 3, 4 and 9, placed directly beneath the dosett magnets **12.** These magnets are oriented with like poles facing each other. When the dosett **1** is inserted into the dispenser, the opposing magnetic fields force the dosett magnets **12** to move upward against their springs **11**. This removes the magnets **12** from the sliding panels **5** holes **13,** allowing the sliding panels **5** to be removed from the dosett.

In each block **6** which is mounted to each panel **5**, are two cavities **28** of different sizes as seen in Figure 3. On the linker **8** bracket are mounted two different sizes of pem nuts whose bosses exactly fit these cavities. This is a keying mechanism to ensure that the linkers **8** are mounted in the correct orientation. Also, the front pem nut is used in conjunction with screw **14** to secure the linker to panel **5**.

The linkers **8** are protected in transit by a molded plastic cover which can easily be snapped on and off as required (not shown).

NOTE ON DOSETT SLIDERS

This embodiment of the dosett has been described with two sliding panels **5**, each covering two rows of seven cells each. However, the dosett could be constructed using a single sliding panel covering the entire 28 cells. The two sliding panel approach was chosen to ensure rigidity taking into account the type of material used. A single sliding panel could conceivably flex where as with the dual slider approach ensures that pills can not jam or escape when the sliding

panels are moving. The single slider approach might be revisited, as a cost reduction, in the future, using a different material.

INSERTING/REMOVING A DOSETT

To insert (remove) a dosett into (from) the dispenser, the lid of the dispenser is unlocked and raised. This allows access to the access slider **25** as seen in Figures 8, 9 and 12. Removing this pull up slider **25** allows an operator access to the dosett **1** and pill array **18** for dosett changing. The access slider **25** can now be lifted up and out by pulling upward on thumb screw **44**. By pulling on tab **56** as seen in Figures 10 and 12, the dosett **1** and pill array **18** combination can be pulled to the left approximately two inches as seen in Figure 9. This movement is controlled by slot **20** on the frame **27**. Figures 9 and 12 show the pill array **18** in the open position. This action allows the linkers **8** on the dosett to clear the dispenser face plate's **61** front edge **15**. The empty dosett can now be lifted upward and out. The filled dosett can be inserted on to the three pins **22** of the pill array **18** and the dosett pill array combination pushed to the right until it stops. The access slider **25** is returned to its position. It presses against the tab **56** on the pill array **18** holding the dosett and pill array in place. Access to the access slider **25** is prevented when the lid of the dispenser is closed and locked. The dosett is now securely in place with it's linkers **8** pressing against it's associated electromagnetic latches **16A** and **16B**.

FILLING A DOSETT

The filling of a dosett is performed by a pharmacist using a loading dock **30**, see Figure 11. This device is dimensioned to receive a dosett. The pharmacist slides the dosett with it's sliding panels **5** facing up, into the loading dock **30** from it's open end ensuring the dosett **1** is up against the loading dock closed end **46**. This places the dosett locking blocks **4** firmly up against the loading dock magnets **43.** These magnets are positioned to the right and below the center of the dosett magnets **12** such that the magnetic fields of loading dock magnets **43** aid the magnetic field of dosett magnets **12**. This pulls the magnets **12** in the

dosett, down against their springs **11** clearing the dosett magnets from the holes **13** in sliding panels **5.** This allows the sliding panels **5** to be removed. The pharmacist removes the two sliders and proceeds with filling the dosett according to the user's pill regime. The sliding panels **5** are returned to the dosett **1** and the dosett is removed from the loading dock **30**. On removal, the dosett is again locked. The pharmacist applies the appropriate label and the dosett is ready for pickup. This completes the description of the dosett.

OPERATIONAL DETAIL

The following is a description of the operation of the Dosett Loaded Automatic Prescription Pill Dispensing System. The actions required to get the dispenser up and running where pills are dispensed at regular time periods will be presented. Related support operations will be described as required. Using an example, the dispenser will be stepped through one day's operation.

The actions to be described are as follows:

- Set STDT/DLST on power up
- Set time on power up
- Set controls
- Days of operation
- Time periods and Time intervals
- Loading sequence
- Eject function
- Fault conditions and reporting

SET STDT/DLST ON POWER UP

When the system is first powered up, all micro-controllers are initialized. The system does not know if it is standard time (STDT) or day light saving time (DLST). The STDT visual indicator (LED), by default, turns on green, indicating standard time. Day light saving time is from the first Sunday in April to the last Sunday in October.

If the system is turned on between the last Sunday in October and the first Sunday in April (STDT), the operator does nothing.

If the system is turned on between the first Sunday in April to the last Sunday in October (DLST) the operator has 10 minutes to press the change time button to change the status of the DEC_T bit in the micro-controller. The STDT LED also changes from green to red. The 10 minutes is arbitrarily set and is more than enough time to perform this task. After 10 minutes the change time button will change it's function from a setup mode to a change time mode. It will stay in this mode until the dispenser is powered up again. Now pressing the change time button in the Spring and the Fall toggles the DEC_T bit and changing the LED. Making this button serve two functions, reduces the number of buttons on the control panel.

The initialization of the micro-controllers on power up, sets other functions to their default states. These functions are listed as follows:

- Time defaults to 1:00 a.m.
- Dosett setup LED defaults to requires setting - LED red
- Noon row defaults to requires checking for empty cells - LED red
- Time intervals defaults to early - LED off
- Fourteen day mode defaults to seven day - LED off
- Day Away defaults to unit is present or not used - LED green

SET TIME ON POWER UP

The time on the time display defaults to 1:00 a.m. Using the hours and minutes buttons set the time on the time display to the current time. Press the update time button to transfer this time to the main controller in the dispenser.

SET CONTROLS

Check for empty cells

The first task in setting up the system after the first dosett is inserted is to record, in the micro-controller, any empty cells in the dosett. The Morning cells, by default, have pills in all seven cells (no empty cells), therefore, the software

bypasses the setting up of these cells. The Noon, Afternoon and Evening time period cells could have empty cells, in fact, an entire seven cells of a time period could be empty. The reason that empty cells are recorded is so the micro-controller will know when not to activate the pills present audio and visual indicators. If they were activated on an empty cell, the user would respond by pressing the pill eject button and nothing would come out. This could confuse the user. This activity will be stepped through in the example below.

Set early/late time intervals

The system operates on four time periods: Morning, Noon, Afternoon and Evening. Each time period has two time intervals early or late. This gives the user the choice of when he/she would like to take the pills. The early time intervals are: 8 a.m., 12 p.m., 4 p.m. and 8 p.m. The late time intervals are: 9 a.m., 1 p.m., 5 p.m. and 9 p.m. The system defaults to early time intervals.

If the early time intervals are required, do nothing, the late time interval LED stays off.

If the late time intervals are required, press the late time interval button, a green LED turns on to inform the operator that the late time intervals have been selected.

DAYS OF OPERATION

The system can dispense pills for seven days which involves loading one full dosett **1** or for fourteen days which involves loading a second full dosett. The seven day loading action must be completed before the fourteen day loading action can be done. The fourteen day mode of operation is the preferred mode of operation. If a fourteen day mode is required, wait for the first dosett to transfer it's pills then retrieve the pill array extender **77** from under the catch bin **42** and insert it into the slots in the lower left hand wall **78** and press it firmly into position, refer to Figures 8 and 10. Remove the empty dosett and insert a second full dosett. The fourteen day mode LED automatically turns on (green), informing the operator that the fourteen day mode is active. When the first

seven days have passed, the contents of the second full dosett is automatically transferred into the pill array **18**. When in the fourteen day mode, the early warning signal, which occurs twelve hours before the system is empty, and the system empty signal are suppressed. These signals will be issued at the appropriate times at the end of fourteen days of operation.

When in the fourteen day mode, the operating time of the dispenser can be increased from fourteen to twenty-one days, without going through a complete reload procedure. This is accomplished by inserting a third full dosett into the dispenser after the second dosett has transferred it's pills (now empty) and before the seventh day of the second dosett arrives. This feature gives more flexibility to the operator as to when the dispenser is reloaded. If a third dosett is not inserted, the fourteen day LED turns off on the first occurrence of the seventh day and the system reverts to a seven day mode. In this mode, the empty warning and empty alarms are enabled and will be issued at their appropriate times. If during the second week of a fourteen day mode of operation, the operator wants to perform a reload (before the first occurrence of the fourteenth day), the operator presses the fourteen day off button which forces the system to a seven day mode. In the seven day mode a full setup and reload can be performed.

TIME PERIODS AND TIME INTERVALS

Pills are always moved from the pill array **18** to the remove slider repositories **37A** and **37B** one time period before they are to be used and on a late time interval. They occur at 9 a.m. for the Noon time period, 1 p.m. for the Afternoon time period, 5 p.m. for the Evening time period and at 2 a.m. for the Morning time period. Once the pills are in the remove slider repositories **37A** and **37B**, they are ejected when the eject button is pressed. This occurs at either the early or late time intervals depending on the setup. At 9 a.m., the Noon array slider **33B** will be moved as described above and transfer the pills for 12 p.m. to the remove slider repositories **37A** and **37B**. For example, if the system was left in the default mode (early time intervals) and the next time period (Noon) is

detected, the audio and visual indicators would be turned on. The user would respond by pressing the eject button **68** and the pills would be ejected to the external tray **26**. The repositories are now empty. Say we have the same conditions except the late time intervals are selected. When the next time period (Noon) is detected, no alarms are sounded, therefore, the user does not respond. When 1 p.m. time interval is detected, the audio and visual indicators would be turned on. The user would respond by pressing the eject button **68** and the pills are ejected to the external tray **26**. After this action is complete, the system would activate and load the next time period pills (Afternoon) into the remove slider repositories **37A** and **37B**. The system repeats this sequence through all time intervals until 9 p.m. is detected after which the system goes to sleep. It wakes up at 2 a.m., performs some housekeeping tasks, loads pills into the remove slider repositories **37A** and **37B** for the 8 a.m. time period and goes back to sleep until 8 a.m.

The reason that the system loads pills one time period ahead, is to reduce the time it takes the user to receive the pills after the eject button is pressed. A worst case example would be if the system was on the seventh day of operation and the pills are taken directly from the pill array **18,** as opposed to, from the repositories **37A** and **37B** (placed there one time period before). After the user presses the eject button, the appropriate array slider moves seven cell positions and returns for a total of 25 seconds. Now the remove sliders **36A** and **36B** move two cell positions for an additional four seconds. This is a total of 29 seconds for the pills to drop into the external tray. If the pills were in the repositories, it would take four seconds for the pills to drop into the external tray **26**.

LOADING SEQUENCE

Press the reload button, the Wait indicator turns on and the system automatically sequences through purge, transferring pills from dosett to pill array, removal of purged pills to catch bin and then transferring pills for next time

period. This total process takes approximately one minute. These four functions are detailed below.

Purge

The purpose of the purge action is to clear out any pills left in the pill array **18** before a new set of pills are transferred from the dosett **1**. There could be pills left in the pill array **18** if the dispenser was reloaded after say thirteen days instead of the full fourteen days. This product supports a reload at any time. The purge action will automatically take place even if there are no pills, in the pill array, to remove.

The micro-controller activates all four time period electromagnetic latches **16C,D,E** and **F** which binds the array sliders **33A,B,C** and **D** to their electromagnetic latches **16C,D,E** and **F** on the trolley PCB. The Trolley is turned on and moves seven cell positions to the right, pulling the four sliders with it. This opens all cells and drops any remaining pills, in the 28 cell pill array **18** above, onto the slider carrier **19** floor **31** below. The Trolley reverses after the back micro-switch **49** encounters back stop **59** and the four slider paddles **7** on the array sliders **19** sweep the pills ahead of it as the Trolley goes to the home position. At the home position, the front micro-switch **57** encounters the front stop **53** and the Trolley stops. The pills are dropped through the aperture **34** in the floor **31** of the slider carrier **19** into the remove sliders **36A** and **36B** repositories **37A** and **37B** below. The bottoms of all the pill array **18** cells are covered again. This completes the purge function. This function takes 25 seconds.

Dosett pill transfer

The transfer of pills, in the dosett **1**, into the pill array **18** follows the purge action. The micro-controller activates the dosett electromagnetic latches **16A** and **16B** which binds the dosett slider linkers **8** to the dosett electromagnetic latches. The Trolley is turned on and moves seven cell positions to the right, pulling the two dosett sliders **5** with it. This action transfers all the pills in the

dosett twenty eight cells into the pill array twenty eight cells below. The Trolley reverses after the back micro-switch **49** encounters back stop **59** and the Trolley goes to the home position closing the dosett sliders **5.** The front micro-switch **57** encounters the front stop **53** and stops. The dosett is now empty and could be removed or left in place for storage. This function takes 25 seconds.

Before proceeding, note that the purge and dosett pill transfer functions utilize the systems home **57** and back **49** micro-switches. When these functions are activated, the Trolley always goes to the extreme right and back home. There is no cell counting. The three functions that follow namely, remove, eject and fill, can move a specific number of cell positions under the control of the micro-controller. The operation of the cell counting mechanism will now be detailed.

Cell counting

Mounted on the base of the dispenser is a positioner **51**, as seen in Figure 10. This device has seven notches where the distance from the leading edge of one notch to the leading edge of the next notch is the same as the distance from one cell position to the next cell position. Mounted on the trolley PCB **17** is an optical device **58** that straddles the positioner **51,** as seen in Figure 16. When the Trolley is moving, and the optical device passes over the leading edge of a positioner notch, light passes from one side of the device to the other producing a electrical pulse. The micro-controller records the position of the Trolley by counting these pulses. If for example, the Trolley was moving to the right pulling the Morning array carrier slider **33A** (bound to latch **16C**), the slider would have fully uncovered the first Morning cell of the pill array **18** when the first notch on the positioner **51** was detected. If the system was in the first day of operation, the Trolley would reverse and go to the home position and turn off. If the system was in the second day of operation, the Trolley would go two cell positions, drop the pills in the second cell, reverse and go to the home position and turn off.

In the case of the eject and remove functions, the number of cell positions moved are fixed at two positions. In the case of the fill function, the array sliders

33A,B,C and **D** move one slider at a time, one cell position on the first day of operation. The starting point of a week depends on when the dispenser was loaded. From this point on, it cycles through the four time periods, i.e. Morning, Noon, Afternoon and Evening (eight time intervals) and then jumps to two cell positions. It repeats this sequence through the fourteen days of operation. We will continue now with the dispenser operation.

Remove function

The remove function is a safety mechanism that removes pills from the remove slider repositories to a catch bin **42** if the user does not respond and eject the pills within 28 minutes of the sounding of the pill present audio device. After the pills are removed, the alarms are turned off and the remote reporting system sends a Code 3 call to the pager to inform the operator that pills were not taken. The operator responds accordingly.

NOTE: The remove mechanism is the same regardless if it occurs after a purge action or a 28 minute delay.

The leftover pills in the array have been purged and a new set of pills have been transferred from the dosett to the pill array. The next step is to remove these leftover pills from the repositories to the catch bin **42**. Or after the 28 minutes wait period for the user to respond, the software initiates the remove function. The micro-controller activates the remove electromagnetic latches **16G** and **16H** and binds them to the remove slider linkers **32B.** The Trolley turns on and moves two positions to the right, pulling the two remove sliders **36A** and **36B** with it. This action transfers all the pills in the remove slider repositories **37A** and **37B** into the catch bin **42** below. The Trolley reverses direction and moves to the home position. The front micro-switch **57** encounters the front stop **53** and the Trolley stops. The remove sliders **36A** and **36B** are at their home position. These pills will remain in the catch bin **42** until the reload action is complete or the next time the operator goes to the user's resident to reload the dispenser. In either case, the operator removes the access panel **71** and removes the catch

bin **42**, retrieving any pills in it. The catch bin **42** and access panel **71** are returned. The access panel **71** can only be removed when the lid is open. This function takes 8 seconds.

Pill transfer after a reload

After the remove action is complete, the system transfers pills from the pill array **18** to the repositories **37A** and **37B** in advance of the next time period. Normally the transfer occurs on the late (odd) time intervals, i.e. 9 a.m., 1 p.m., 5 p.m. and 9 p.m. in the normal sequencing mode. But after a reload, which can occur at any time, the first transfer occurs at the time of loading. Conditions in the micro-controller must be set to allow or not allow this transfer to occur for the following reasons: If the time intervals are set to early, there is no issue of transferring the pills from the Morning period cell to the repositories immediately (say time of loading was Tuesday 8:30 a.m.) since pills are not going to be taken by the user at 9 a.m. because both alarm indicators are inhibited. When 9 a.m. is detected, the system will go through the motions of transferring pills but there are no pills in the repositories (moved at 8:30) and therefore no harm is done.

If the time intervals are set for late, i.e. 9 a.m., 1 p.m., 5 p.m. and 9 p.m., when 9 a.m. is detected, the alarms will be activated and the user will respond by pressing the eject button to get the pills. In this case, the pills must be present so that they can be taken at 9 a.m. Also, after the eject action is complete, the system initiates a fill action and pills in the pill array for the Noon time period are transferred to the remove repositories, ahead of time, ready for the next time period, Noon. In this case pills will not be transferred at the time of loading but at the late time interval. In this case, Tuesday at Noon is the starting point of the new week. When the Wait visual indicator turns off, the operator closes the lid which locks. The system is now set for another week of operation.

Pill transfer in normal operation

After the loading is complete, the system is idle until it detects the next time period (Noon). Since the time interval is in the default mode, when 12 p.m. is

detected, the pills present visual and audible alarms are turned on and the eject function is enabled. If the user responds to the alarms and presses the Illuminated eject button **68**, the eject function is activated. Refer to EJECT FUNCTION for description of operation. If the user does not respond within 28 minutes, the remove function is activated. Refer to REMOVE FUNCTION for description of operation. When these actions are complete the system is idle until the 1 p.m. time interval is detected. At that time, the micro-controller turns on the Noon electromagnetic latch **16D** and the Noon array slider **33B** is pulled one cell position to the right transferring the pills in the first Noon cell of the pill array **18** into the remove slider repositories **37A** below. The Trolley reverses and goes to the home position. The front micro-switch **57** encounters the front stop **53** and the Trolley stops. The repositories now contain the pills for the Afternoon time period. If the time interval was set to late, and the next time period is Noon, the 12 p.m. time interval will produce no alarms, therefore, no response from the user. The system is idle until the 1 p.m. time interval is detected. At this time, the fill function is activated and pills transferred to the repositories for the Afternoon time period as described above.

EJECT FUNCTION

The eject function is enabled when the pills present visual and audible alarms are active. The user responds by pressing the illuminated eject button **68** on the front visual panel. The eject electromagnetic latches **16I** and **16J** are energized and binds the eject slider linkers **40** to the eject electromagnetic latches **16I** and **16J**. The Trolley is turned on and moves two positions to the right, pulling the two eject sliders **38A** and **38B** with it. This action allows the pills in the remove slider repositories **37A** and **37B** to drop down the chute **41A,** as shown as a dotted line in Figure 10, into the external tray **26** on the left side of the dispenser.

If the user fails to respond to the pills present alarms after 28 minutes, the remove function is activated and the pills in the repositories are placed in the catch bin **42** as described in the remove function.

FAULT CONDITIONS AND REPORTING

When one of the seven system conditions occur, the dispenser seizes the telephone line and sends a call to the person that is carrying the pager. This person could be a member of the family or an assigned caregiver. It is the responsibility of this person to respond accordingly. The codes are described below.

Code 1 - Help Me. This code is sent when the user pushes the button on a pendant or bracelet as a call for help. This is the most serious code and must be responded to immediately.

Code 2 - System Failure. This code is generated by the system when a major failure occurs such as a forced system shutdown due to a timing fault, a loss of internal power or when the dispenser is empty of pills. This code must be responded to as soon as possible.

Code 3 - Pills not Taken. This code is sent as a status condition. The operator would call the user to determine why the pills were not taken.

Code 4 - Empty Warning. This code is sent twelve hours before the dispenser is empty. It is a reminder to the operator to fill the dispenser within twelve hours.

Code 5 - External Power Failure/Loss of Charging. This is considered a minor call since the system backup power will maintain operation for 48 hours. This gives the operator time to respond.

Code 6 - Day Away Removed. This call notifies the operator that the user has

removed the Day Away from the main dispenser. This is important since removing the Day Away forces the main dispenser to stop dispensing pills. This is done for safety reasons to prevent the user from taking pills from both units in the same time period.

Code 7 - Day Away Returned. Knowing that the Day Away has been removed, the operator is expecting the Day Away to be returned at some reasonable time in the future. If the return call is not received, the operator must call to determine the status of the user. Usually it will be simply that the user forgot to return the Day Away to it's holder.

Code 1 must be transmitted from the pill dispenser immediately. My old design monitored the telephone line and seized it when it was free (on hook). With the introduction of this new feature, it was necessary to develop an approach where the dispenser could seize the telephone line even if it is in use by the user or is left off hook. This is accomplished by passing the incoming telephone line through a relay in the dispenser and then to a remote jack which is plugged into a power outlet. The remote jack transmitter uses the house wiring to transmit the telephone signals to a receiver which is plugged into a different power outlet in another room. The user's phone is plugged into this receiver and not into a normal telephone jack. If the dispenser needs to report a condition and the telephone line is off hook, it energizes the relay which removes the off hook condition from the line, allowing the dispenser to seize the line and send a call to the pager. This breaks the line from the user for a period of 16 seconds.

Another safety feature is a circuit that constantly monitors the telephone connection to the phone line. If this connection is broken (phone removed from the wall jack), the dispenser produces an audible alarm to which the user should

respond. This same circuit alarms if the phone is off hook for more that one hour.

NORMAL OPERATING MODE

The best way to present a clear picture of the operation of this product is by example. This example traces the operation of the dispenser over a typical day. The system has been operating in normal mode for months. Power up conditions do not apply.

The operator arrives at the user's residence at 8:30 a.m. of the fourteenth day to reload the dispenser. Since the dispenser is on the fourteenth day, the fourteen day LED is off and a complete reload procedure is required. The dispenser is unlocked and the empty dosett is removed and a filled dosett inserted as described in the section INSERTING/REMOVING A DOSETT. The dosett LED turns on (red) as soon as the new dosett is inserted. This indicates that the dosett must be checked for empty cells. Since the 7 cells of the Morning row have pills in all seven cells by default, the system starts the checking at the Noon row by turning on the Noon LED (red). The operator scans the Noon row for empty cells, if all seven cell are full the operator presses the ENTER button. Say cell 4 is empty, the operator sets the code switch to 4 and presses RECORD. If there are no other empty cells the operator presses ENTER. The Noon LED turns off and the Afternoon LED turns on (red). The operator repeats this procedure through to the Evening row. When the checking of the Evening row cells is complete the ENTER button is pressed, the Evening LED turns off and the dosett LED changes to green.

NOTE: The reload button is inhibited until the dosett LED is on (green).

The next step is to select early or late mode of operation. The system defaults to early time intervals and the time interval LED is off. If the late time intervals is desired, the time interval button is pressed and the LED turns on (green). In this example, the system is left in the default condition which is early time intervals. This completes the setup, now the system must be loaded.

The operator presses the RELOAD button. The Wait LED turns on (red) and the loading sequence commences. Refer to the section LOADING SEQUENCE for a description of the four loading actions. When the four loading actions are complete, the Wait LED turns off and the loading of the first dosett is complete.

The procedure stops here if a seven day operation is required. Return the catch bin **42**, the access panel **71** and the access slider **25** to their positions and close the lid. It will lock and prevent access to these parts. The system is set to automatically dispense pills for seven days.

For example, if a fourteen day operation is required (preferred mode of operation), a second full dosett is installed as described in the section DAYS OF OPERATION.

If the caregiver arrived at the user's residence at 8:40 a.m. of the thirteenth day to reload the system, the fourteenth day LED is still on, therefore, a normal setup is averted and the following short procedure is performed.

The dispenser is unlocked and the empty dosett (second dosett) is removed and a filled third dosett inserted as described in the section DAYS OF OPERATION. The dosett LED turns on (red) as soon as the third dosett is installed indicating that this new dosett must be checked for empty cells. The test for empty cells is performed as described above and the fourteen day LED stays on (green). The access panel **71** and the access slider **25** are returned, the lid is closed and locked. The system is again operational for another week.

At the end of the second week, the system automatically transfers the pills of the third dosett and the system will continue to dispense pills for a third week. This procedure can be repeated indefinitely.

Now back to the example, the loading is complete. Since the operator started the reload action at 8:40 a.m., the next time period is Noon (12 p.m.) and the time interval was set to early. The system is idle until 12 p.m. is detected. When it is detected, the eject function is enabled and the pills present alarms turned on. The system waits for the user to respond. If the user responds by pressing

the illuminated eject button **68**, the system activates the eject action as described in section EJECT FUNCTION. If the user does not respond within 28 minutes, the remove function is activated as described in section REMOVE FUNCTION.

The system remains idle until the next time interval is detected by the micro-controller which, in this example, is 1 p.m. When 1 p.m. is detected, there are no audible and visual indicators turned on since the early time intervals were selected during setup. There is no response by the user. The system initiates a fill action and pills in the pill array **18** for the Afternoon time period are transferred to the remove repositories **37A** and **37B**, ahead of time, ready for the next time period, Afternoon. Refer to section PILL TRANSFER IN NORMAL OPERATION for details.

The system again remains idle until the next time interval is detected by the micro-controller which, in this example, is 4 p.m. Since the system is in early time interval mode, the micro-controller initiates the pills present visual and audible alarms. The user responds by pressing the illuminated eject button **68** on the front visual panel. The eject function activates and pills are placed in the external tray **26**.

At 5 p.m. the micro-controller initiates a fill action and by the same action as described above, pills are transferred from the first cell of the Evening cell into the repositories and waits for the 8 p.m. time interval to be detected. When detected, the pills present alarms will sound and the system waits for the user to respond. The system will continue with this sequence of events four times a day for seven days.

If the user does not respond after twenty eight minutes, the micro-controller will initiate the remove function as described above and the pills in the remove slider repositories will be transferred to the catch bin **42** and a Code 3 is sent to the operator.

If the operator does not come to reload the system, on the first occurrence of the fourteenth day, an empty warning Code 4 is sent to the operator, reminding the operator that the system requires refilling within 12 hours. If the system is not filled before the 12 hours is up an empty Code 2 is sent to the operator and the system shuts down. This Code 2 is repeated every four hours until action is taken.

At 9 p.m. the system goes to sleep and wakes up a 2 a.m. to do some house keeping tasks then transfers pills to the repositories for 8 a.m. This completes one day of operation. This cycle repeats for fourteen days.

OPTIONAL FEATURES

There are three optional features associated with this Automatic Prescription Pill Dispensing System as listed below:

- Day Away
- Help Me
- Hearing Impaired Visual Aid

DAY AWAY

This device was fully disclosed in Canadian patent 2217220 granted May 2001. It's description is repeated here for continuity.

This is a hand held device **50** composed of four cells **69**, one mounted on each face of the device **50** see Figure 13. The cells are covered by locked thumb operated sliders **76**. One of the sliding covers **75** is open to show the pill cell **69**. The device holds a small number of essential pills required for the well being of the user for one day. The unit communicates with the main dispenser through connector **73**. Tab **74** is a key that forces the Day Away to align correctly with the connector in the holder (it can only be inserted one way). When removed from it's holder **70** on the right side of the main dispenser, the main dispenser will send a Code 6 to the pager carried by the caregiver assigned to that particular dispenser. Also, the main dispenser will stop dispensing pills

while the Day Away is removed from it's holder. The main dispenser continues to function but the pills present alarms and the reporting of Code 3 is inhibited. The pills are transferred to the catch bin **42**. A Code 7 is issued when the Day Away is returned. The purpose of these warning codes is to make the operator aware that the user's dispenser is inhibited while the Day Away is out of it's holder. If the unit is not returned after a reasonable length of time, the operator should check on the user.

HELP ME

This feature adds additional support to the elderly. A typical situation is if the user should fall and can not get up. The user wears a pendant or a bracelet that has a button which can be pressed if the user is in trouble. A signal is transmitted to the dispenser which in turn reports a Code 1 to the caregiver carrying the pager. This call will repeat every ten minutes. The caregiver must respond immediately with a preset set action plan. The final action of this plan is to go to the user's residence to ensure that the actions put into motion were carried out. Only after the immediate problem has be alleviated, can the caregiver turn his/her attention to the dispenser and cancel the continuous transmission of Code 1 by pressing the pager off button twice. The pager off LED on the front visual panel will turn on and off. This feature is activated by setting a jumper on the back PCB.

HEARING IMPAIRED VISUAL AID

If the user is hearing impaired, an option is available where the pills present audible alarm is supplemented with a flashing lamp. The lamp can be in any room in the user's residence. This flashing lamp operates the same way as the audible alarm, in that it flashes for 20 seconds, turns off for 9 minutes then flashes again. It repeats this action for 28 minutes. This feature is activated by setting a jumper on the back PCB.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. An automatic prescription pill dispensing system consisting of a main dispensing unit and a removable dosett,

the removable dosett comprising:

a rectangular horizontal pill-holding array of pill-retaining cells for holding pills to be loaded into the dispensing system, each of the cells being open at the bottom to permit the loading of pills therein and to permit pills to fall through the cell;

two sliding bottom panels under the array of cells forming a pill retaining bottom for the cells in said array located above said both panels, being able to slide between a closed position such that pills in the cells are prevented from falling through the cells, and an open position such that pills fall through the cells;

two sliding bottom panels under the pill-holding array may be opened to permit pills to be loaded into the pill array in the dispenser;

the main dispensing unit comprising:

a pill array comprising a rectangular array of pill-retaining cells of the same dimensions as the pill-holding array of the dosett for retaining pills to be dispensed, each of the pill-retaining cells being open at the top to permit pills to fall into the pill-retaining cells from the dosett when the dosett is installed over the pill array and being open at the bottom to permit pills to fall through the bottom of the pill-retaining cells;

a plurality of array slider means located under the pill array to act as a pill-retaining floor for the pill-retaining cells of the pill array above said slider means when in a fully closed position and selectively movable a

predetermined distance between open and closed positions to permit pills from a desired pill-retaining cell of the pill array above to drop into a pre-dispensing location;

means for moving the sliding bottom panels of the removable dosett when the dosett is installed over the pill array to permit movement between a closed and an open position;

array slider movement means associated with each of the array slider means for selectively moving each of the array slider means a desired distance between open and closed positions;

user-operable dispenser activation means to cause movement of pills from the pre-dispensing location to a dispensing location where they may be accessed by the user;

microprocessor means for controlling the movement of the dosett slider means and the array slider means to permit dispensing of pills;

whereby pills to be dispensed may be loaded from the removable dosett installed into the main dispensing unit in order to transfer the pills to be dispensed into the pill array and to load the pills to be dispensed from the pill array to the pre-dispensing location.

FIG. 1A

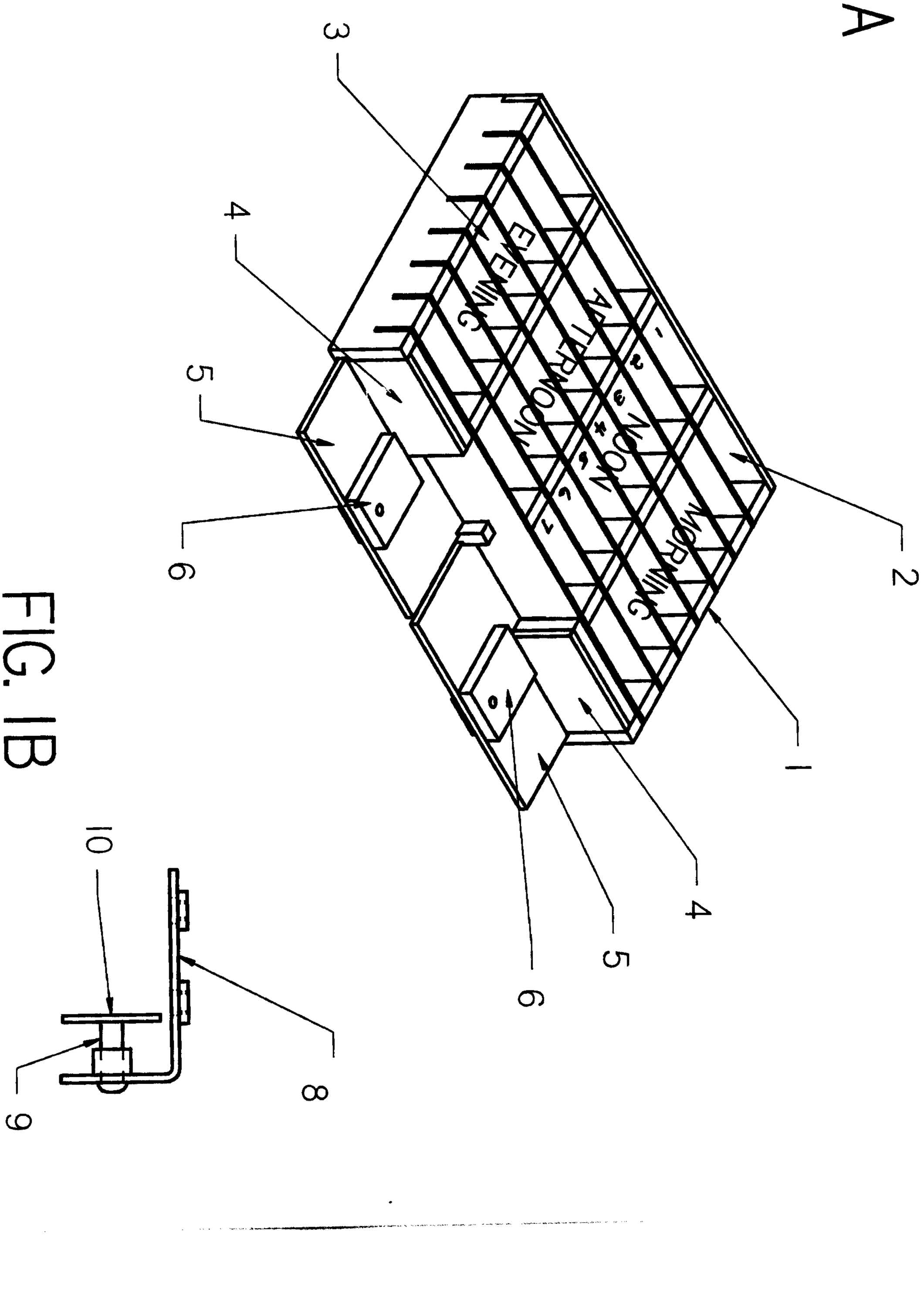


FIG. 1B

FIG. 2A

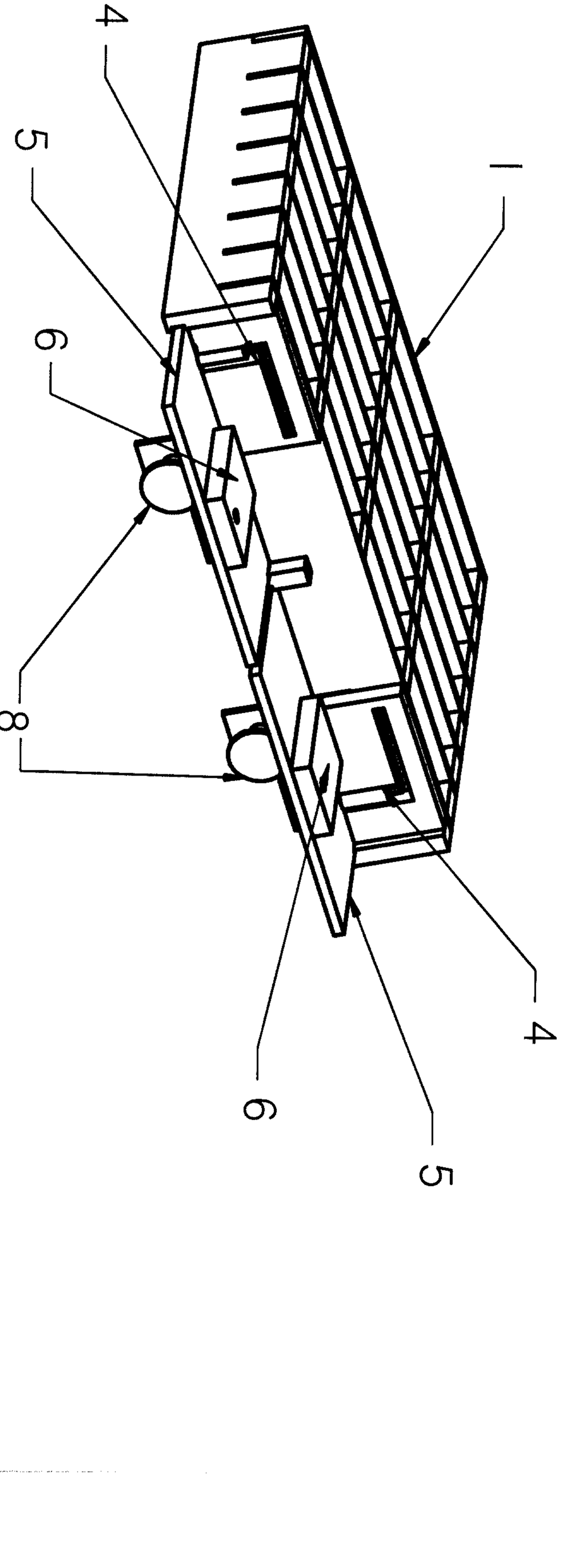
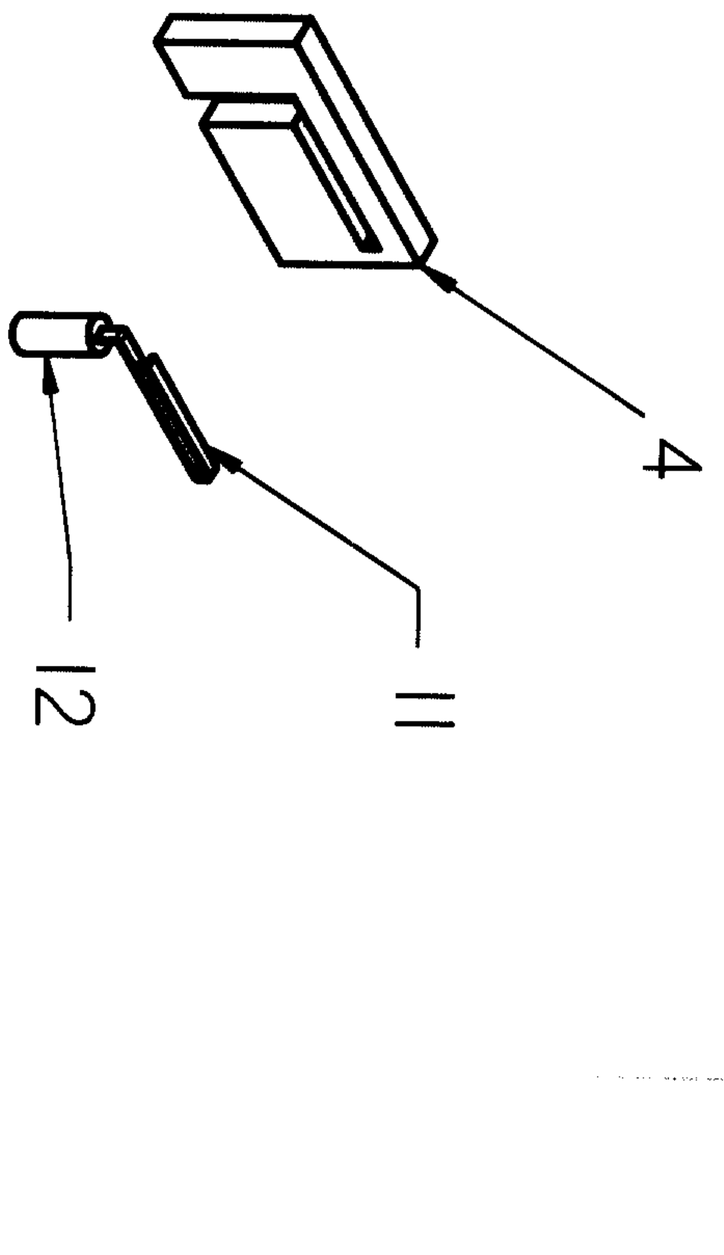


FIG. 2B



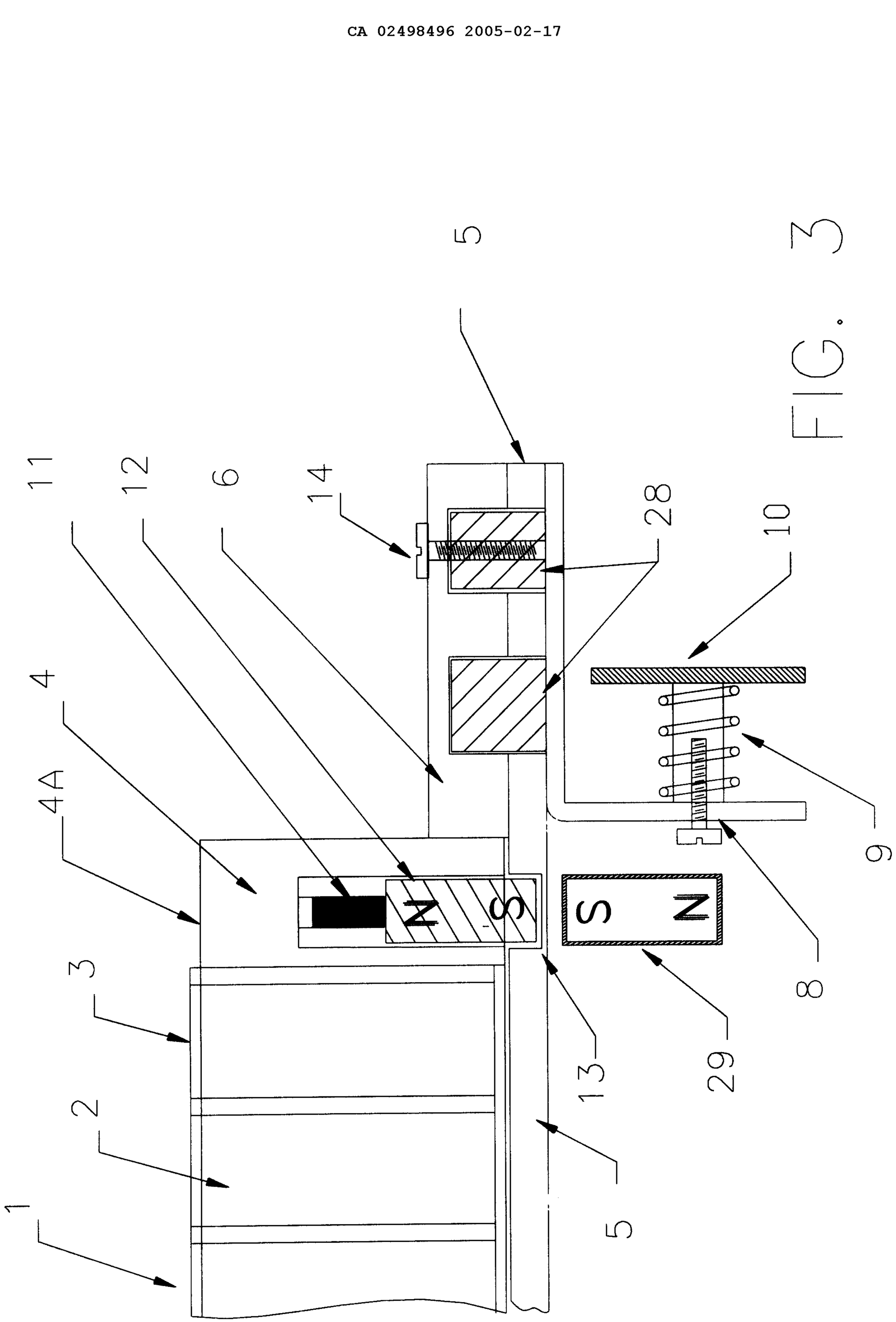


FIG. 3

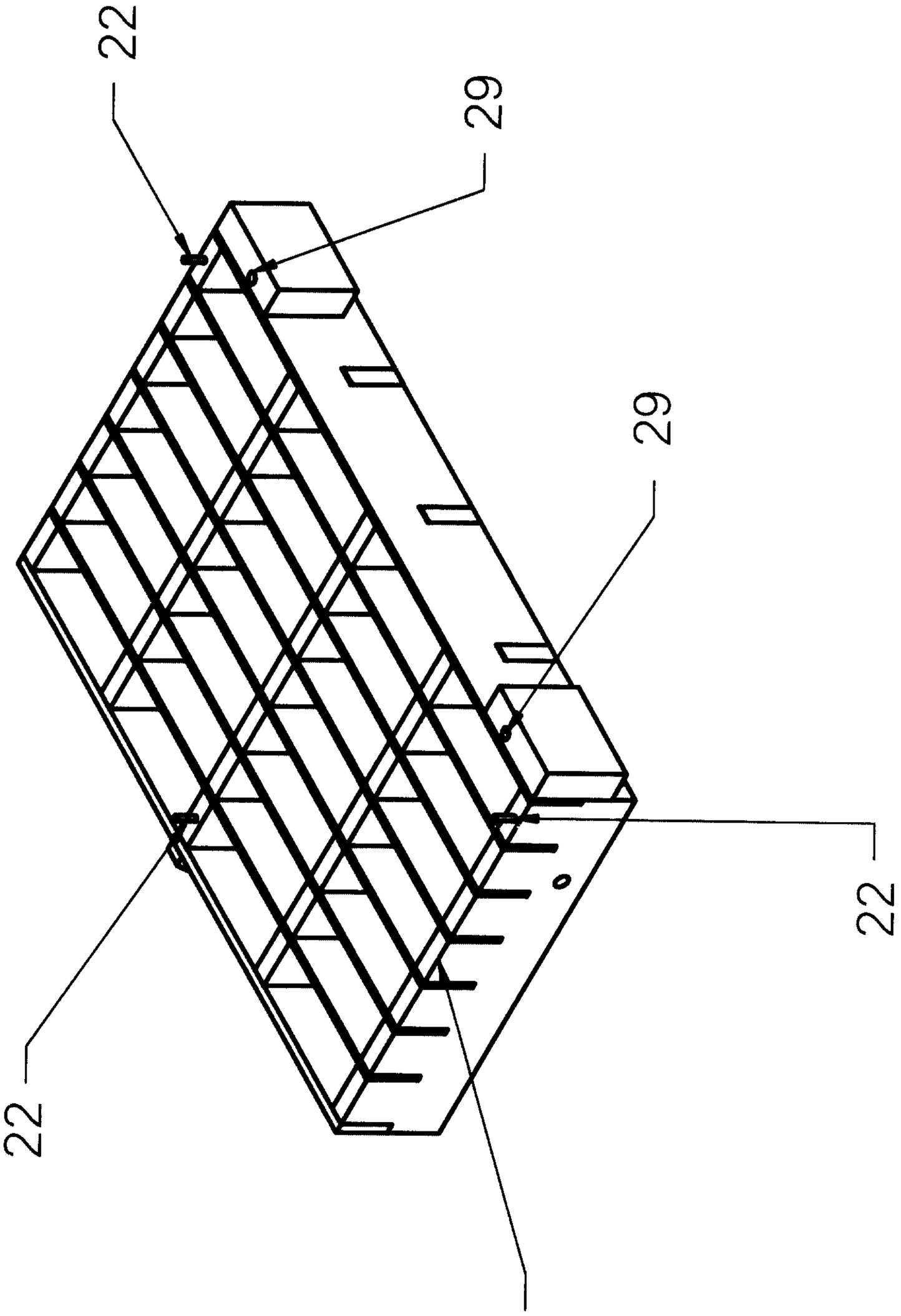


FIG. 4

FIG. 5A

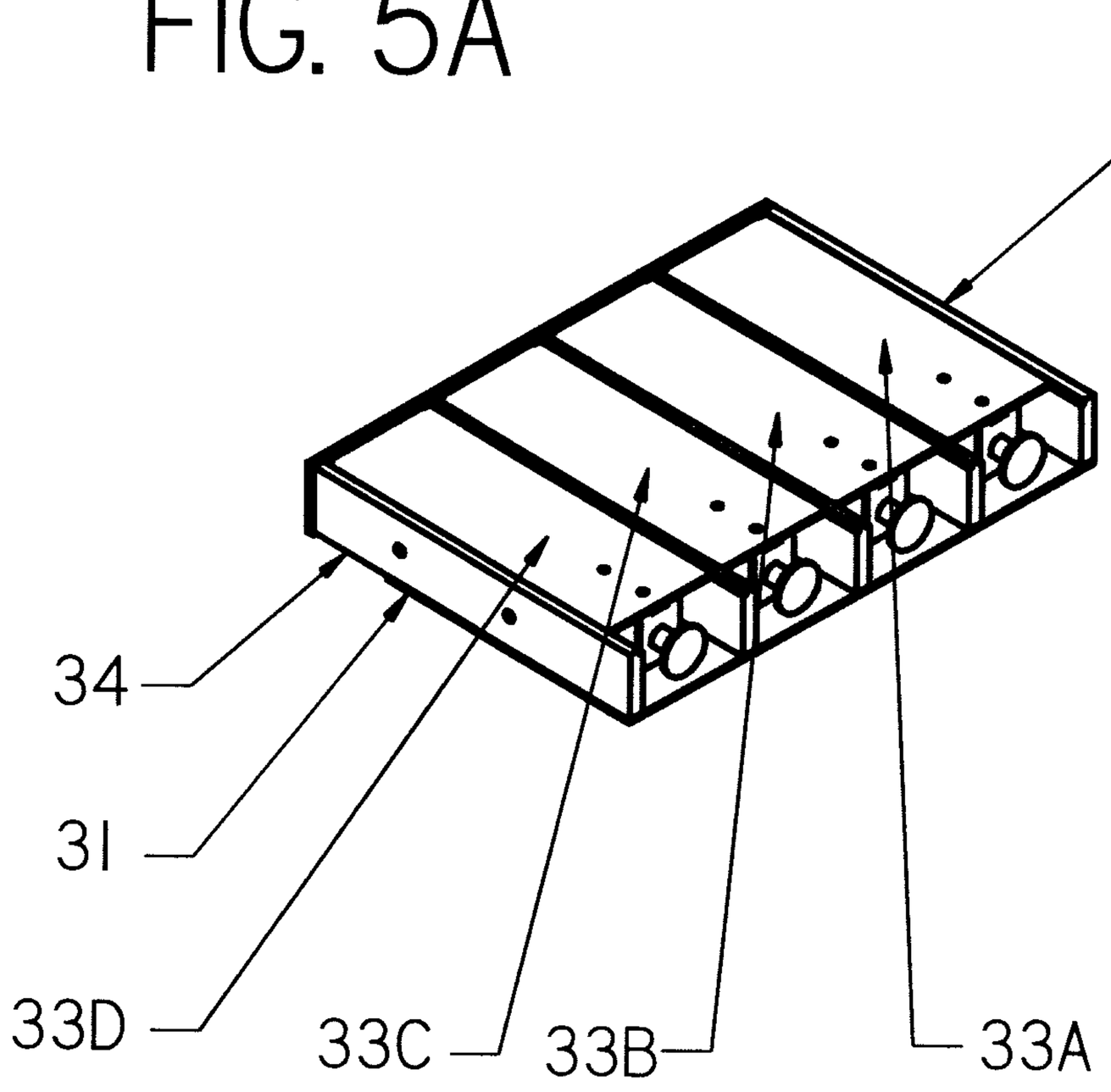


FIG. 5B

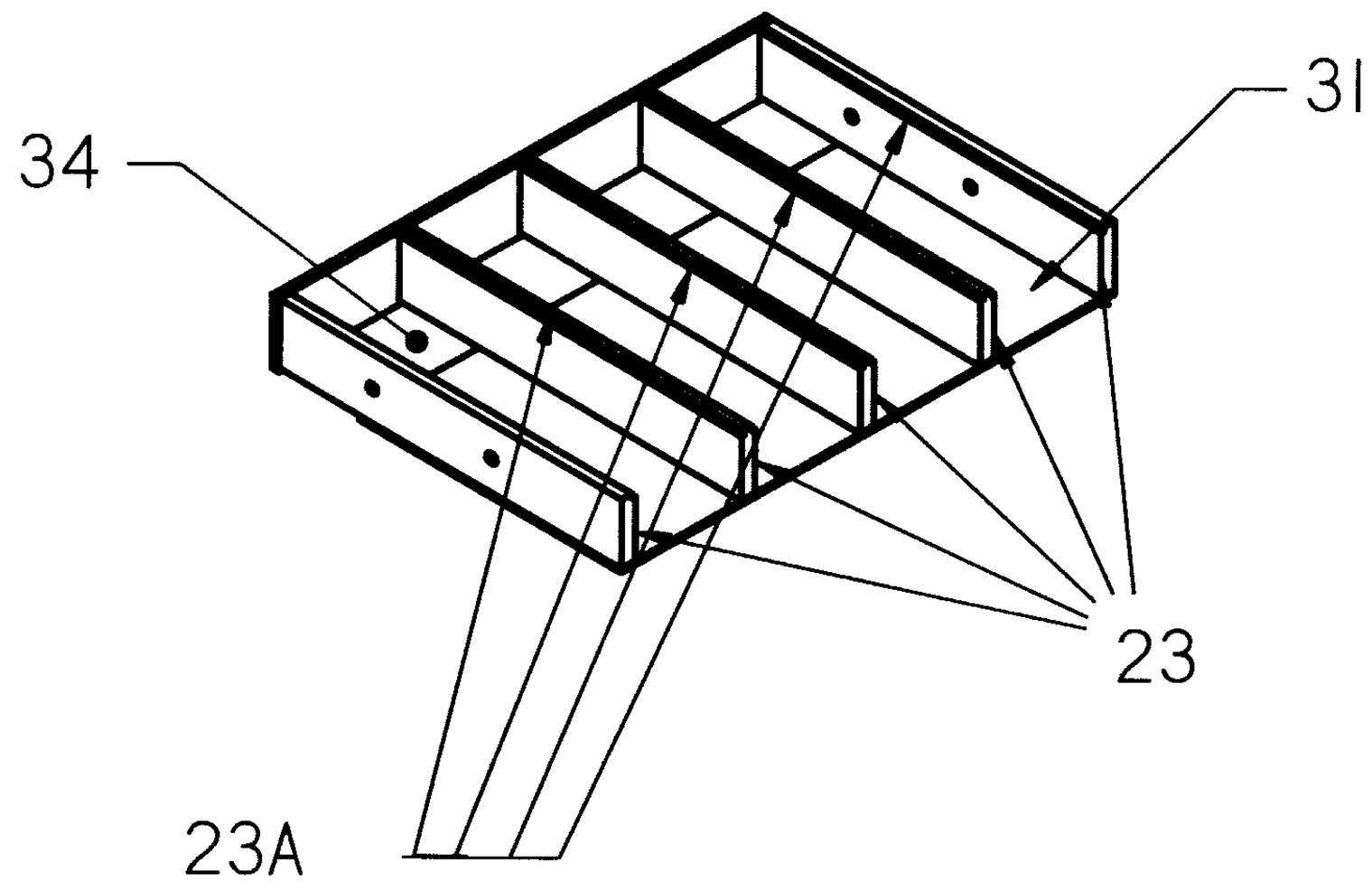
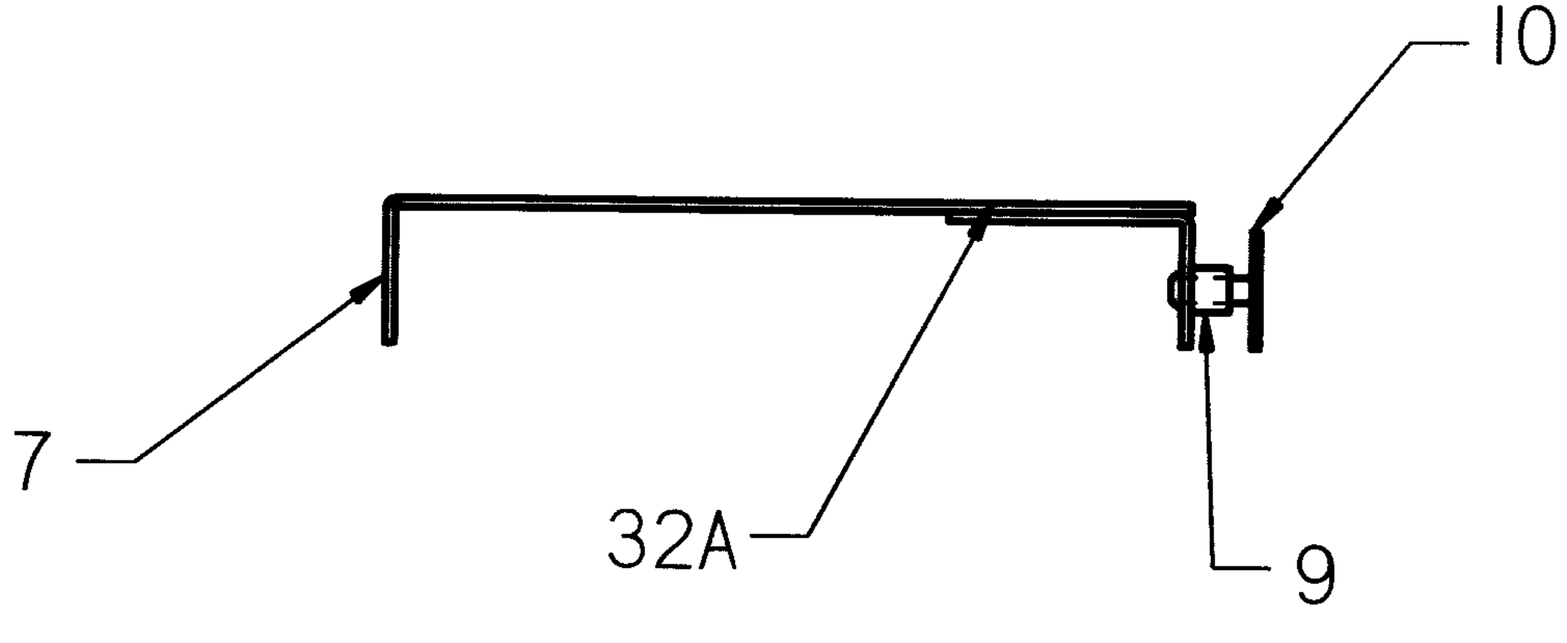


FIG. 5C



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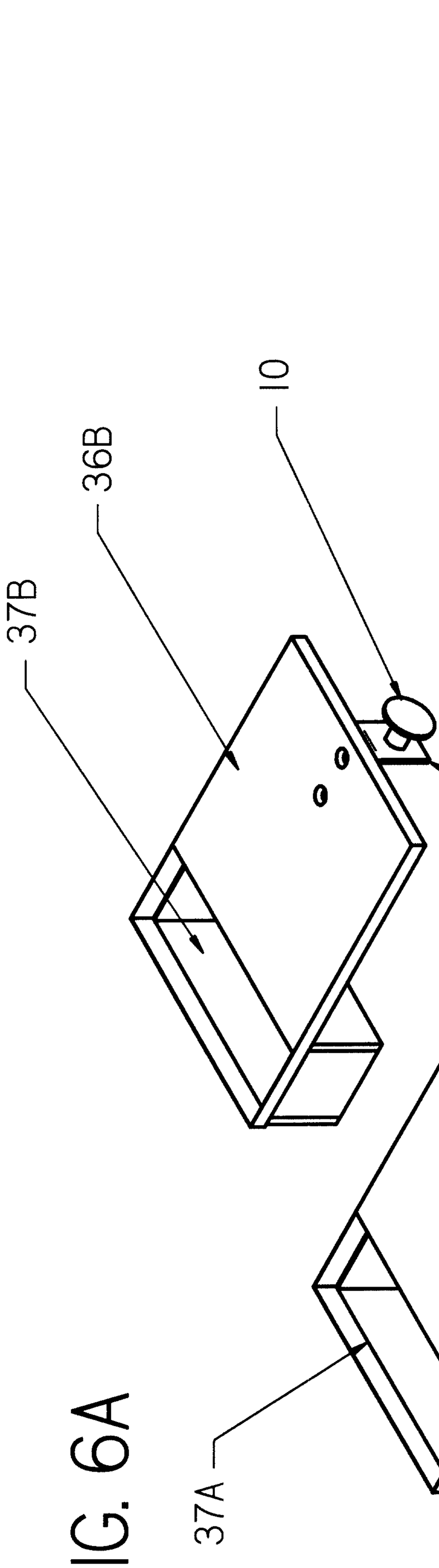


FIG. 6A

FIG. 6B

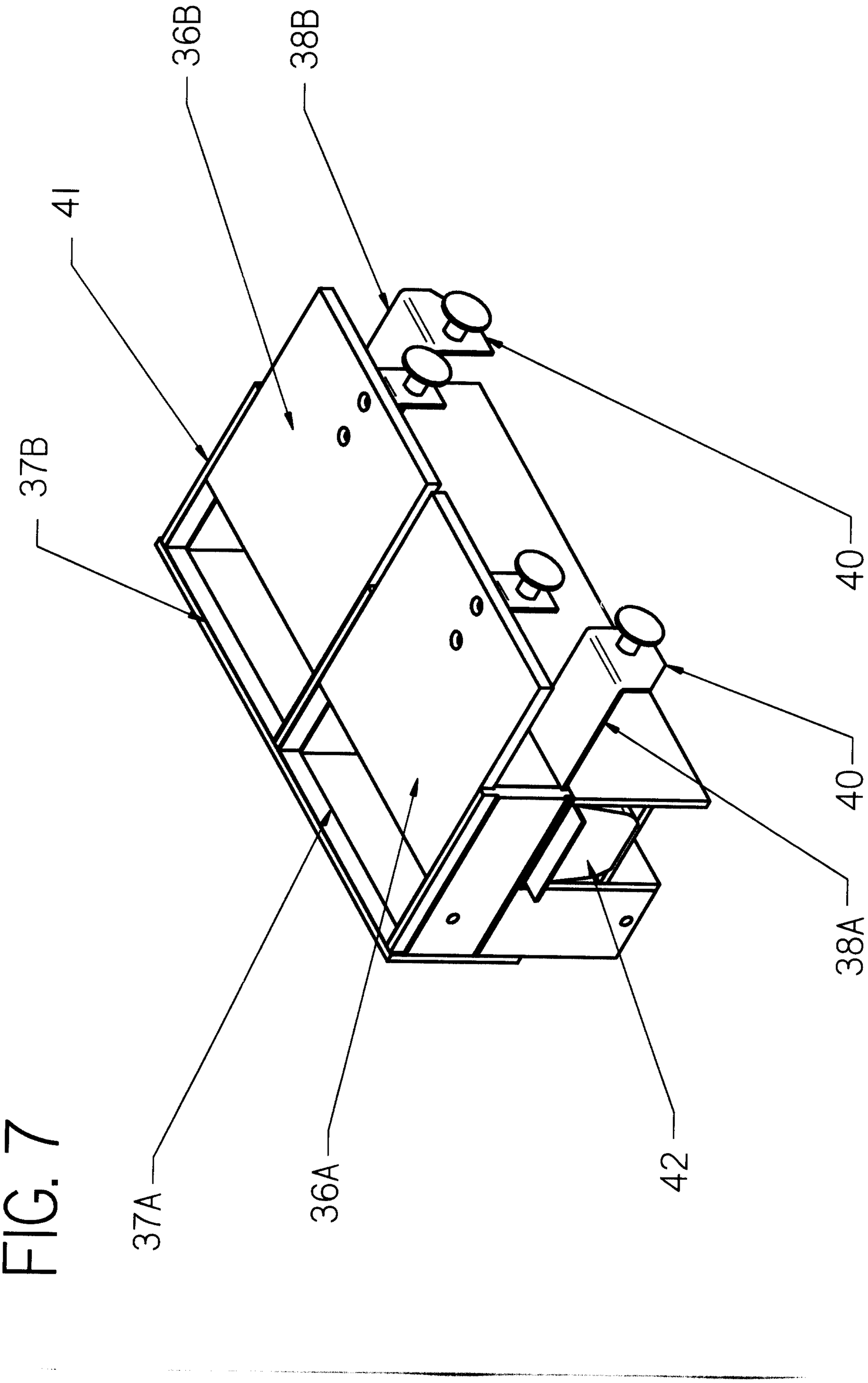


FIG. 7

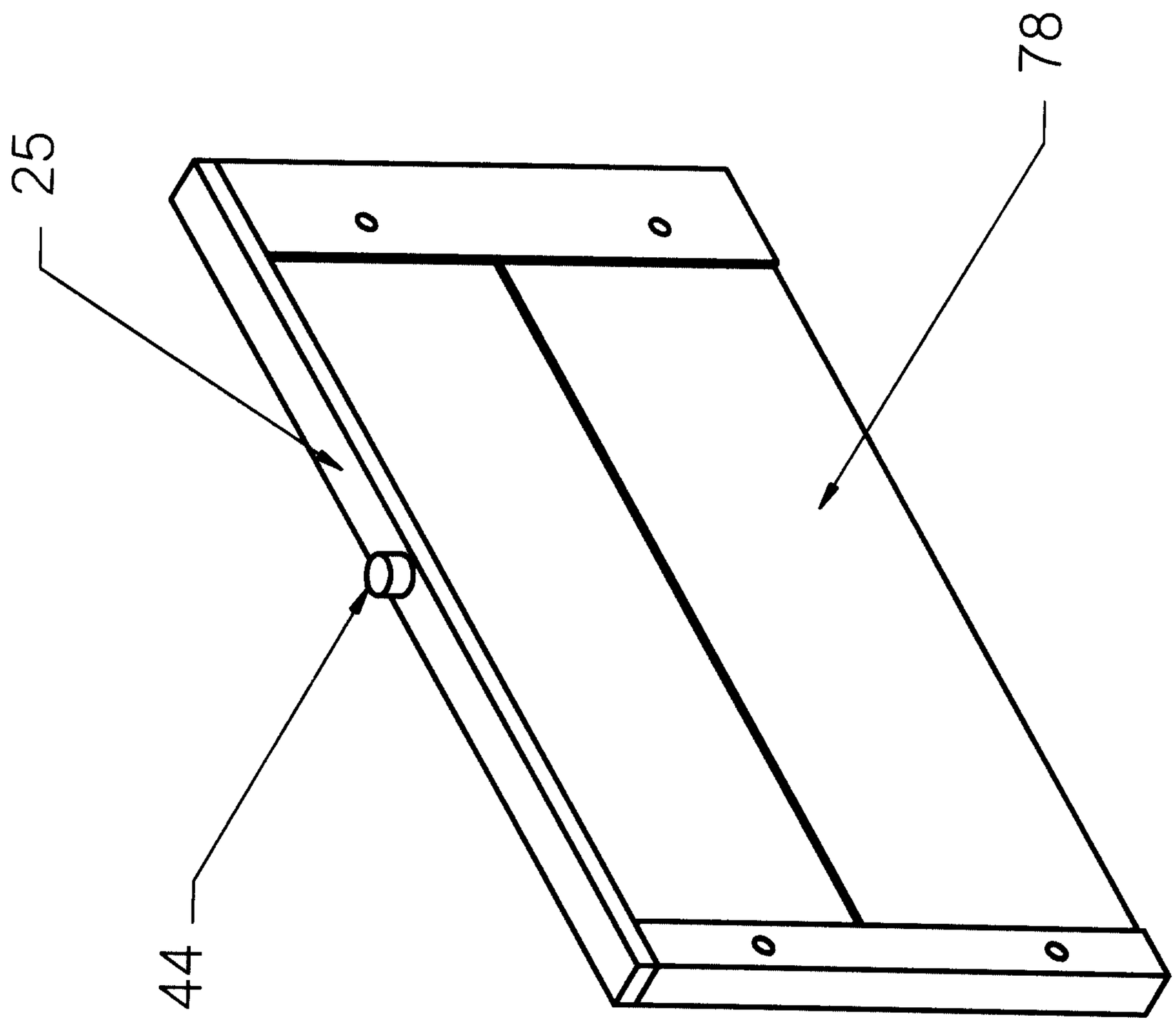


FIG. 8

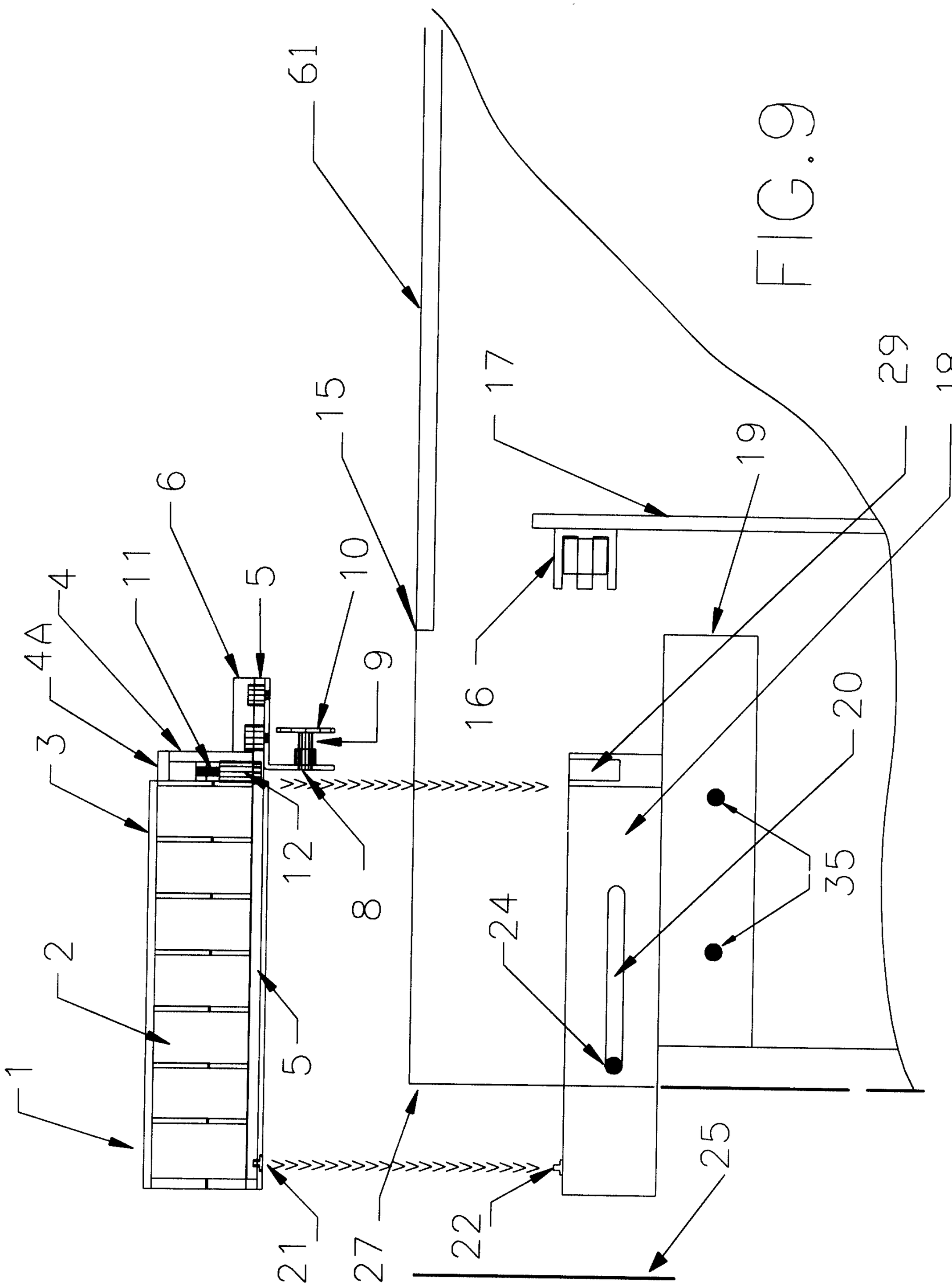


FIG. 9

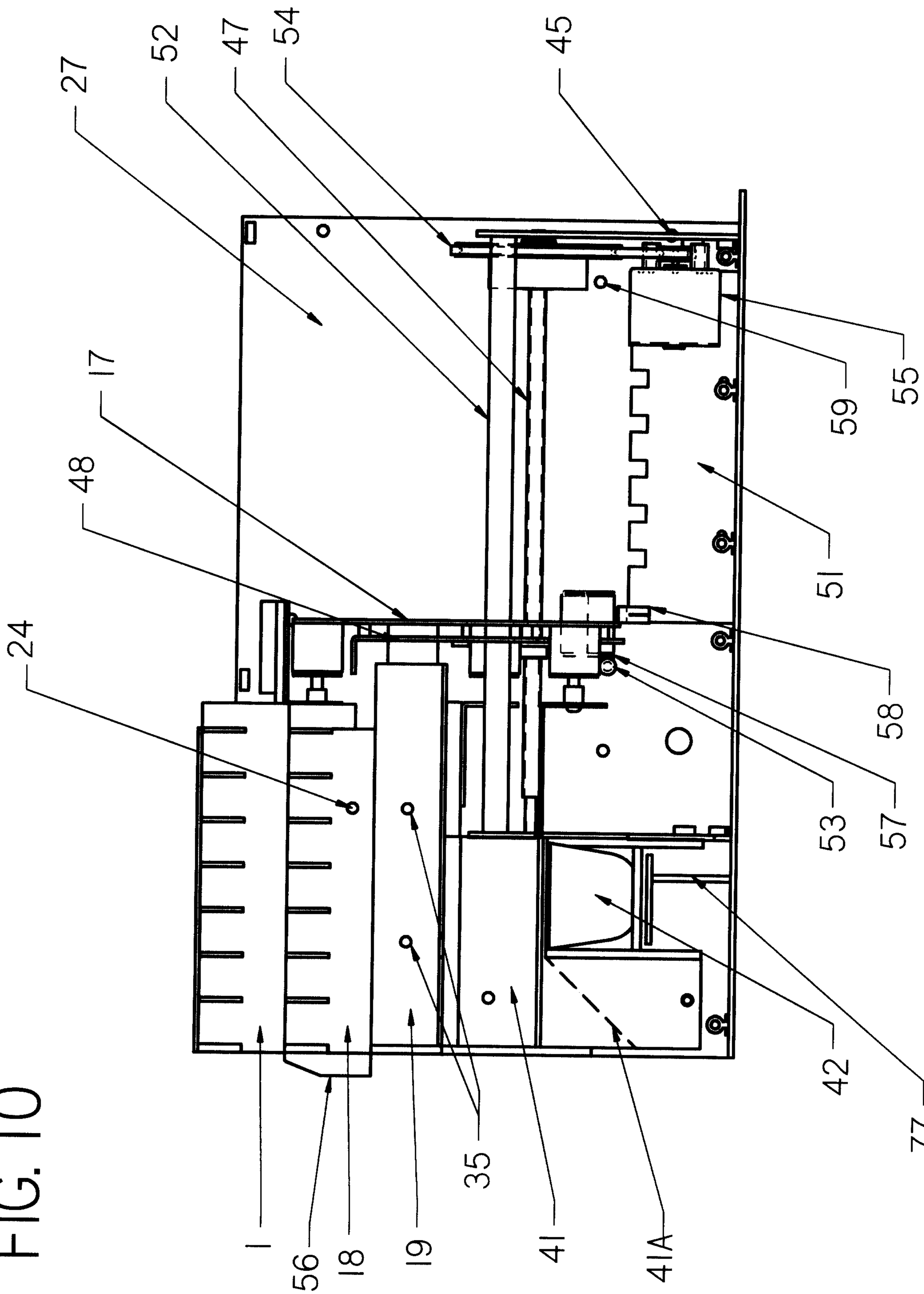
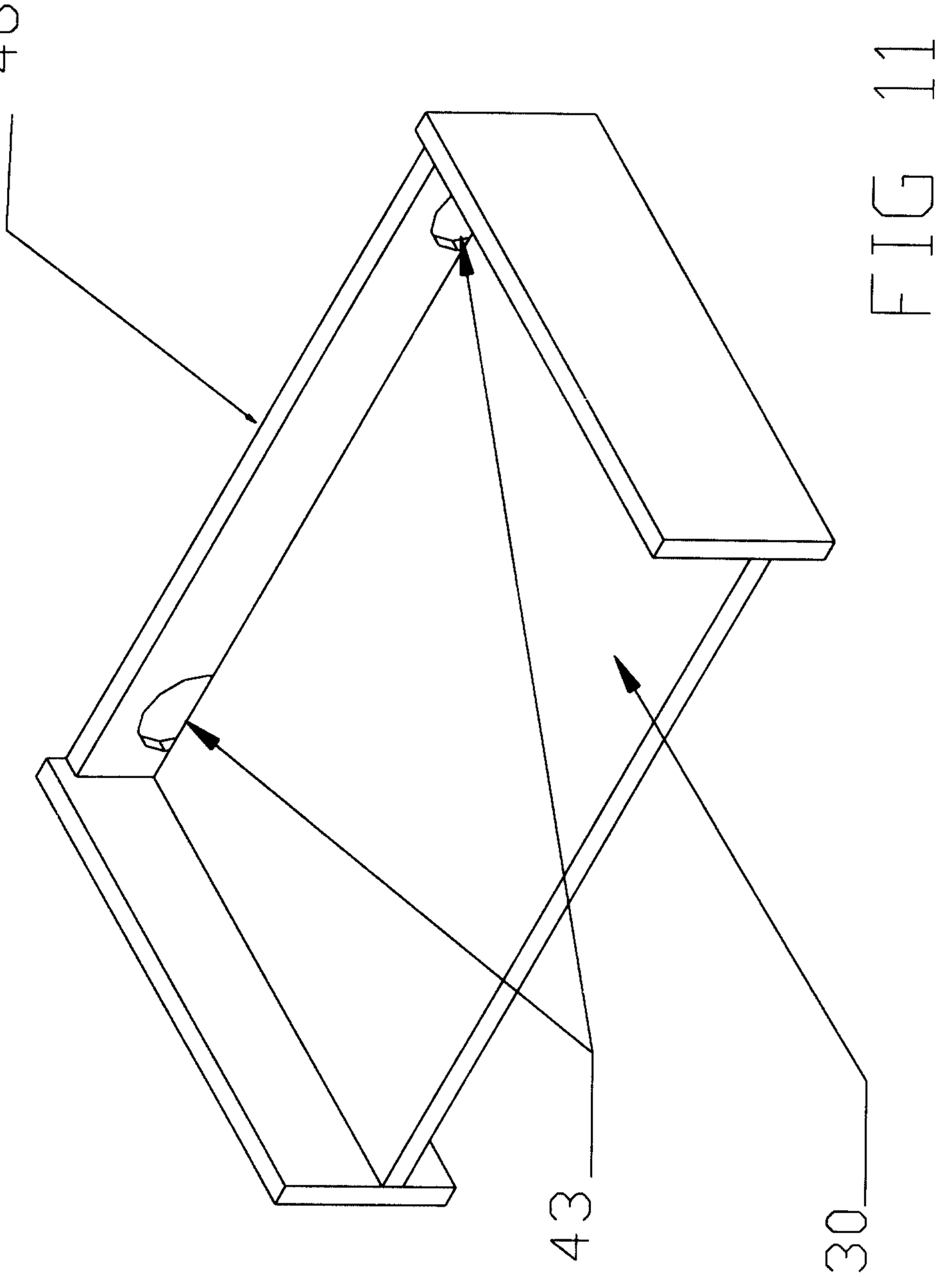


FIG. 10



FIG

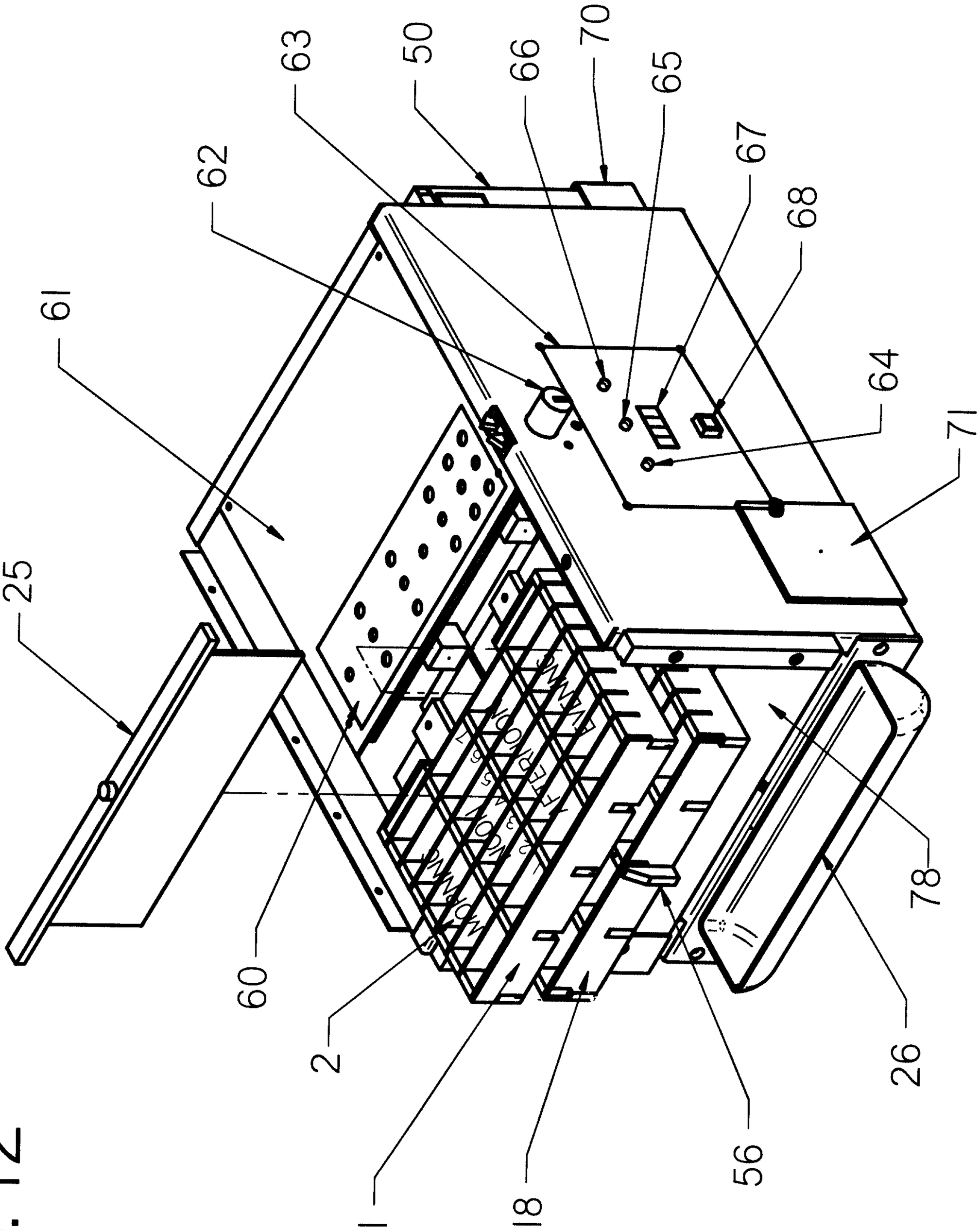


FIG. 12

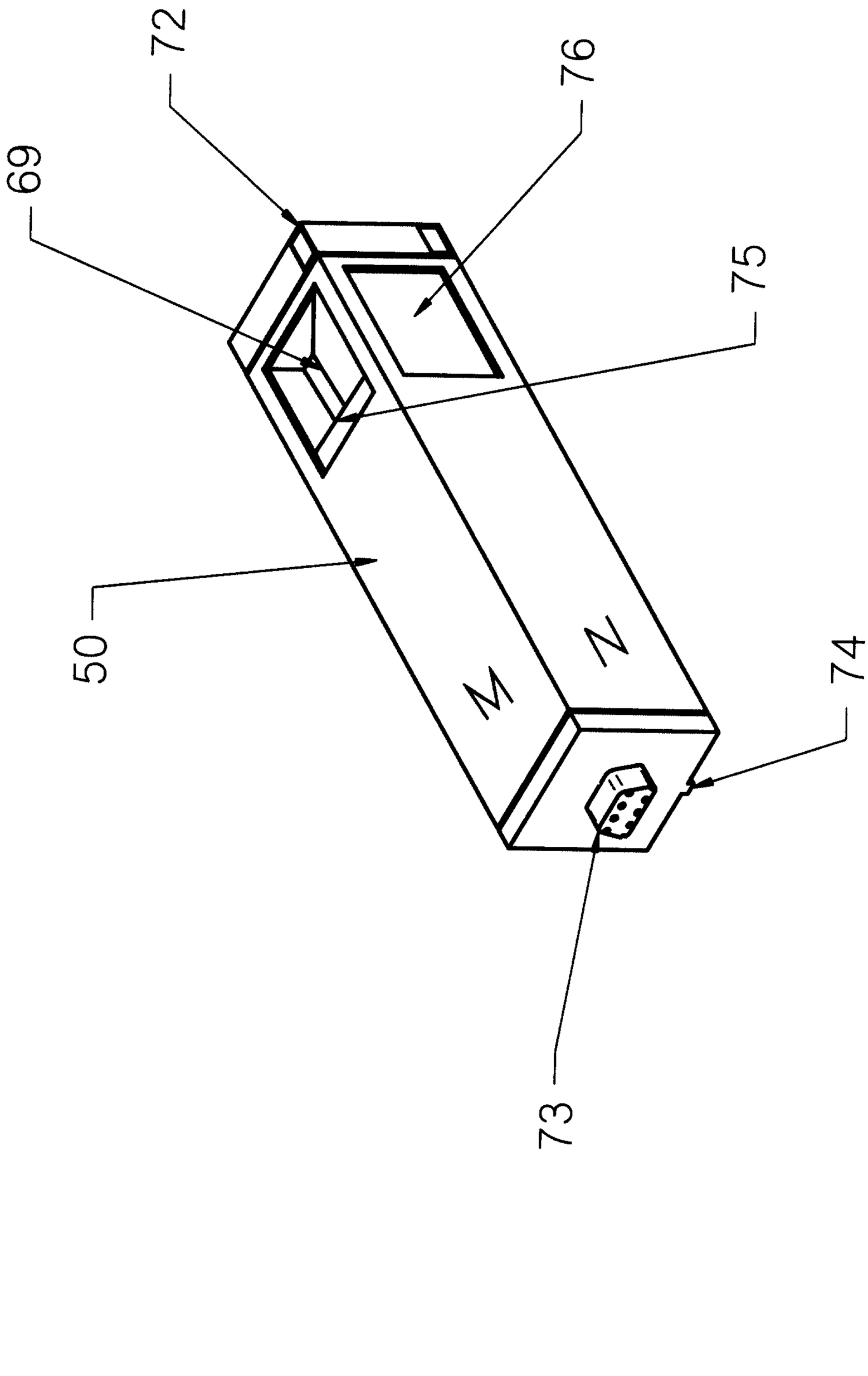


FIG. 13

MAIN CONTROL PANEL

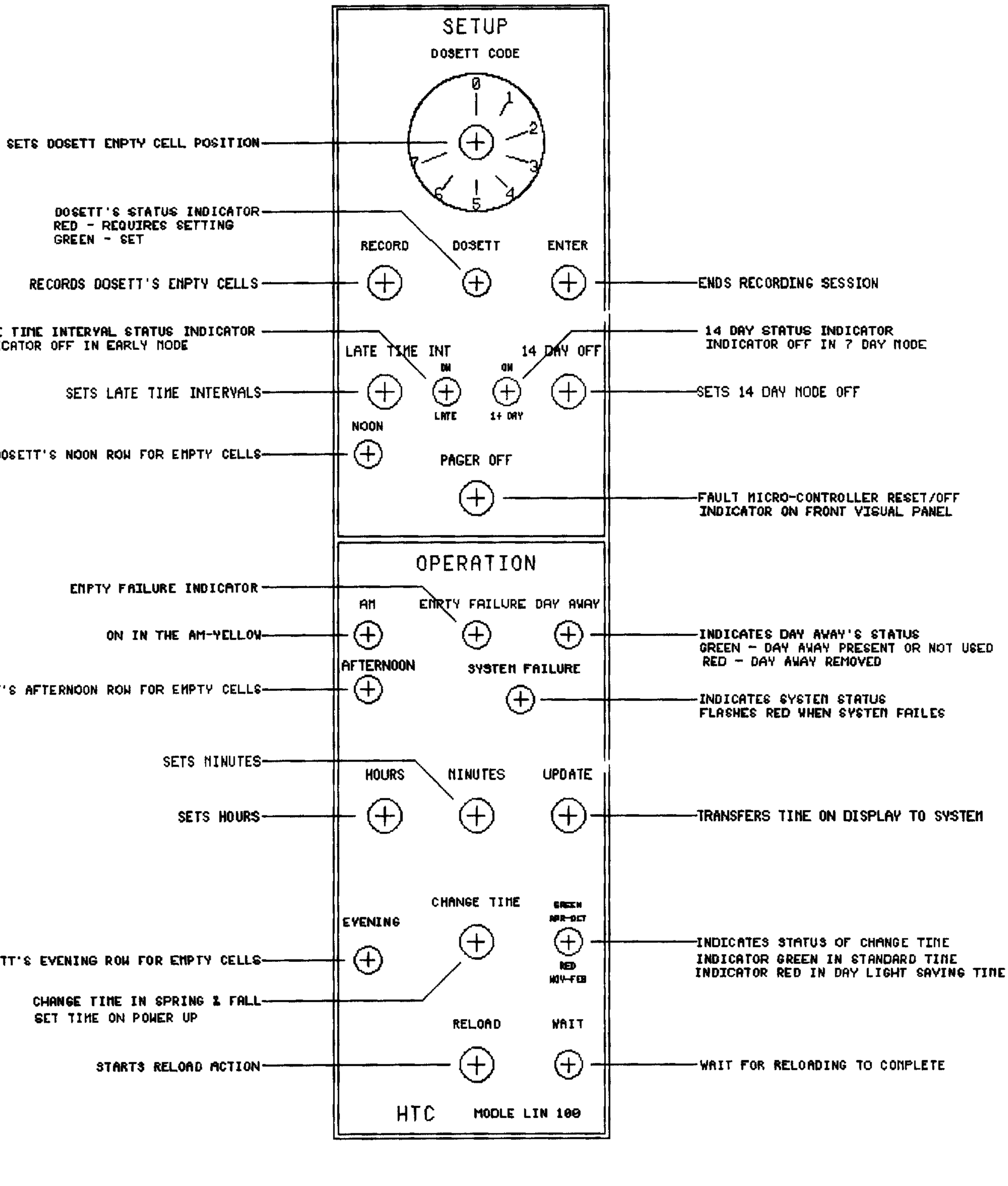


FIGURE 14

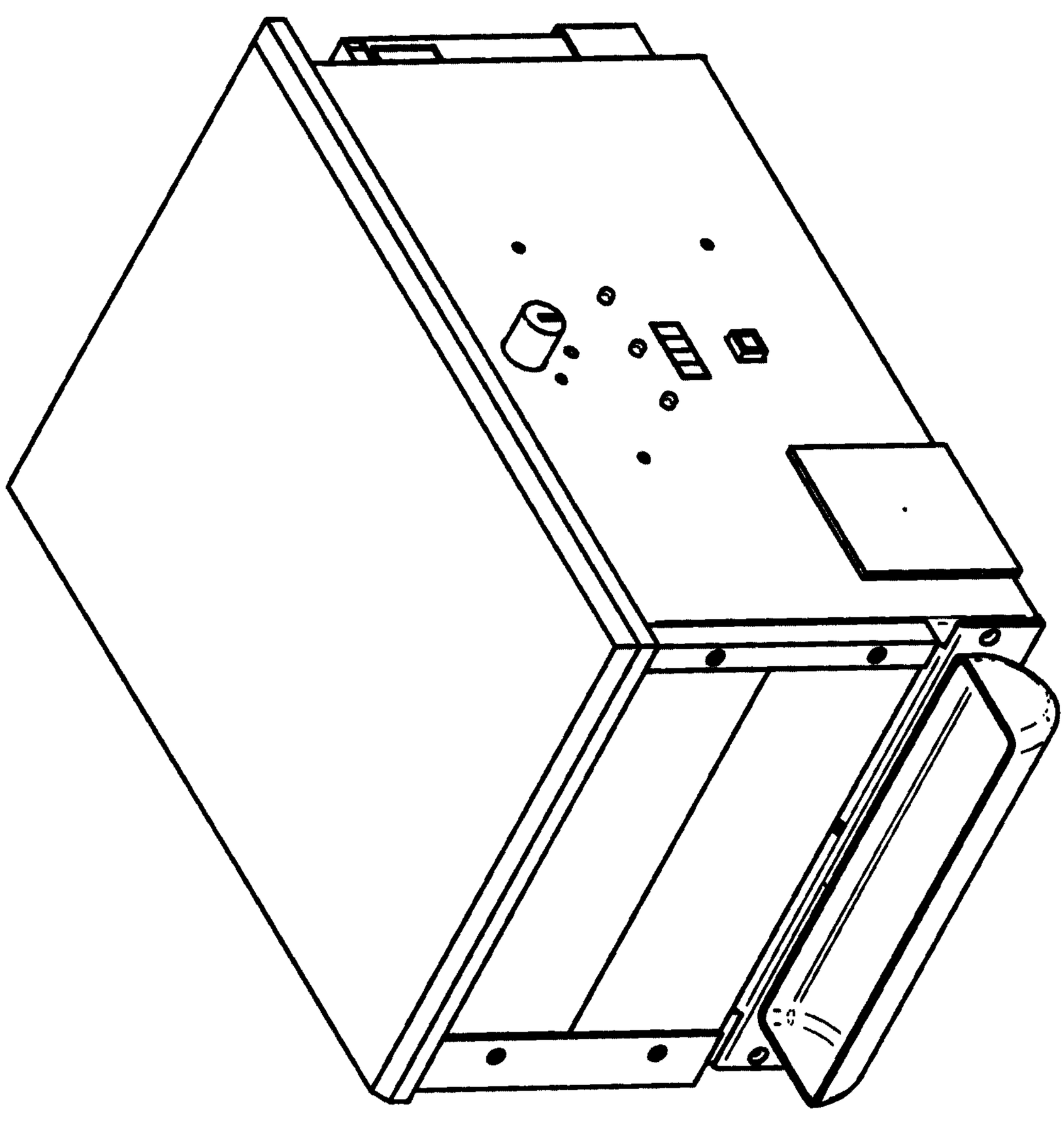


FIG. 15

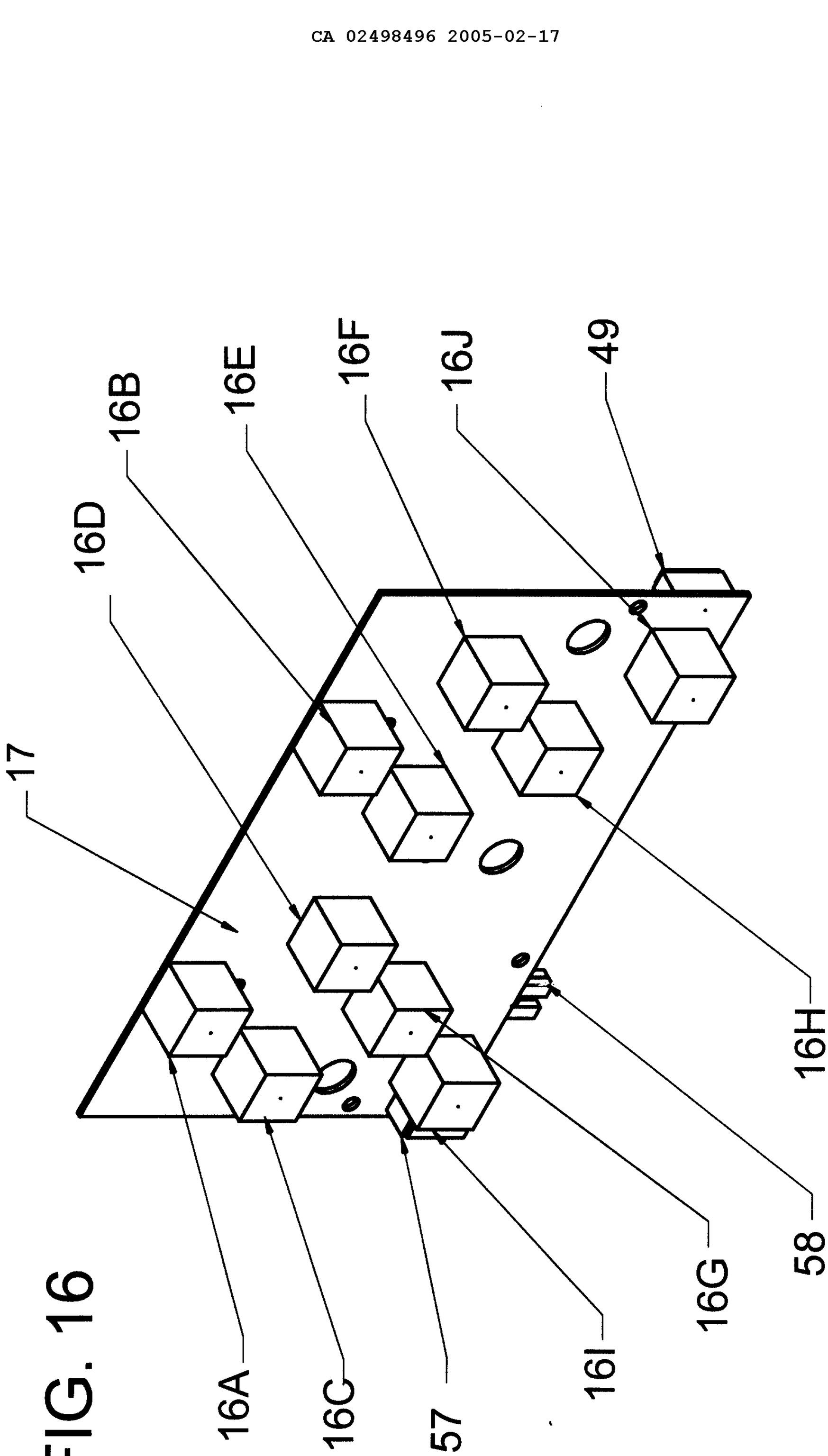


FIG. 16