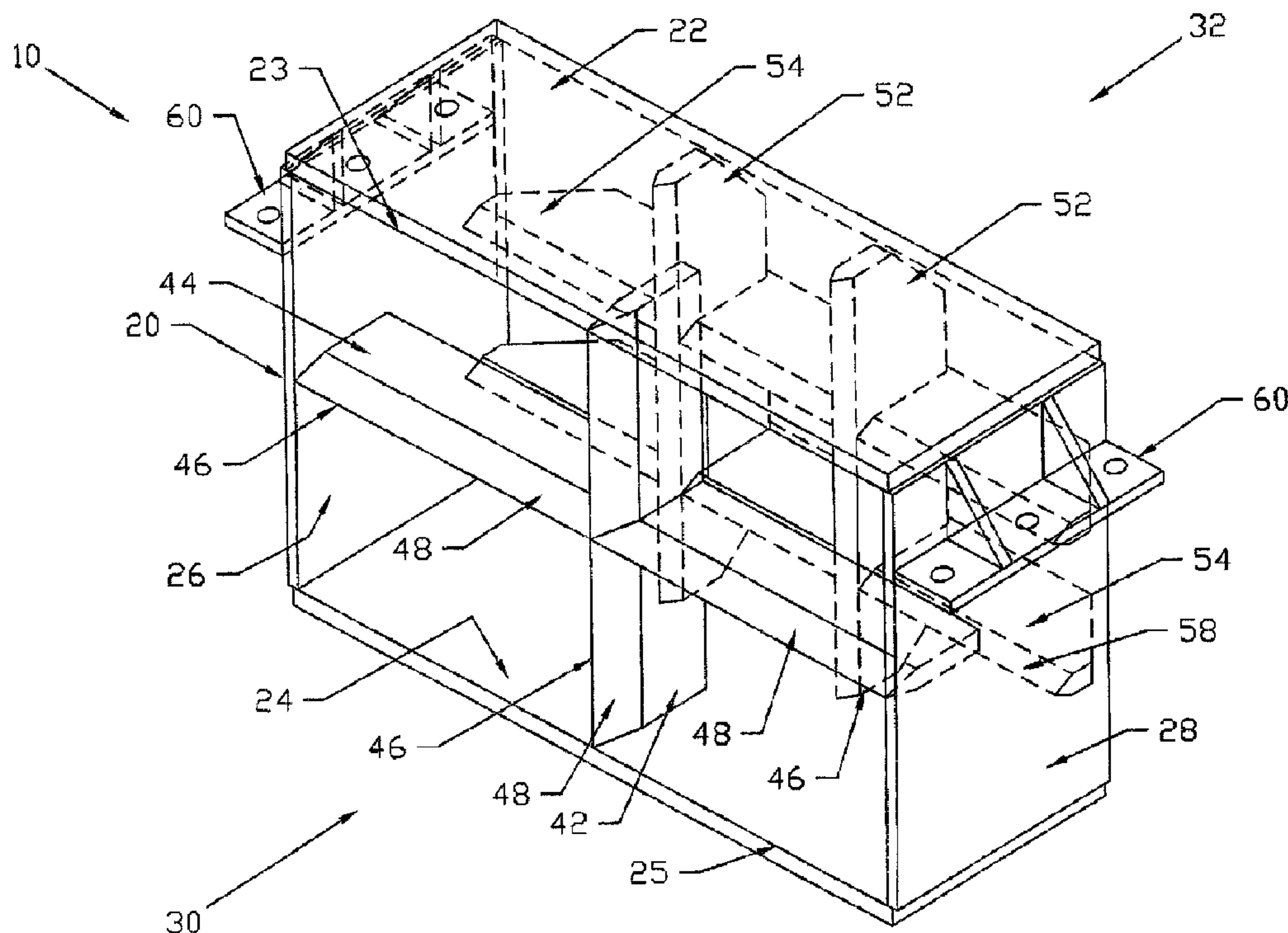




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(54) Titre : FENDEUSE HYDRAULIQUE A DEUX ETAGES ET A DEUX TEMPS
 (54) Title: TWO-STAGE TWO-STROKE LOG SPLITTING SYSTEM



(57) **Abrégé/Abstract:**

A log splitting system comprises a splitter box, having top, bottom and sidewalls, and open entrance and discharge ends. A first set of cutting blades secured adjacent to the entrance end divides the entrance end into at least two, first sections. A second set of cutting blades, secured adjacent to the first set of cutting blades and opposite the entrance end, further divides each splitter box's first section into at least two, second sections. A ram assembly with a force applying surface moveable toward the splitter box's entrance end contacts a log with the first set of cutting blades. The ram member's surface has a plurality of surface portions, each sized to fit into one of the splitter box's first section, to further contact the log with the second set of cutting blades, splitting the log into at least four pieces.

In the Abstract:

A log splitting system comprises a splitter box, having top, bottom and sidewalls, and open entrance and discharge ends. A first set of cutting blades secured adjacent to the entrance end divides the entrance end into at least two, first sections. A second set of cutting blades, secured adjacent to the first set of cutting blades and opposite the entrance end, further divides each splitter box's first section into at least two, second sections. A ram assembly with a force applying surface moveable toward the splitter box's entrance end contacts a log with the first set of cutting blades. The ram member's surface has a plurality of surface portions, each sized to fit into one of the splitter box's first section, to further contact the log with the second set of cutting blades, splitting the log into at least four pieces.

TWO-STAGE TWO-STROKE LOG SPLITTING SYSTEM

Field of the Invention

The present invention relates to a system for splitting log sections. More particularly, the present invention relates to a hydraulic device coupled to a splitter box device. Most particularly, the present invention relates to a two-stage hydraulic device coupled to a two-stage splitter box device for splitting log sections into small pieces suitable for firewood.

Background of the Invention

It is common practice to split logs into smaller pieces to provide firewood that burns readily. This task can be done manually using a mallet to strike a wedge which splits the log, but this is labor intensive and requires physical strength and endurance. In recent years, hydraulic cylinders have been used to push a section of log against a stationary wedge to split the log section into smaller pieces. The simple wedge has been replaced by devices having multiple cutting edges to divide the log section into smaller pieces with a single stroke of the hydraulic cylinder. Although numerous variations on the cutting wedge, also termed a splitter box, have been developed, nearly all are subject to plugging and binding when attempting to split the log section into many smaller pieces in a single pass through the splitter box.

Some examples of inventions involving devices or systems for cutting and splitting logs for which patents have been granted include the following.

Connolly et al., in U.S. Patent No. 4,286,638, describe a machine for cutting a log into a succession of pieces of predetermined length at a cutting station, moving the cut piece to a first splitting station, splitting the first cut piece at the first splitting station while the next piece is being cut at the cutting station, moving the next piece to a second splitting station, splitting the next piece at the second splitting station while a third piece is being cut at the cutting station, moving the third piece to the first splitting station, and splitting the third piece at the first splitting station while a fourth piece is being cut and so on. The production of split wood is thus substantially increased by the use of two splitters combined with means for moving the successively cut pieces alternately to the splitters.

In U.S. Patent No. 4,353,401, Schilling discloses a method and apparatus for splitting a log substantially along the grain into a plurality of sector-shaped segments. The apparatus

comprises at least one sector splitter ring having a plurality of blades, a support for locating the splitter ring in a log movement path, means for pushing the log axially along a log movement path, a rotating backplate for supporting one end of the log being pushed along, with the backplate adapted to tilt and allow the backplate-supported end of the log to rotate as the log is pushed through the splitter ring, and guide means adapted to retain the floating backplate in the log movement path. The process comprises forcing one end of a log axially against and through at least one splitting blade, the other end of the log being in contact with a backplate that can tilt, and permitting relative rotation between the log and the splitting blade so that a split occurring in the log from the splitting blade substantially tends to follow the grain in the log.

Barnes et al., in U.S. Patent No. 4,371,020, describe a process for preparation of long wood strands. Long wood strands are required for the production of structural lumber products. These strands must be split, and a method of splitting logs into longitudinal-grain wood strands comprises the steps of radially splitting a log substantially along the grain of the log into a plurality of sector shaped segments, parallel splitting each of the sector shaped segments along the grain of the segments into a plurality of substantially parallel slabs, and further splitting each of the parallel slabs substantially along the grain of the slabs into a plurality of longitudinal-grain wood strands.

In U.S. Patent No. 4,373,564, Heikkinen discloses a self-propelled and steerable wood processing system for converting a log into firewood wherein the wood processing system has a pick-up mechanism that can be advanced into a pile of logs to be cut with the pick-up mechanism rotatably mounted to permit placing a log on a log deck where it can be fed into a cutting and splitting mechanism for forming the log into firewood.

Sakraida, Jr., in U.S. Patent No. 4,391,312, describes a log splitting head comprising a baseplate, first and second vertical cutting plates opposed and spaced from each other and mounted to and perpendicular with the baseplate, each including a cutting edge, a horizontal cutting plate mounted to and supported by the first and second cutting plates, and also including a cutting edge, and means for securing the baseplate to the main frame of a log splitting machine.

In U.S. Patent No. 4,421,149, Barnes et al. disclose a process for making long wood

strands. Long wood strands are required in structural lumber products and, in order to obtain maximum strength, should be split along the grain. A method of splitting a log into longitudinal-grain wood strands is disclosed comprising the steps of radially splitting the log substantially along the grain of the log into a plurality of sector shaped segments. Radial splitting includes pushing the log axially through at least one sector splitter ring, and further splitting the sector shaped segments substantially along the grain of the segments. The further splitting step includes feeding each of the sector shaped segments through two rows of intermeshing counter rotating discs, pulling each of the segments between the rows of discs and simultaneously splitting each of the segments into a plurality of longitudinal-grain wood strands.

Johnston, in U.S. Patent No. 4,478,263, describes a mobile self-contained wood processing machine used for the processing of logs into specific lengths and then splitting the lengths into individual pieces suitable for use as firewood or the like. The individual pieces are retained in a unit bin until a desired quantity has been processed. Once the desired quantity is processed, the unit bin is operated to release the stored pieces to a handling cart or to packaging.

In U.S. Patent No. 4,782,866, Valdez discloses a log splitting head, which includes a downwardly sloped top portion having a sharpened leading edge in the form of a V-shaped cutting blade. Beneath the top portion, a first row of vertical cutting blades is provided, each including a sharpened leading edge. Also included is a second row of vertical cutting blades beneath the first row of blades and structurally similar thereto. Separating the two rows of blades is a medial portion having a sharpened leading edge. The sides of the splitting head include two vertical plates having sharpened leading edges. All of these components are arranged in a specific angular configuration designed to accomplish log splitting with maximum efficiency. The entire unit is adapted for attachment to a horizontal platform and enables the splitting of logs into uniformly sized sections.

Nunnery et al., in a series of patents, including U.S. Patent Numbers 4,829,865, 4,830,070, 4,834,154 and 4,869,303, describe a wood processor for cutting a log into a series of shorter lengths and subsequently splitting the shorter lengths into individual pieces of firewood or the like. The processor includes a carriage for receiving the log. Clamps engage

the log from both sides to secure it in the carriage, which advances the log into contact with a plurality of parallel rotating saws. After the carriage is retracted, a pusher rod moves the cut log pieces along an axis onto a plurality of cradle members, one cradle supporting each log section. The cradle members are tilted to dump the log sections alternately onto opposite sides of the axis of log movement. The logs dumped from the cradles are fed to a plurality of individual hydraulically operated log splitters.

In U.S. Patent No. 4,830,071, Gollahon discloses a wood stump splitting apparatus that includes a splitting chamber for receiving a plurality of various sized wood stumps. The splitting chamber has one wall including a splitter grid. Press is provided for pressing the wood stumps against cutting edges of the splitter grid and pushing the plurality of wood stumps through the splitter grid apertures. Press includes a plurality of longitudinal, spaced-apart pushing members, which push the stumps through grid apertures and ensure complete extrusion of wood pieces and prevent sticking of the compressed wood pieces in grid apertures.

Meyer, in U.S. Patent No. 4,842,030, describes improvements in log splitting devices, including an improved log-lifting table having multiple attachment points and greater upward radial movement. A multiple-faceted splitting wedge is also disclosed, which has a cutting angle of less than 90 degrees and a splitting angle of greater than 90 degrees.

In U.S. Patent No. 4,875,514, Hollister, Jr. discloses a method and an apparatus for performing the method, wherein a log of wood is split by being forced through a generally conical shaped apparatus, containing a multiplicity of uniquely shaped, spaced, interconnected, and cooperatively operative knives or splitting elements. The method involves forcing a large log of wood through the uniquely shaped knife, or splitting element, arrangement in such a manner that there is in effect a stepped splitting of the wood into relatively uniformly shaped pieces of wood suitable to be used for a variety of purposes including, but not limited to, firewood, and the like.

Hudson, in U.S. Patent No. 4,961,452, describes a log splitting apparatus with a sensing mechanism arranged with adjustment linkages to vary the position of a cutter blade in accordance with the sensed diameter of a given log to be split. A sensing wheel is arranged to ride on the side of the log and is mounted on a pivotable arm, operatively connected to the

cutter blade. The pivotable arm is connected to mechanical linkages, so as to automatically position a cutter assembly for producing the splitting of logs substantially in half. An optional multi-blade cutter assembly produces quartering of a log during a single log feeding operation.

U.S. Patent No. 5,022,445 by Holestine discloses a double-acting hydraulic ram that drives a log section or block through a blade assembly to split the log section into several smaller pieces. The blade assembly is configured to minimize the force required to split the log section into several pieces without jamming. More specifically, the assembly includes a vertical blade having a splitting edge inclined rearward in the direction of movement of the block section toward the blade and horizontal wings cantilevered from the vertical blade. Each wing is swept outward and rearward from the vertical blade and has a leading edge staggered rearward from the splitting edge of the vertical blade. An exit conveyor is provided with a chain and flight members, driven solely by the reciprocating action of the ram for transporting the split pieces to a desired location.

In U.S. Patent No. 5,284,193, Mires et al. disclose a log splitter having a first frame with a wedge fixedly attached thereto and extending outwardly therefrom. A carriage is mounted for reciprocation upon the first frame, and an abutment plate is attached to the carriage and extends outwardly therefrom in alignment with the wedge, so arranged to split a log between the abutment plate and the wedge. A hydraulic cylinder is present for reciprocating the abutment plate and carriage toward and away from the wedge, together with a second frame rotatably mounted to the first frame so that the first frame may rotate relative thereto about an axis. A hydraulic piston and cylinder is operably interposed between the first and second frames for rotating the first frame about its longitudinal axis. A log support cradle extends outwardly from the carriage, with rollers on the cradle to ease positioning of a log. The first frame rotates between a loading position, in which a log on the ground is gripped between the abutment plate and the wedge, and a splitting position, in which the log is split, with the log being lifted onto the splitter as the first frame rotates.

Smith, in U.S. Patent No. 5,711,357, describes an adjustable, multi-wedge, splitting head for a log splitting apparatus equipped with a ram for axially advancing precut logs toward the splitting head in a horizontal direction. The apparatus includes a vertically

oriented stationary post and a stationary triangular splitting wedge disposed between the post and the log to be split. The post holds upper and lower multiple splitting wedge assemblies, which can be slideably positioned on the post by hydraulic cylinder/piston units. The triangular splitting wedge severs a log into two pieces. The wedge assemblies then sever the initially produced two pieces into smaller pieces, the number of which corresponds to the number of blades in the assembly positioned to interact with the log.

In U.S. Patent No. 5,791,389, Valdez discloses an apparatus and method for processing relatively large tree logs into relatively small firewood logs using two, spaced apart, cutting stations. The apparatus includes a central conveyor, a transfer station and a splitter station wherein relatively large tree logs are placed sequentially onto an entrance portion of each of the two spaced apart cutting stations and are cut into rounds, which are discharged onto the conveyor and moved to a transfer station. Each round is moved into a splitter station, wherein each round is moved over splitter blades to form firewood logs. The splitter blades are mounted in support members secured to a square frame, having spaced apart opposite sidewalls wherein the distance between each two aligned support members is greater than the distance between opposite sidewalls.

Fager, in U.S. Patent No. 6,135,178, describes a device for splitting wood that comprises a rotatable and movable cutting device. A splitting blade is positioned on one end of the cutting device, which acts to split the wood when the cutting device is advanced in a direction toward the wood. The cutting device can be rotated to position the splitting blade with respect to the wood to facilitate the desired splitting of the wood. The cutting device is positioned on a positioning carriage, which is moved with respect to the wood that is to be split. The positioning carriage is movably positioned on a moveable carriage to further assist in positioning the splitting blade with respect to the wood to effectively and efficiently split the wood.

While the invention is amenable to various modifications and alternative forms, specifics thereof have been shown by way of example in the drawings and will be described in detail. It should be understood, however, that the intention is not necessarily to limit the invention to the particular embodiments described. On the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the

invention, as defined by the appended claims.

Summary Of The Invention

The invention is directed to a splitter box assembly for use in a log segment splitting system. The assembly includes a splitter box member having a top, a bottom, and two sidewalls, an open entrance end and an open discharge end. A first set of cutting blades is secured interior the splitter box member and adjacent the open entrance end thereof. The first set of cutting blades divides the open entrance end of the splitter box member into at least two, first sections. A second set of cutting blades is also secured interior the splitter box member. The second set of cutting blades is offset from the first set of cutting blades and positioned adjacent the open discharge end of the splitter box member. The second set of cutting blades divides each splitter box member first section into at least two, second sections. Each cutting blade of the first and second sets has a cutting edge oriented toward the open entrance end of the splitter box member.

The invention also includes a log segment splitting system that comprises a splitter box assembly that includes a splitter box member having a top, a bottom, and two sidewalls, an open entrance end and an open discharge end. A first set of cutting blades is secured interior the splitter box member and adjacent the open entrance end thereof. The first set of cutting blades divides the open entrance end of the splitter box member into at least two, first sections. A second set of cutting blades is also secured interior the splitter box member. The second set of cutting blades is offset from the first set of cutting blades and positioned adjacent the open discharge end of the splitter box member. The second set of cutting blades divides each splitter box member first section into at least two, second sections. Each cutting blade of the first and second sets has a cutting edge oriented toward the open entrance end of the splitter box member.

A ram assembly includes a force applying surface, moveable toward the open entrance end of the splitter box member, to contact a log segment there between with the first set of cutting blades. The force applying surface of the ram member also includes a plurality of surface portions, with each surface portion sized to fit into one splitter box member first section. The surface portions move into the first sections to further contact the log segment with the second set of cutting blades, thereby splitting the log segment into at least four

pieces.

Brief Description Of The Drawings

Figure 1 is an elevational perspective view of one embodiment of the splitter box member of the present invention.

Figure 2 is a top plan view of the one embodiment of the splitter box member of the present invention.

Figure 3 is a front plan view of the one embodiment of the splitter box member of the present invention.

Figure 4 is a side plan view of the one embodiment of the splitter box member of the present invention.

Figure 5 is an elevational perspective view of a preferred embodiment of the splitter box member of the present invention.

Figure 6 is a top plan view of the entrance end section of the preferred embodiment of the splitter box member of the present invention.

Figure 7 is a front plan view of the entrance end section of the preferred embodiment of the splitter box member of the present invention.

Figure 8 is a side plan view of the entrance end section of the preferred embodiment of the splitter box member of the present invention.

Figure 9 is a top plan view of the discharge end section of the preferred embodiment of the splitter box member of the present invention.

Figure 10 is a front plan view of the discharge end section of the preferred embodiment of the splitter box member of the present invention.

Figure 11 is a side plan view of the discharge end section of the preferred embodiment of the splitter box member of the present invention.

Figure 12 is an elevational side view of one embodiment of the log segment splitting system of the present invention.

Figure 13 is a top plan view of the embodiment of the log segment splitting system of Figure 12 of the present invention.

Figure 14 is another elevational side view of the embodiment of the log segment splitting system of Figure 12 of the present invention.

Figure 15 is an end view from the splitter box assembly open discharge end of the embodiment of the log segment splitting system of Figure 12 of the present invention.

Figure 16 is an end view from interior the entrance end section of the splitter box assembly of the embodiment of the log segment splitting system of Figure 12 of the present invention.

Detailed Description of the Preferred Embodiments

Nomenclature:

- 10 Splitter Box Assembly
- 20 Splitter Box Member
- 22 Top Wall of Box
- 23 Sharpened Edge of Top Wall
- 24 Bottom Wall of Box
- 25 Sharpened Edge of Bottom Wall
- 26 Sidewall of Box
- 28 Sidewall of Box
- 30 Open Entrance End of Box
- 32 Open Discharge End of Box
- 34 Entrance End Section of Splitter Box Member
- 36 Discharge End Section of Splitter Box Member
- 38 Fastening Devices Joining Splitter Box Sections
- 40 First Set of Cutting Blades
- 42 Primary Vertical Blade Member
- 44 Primary Horizontal Blade Member
- 46 Sharpened Edge of Primary Blades
- 48 Beveled Surface of Primary Blades
- 50 Second Set of Cutting Blades
- 52 Secondary Vertical Blade Members
- 54 Secondary Horizontal Blade Members
- 56 Sharpened Edge of Secondary Blades

| | |
|-----|---|
| 58 | Beveled Surface of Secondary Blades |
| 60 | Bolt Plate Member |
| 100 | Log Splitting System |
| 105 | Linear Frame Member |
| 110 | First End of Frame Member |
| 115 | Second End of Frame Member |
| 120 | Hydraulic Ram Assembly |
| 125 | Force Applying Surface |
| 130 | Primary Hydraulic Cylinder |
| 135 | Ram Support Member |
| 140 | V-Shaped Log Support Member |
| 145 | Open Channel in Log Support Member |
| 150 | Surface Portions |
| 155 | Secondary Hydraulic Cylinder |
| 160 | Bracket for Portions of Force Applying Surface |
| 170 | Shroud Covering Hydraulic Cylinders |
| 175 | Support Structure for Shroud and Secondary Hydraulic Cylinder |

Construction:

The invention is a log segment splitting system that comprises a splitter box member having a top, a bottom, and two sidewalls, an open entrance end and an open discharge end. A first set of cutting blades is secured interior the splitter box member and adjacent the open entrance end thereof. The first set of cutting blades divides the open entrance end of the splitter box member into at least two, first sections. A second set of cutting blades is also secured interior the splitter box member. The second set of cutting blades is offset from the first set of cutting blades and positioned adjacent the open discharge end of the splitter box member. The second set of cutting blades divides each splitter box member first section into at least two, second sections. Each cutting blade of the first and second sets has a cutting edge oriented toward the open entrance end of the splitter box member. A ram assembly includes a force applying surface, moveable toward the open entrance end of the splitter box

member, to contact a log segment there between with the first set of cutting blades. The ram member, force applying surface also includes a plurality of surface portions, with each surface portion sized to fit into one splitter box member first section, to further contact the log segment with the second set of cutting blades, thereby splitting the log segment into at least four pieces.

Referring to Figures 1-4, several views of one embodiment of the splitter box assembly 10 are shown. The assembly 10 includes a splitter box member 20 that is generally rectangular in shape with a top wall 22, a bottom wall 24 and two sidewalls 26, 28. The splitter box member 20 has an open entrance end 30 and an open discharge end 32. In this embodiment, the entrance end 30 and discharge end 32 are of approximately equal size. Inside the splitter box member 20, a first set of cutting blades 40 is secured to the wall interiors that are adjacent to the open entrance end 30. The first set of cutting blades 40 divide the open entrance end 30 of the splitter box member 20 into at least two, first sections. In the embodiment shown in Figures 1-4, the first set of cutting blades 40 includes a primary, vertical blade member 42, and a primary, horizontal blade member 44 in a perpendicular orientation, resulting in four first sections. Preferably, the primary, vertical blade member 42 is positioned on the vertical centerline of the open entrance end 30, and the primary horizontal blade member 44 is positioned on the horizontal centerline of the open entrance end 30 of the splitter box member 20. Each cutting blade member 42, 44 of the first set 40 has a sharpened edge 46, facing the open entrance end 30 of the splitter box member 20, for penetrating an incoming log segment.

Interior the splitter box member 20, a second set of cutting blades 50 is secured to the wall interiors, the blades 50 offset from to the first set of cutting blades 40 and adjacent the open discharge end 32. The second set of cutting blades 50 divides each first section of the splitter box member 20 into at least two second sections. In the embodiment shown in Figures 1-4, the second set of cutting blades 50 includes a pair of secondary, vertical blade members 52 and a pair of secondary, horizontal blade members 54, with the secondary vertical pair 52 in a perpendicular orientation to the secondary, horizontal pair 54. Thus, each first section is divided into four, second sections, with a total of sixteen, second sections formed, as illustrated in Figure 3. Each cutting blade 52, 54 of the second set of blades 50 has

a sharpened edge **56** facing the open entrance end **30** of the splitter box member **20** for penetrating an incoming log segment. In a preferred embodiment, the splitter box top wall **22** includes a sharpened edge **23** adjacent the open entrance end **30** thereof, and the splitter box bottom wall **24** also includes a sharpened edge **25** adjacent the open entrance end **30** thereof. A bolt plate member **60** is secured to each sidewall **26, 28**, exterior of the splitter box member **20** for fastening the splitter box member **20** to a stationary surface, such as the frame member, during use.

A log segment, centered on the intersection of the first set of cutting blades **40** and passing through the embodiment of the splitter box member **20** shown in Figures 1-4, initially encounters the first set of cutting blades **40** to divide the log segment into four portions, with each portion further divided into four, sub-portions by the second set of cutting blades **50**. The first set **40** and second set **50** of cutting blades are positioned so that the splitting of the log segment by the first set of cutting blades **40** is not completed when contact of the log segment with the second set of cutting blades **50** commences.

Referring now to Figures 5-11, several views of a preferred embodiment of the splitter box assembly **10** are shown. The assembly **10** includes a splitter box member **20** that is generally rectangular in shape with a top wall **22**, a bottom wall **24** and two sidewalls **26, 28**. The splitter box member **20** has an open entrance end **30** and an open discharge end **32**. In this embodiment, the discharge end **32** is larger than the entrance end **30**. In this preferred embodiment, the splitter box member **20** comprises an entrance end section **34** and a discharge end section **36**, reversibly fastened together in register. Suitable fastening devices **38** provide a rigid connection between the two sections **34, 36**. For example, the fastening devices **38** may include pairs of brackets with aligned apertures, one bracket of each pair mounted on a splitter box section **34** or **36**. The pair of brackets is joined with a threaded fastener, as illustrated in Figure 5. The feature of two separable sections **34, 36** for the splitter box member **20** provides for ease of manufacture, facile maintenance and clean out, and lower replacement costs should a portion of the splitter box assembly **10** be damaged.

Inside the splitter box member **20**, a first set of cutting blades **40** is secured to the wall interiors of the entrance end section **34** that are adjacent to the open entrance end **30**. The first set of cutting blades **40** divide the open entrance end **30** of the splitter box member **20** into at

least two, first sections. In the embodiment shown in Figures 5-11, the first set of cutting blades 40 includes a primary, vertical blade member 42, and a primary, horizontal blade member 44 in a perpendicular orientation, resulting in four first sections. Preferably, the primary, vertical blade member 42 is positioned on the vertical centerline of the open entrance end 30, and the primary horizontal blade member 44 is positioned on the horizontal centerline of the open entrance end 30 of the entrance end section 34 of the splitter box member 20. Most preferably, the cutting edge 46 of the primary horizontal blade member 44 is offset from the cutting edge 46 of the primary, vertical blade member 42. In the embodiment shown in Figures 5-11, the cutting edge 46 of the vertical blade member 42 is at the open entrance end 30 while the horizontal blade member 44 is offset toward the discharge end 32. The offset between the blade members 42, 44 could be reversed with equivalent results. Each cutting blade member 42, 44 of the first set 40 has a sharpened edge 46, facing the open entrance end 30 of the splitter box member 20, for penetrating an incoming log segment. With the offset between the cutting blade members 42, 44 of the first set 40, less power is required to advance the log segment into the splitting box assembly 10.

Interior the splitter box member 20, a second set of cutting blades 50 is secured to the wall interiors of the discharge end section 36 that are adjacent to the open discharge end 30. The second set of cutting blades 50 are offset from to the first set of cutting blades 40 and adjacent the open discharge end 32. The second set of cutting blades 50 divides each first section of the splitter box member 20 into at least two second sections. In the embodiment shown in Figures 5-11, the second set of cutting blades 50 includes a pair of secondary, vertical blade members 52 and a pair of secondary, horizontal blade members 54, with the secondary vertical pair 52 in a perpendicular orientation to the secondary, horizontal pair 54. The pairs of the second set of cutting blades 50 are positioned such that each first section produced by the first set of cutting blades 40 is intersected by one secondary, vertical blade member 52 and one secondary horizontal blade member 54. Thus, each first section is divided into four, second sections, with a total of sixteen, second sections formed, as illustrated in the Figures.

Each cutting blade 52, 54 of the second set of blades 50 has a sharpened edge 56 facing the open entrance end 30 of the splitter box member 20 for penetrating an incoming log

segment. In the preferred embodiment of Figures 5-11, the pair of secondary, vertical blade members **52** are inclined toward a vertical centerline of the open entrance end **30** of the splitter box member **20** and the pair of secondary, horizontal blade members **54** are inclined toward a horizontal centerline of the open entrance end **30** of the splitter box member **20**. The inclination of the second set of blades **50** assists in separation of the portions of the log segment generated as the log segment passes through the second set of blades **50**.

Also in this preferred embodiment, the cutting edge **56** of the pair of secondary, vertical blade members **52** includes a single beveled surface **58** oriented away from a vertical centerline of the open entrance end **30** of the splitter box member **20** and the cutting edge **56** of the pair of secondary, horizontal blade members **54** includes a single beveled surface **58** oriented away from a horizontal centerline of the open entrance end **30** of the splitter box member **20**. The inclination of the blades **52**, **54** and the orientation of the blade beveled edges **58** are best seen in Figure 10. The single bevel of the cutting edge **56** of the second set of blades **50** assists in separation of the portions of the log segment generated as the log segment passes through the second set of blades **50**.

Again in this preferred embodiment, the cutting edge **56** of the pair of secondary, vertical blade members **52** are offset relative to the cutting edge **56** of the pair of secondary, horizontal blade members **54**. With the offset between the cutting blade members **52**, **54** of the first set **50**, less power is required to advance the log segment through the splitting box assembly **10**.

In a preferred embodiment, the splitter box top wall **22** includes a sharpened edge **23** adjacent the open entrance end **30** thereof, and the splitter box bottom wall **24** also includes a sharpened edge **25** adjacent the open entrance end **30** thereof. In each instance, the sharpened edges **23**, **25** are part of the entrance end section **34** of the splitter box member **20**.

Referring now to Figures 12-16, one embodiment of the log segment splitting system **100** of the present invention is shown. The splitter box assembly **10** is mounted at a first end **110** of a linear frame member **105**, with the open entrance end **30** of the splitter box member **20** facing the rest of the system. At the second end **115** of the frame member **105** is mounted a hydraulic ram assembly **120** for forcing a log segment through the splitter box assembly **10**. The ram assembly **120** is anchored to the frame member **105** at the frame member second end

115 opposite the splitter box assembly **10** and the ram assembly **120** moves parallel along the frame member **105**. A force applying surface **125** is present on the ram assembly **120** opposite the anchored end, such that extending the primary hydraulic cylinder **130** of the ram assembly **120** moves the force applying surface **125** toward the splitter box assembly **10**. The ram assembly **120** also includes a support member **135** that slides along the frame member **105** to support the force applying surface **125** during operation. A V-shaped log segment support member **140** is positioned between the splitter box assembly **10** and the ram assembly **120** to position the log segment for splitting. The log segment support member **140** includes an open channel **145** to accommodate the ram support member **135** as it moves along the frame member **105** in either direction relative to the splitter box assembly **10**. The open channel **145** is best seen in the top plan view of the system in Figure 13. The fully retracted position for the hydraulic ram assembly **120** is shown in Figures 12 and 13, while the fully extended position for the hydraulic ram assembly **120** is seen in Figure 14. A power source (not shown), such as an internal combustion engine, provides the energy to operate the hydraulic cylinders **130**, **155** of the ram assembly **120**.

The force applying surface **125** of the ram assembly **120** includes a plurality of surface portions **150**, with each surface portion **150** sized to fit into one splitter box member first section. The surface portions **150** initially move in unison with the force applying surface **125**, via the primary hydraulic cylinder **130**, to force the log segment into the first set of cutting blades **40** of the splitter box assembly **10**. The support member **135** of the ram assembly **120** stops short of the splitter box assembly **10**, as illustrated in Figure 14. In order to move the unsplit end of the log segment past the first set of cutting blades **40**, each surface portion **150** of the force applying surface **125** moves into the splitter box assembly **10**, past the first set of cutting blades **40**, but stopping short of the second set of cutting blades **50**. In the embodiment shown in Figures 12-16, the force applying surface **125** includes four surface portions **150** that extend into the splitter box assembly **10**, the surface portions **150** powered by at least one, secondary hydraulic cylinder **155** mounted on the primary hydraulic cylinder **130** of the hydraulic ram assembly **120**. The surface portions **150** of the ram assembly **120** are best seen in Figure 16, which is an end view of the log splitting system **100** from interior the splitter box assembly **10**, between the first set **40** and second set **50** of cutting blades. An

end view of the log splitting system **100** from exterior the splitter box assembly **20** is shown in Figure 15.

In a preferred embodiment of the invention, the force applying surface **125** is attached to a rigid, heavy duty bracket member **160** housing a single, secondary hydraulic cylinder **155**, which is, in turn, mounted to the primary hydraulic cylinder **130** of the hydraulic ram assembly **120**. In addition, a shroud member **170** is mounted to the hydraulic ram assembly **120**, via the bracket member **160**, the shroud member **170** covering the upper sides of the primary **130** and secondary **155** hydraulic cylinders during operation. The shroud member **170** prevents log segments from entering the log support member **140** with the primary **130** and secondary **155** hydraulic cylinders in an extended condition during the operating cycle. A log segment could prevent retraction of one or both hydraulic cylinders **130**, **155**, causing damage to these components.

A control system (not shown) is employed to run the log splitting system **100** through a cycle that splits one log segment. The sequence is entry of the log segment onto the log support member **140**, extension of the primary hydraulic cylinder **130** to bring the force applying surface **125** just to the entrance end **30** of the splitter box assembly **10**, extension of the secondary cylinder **155** to bring the surface portions **150** of the force applying surface **125** into the first sections of the splitter box assembly **10**, stopping just short of the second set of cutting blades **50**, thereby completely splitting the log segment into smaller pieces. The secondary cylinder **155** and the primary hydraulic cylinder **130** retract to the starting position and another log segment enters onto the log support member **140**, followed by repeating the above cycle.

It is important to the successful operation of the splitting system **100** that splitting a first log segment by the first set of cutting blades **40** be completed before commencing with splitting a second log segment. Attempting to use the second log segment to force the partially split first segment through the second set of cutting blades **50** often results in several split log pieces wedging within the splitter box second sections or between the blades **40**, **50** and the walls **22**, **24**, **26**, **28** of the splitter box **20**. The completion of the two-stage splitting process by the travel of each surface portion **150** of the force applying surface **125** into the first sections and up to the second set of cutting blades **50** eliminates plugging and/or wedging

of the splitter box assembly **10** by split log pieces.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

CLAIMS:

1. A splitter box assembly for use in a log segment splitting system comprising;
a splitter box member having a top, a bottom, and two sidewalls, an open entrance end and an open discharge end;
a first set of cutting blades secured interior the splitter box member and adjacent the open entrance end thereof, the first set of cutting blades dividing the open entrance end into at least two, first sections;
a second set of cutting blades secured interior the splitter box member, offset from the first set of cutting blades and adjacent the open discharge end thereof, the second set of cutting blades dividing each splitter box member first section into at least two, second sections;
each cutting blade of the first and second sets having a cutting edge oriented toward the open entrance end of the splitter box member, and
the splitter box member including an entrance end section housing the first set of cutting blades and a discharge end section housing the second set of cutting blades, the entrance end section and discharge end section reversibly secured together in register.
2. The splitter box assembly for use in a log segment splitting system of claim 1 wherein, the open discharge end of the splitter box member is larger than the open entrance end of the splitter box member.
3. The splitter box assembly for use in a log segment splitting system of claim 1 wherein, the splitter box member top and bottom each include a sharpened edge adjacent the open entrance end thereof.
4. The splitter box assembly for use in a log segment splitting system of claim 1 wherein, the first set of cutting blades includes a primary, vertical blade member and a primary, horizontal blade member, the cutting edge of the horizontal blade member offset from the cutting edge of the vertical blade member.

5. The splitter box assembly for use in a log segment splitting system of claim 4 wherein, the primary, vertical blade member is positioned on a vertical centerline of the open entrance end of the splitter box member and the primary, horizontal blade member is positioned on a horizontal centerline of the open entrance end of the splitter box member.
6. The splitter box assembly for use in a log segment splitting system of claim 1 wherein, the second set of cutting blades includes a pair of secondary, vertical blade members and a pair of secondary, horizontal blade members, the second set of cutting blades positioned such that each first section produced by the first set of cutting blades is intersected by one secondary, vertical blade member and one secondary horizontal blade member.
7. The splitter box assembly for use in a log segment splitting system of claim 6 wherein, the pair of secondary, vertical blade members are inclined toward a vertical centerline of the open entrance end of the splitter box member and the pair of secondary, horizontal blade members are inclined toward a horizontal centerline of the open entrance end of the splitter box member.
8. The splitter box assembly for use in a log segment splitting system of claim 6 wherein, the cutting edges of the pair of secondary, vertical blade members are offset relative to the cutting edge of the pair of secondary, horizontal blade members.
9. The splitter box assembly for use in a log segment splitting system of claim 6 wherein, the cutting edge of the pair of secondary, vertical blade members includes a single beveled surface oriented away from a vertical centerline of the open entrance end of the splitter box member and the cutting edge of the pair of secondary, horizontal blade members includes a single beveled surface oriented away from a horizontal centerline of the open entrance end of the splitter box member.
10. A splitter box assembly for use in a log segment splitting system comprising;
a splitter box member having a top, a bottom, and two sidewalls, an open entrance end and an open discharge end larger than the open entrance end;

a first set of cutting blades secured interior the splitter box member and adjacent the open entrance end thereof, including a primary, vertical blade member and a primary, horizontal blade member, the cutting edge of the horizontal blade member offset from the cutting edge of the vertical blade member, the first set of cutting blades dividing the open entrance end into four, first sections;

a second set of cutting blades secured interior the splitter box member, offset from the first set of cutting blades and adjacent the open discharge end thereof, the second set of cutting blades including a pair of secondary, vertical blade members and a pair of secondary, horizontal blade members, the second set of cutting blades positioned such that each first section produced by the first set of cutting blades is divided into four, second sections;

each cutting blade of the first and second sets having a cutting edge oriented toward the open entrance end of the splitter box member, and

the splitter box member including an entrance end section housing the first set of cutting blades and a discharge end section housing the second set of cutting blades, the entrance end section and discharge end section reversibly secured together in register.

11. The splitter box assembly for use in a log segment splitting system of claim 10 wherein, the splitter box member top and bottom each include a sharpened edge adjacent the open entrance end thereof.

12. The splitter box assembly for use in a log segment splitting system of claim 10 wherein, the cutting edges of the pair of secondary, vertical blade members are offset relative to the cutting edge of the pair of secondary, horizontal blade members.

13. The splitter box assembly for use in a log segment splitting system of claim 10 wherein, the cutting edge of the pair of secondary, vertical blade members includes a single beveled surface oriented away from a vertical centerline of the open entrance end of the splitter box member and the cutting edge of the pair of secondary, horizontal blade members includes a single beveled surface oriented away from a horizontal centerline of the open entrance end of the splitter box member.

14. A log segment splitting system comprising;
- (a) a splitter box assembly including a splitter box member having a top, a bottom, and two sidewalls, an open entrance end and an open discharge end;
- a first set of cutting blades secured interior the splitter box member and adjacent the open entrance end thereof, the first set of cutting blades dividing the open entrance end into at least two, first sections;
- a second set of cutting blades secured interior the splitter box member, offset from the first set of cutting blades and adjacent the open discharge end thereof, the second set of cutting blades dividing each splitter box member first section into at least two, second sections;
- each cutting blade of the first and second sets having a cutting edge oriented toward the open entrance end of the splitter box member;
- the splitter box member including an entrance end section housing the first set of cutting blades and a discharge end section housing the second set of cutting blades, the entrance end section and discharge end section reversibly secured together in register; and
- (b) a ram assembly having a force applying surface moveable toward the open entrance end of the splitter box member to contact a log segment there between with the first set of cutting blades, the ram assembly force applying surface including a plurality of surface portions, each surface portion sized to fit into one splitter box member first section to further contact the log segment with the second set of cutting blades, thereby splitting the log segment into at least four pieces.
15. The log segment splitting system of claim 14 wherein, the ram assembly includes a primary hydraulic cylinder moving the force applying surface toward the open end of the splitter box member and a secondary hydraulic cylinder mounted on the primary hydraulic cylinder moving the surface portions of the force applying surface into the first sections of the splitter box member's open entrance end.
16. The log segment splitting system of claim 14 further including a linear frame member with the splitter box assembly mounted at a first end thereof and the ram assembly mounted at a second end thereof.

17. The log segment splitting system of claim 16 further including a support member fastened adjacent the force applying surface of the ram assembly, the support member sliding along the linear frame member with movement of the force applying surface.

18. The log segment splitting system of claim 17 further including a V-shaped log segment support member secured to the linear frame member adjacent the open entrance end of the splitter box member, the log segment support member including an open channel accommodating movement of the ram assembly support member there through.

19. A log segment splitting system comprising;

(a) a linear frame member with a splitter box assembly mounted at a first end thereof and a ram assembly mounted at a second end thereof;

(b) the splitter box assembly including a splitter box member having a top, a bottom, and two sidewalls, an open entrance end and an open discharge end;

a first set of cutting blades secured interior the splitter box member and adjacent the open entrance end thereof, the first set of cutting blades dividing the open entrance end into at least two, first sections;

a second set of cutting blades secured interior the splitter box member, offset from the first set of cutting blades and adjacent the open discharge end thereof, the second set of cutting blades dividing each splitter box member first section into at least two, second sections;

each cutting blade of the first and second sets having a cutting edge oriented toward the open entrance end of the splitter box member;

the splitter box member including an entrance end section housing the first set of cutting blades and a discharge end section housing the second set of cutting blades, the entrance end section and discharge end section reversibly secured together in register;

(c) the ram assembly having a force applying surface moveable toward the open entrance end of the splitter box member to contact a log segment there between with the first set of cutting blades, the ram assembly's force applying surface including a plurality of surface portions, each surface portion sized to fit into one splitter box member first section to further contact the log segment with the second set of cutting blades, thereby splitting the log segment into at least four pieces;

the ram assembly including a primary hydraulic cylinder moving the force applying surface and a secondary hydraulic cylinder mounted on the primary hydraulic cylinder moving the surface portions of the force applying surface;

the ram assembly including a support member fastened adjacent the force applying surface thereof, the support member sliding along the linear frame member with movement of the force applying surface; and

(d) a V-shaped log segment support member secured to the linear frame member adjacent the open entrance end of the splitter box member, the log segment support member including an open channel accommodating movement of the ram assembly support member there through.

20. The log segment splitting system of claim 19 wherein, the open discharge end of the splitter box member is larger than the open entrance end of the splitter box member.

21. The log segment splitting system of claim 19 wherein, the splitter box member top and bottom each include a sharpened edge adjacent the open entrance end thereof.

22. The log segment splitting system of claim 19 wherein, the first set of cutting blades includes a primary, vertical blade member and a primary, horizontal blade member, the cutting edge of the horizontal blade member offset from the cutting edge of the vertical blade member.

23. The log segment splitting system of claim 19 wherein, the second set of cutting blades includes a pair of secondary, vertical blade members and a pair of secondary, horizontal blade members, the second set of cutting blades positioned such that each first section produced by the first set of cutting blades is intersected by one secondary, vertical blade member and one secondary horizontal blade member.

24. The log segment splitting system of claim 23 wherein, the pair of secondary, vertical blade members is inclined toward a vertical centerline of the open entrance end of the splitter box member and the pair of secondary, horizontal blade members are inclined toward a horizontal centerline of the open entrance end of the splitter box member.

25. The log segment splitting system of claim 23 wherein, the cutting edges of the pair of secondary, vertical blade members are offset relative to the cutting edge of the pair of secondary, horizontal blade members.

26. The log segment splitting system of claim 23 wherein, the cutting edge of the pair of secondary, vertical blade members includes a single beveled surface oriented away from a vertical centerline of the open entrance end of the splitter box member and the cutting edge of the pair of secondary, horizontal blade members includes a single beveled surface oriented away from a horizontal centerline of the open entrance end of the splitter box member.

27. The log segment splitting system of claim 19 further including a shroud member secured to the ram assembly, the shroud member positioned to cover from above the primary hydraulic cylinder and the secondary hydraulic cylinder in an extended condition.

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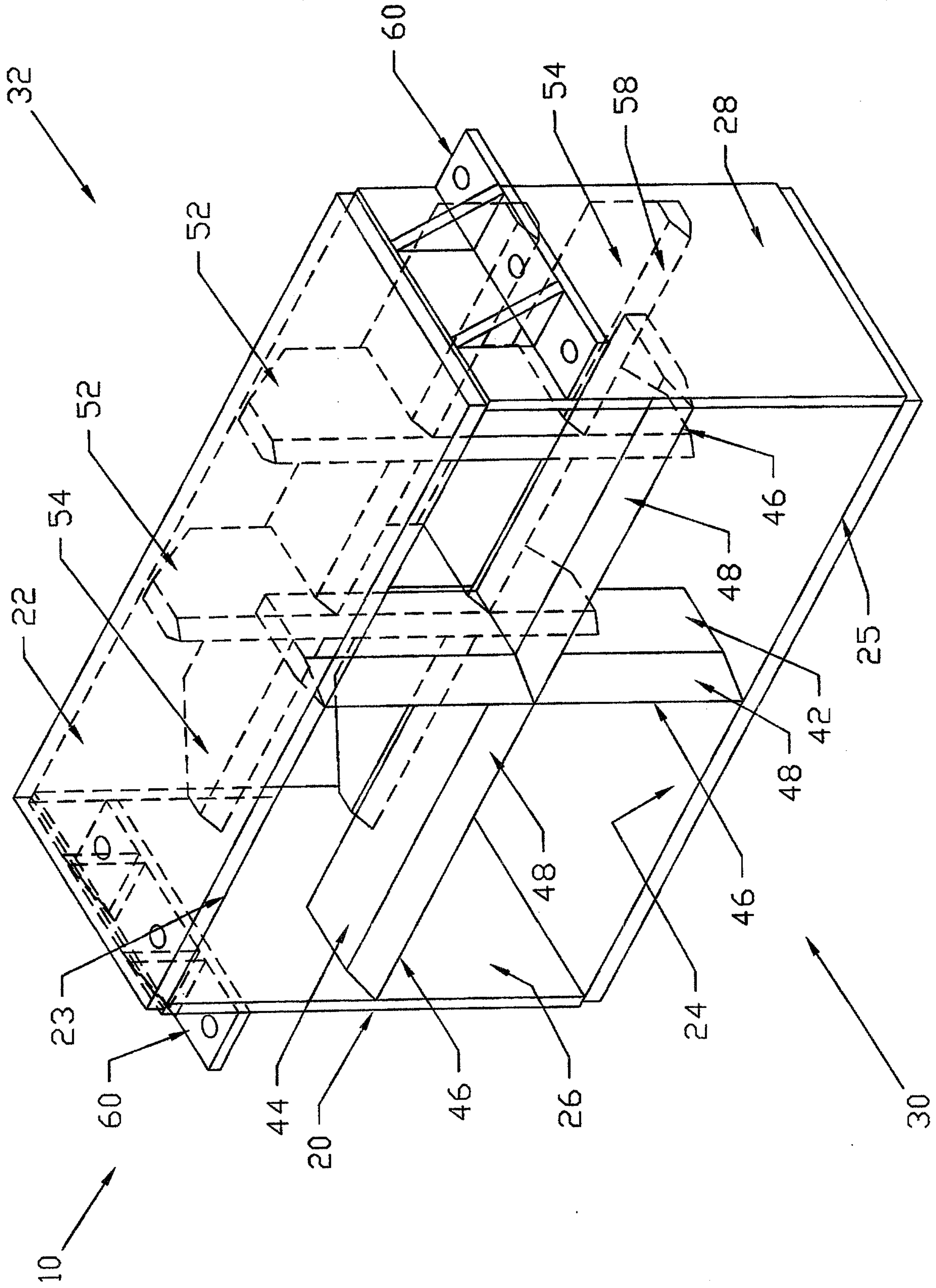


FIG. 1

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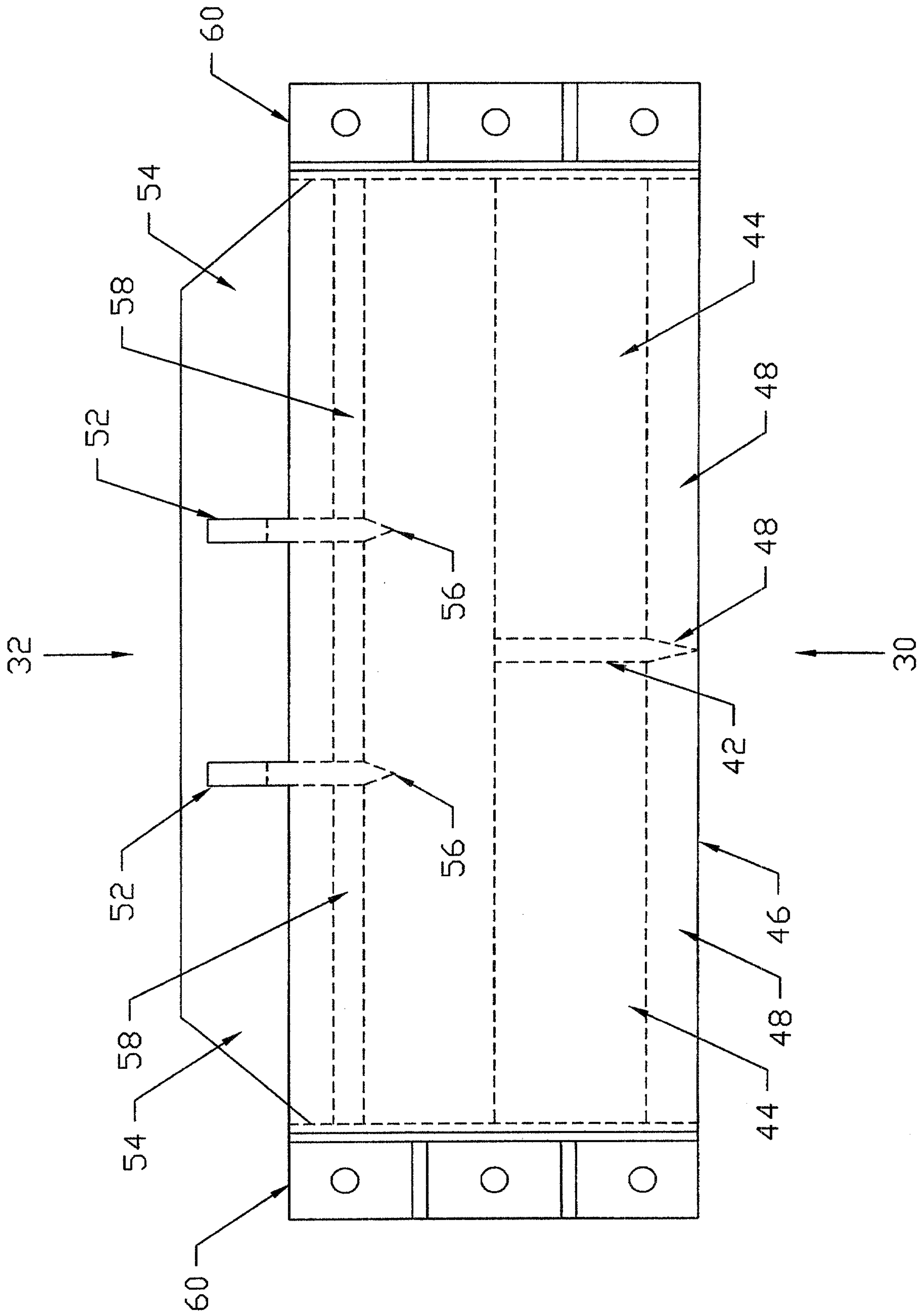


FIG. 2

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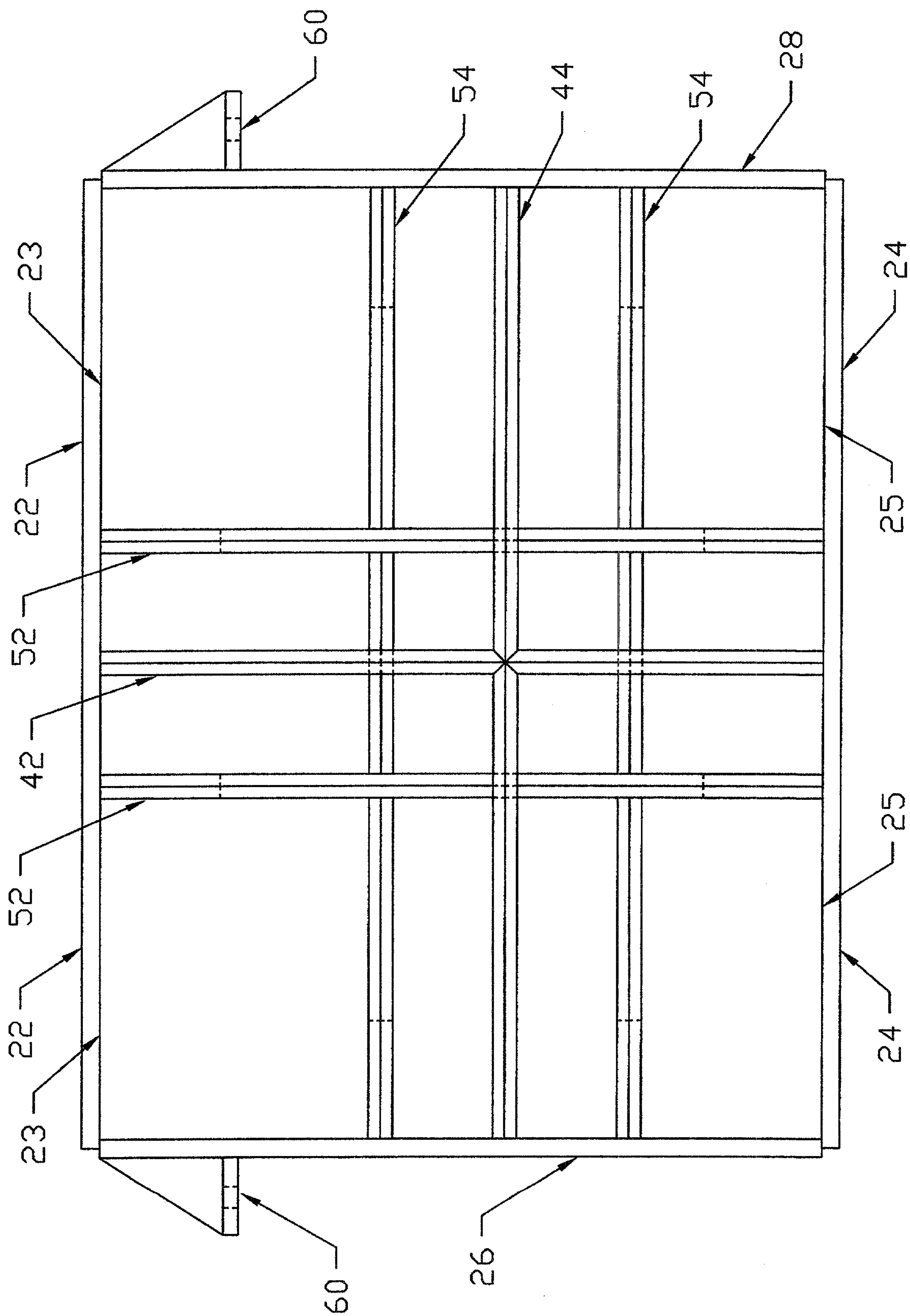


FIG. 3

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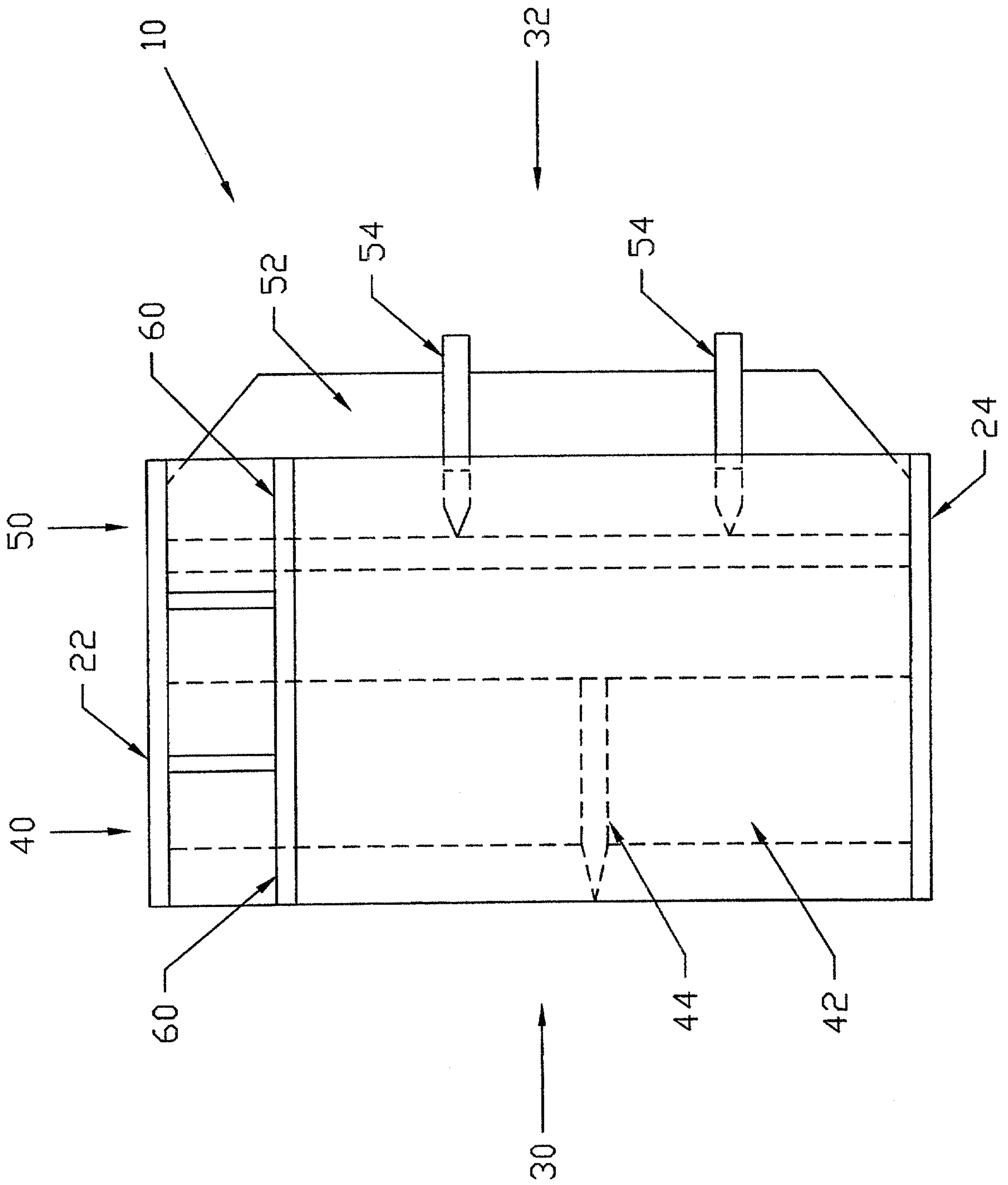


FIG. 4

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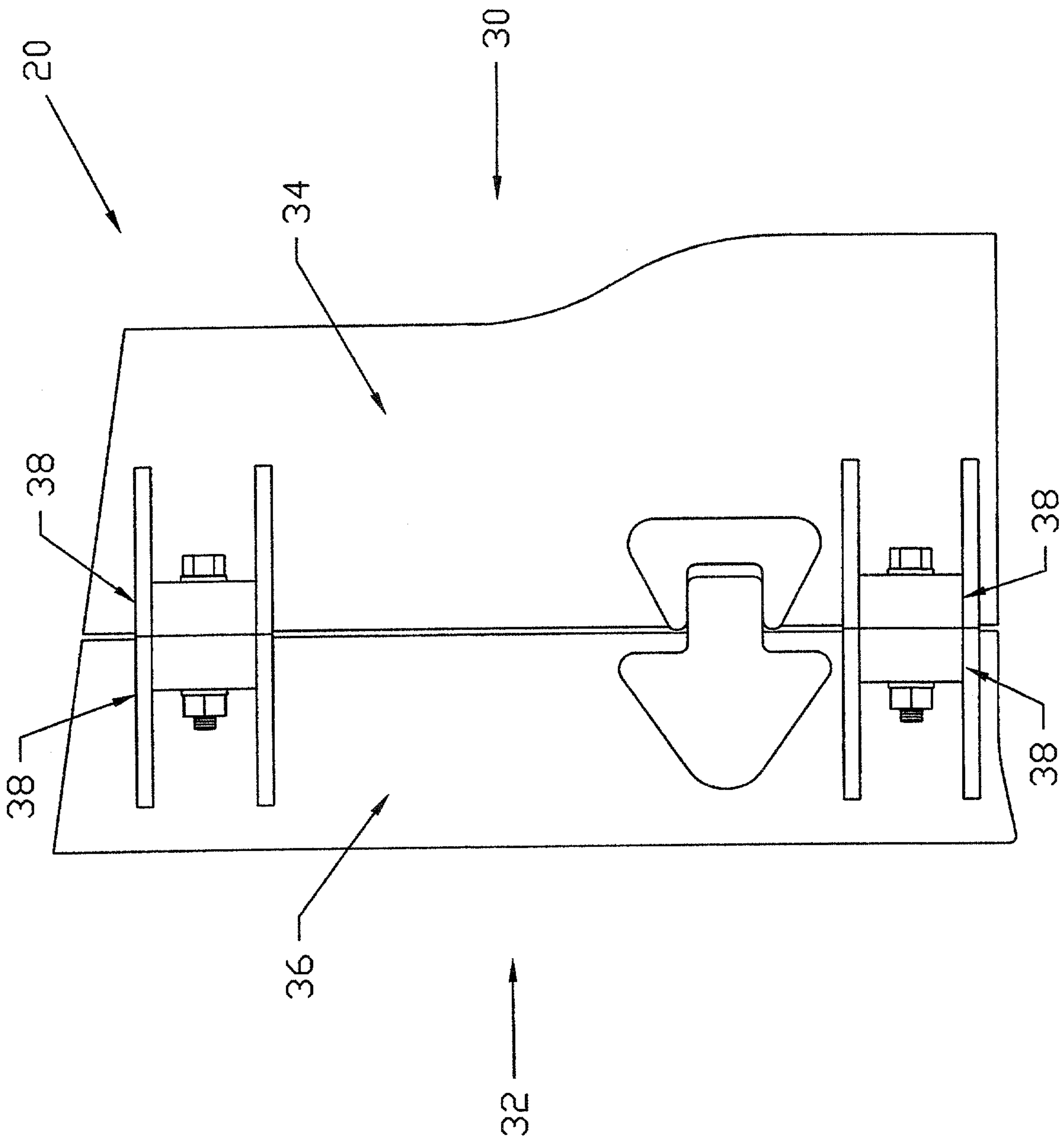


FIG. 5

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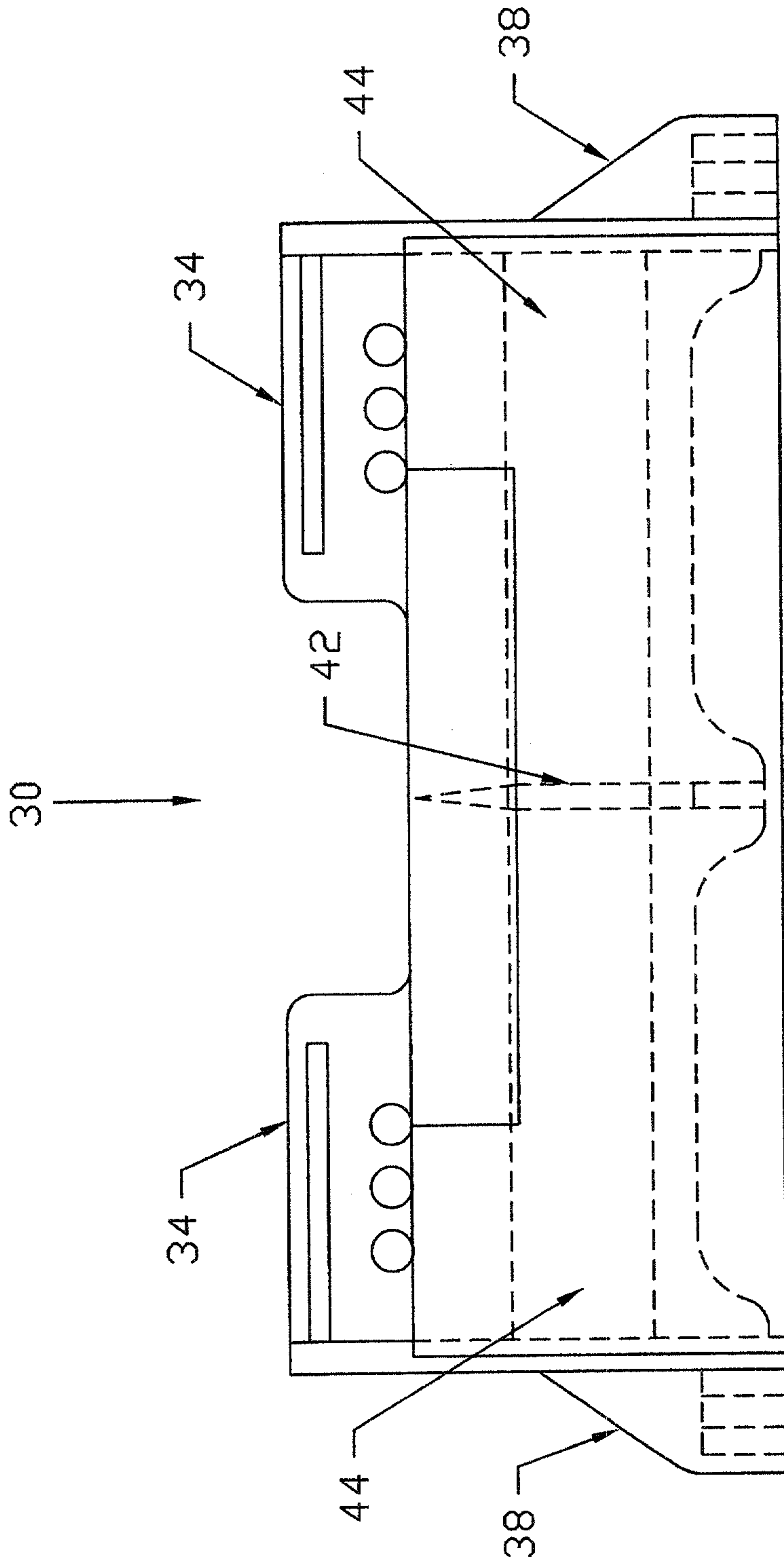


FIG. 6

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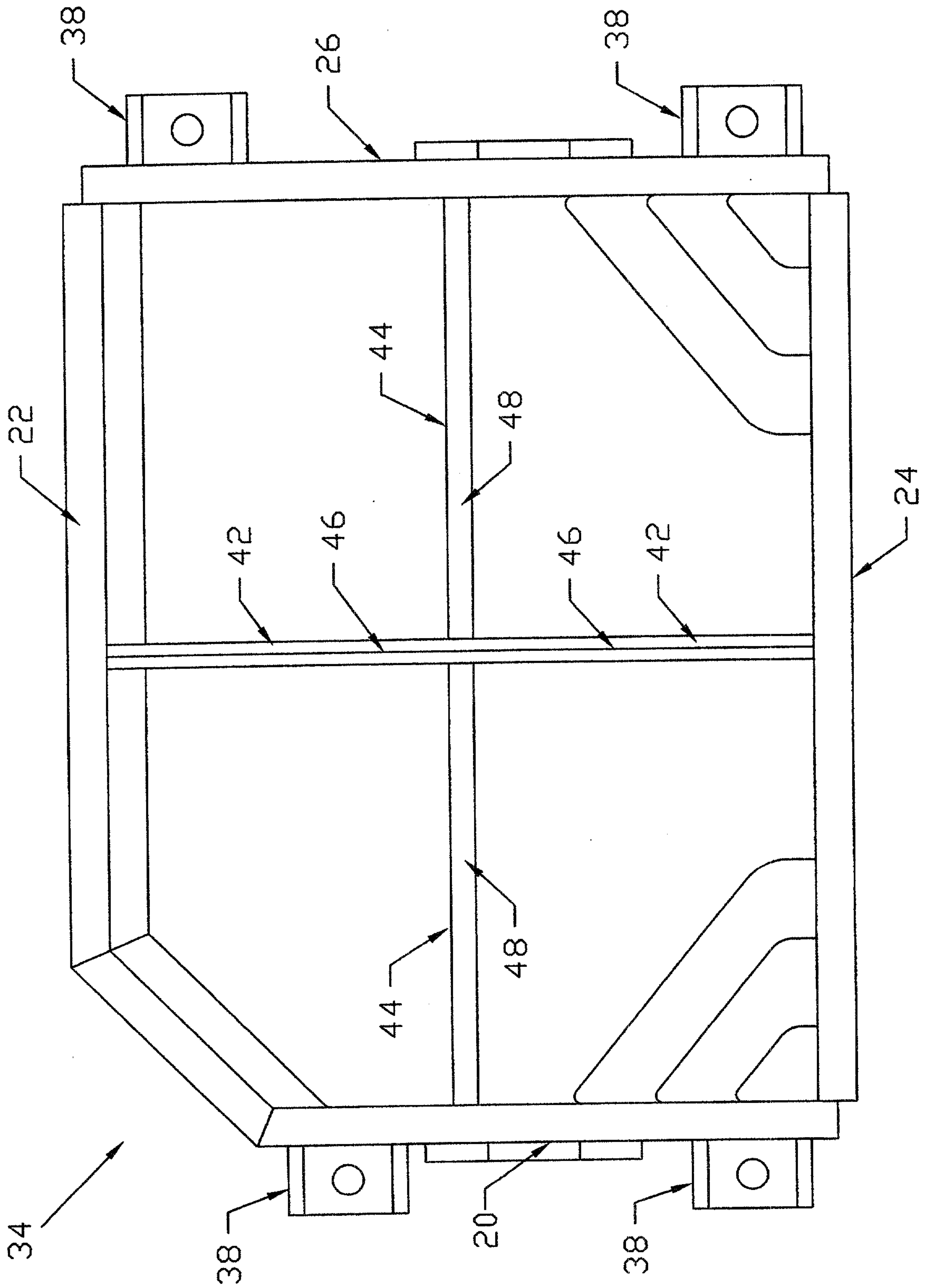


FIG. 7

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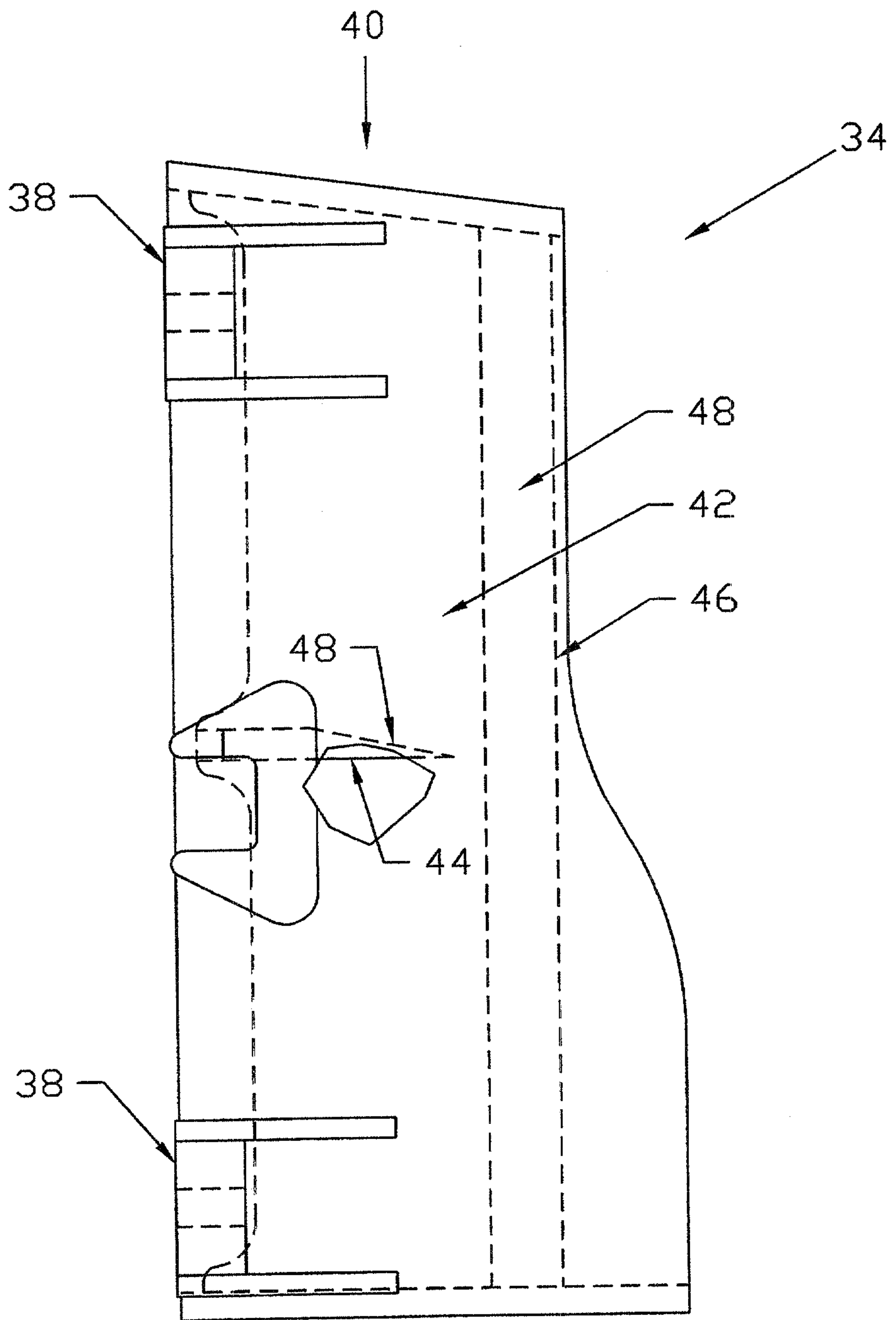


FIG. 8

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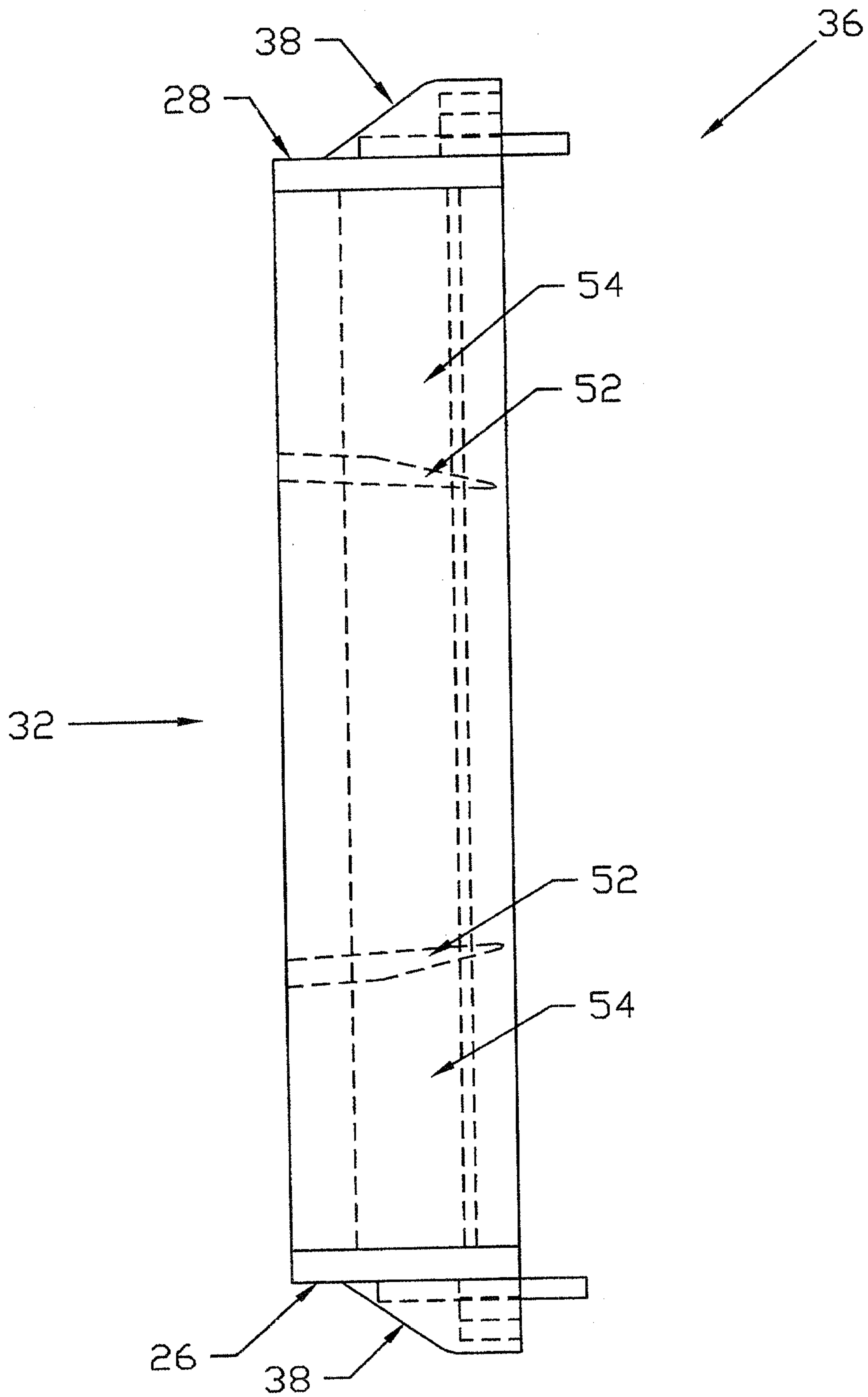


FIG. 9

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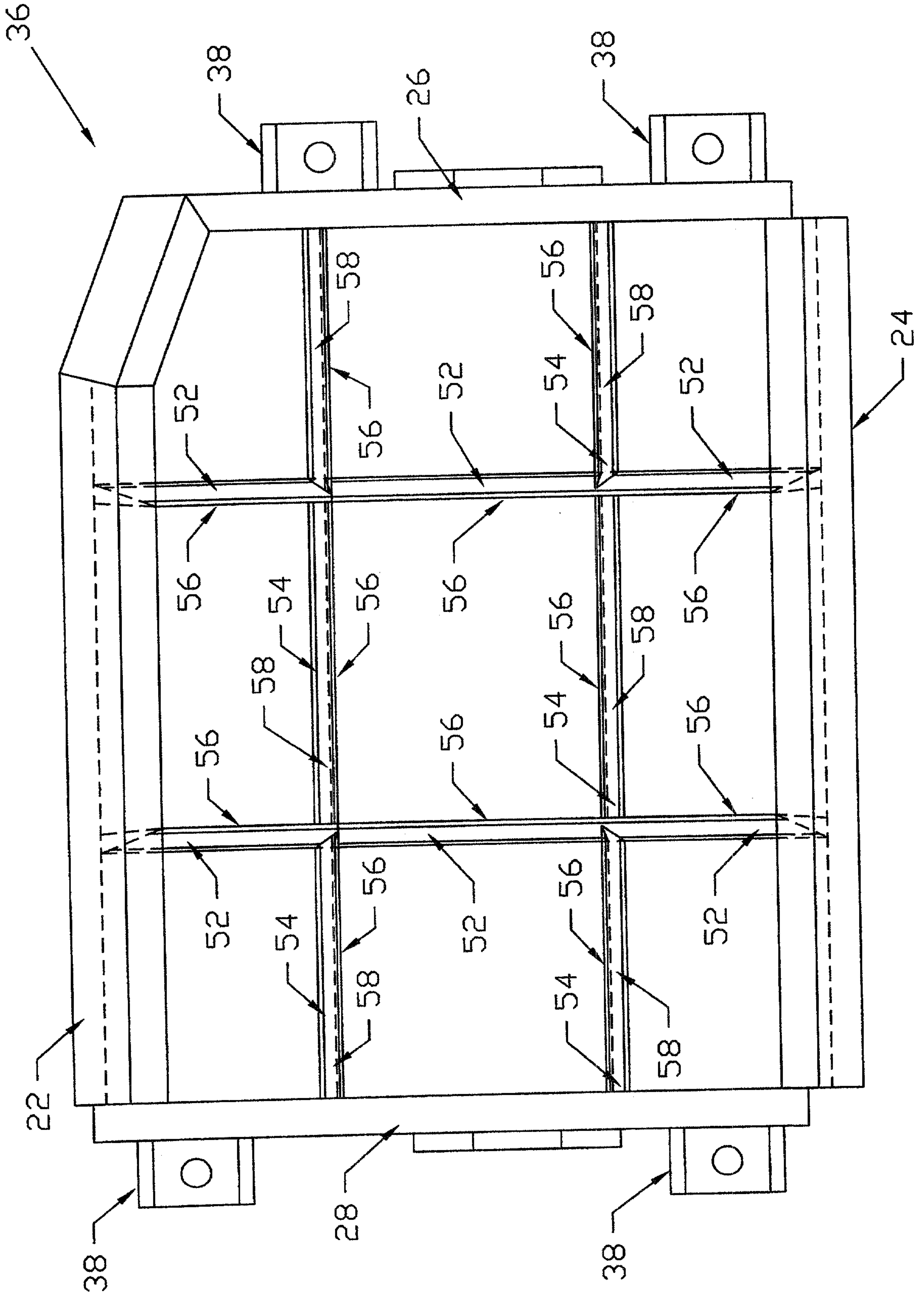


FIG. 10

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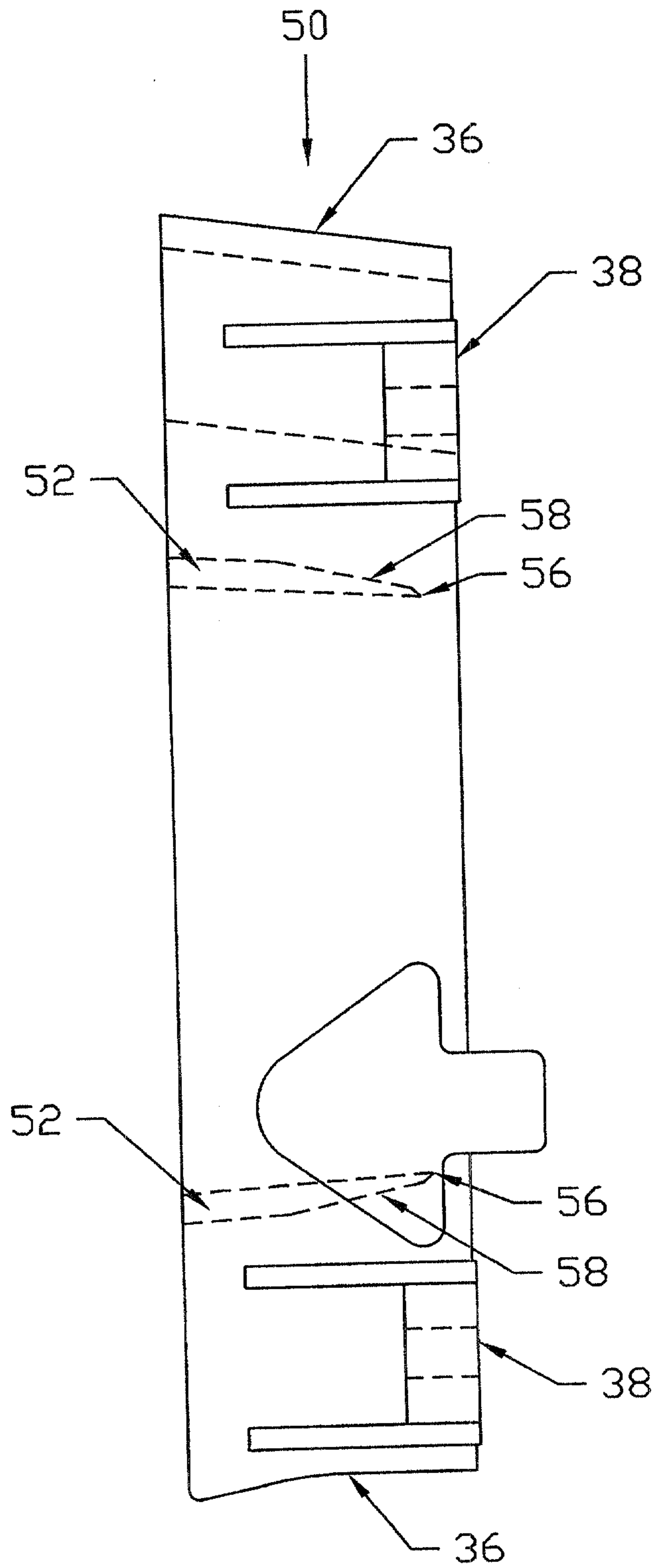


FIG. 11

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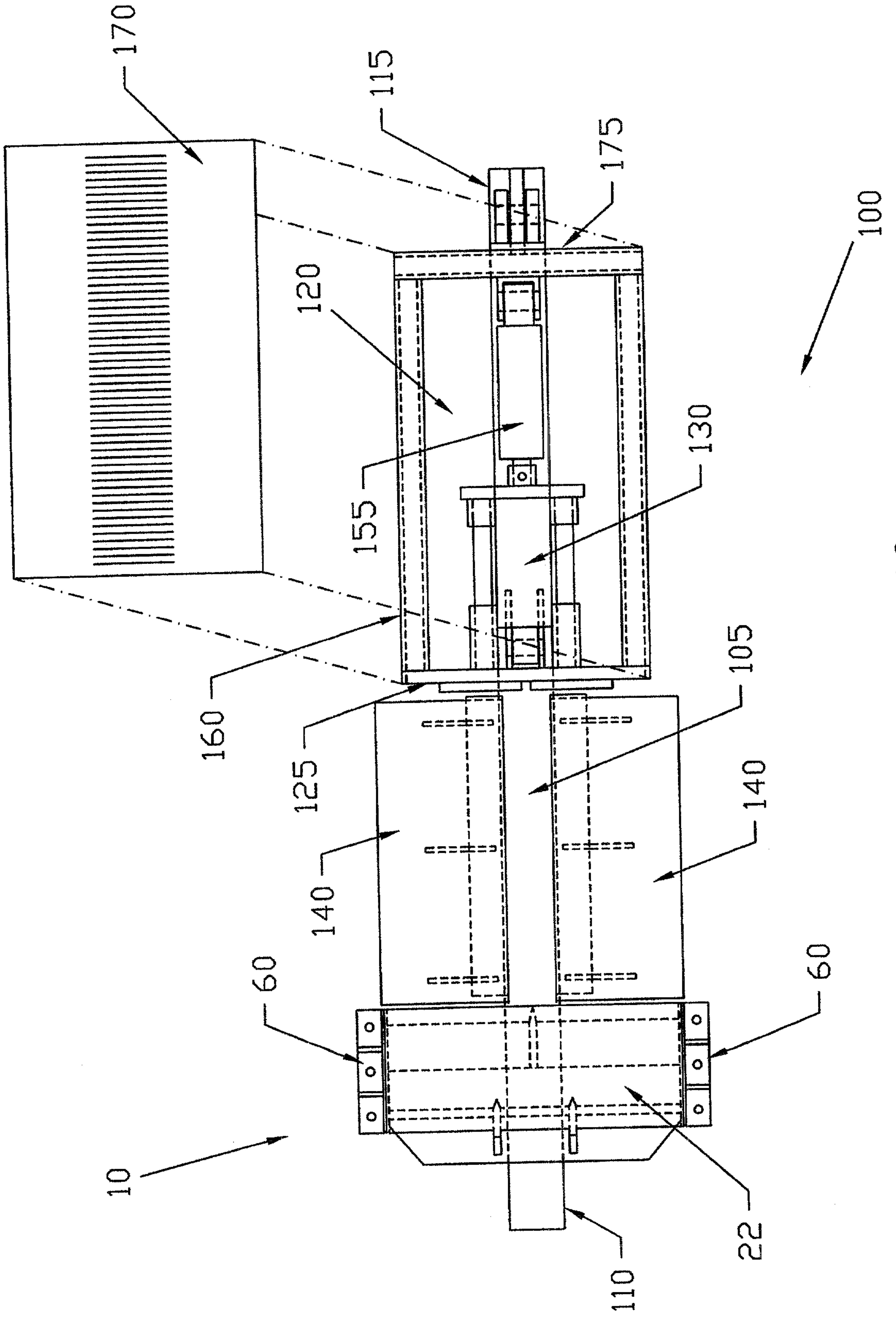


FIG. 13

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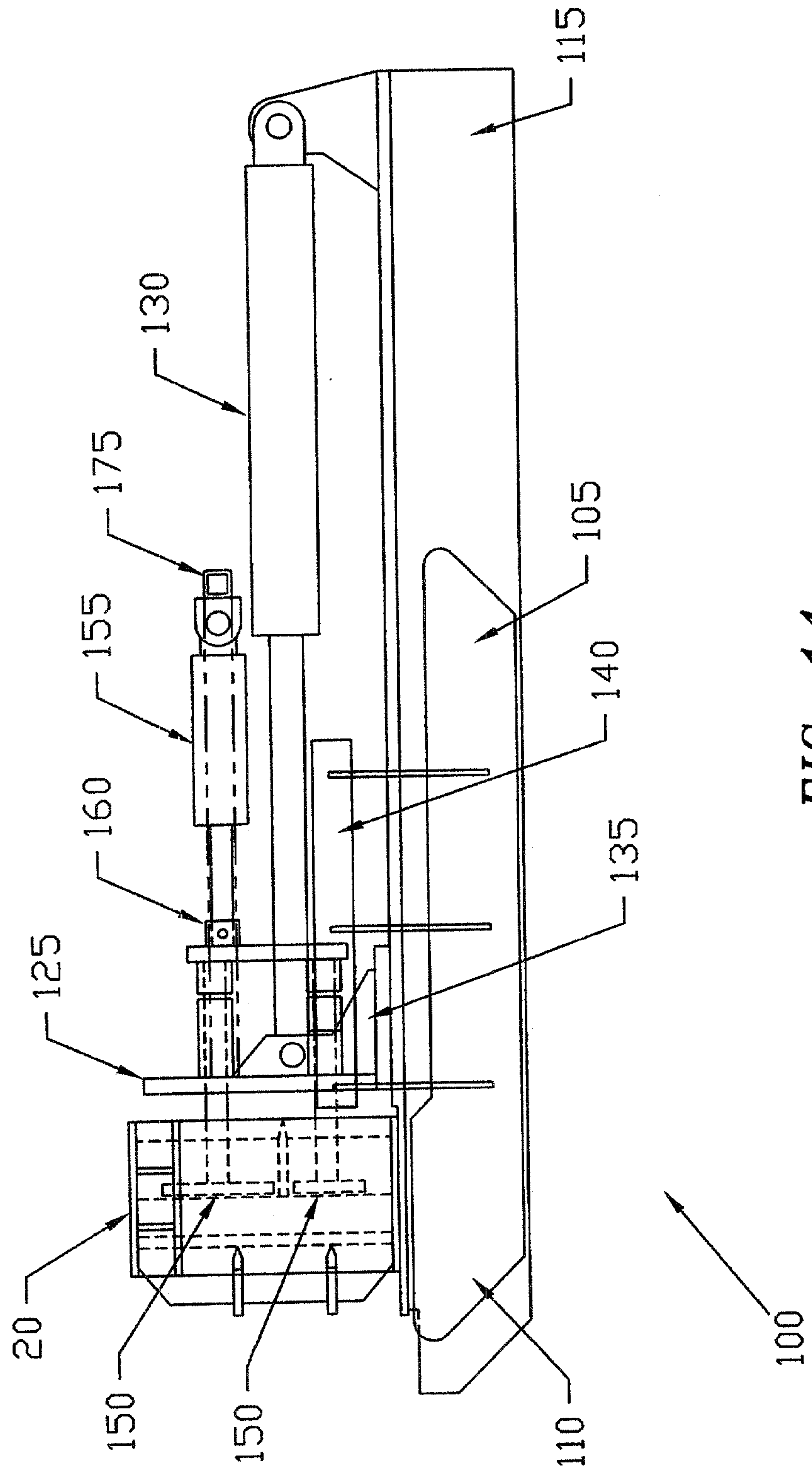


FIG. 14

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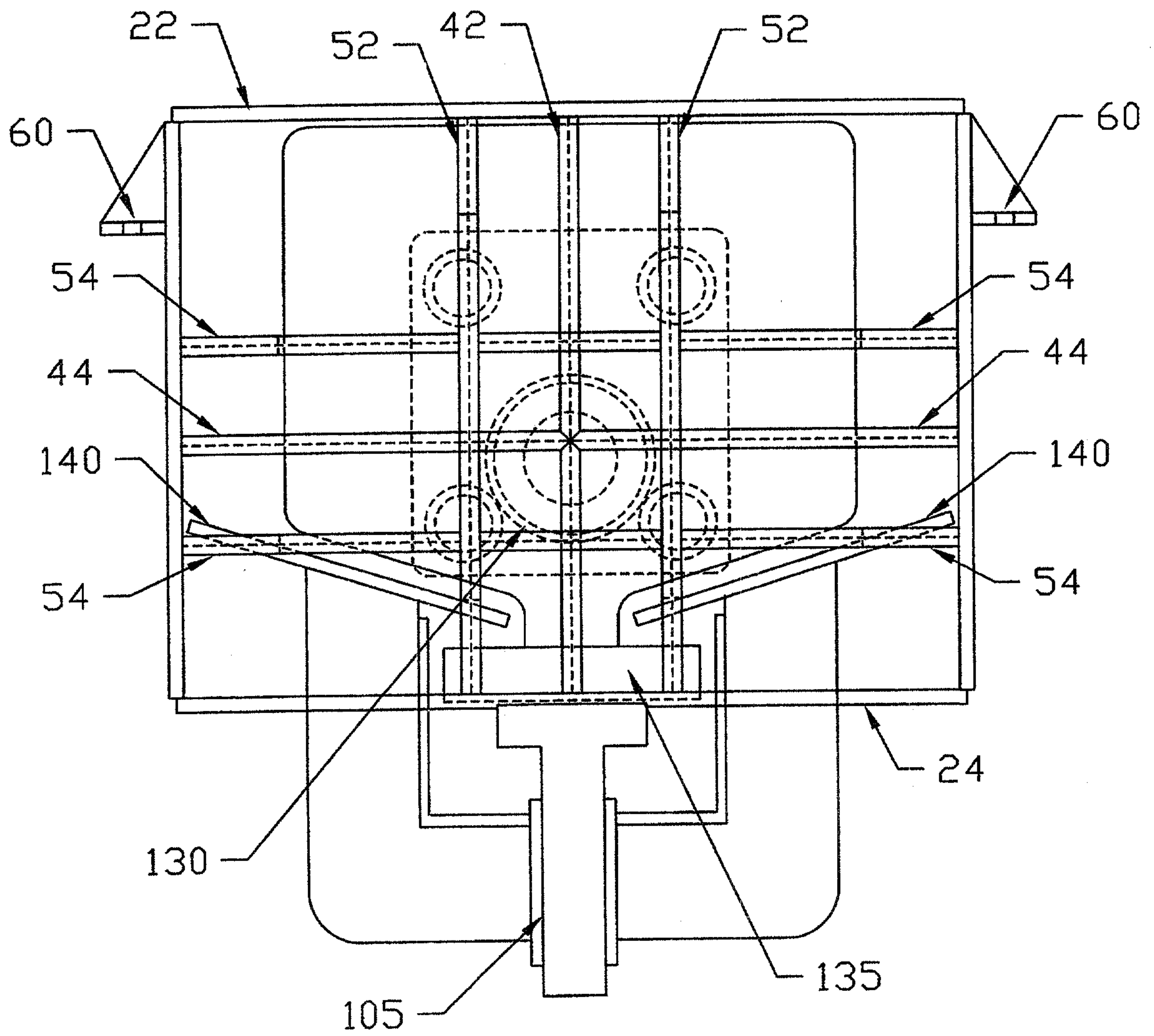


FIG. 15

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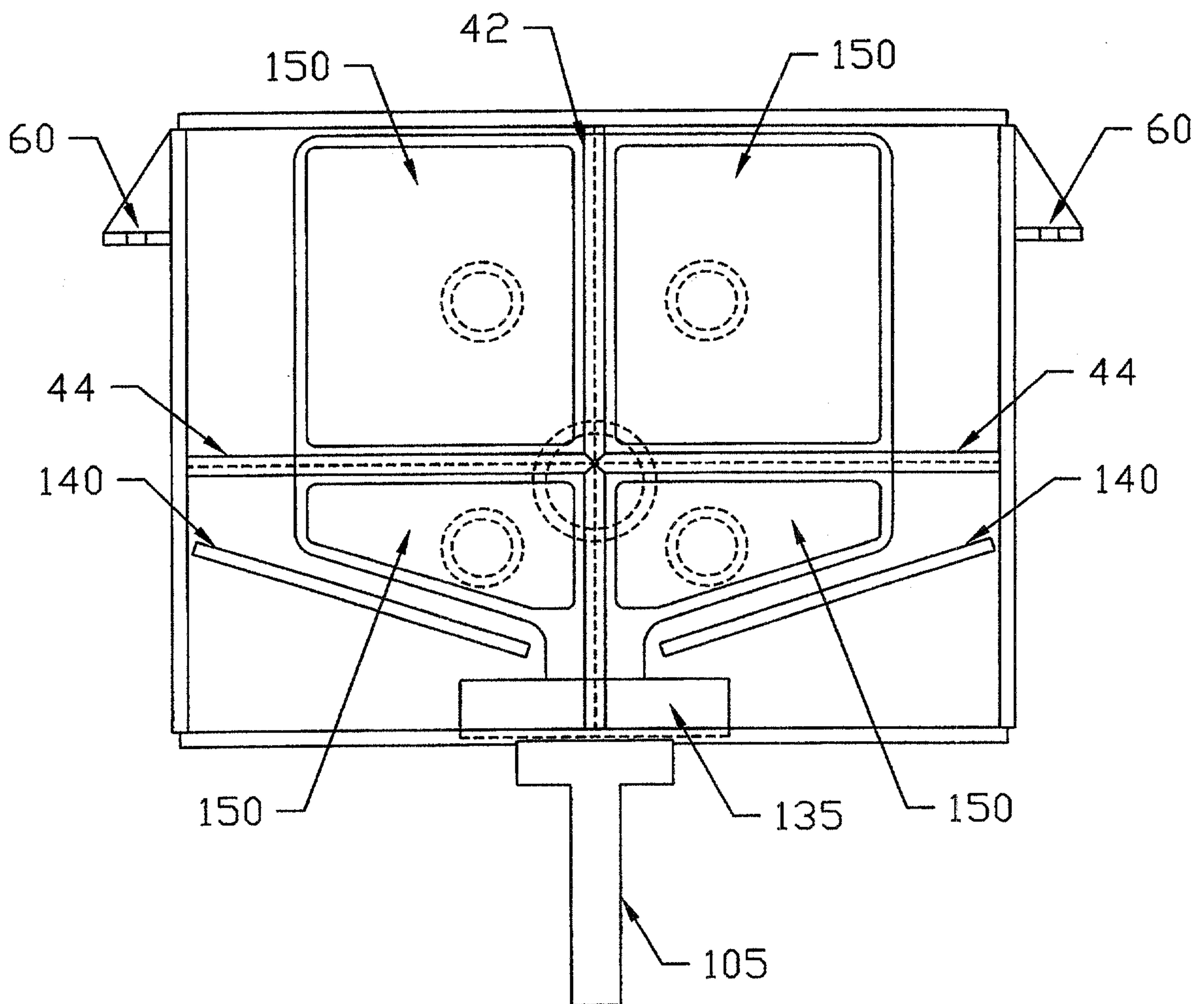


FIG. 16

