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(72) Inventeur/Inventor:
KITCHELL, EDWARD W., US

(73) Propriétaire/Owner:
CIVES CORPORATION, US

(74) Agent: OSLER, HOSKIN & HARCOURT LLP

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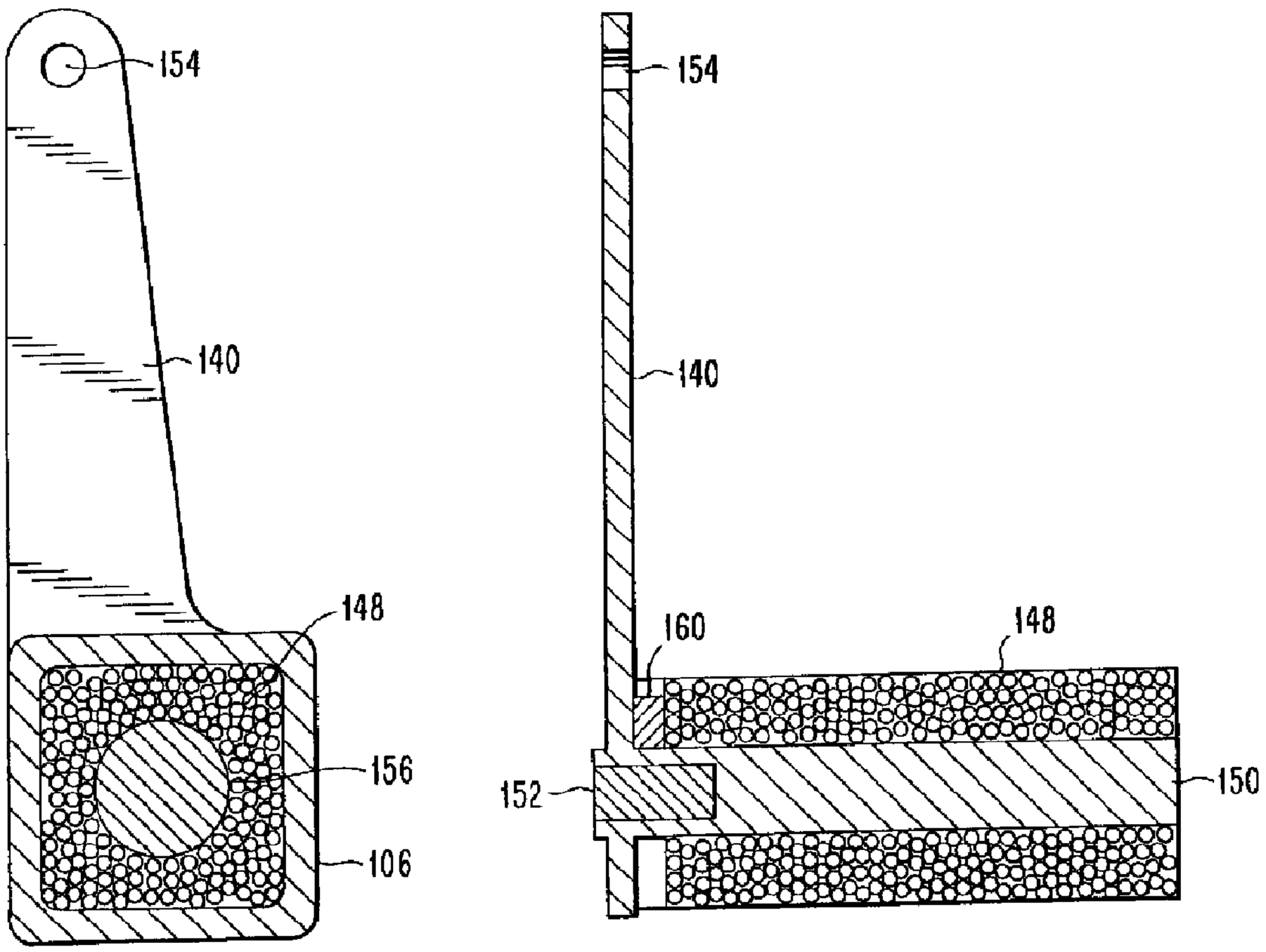

(57) Abrégé/Abstract:
A mounting arrangement for a moldboard includes a pair of arms having resilient members which are received within a mounting member. The resilient members enable the arms and the moldboard to pivot about the mounting member in the event that an obstruction is encountered by the moldboard. The mounting arrangement for the moldboard includes a series of holes whereby the orientation of the moldboard to the surface to be plowed may be adjusted. A cutting edge may be connected to a lower edge of the moldboard by a polyurethane hinge.

ABSTRACT OF THE DISCLOSURE

A mounting arrangement for a moldboard includes a pair of arms having resilient members which are received within a mounting member. The resilient members enable the arms and the moldboard to pivot about the mounting member in the event that an obstruction is encountered by the moldboard. The mounting arrangement for the moldboard includes a series of holes whereby the orientation of the moldboard to the surface to be plowed may be adjusted. A cutting edge may be connected to a lower edge of the moldboard by a polyurethane hinge.

FIELD OF THE INVENTION

The present invention relates to devices that are useful for mounting moldboards onto vehicles and more particularly to devices that are useful for mounting moldboards used to remove material such as ice and snow from road surfaces and parking lots where obstructions may likely be encountered and for adjusting the orientation of moldboards with respect to the surface to be plowed. This invention also relates to cutting edges for moldboards and to arrangements for connecting a cutting edge to a moldboard.

BACKGROUND AND SUMMARY OF THE INVENTION

Moldboards, such as are conventionally used for snow and ice removal, are well known in the art. Moldboards come in a wide variety of shapes and sizes depending upon the intended use. Some moldboards are relatively small and light and are intended to be mounted on a light domestic truck, i.e., a "pickup truck". Other moldboards are of significantly larger size and weight and are intended for municipal or commercial use. These larger moldboards are typically mounted on large trucks which may also be used for spreading sand or salt.

A concern when using a moldboard to remove snow or ice is how to deal with obstructions occurring on the surface being plowed. Some surfaces are considerably rougher than others and may have numerous obstructions. Objects such as grates and manhole covers, rocks, curbs, etc., provide impediments to the removal of ice and snow and may damage the lower edge of the moldboard. In addition. if an obstruction is large enough, the obstruction may cause significant damage to the moldboard and may bring the vehicle used in the plowing operation to an abrupt halt which may result in injury to the vehicle operator.

Various arrangements have been provided along the bottom edge of a moldboard to deal with obstructions. These arrangements are commonly called "trip mechanisms" and are provided to avoid damage to the moldboard and to the vehicle carrying the moldboard.

A representative trip mechanism is described in United States Patent No. 5,079,866, of Gene Farrell, which was issued on January 14, 1992. In the '866 patent, the trip mechanism has a hinged cutting edge along the bottom of the moldboard with two pivotally mounted linkage members and a trip return spring provided on each end of the moldboard to resiliently maintain the orientation of the cutting edge of the moldboard relative to the surface being plowed. If the cutting edge of the moldboard should encounter an obstruction, the pivotally mounted linkage members act on the plowshoe to cause the moldboard to raise and clear the obstruction. After the moldboard has passed beyond the obstruction, the trip return springs cause the cutting edge to return to its normal orientation and the moldboard returns to its initial position.

A trip mechanism such as is described in the '866 patent or other trip mechanisms provided along the bottom edge of a moldboard used in snow removal provide significant protection against damage to the moldboard or to the surface being plowed. However, the need exists for different or for additional protection for moldboards and for the surfaces being plowed especially in the event that a moldboard should encounter a substantial obstruction.

Such different or additional protection against obstructions must be economical in design and construction as well as reliable in operation. Preferably, such protection for moldboards against obstructions will have relatively few moving parts and will be resistant to damage from rust or from low temperatures because of the environment in which such mechanism must function.

In addition to providing protection against obstructions, it is desirable to adjust the orientation of the snowplow with respect to the surface to be plowed such as a street or road depending upon the speed of the vehicle and the conditions of the snow or ice or other material to be removed by the plow.

In view of the above background information, it is an object of the present invention to provide a mounting arrangement for a moldboard which provides protection against obstructions encountered during plowing.

A further object of the present invention is to provide a mounting arrangement for a moldboard providing an improved trip mechanism of high reliability and low complexity.

It is another object of the present invention to provide a mounting arrangement for a moldboard having an improved trip mechanism requiring low maintenance and which is suitable for use in a wet and cold environment.

An additional object of the present invention is to provide a mounting arrangement for a moldboard having an improved trip mechanism capable of preventing or significantly reducing damage to the moldboard or to the vehicle or to the operator when obstructions are encountered by the moldboard during plowing.

Yet another object of the present invention is to provide a mounting arrangement for a moldboard by which the orientation of the moldboard to the surface to be plowed may be readily varied or adjusted.

Yet still another object of the present invention is to provide a mounting arrangement for a moldboard by which the orientation of the moldboard to the surface to be plowed may be subjected to a coarse or gross adjustment as well as to a fine adjustment.

Yet another object of the present invention is to provide a plow assembly having a moldboard and a cutting edge with an arrangement for attaching the cutting edge to the moldboard to provide a lower trip for the moldboard.

Still yet another object of the present invention is to provide a plow assembly including a moldboard and a cutting edge with an arrangement for attaching the cutting edge to the moldboard having a resiliency which is compatible with the resiliency of an upper trip mechanism for the moldboard.

The above objects as well as other objects not specifically mentioned are accomplished by a mounting arrangement for a moldboard in accordance with the present invention. The mounting arrangement for a moldboard according to the present invention comprises truss means for connecting the moldboard to a vehicle and arm means for pivotally mounting the moldboard on the truss means. In

addition, means are provided for resiliently connecting the arm means to the truss means. In the preferred embodiment of the present invention, the truss means includes a mounting member extending longitudinally along the moldboard, with the arm means including first and second arm members received at the ends of the mounting member. In addition, the means for resiliently connecting the arm means to the truss means preferably includes a polyurethane member provided at each of the first and second arm members between the arm members and the mounting member. Preferably, the mounting member is square in cross-section and hollow along the entire length of the mounting member to provide openings at each end of the mounting member with the polyurethane members being square in cross-section and configured to be snugly received within the openings in the mounting member. Preferably, each of the first and second arm members includes a shaft extending perpendicularly from said arm member with one of the polyurethane members being bound to the shaft of each of the arm members. In the preferred embodiment, a cam member is provided on each shaft to limit the extent of angular movement of the arm member and the moldboard about the mounting member.

In an alternative embodiment, each of the shafts of the first and second arm members is square in cross section whereby pivoting of the arm members and the moldboard about the mounting member causes the polyurethane members to be compressed inside the mounting member when the moldboard encounters an obstruction.

The adjustment of the moldboard may be accomplished by a mounting arrangement for a moldboard in accordance with the present invention comprising truss means for connecting the moldboard to a vehicle and arm means for mounting the moldboard on the truss means. The arm means includes first and second arm members with the arm members being connected to the truss means and to the moldboard at a lower portion of the arm members and with the arm members being selectively connected to the moldboard at the upper portion of the arm members. In the preferred embodiment, the moldboard has a number of spaced apart holes which

enables the moldboard to be selectively oriented with respect to the arm members and therefore with respect to the surface to be plowed. In addition, in the preferred embodiment, the truss means includes adjustment means by which the position of the arm means with respect to the truss means may be adjusted and thereby adjust the position of the moldboard with respect to the surface to be plowed.

In another embodiment of the present invention, the adjustment of the moldboard may be accomplished by a mounting arrangement for a moldboard comprising truss means for connecting the moldboard to a vehicle and arm means for pivotally mounting the moldboard on the truss means. In addition, means are provided for resiliently connecting the arm means to the truss means. In the preferred embodiment of the present invention, the truss means includes a mounting member extending longitudinally along the moldboard, with the arm means including first and second arm members received at the ends of the mounting member. In addition, the means for resiliently connecting the arm means to the truss means preferably includes a polyurethane member provided at each of the first and second arm members between the arm members and the mounting member. Preferably, the mounting member is square in cross-section and hollow along the entire length of the mounting member to provide openings at each end of the mounting member with the polyurethane members being square in cross-section and configured to be snugly received within the openings in the mounting member.

The arm means includes first and second arm members with the arm members being connected to the truss means and to the moldboard at a lower portion of the arm members and with the arm members being selectively connected to the moldboard at the upper portion of the arm members. In the preferred embodiment, the moldboard has a number of spaced apart holes which enables the moldboard to be selectively oriented with respect to the arm members and therefore with respect to the surface to be plowed. In addition, in the preferred embodiment, the truss means includes adjustment means by which the position of the arm means with respect to

the truss means may be adjusted and thereby adjust the position of the moldboard with respect to the surface to be plowed.

Preferably, each of the first and second arm members includes a shaft extending perpendicularly from said arm member with one of the polyurethane members being bound to the shaft of each of the arm members. In the preferred embodiment, a cam member is provided on each shaft to limit the extent of angular movement of the arm member and the moldboard about the mounting member.

According to another embodiment according to the present invention, a cutting edge is provided along the lower edge of the moldboard with a polyurethane strip provided as a hinge for mounting the cutting edge to the moldboard. In a more preferred embodiment of the present invention, the polyurethane strip is formed with a polyester backbone and is cured using an MBCA agent. Preferably the polyurethane and curing agent are mixed at 101% of theory to achieve a desired resiliency or stiffness. In addition, the thickness of the polyurethane strip is preferably 1.375 inches to 1.75 inches and the width of the polyurethane strip is preferably 5.5 inches.

BRIEF DESCRIPTION OF THE DRAWINGS

The preferred embodiments of the present invention will be described in greater detail with reference to the accompanying drawings, wherein like members bear like reference numerals and wherein:

Fig. 1 is a pictorial view of a moldboard according to the present invention;

Fig. 2 is a side view of a mounting arrangement for a moldboard according to the present invention;

Fig. 3 is a view through the line 3-3 of Fig. 2;

Fig. 4 is a view through the line 4-4 of Fig. 2;

Fig. 5 is a view through the line 5-5 of Fig. 2;

Fig. 6 is a cross sectional view of an arm member and resilient member according to the present invention;

Fig. 7 is a cross sectional view of another embodiment according to the present invention;

Fig. 8 is a side view in partial cross-section of the mounting arrangement for adjusting the orientation of a moldboard relative to the surface to be plowed according to the present invention in the normal position;

Fig. 9 is a side view in partial cross-section of the mounting arrangement for adjusting the orientation of a moldboard relative to the surface to be plowed with the moldboard in a more vertical orientation;

Fig. 10 is a side view in partial cross-section of the mounting arrangement for adjusting the orientation of a moldboard relative to the surface to be plowed with the moldboard in an intermediate position;

Fig. 11 is a side view in partial cross-section of the mounting arrangement for adjusting the orientation of a moldboard relative to the surface to be plowed with a relatively fine adjustment of the orientation of the moldboard; and,

Fig. 12 is a front view of a moldboard having a cutting edge mounted on the moldboard with a polyurethane strip.

DETAILED DESCRIPTION

A preferred embodiment of a mounting arrangement according to the present invention is shown the accompanying drawings. With reference to Fig. 1, a moldboard 100 of conventional design is carried by a truss 102. The truss 102 is arranged to be removably mounted on the front of a truck or other suitable vehicle (not shown) through a bracket 104 in a suitable and conventional manner well known in the art. The truss 102 has a mounting member 106 which is formed from steel square tubing and which comprises a box beam, i.e., a member having a square cross-section, which is hollow along the length of the box beam.

The mounting member 106 is carried on the truss 102 by an A-frame member 108. The mounting member 106 is pivotally attached to the A-frame member 108 at a mid-point of the mounting member 106 with a pair of hydraulic cylinders 110 provided on either side of the A-frame member 108. The hydraulic cylinders 110 are provided to selectively orient the mounting member 106, and therefore to selectively orient the moldboard 100, with respect to the truss 102. In this way, the angle that the moldboard makes with respect to the vehicle may be varied as desired.

In addition, the truss 102 includes an arrangement 112 to lift the moldboard 100 when desired. The arrangement 112 includes a support arm 114 which is pivotally attached to the truss 102. The A-frame member 108 may be attached to the end of the support arm 114 by a chain 116. In addition, the support arm 114 may be raised or lowered by a hydraulic cylinder 118 to raise or lower the A-frame member 108, and thereby raise or lower the moldboard 100.

If desired, the truss 102 may also include headlights 120 to illuminate the roadway in front of the moldboard 100.

If desired, the cutting edge 124 of the moldboard may be made of a flexible or resilient material in order to minimize damage to the moldboard in the event that the cutting edge 124 should strike an obstruction during plowing. The cutting edge 124 may also be provided with a trip mechanism such as is described in United States Patent No. 5,079,866.

The moldboard 100 includes a frame 126 which includes a series of curved support members 128. The support members 128 are connected at their uppermost and lowermost portions to an upper cross member 130 and to a lower cross member 132. Two additional support members 132 are provided adjacent the left and right sides of the moldboard 100 and are provided to connect the moldboard 100 to the truss 102.

The additional support members 132 include a hole 134 which receives a bolt 136 positioned centrally within an end of the mounting member 106. The

additional support members 132 also include a series of holes 138 provided at about a midpoint of the frame 126. A pair of arm members 140 formed of steel are carried by the mounting member 106 and the arm members in turn carry the moldboard 100. The series of holes 138 permit the orientation of the moldboard with respect to the arm members 140 to be selectively adjusted.

With reference now to Fig. 2, the mounting member 106 includes a pair of A-frame pivot bearings 142 at a mid-point of the mounting member 106. The mounting member is free to pivot about the pivot bearings 142 with respect to the A-frame member 108 (see Fig. 1). The mounting member 106 also includes a number of power angling bushings 144. The hydraulic cylinders 110 are connected to the mounting member 106 through selected power angling bushings 144.

The mounting member 106 is square in cross section with an opening 146 provided in a side wall of the mounting member 106 adjacent the vehicle to enable the hydraulic cylinders 110 to be connected to the power angling bushings 144.

In a moldboard mounting arrangement according to the prior art (not shown), the arm members 140 have a projection made from steel square tubing which extends at a right angle with respect to the arm member 140. The projection is formed from a rigid box beam having a square configuration in cross-section with the projection sized so as to be snugly received within the ends of the mounting member 106. In the prior art arrangement, the arm members 140 are slidingly received within the mounting member and cannot pivot or rotate with respect to the mounting member 106.

According to the present invention, the arm members 140 are each provided with a resilient member 148 (see Fig. 6). The resilient member 148 has a square cross section and is sized so as to be snugly received within the opening provided at either end of the mounting member 106.

The resilient member 148 enables the arm member 140 to pivot with respect to the mounting member 106. The resilient member 148 preferably has sufficient rigidity to prevent the arm member (and therefore the moldboard) from pivoting

about the mounting member 106 during normal operation of the plow in the absence of an obstruction. The flexibility of the resilient member 148 is measured in durometers and a suitable value depends upon the size and weight of the moldboard as well as the flexibility or resiliency desired for the resilient members 148. For a typical moldboard of a light weight to medium weight construction, a durometer of about 330 pounds per linear inch is likely to be suitable.

In the preferred embodiment, the resilient member is connected to the arm member 140 through a shaft 150. The shaft 150 is either integral with the arm member 140 or is welded to the arm member at one end of the shaft 150. The shaft 150 has a sufficient diameter to enable the shaft to be provided with a threaded opening 152 extending through the arm member 140 to receive the bolt 136 (not shown in Fig. 6, but see Fig. 1). The bolt 136 passes through the lower hole provided in the additional support members 138 of the moldboard frame to connect the moldboard to the arm members. The shaft 150 is preferably centrally located in the resilient member 148 so that the shaft 150 is likewise centrally located in the end of the mounting member 106. In this way, the arm member 140 and the moldboard 100 are arranged to pivot about the shaft 150.

With reference now to Fig. 3, the arm member 140 has the first hole 152 provided in a lower portion of the arm member having a generally square configuration. The arm member 140 includes an upwardly extending portion provided with a second opening 154 which receives a second bolt (see also, Fig. 1) to connect the additional support member 132 to the arm member 140 through one of the series of holes provided in the additional support member at a mid-point of the moldboard 100.

With reference to Fig. 4, the resilient member 148 is snugly received within the square opening provided in the end of the mounting member 106. Because the resilient member 148 is securely bound to the surface of the shaft 156, rotation of the shaft causes a deformation of the resilient member 148 inside the mounting member 106. The extent to which the resilient member resists deformation

determines the amount of force needed to rotate the arm member 140 about the shaft 156.

With reference now to Fig. 5, to limit the angular range of motion of the arm member 140 about the shaft 156, the shaft may be provided with a cam member 160. The cam member 160 is fixed with respect to the shaft 150 and with respect to the arm member 140 such as by welding. The cam member 160 has four relatively flat surfaces 162 which contact the inside surface of the mounting member when the arm member 140 is in the rearwardmost position relative to the vehicle. The cam member 160 likewise has four additional relative flat surfaces 164 which abut the inside surface of the mounting member when the arm member 140 has moved sufficiently forward. In this way, the cam member 160 serves to limit the angular extent of movement of the arm member 140 and in turn limit the angular extent of movement of the moldboard 100 about the shaft 156.

The cam member 160 may be welded in the valleys between the flat portions about the perimeter surface of the cam member in order to increase the strength of the cam member.

Preferably, the cam member prevents rotation of the moldboard about the shaft 150 to about 22.5 degrees and usually less than about 35 degrees of rotation in the event that the moldboard encounters an obstruction.

To adjust the ability of the resilient member to oppose a rotation of the moldboard about the shaft 150, the length of the resilient member may be varied as well as the composition of the resilient member. For example, longer and therefore heavier moldboards likely require either longer resilient members 148 or resilient members of a material having a relatively higher durometer.

The mounting arrangement for a moldboard according to the present invention provides significant protection against damage to the moldboard or to the vehicle used for plowing and the vehicle operator (as well as to preventing damage to obstructions) in the event that the moldboard should encounter an obstruction during plowing. However, additional protection is provided when the mounting

arrangement according to the present invention is used in conjunction with a conventional trip mechanism for a moldboard. Preferably, the mounting arrangement according to the present invention is used in conjunction with a lower trip mechanism for a moldboard in which a polyurethane strip according to the present invention connects the cutting edge to the moldboard.

With reference now to Fig. 7, an alternative embodiment is disclosed in which the arm member 140 is provided with a square shaft 150'. The square shaft 150' is welded to the arm member 140 and is oriented so that the corners of the square shaft are adjacent the flat interior surfaces of the mounting member 106 when the arm member 140 is in the rearwardmost position. When the arm member 140 rotates forwardly (such as when the moldboard 100 encounters an obstruction), the flat exterior surfaces of the square shaft 150' compress the resilient member 148' against the inside surfaces of the mounting member 106. In this way, the resistance of the resilient member to being compressed prevents the moldboard 100 from rotating forward about the central axis of the square shaft 150'. As in the embodiment of Fig. 3, the moldboard is connected to the arm member 140 through a bolt 136 which is threadably received by the arm member 140 and by the square shaft 150'.

The square shaft 150' may be solid, if desired, or may be hollow depending upon the weight of the moldboard and the thickness of the walls of the square shaft 150'.

The resilient member 148 may be formed of any number of materials readily apparent to one skilled in the art with a suitable material being Adiprene LF 1860A (Adiprene is a trademark of Uniroyal Chemical Company, Inc. of Middlebury, Connecticut). Another suitable material is Adiprene LF 1800A. Both Adiprene LF 1800A and Adiprene LF 1860A may be cured with MBCA (4,4'-methylene-bis-(o-chloroaniline)) (MBCA Activator M is available from Miki Sangyo USA, Inc. and MBCA Bis Amine A is available from Omni Spec. Corporation-formerly Palmer Davis Sieka). In addition, when the Adiprene is being cured in a mold, it is

preferable (or necessary) to use a mold release such as Mold Release S236™ available from Stoner. If the shaft 150 (or the square shaft 150') is to properly bind to the polyurethane, the surface of the shaft must be prepared. Suitable preparation involves a grit blasting of the shaft using G40 or G50 steel or aluminum oxide 60 mesh at 80-100 p.s.i. In addition, Adiprene Primer Chemlock AP213 or AP218 available from Hughson Chemicals, Division of Lord Corporation, Erie Pennsylvania may be used to facilitate the attachment of the polyurethane to the shaft.

A suitable process for bonding liquid cast Adiprene to metal surfaces includes the following steps:

1. Degrease metal surfaces with suitable solvent to reduce contamination of grit.

2. Grit blast metal surfaces to be bonded with G40 or G60 steel grit or aluminum oxide-60 mesh at 80-100 p.s.i. air pressure.

3. Degrease metal with solvents; toluene, methyl ethyl ketone, trichloroethylene or perchloroethylene. (Avoid using fast evaporating solvents which may cause moisture condensation on the metal surfaces and result in poor adhesion.) Prepare surfaces just before application of the primer to prevent rusting and contamination. Care should be taken in the selection and application of mold releases to avoid contamination from mold releases on the surfaces intended to be bound to the Adiprene.

4. Apply one or more primer coats and allow to dry.

5. Preheat metal part and mold to about 212 degrees Fahrenheit before casting.

6. Cast mixture of Adiprene prepolymer and crosslinking agent and cure according to manufacturer's instructions.

In operation, a moldboard mounted on a vehicle using the mounting arrangement according to the present invention may be used for plowing material such as ice and snow from a road or other surface. In the event that the moldboard

should encounter an obstruction, the resilient material provided about the shaft of the arm members permits the moldboard to pivot forward about 22.5 degrees and preferably less than about 35 degrees to permit the moldboard to pass over the obstruction. In this way, the damage to the moldboard, to the vehicle carrying and moldboard and, most importantly to the operator of the vehicle, from encountering the obstruction is either prevented or significantly reduced.

A preferred embodiment of a mounting arrangement for adjusting the orientation of the moldboard with respect to the surface to be plowed according to the present invention is shown especially in connection with Figs. 8-11 of the accompanying drawings. With reference to Fig. 8 (and with continued reference to Fig. 1), the moldboard 100 is carried by the truss 102 with the truss 102 arranged to be removably mounted on the front of a truck or other suitable vehicle (not shown) through the bracket 104 (not shown in Fig. 8). As shown in Fig. 1, the truss 102 includes the mounting member 106 which is formed from steel square tubing and which comprises a box beam, i.e., a member having a square cross-section, which is hollow along the length of the box beam.

The mounting member 106 is carried on the truss 102 by the A-frame member 108. The mounting member 106 is pivotally attached to the A-frame member 108 at a mid-point of the mounting member 106 with the pair of hydraulic cylinders 110 (not shown in Fig. 8) provided on either side of the A-frame member 108.

In addition, the truss 102 includes the arrangement 112 to lift the moldboard 100 when desired. The arrangement 112 includes the support arm 114 which is pivotally attached to the truss 102. The A-frame member 108 may be attached to the end of the support arm 114 by the chain 116. In addition, the support arm 114 may be raised or lowered by the hydraulic cylinder 118 to raise or lower the A-frame member 108, and thereby raise or lower the moldboard 100.

If desired, the truss 102 may also include headlights 120 to illuminate the roadway in front of the moldboard 100.

As described above, the cutting edge 124 of the moldboard may be made of a flexible or resilient material in order to minimize damage to the moldboard in the event that the cutting edge 124 should strike an obstruction during plowing. Especially if the cutting edge 124 is of steel or some other rigid material, the cutting edge may be connected to the moldboard by a polyurethane hinge 125 which extends substantially along the length of the moldboard 100 and the cutting edge 124. The polyurethane hinge 125 is bolted to the lower edge of the moldboard 100 by a series of bolts 127 which extend through holes in the moldboard 100 and through holes in the polyurethane hinge 125. Similarly, the cutting edge 124 is connected to the polyurethane hinge 125 by a series of bolts 129 which extend through holes in the cutting edge 124 and through holes in the polyurethane hinge 125. When the cutting edge encounters an obstruction, the polyurethane hinge 125 may bend in order to allow the cutting edge to pivot with respect to the lowermost edge of the moldboard and thereby pass over the obstruction. The resiliency of the polyurethane hinge 125 may be varied as desired in order to adjust the ability of the cutting edge 124 to pivot with respect to the lowermost edge of the moldboard.

In the preferred embodiment of the present invention, the polyurethane hinge has a polyester backbone with the polyurethane hinge 125 being made of Adiprene LF 1860A (Adiprene is a trademark of Uniroyal Chemical Company, Inc. of Middlebury, Connecticut). Another suitable material is Adiprene LF 1800A. Also in the preferred embodiment, the polyurethane hinge has been cured with MBCA (4,4'-methylene-bis-(o-chloroaniline)) (MBCA Activator M™ is available from Miki Sangyo USA, Inc. and MBCA Bis Amine A is available from Omni Spec. Corporation-formerly Palmer Davis Sieka).

As described above in connection with the upper trip mechanism, when the Adiprene is being cured in a mold, it is preferable (or necessary) to use a mold release such as Mold Release S236™ available from Stoner.

When preparing the mixture of Adiprene prepolymer and crosslinking agent to form the polyurethane hinge 125, it is preferable to calculate the mixture at 101%

of the theoretical mixture and then cure the mixture according to the manufacturer's instructions. In other words, to obtain a predetermined (or desired) durometer for the polyurethane hinge, a particular mixture of Adiprene and MBCA™ can be calculated theoretically. In practice, that mixture should be prepared at 101% of the theoretical mixture in order to achieve the predetermined (or desired) durometer for the polyurethane hinge.

For a moldboard having a length of 8 feet, it is preferable for the polyurethane hinge to have a width of 5.5 inches so as not to extend too low on the cutting edge or too high on the moldboard. If the polyurethane hinge extends too low, usually more than 30 % of the cutting edge height, then the useful life of the cutting edge will be diminished because the cutting edge is subject to wear during use. If the polyurethane hinge 125 extends too high on the moldboard, the hinge will interfere with the structure of the moldboard and with the adjustment and positioning of the moldboard.

For a moldboard having a length of 8 feet, it is preferable that the polyurethane hinge extends substantially along the entire length of the moldboard and that the polyurethane hinge has a thickness of at least 1.375 inches. If the length of the moldboard is 10 feet, it is preferable for the thickness of the polyurethane hinge to be 1.750 inches.

With reference now to Fig. 12, in the preferred embodiment of the lower trip mechanism, the bolts 129 which connect the cutting edge 124 to the lower portion of the polyurethane hinge 125 are preferably spaced 12 inches apart with the bolts at either end of the cutting edge being at least 6 inches and no more than 12 inches from the sides of the cutting edge 124. The bolts 127 which connect the lower edge of the moldboard to the upper edge of the polyurethane hinge 125 may be spaced apart 8 or 9 inches with the bolts at either end of the moldboard being at least 6 inches and no more than 12 inches from the sides of the moldboard.

The arrangement for mounting a cutting edge on the lowermost edge of a moldboard using a polyurethane hinge according to the present invention may be

used with or without the upper trip mechanism and with or without the arrangement for adjusting the orientation of the moldboard. If the polyurethane hinge is used in conjunction with an upper trip mechanism according to the present invention, the durometer of the polyurethane strip and the durometer of the polyurethane members in the upper trip mechanism should be configured so as to provide the desired relative resiliency for the upper and lower trip mechanisms.

As described in connection with Fig. 1, the moldboard 100 includes the frame 126 which includes the series of curved support members 128 (not shown in Fig. 8). The two additional support members 132 are provided adjacent the left and right sides of the moldboard 100 and are provided to connect the moldboard 100 to the truss 102.

The additional support members 132 each include the hole 134 which receives the bolt 136 positioned centrally within the end of the mounting member 106. The additional support members 132 also include the series of holes 138 provided at about a midpoint of the frame 126. The holes 138 are preferably set apart 5 degrees to 7 degrees depending upon the size of the moldboard and the range of adjustability desired.

A pair of arm members 140' formed of steel are carried by the mounting member 106 and the arm members in turn carry the moldboard 100. The arm members 140' according to the embodiment of Fig. 8 are curved forwardly (in the same direction as the curvature of the moldboard) in order to more easily avoid obstruction with the configuration of the moldboard and mounting arrangement. The degree of curvature of the arm members 140' is a matter of design choice as will be readily apparent to one skilled in the art.

The series of holes 138 permits the orientation of the moldboard with respect to the arm members 140 to be selectively adjusted, as will be more fully described below.

The arm member 140' has the first hole 152' provided in a lower portion of the arm member having a generally square configuration. The arm member 140'

includes an upwardly extending portion provided with a second opening 154' which receives a second bolt (see also, Fig. 1) to connect the additional support member 132 to the arm member 140' through one of the series of holes provided in the additional support member at a mid-point of the moldboard 100.

In the normal position, the arm members 140' are connected to the moldboard through the middlehole 138 in each of the support members 132. However, other orientations of the moldboard (and hence the cutting edge) to the surface to be plowed may be desirable depending upon the conditions of the surface to be plowed. For example, if the cutting edge is oriented in a more vertical angle, the cutting edge will more easily hop or skip over an obstruction. If the cutting edge is oriented at a flatter or more horizontal angle to the surface to be plowed, the cutting edge will glide over the surface to be plowed more easily but the cutting edge will also tend to trip only after the forward edge of the cutting edge has jammed into an obstruction.

With reference now to Fig. 9, the moldboard has been moved relative to the arm members 140' so that the hole 154' aligns with the rearwardmost hole 138 in the support members 132. This may be accomplished by first removing the bolt from the holes 154' and 138, repositioning the moldboard (i.e., by extending the hydraulic piston 118 to lift the member 108) and then reinserting the bolts when the holes 154' are aligned with the rearwardmost holes 138 in the support arm.

Having the moldboard in the orientation of Fig. 9 positions the cutting edge at a relatively vertical orientation to the surface to be plowed. This orientation is most useful in the case of heavily packed snow and ice. However, this angle of orientation is preferably only used when the snowplow is moving at about 5 miles per hour or less in order to avoid damage to the moldboard or to the surface being plowed.

For high speed plowing operations, the moldboard is mounted to the arm members 140' using the more forward holes 138 (configuration not shown).

In addition, with reference to Fig. 10, an intermediate position may be selected as desired depending upon the conditions of the surface to be plowed.

In the event that a more precise adjustment of the orientation of the cutting edge to the surface to be plowed is desired, the mounting position of the A-frame member 108 to the truss 102 may be changed. With reference to Fig. 8, the truss 102 is provided with a mounting bracket 170 which has a pair of upper holes 172 and a pair of lower holes 174. Similarly, the A-frame member 108 has a mounting bracket 176 which has a number of holes 178 arranged vertically. With reference to Fig. 11, the A-frame member 108 may be raised or lowered with respect to the truss 102 in order to align different holes in the mounting brackets 170, 176. In this way, the orientation of the A-frame member 108 with respect to the surface to be plowed is slightly varied and thereby the orientation of the moldboard 100 and the cutting edge 124 with respect to the surface to be plowed is similarly varied.

The mounting arrangement having the capability to adjust the orientation of the moldboard with respect to the surface to be plowed may be used with or without the resilient mounting members and with or without the polyurethane hinge for the cutting edge.

The principles, preferred embodiments and mode of operation of the present invention have been described in the foregoing specification. However, the invention which is intended to be protected is not to be construed as limited to the particular embodiments disclosed. The embodiments are therefore to be regarded as illustrative rather than as restrictive. Variations and changes may be made without departing from the spirit of the present invention. Accordingly, it is expressly intended that all such equivalents, variations and changes which fall within the spirit and scope of the present invention as defined in the claims be embraced thereby.

WHAT IS CLAIMED IS:

1. A moldboard and mounting arrangement comprising:

a moldboard;

truss means for connecting the moldboard to a vehicle, said truss means including a mounting member;

means for pivotally mounting the moldboard on the truss means; and

means for resiliently connecting the means for pivotally mounting the moldboard to the truss means, said means for resiliently connecting the means for pivotally mounting the moldboard to the truss means including a urethane member provided between the means for pivotally mounting the moldboard and the mounting member,

said moldboard including trip means provided along a lower edge of said moldboard for enabling the moldboard to pass over obstructions, the trip means including a urethane hinge which extends substantially along the lowermost edge of the moldboard with the moldboard connected to an upper portion of the urethane hinge and with a cutting edge connected to a lower portion of the urethane hinge.

2. A moldboard and mounting arrangement comprising:

a moldboard;

truss means for connecting the moldboard to a vehicle;

arm means for pivotally mounting the moldboard on the truss means; and

means for resiliently connecting the arm means to the truss means,

said truss means including a mounting member extending longitudinally along the moldboard, said mounting member comprising first and second ends, said arm means including first and second arm members received at said ends of said mounting member, and

said means for resiliently connecting the arm means to the truss means including a urethane member provided at each of the first and second arm members between the arm members and the mounting member,

the moldboard comprising trip means provided along a lower edge of said moldboard for enabling the moldboard to pass over obstructions,

the trip means including a urethane hinge which extends substantially along the lowermost edge of the moldboard with the moldboard connected to an upper portion of the urethane hinge and with a cutting edge connected to a lower portion of the urethane hinge.

3. A moldboard and mounting arrangement comprising:

a moldboard;

truss means for connecting the moldboard to a vehicle;

arm means for pivotally mounting the moldboard on the truss means;

a urethane member, said urethane member resiliently connecting the arm means to the truss means;

a cutting edge provided along a lowermost edge of the moldboard; and

hinge means for enabling the moldboard to pass over obstructions, said hinge means comprising a urethane strip which extends along said lowermost edge of the moldboard and along said cutting edge.

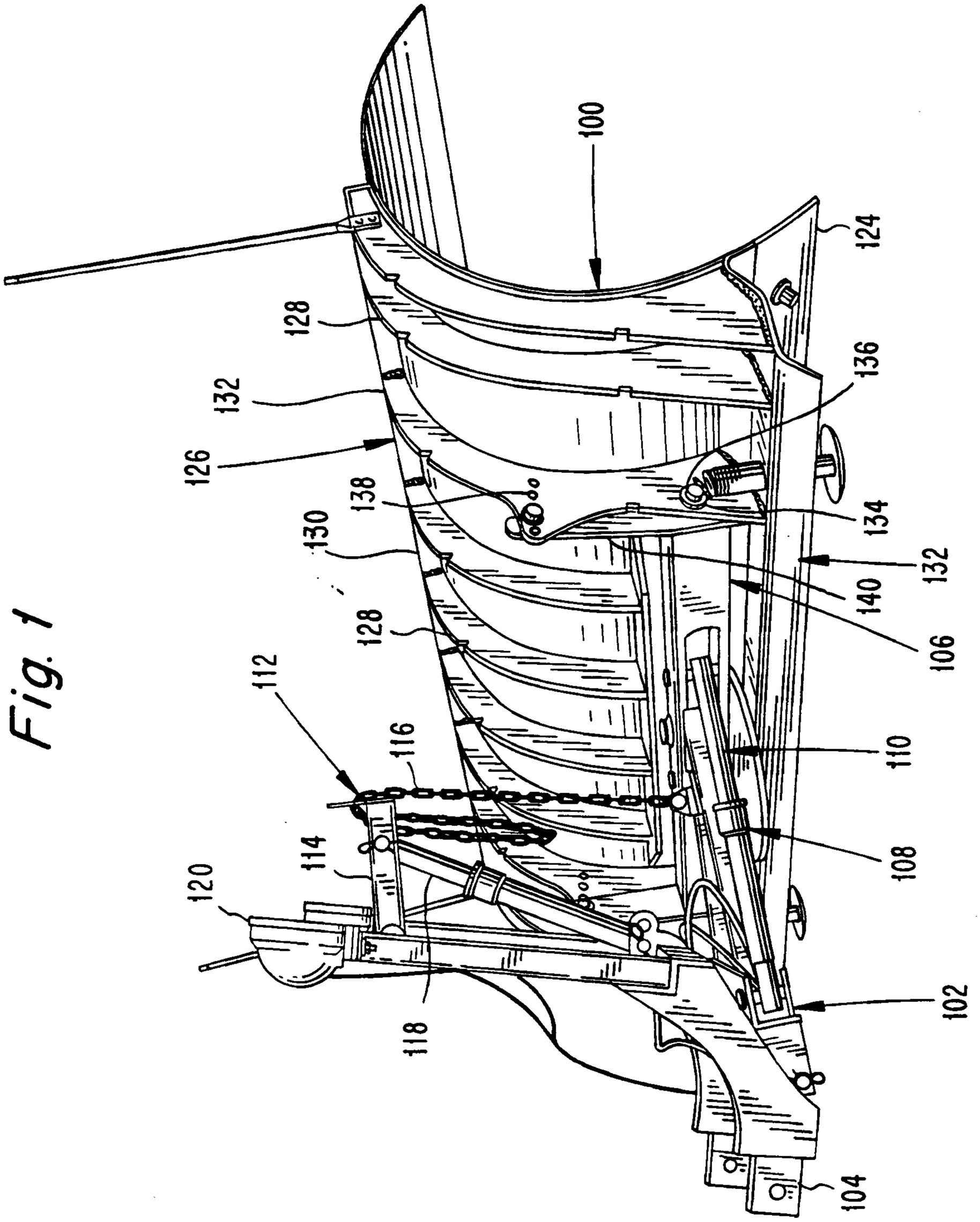
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Fig. 1

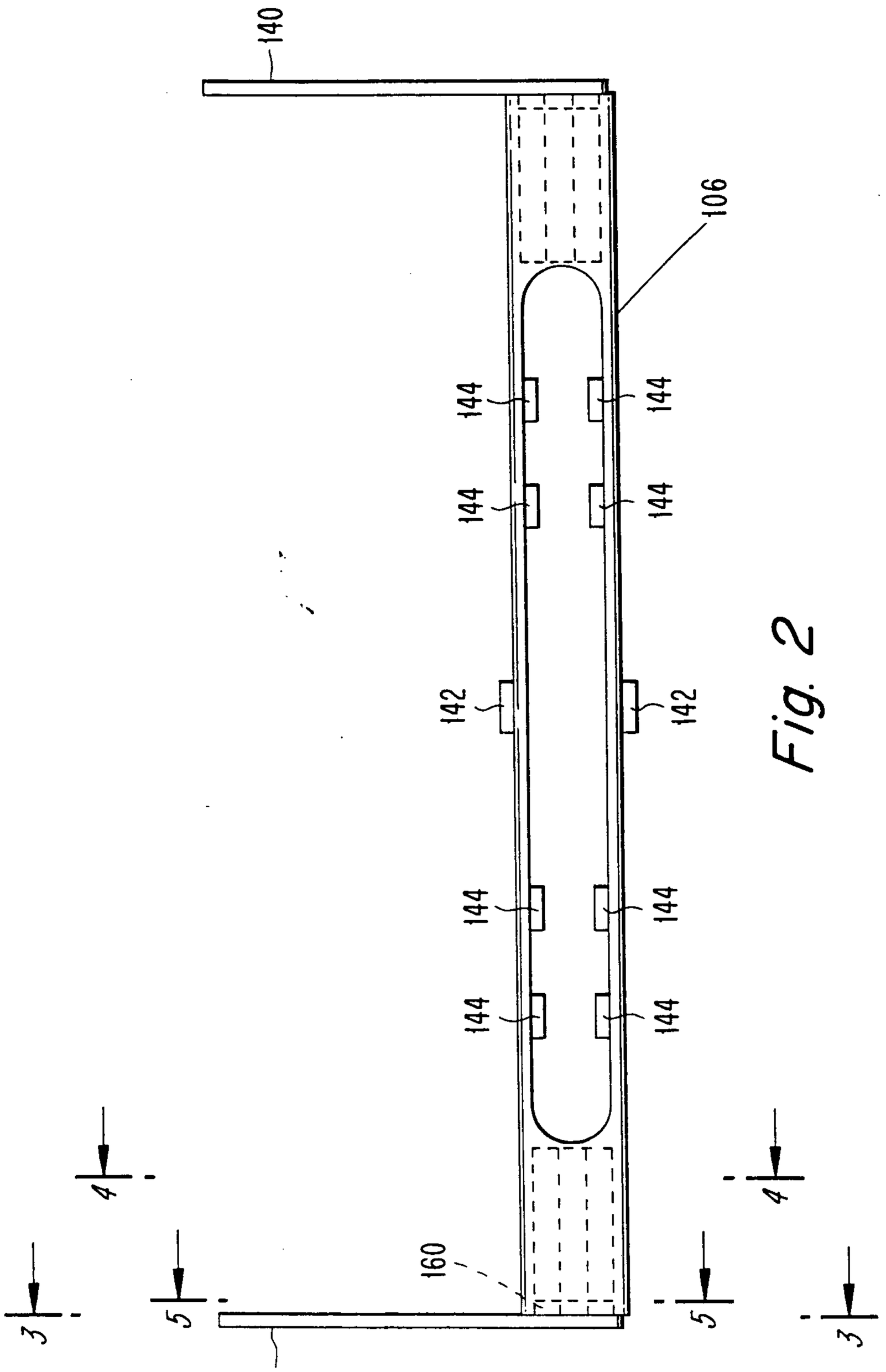


Fig. 2

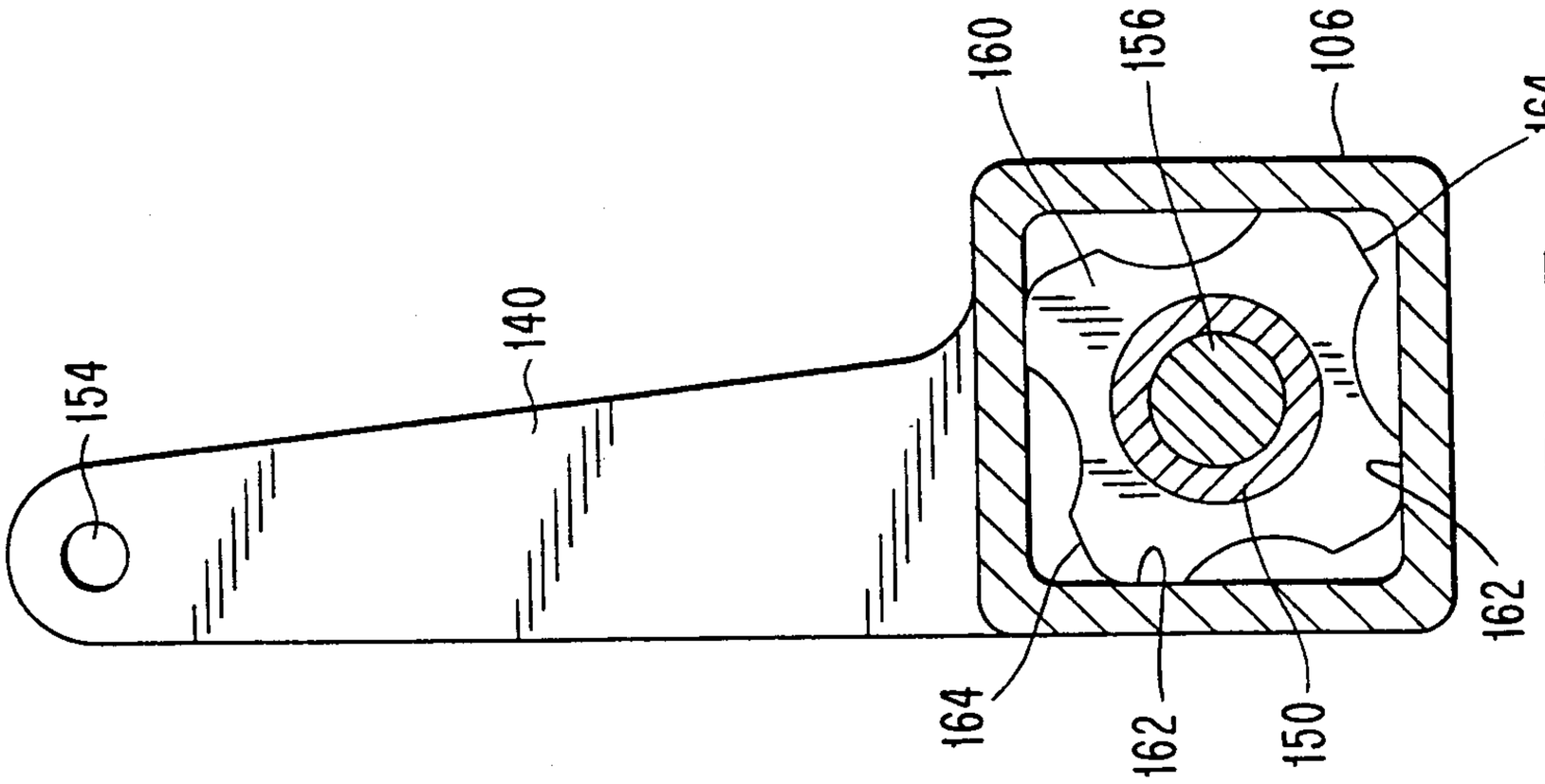


Fig. 5

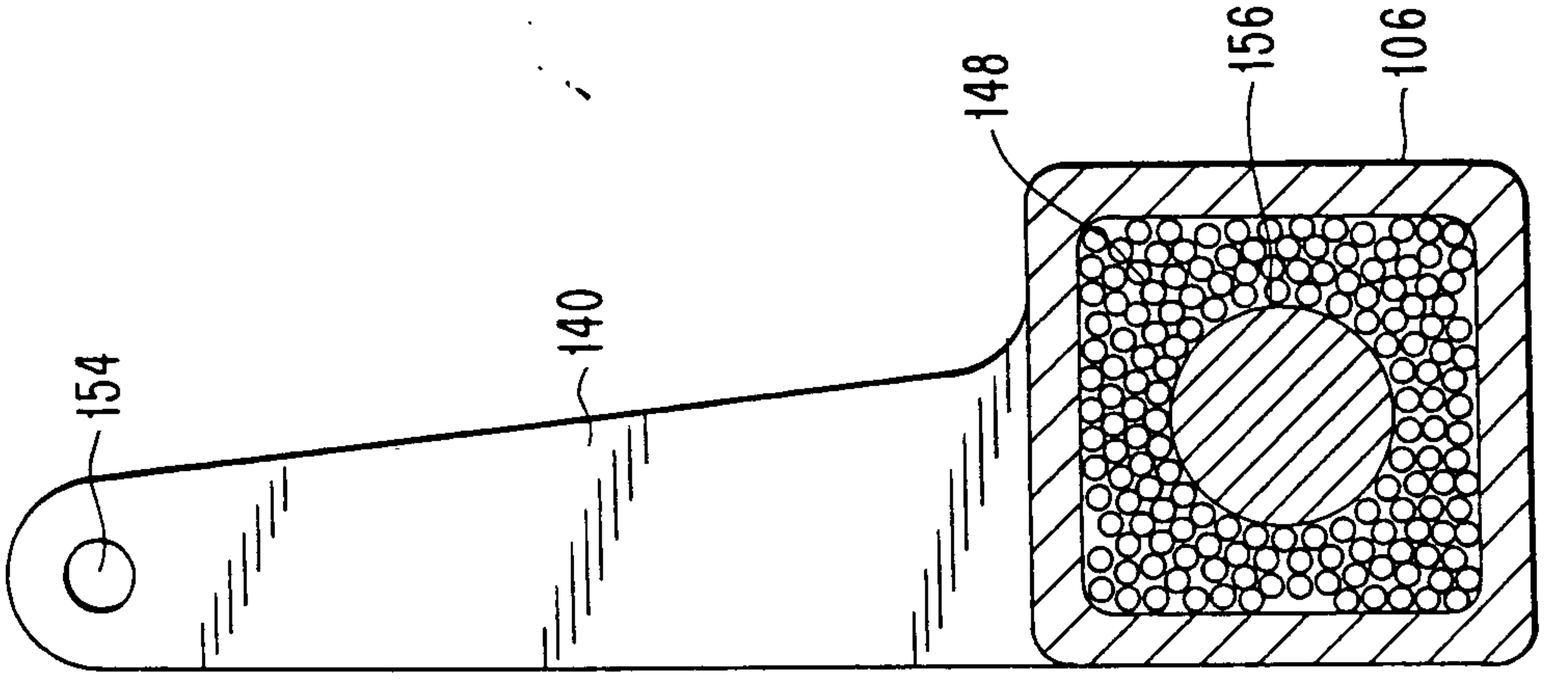


Fig. 4

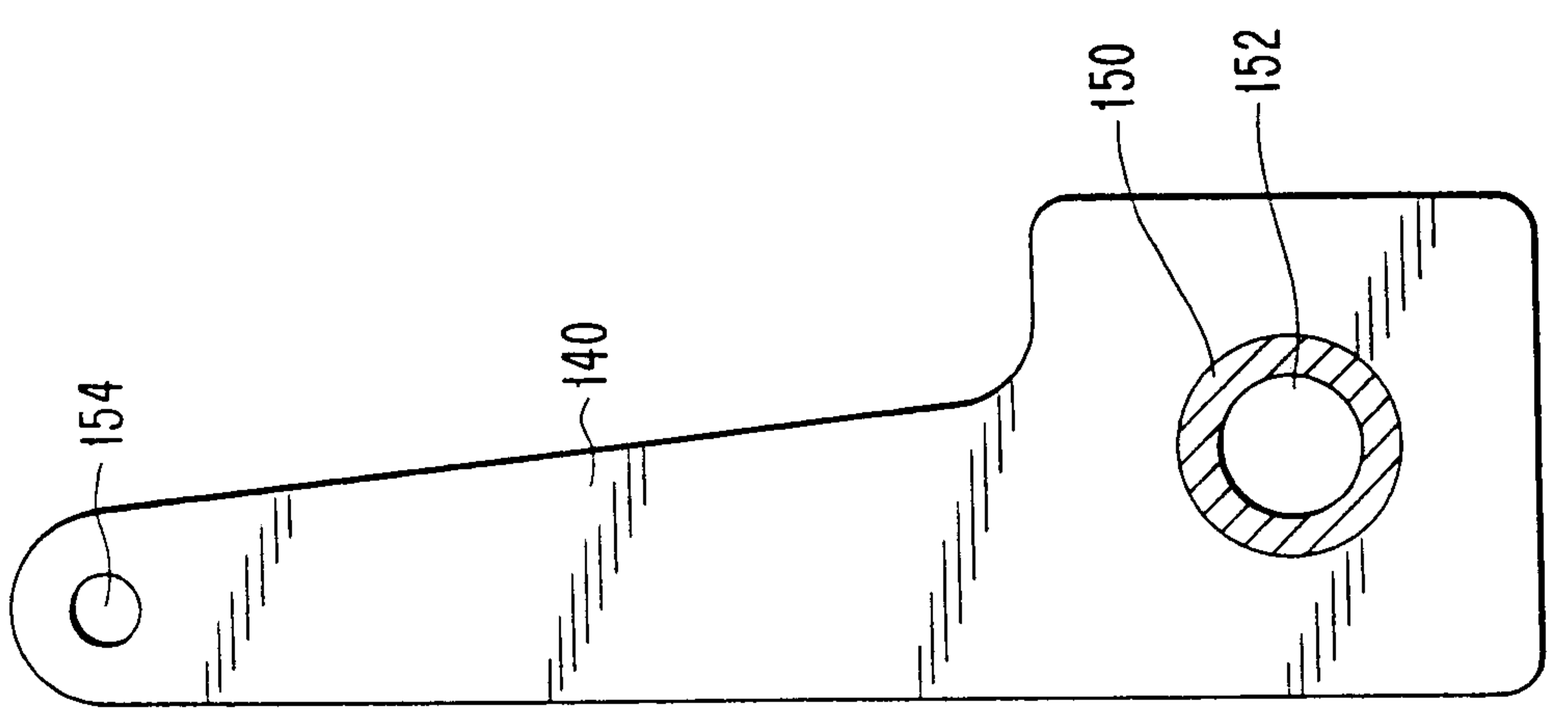


Fig. 3

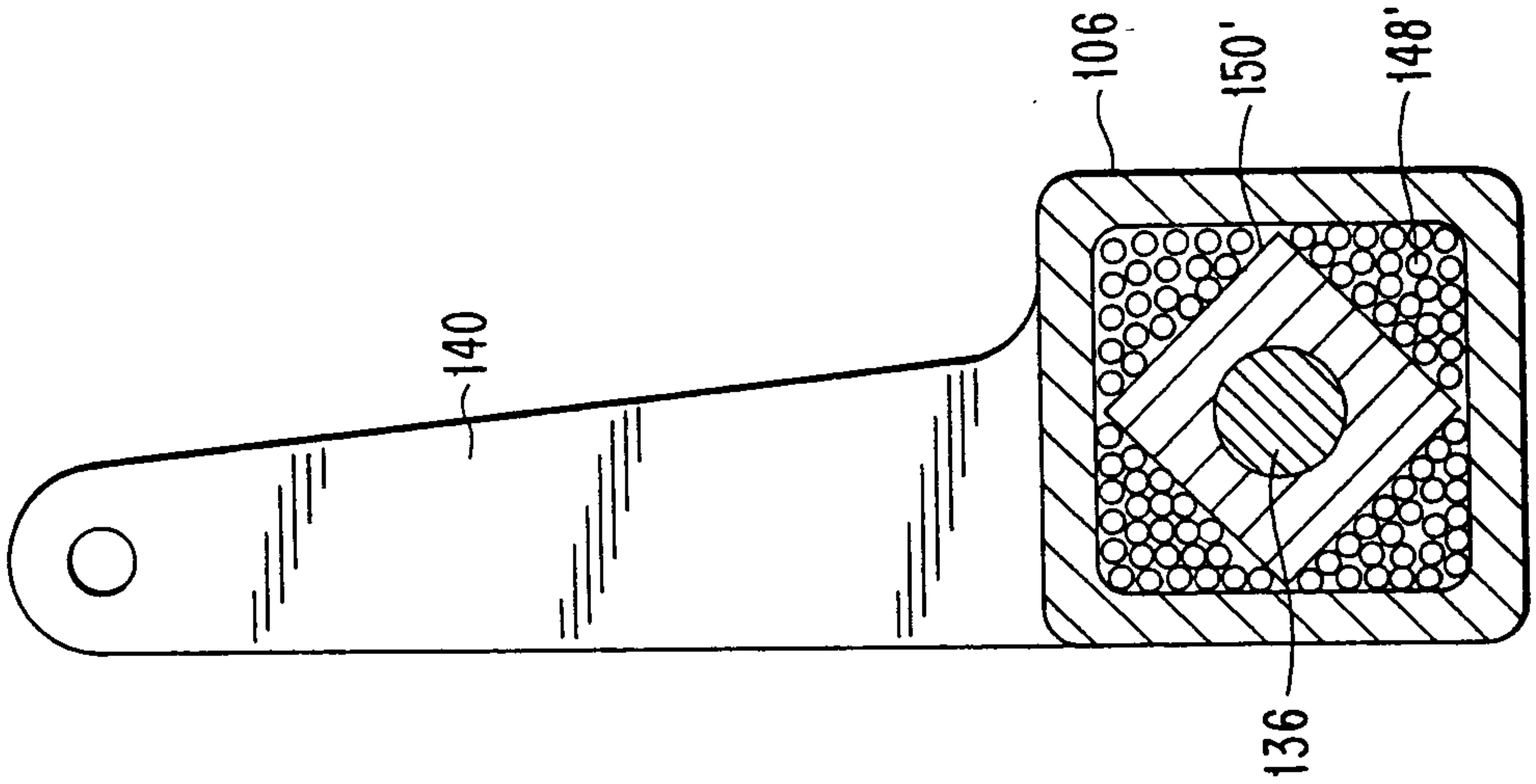


Fig. 7

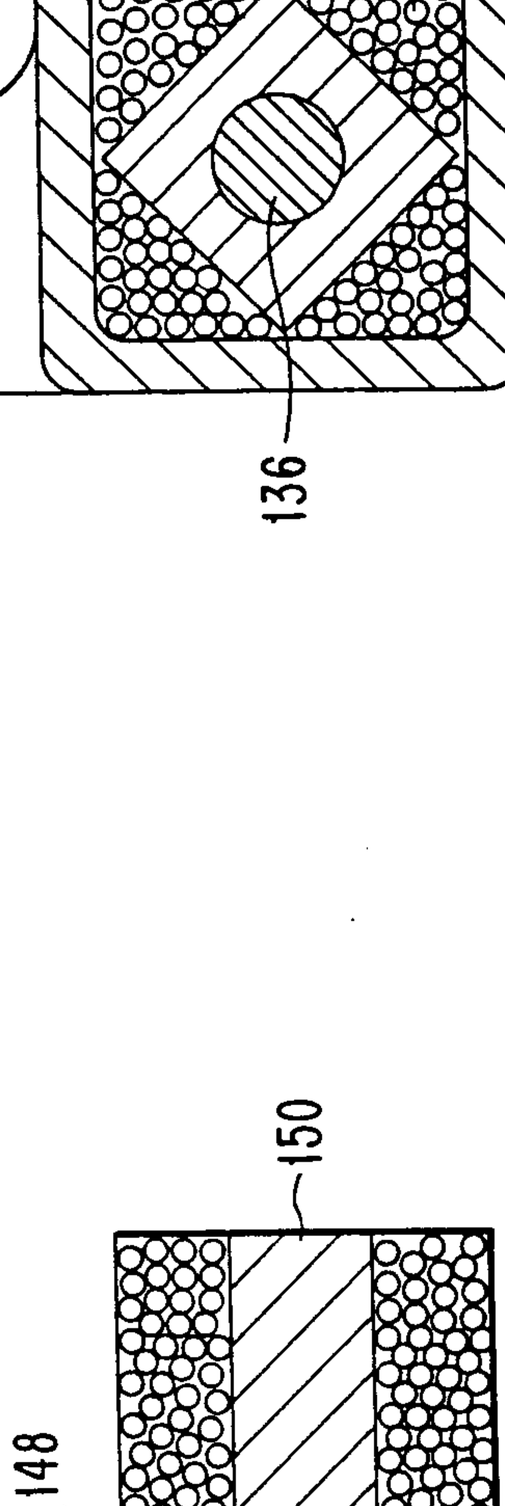
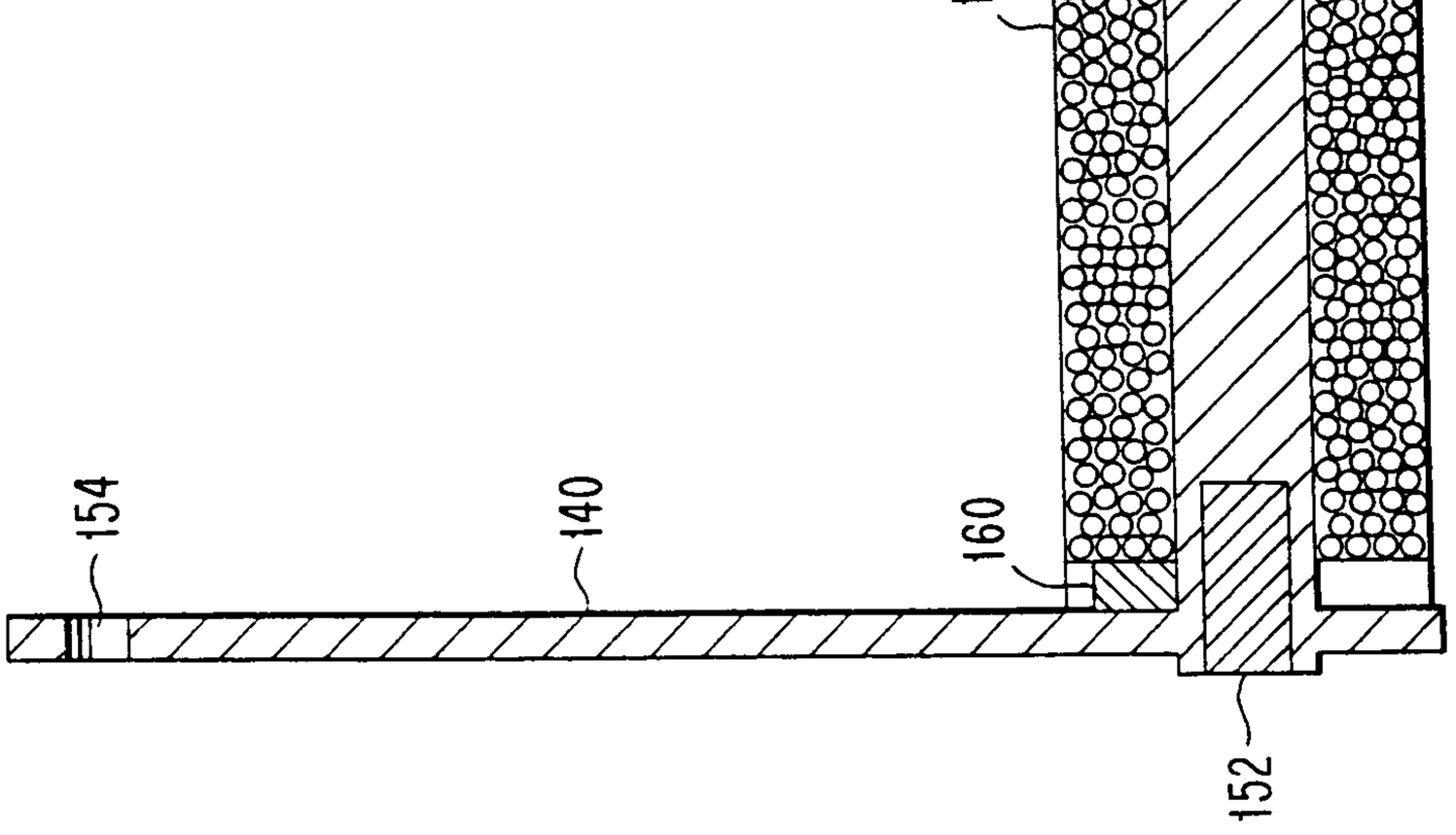


Fig. 6



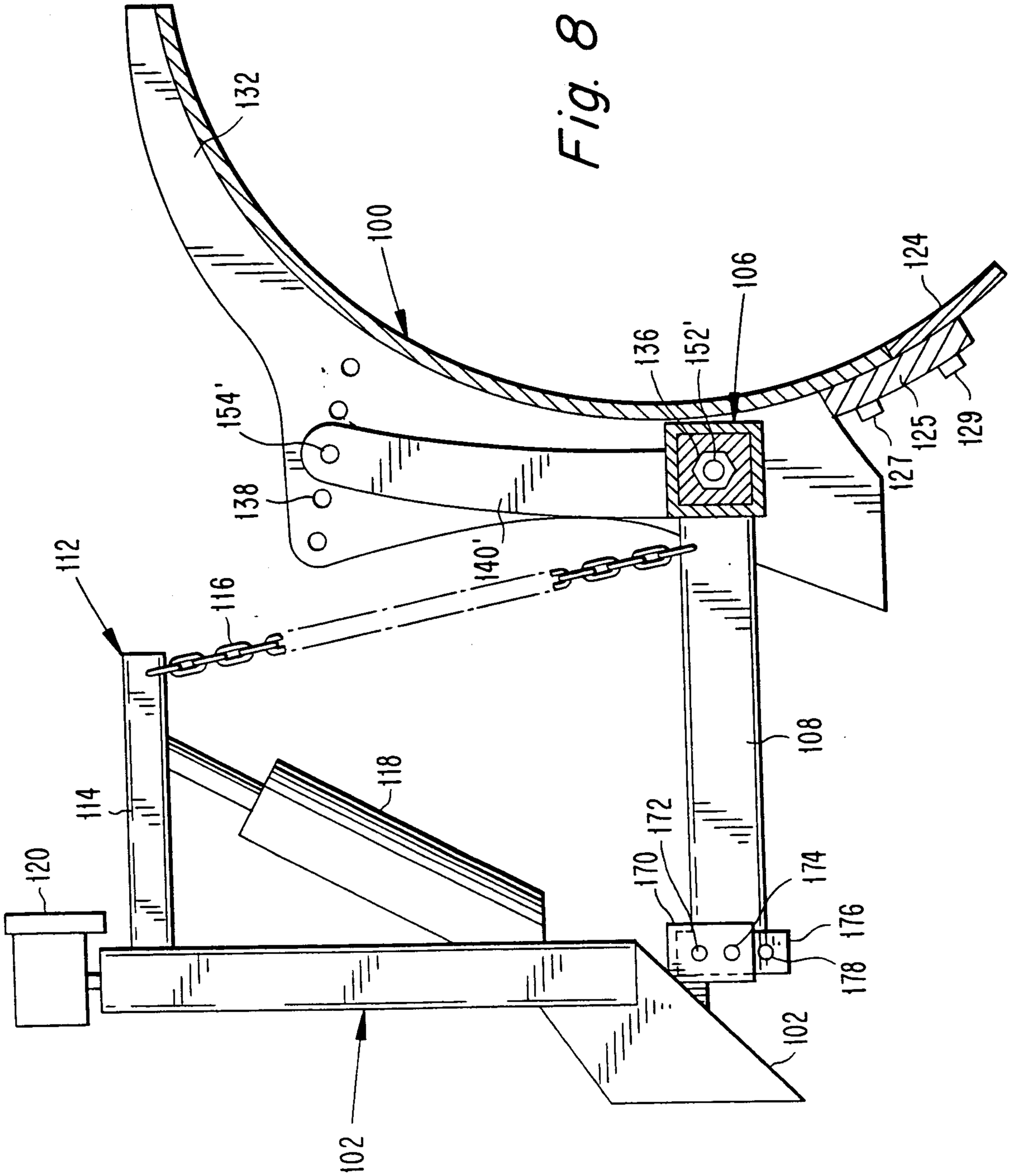

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Fig. 8

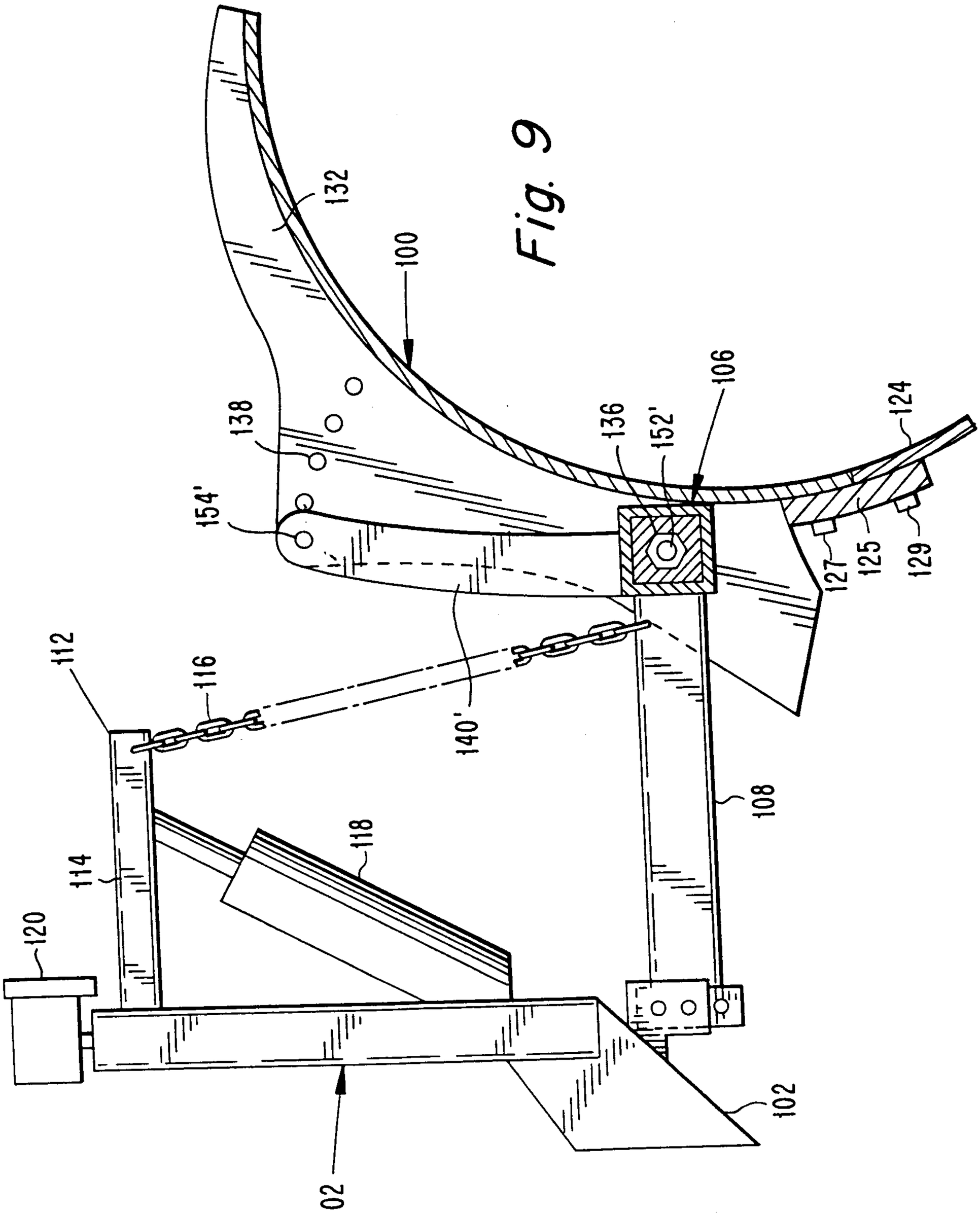
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Fig. 9

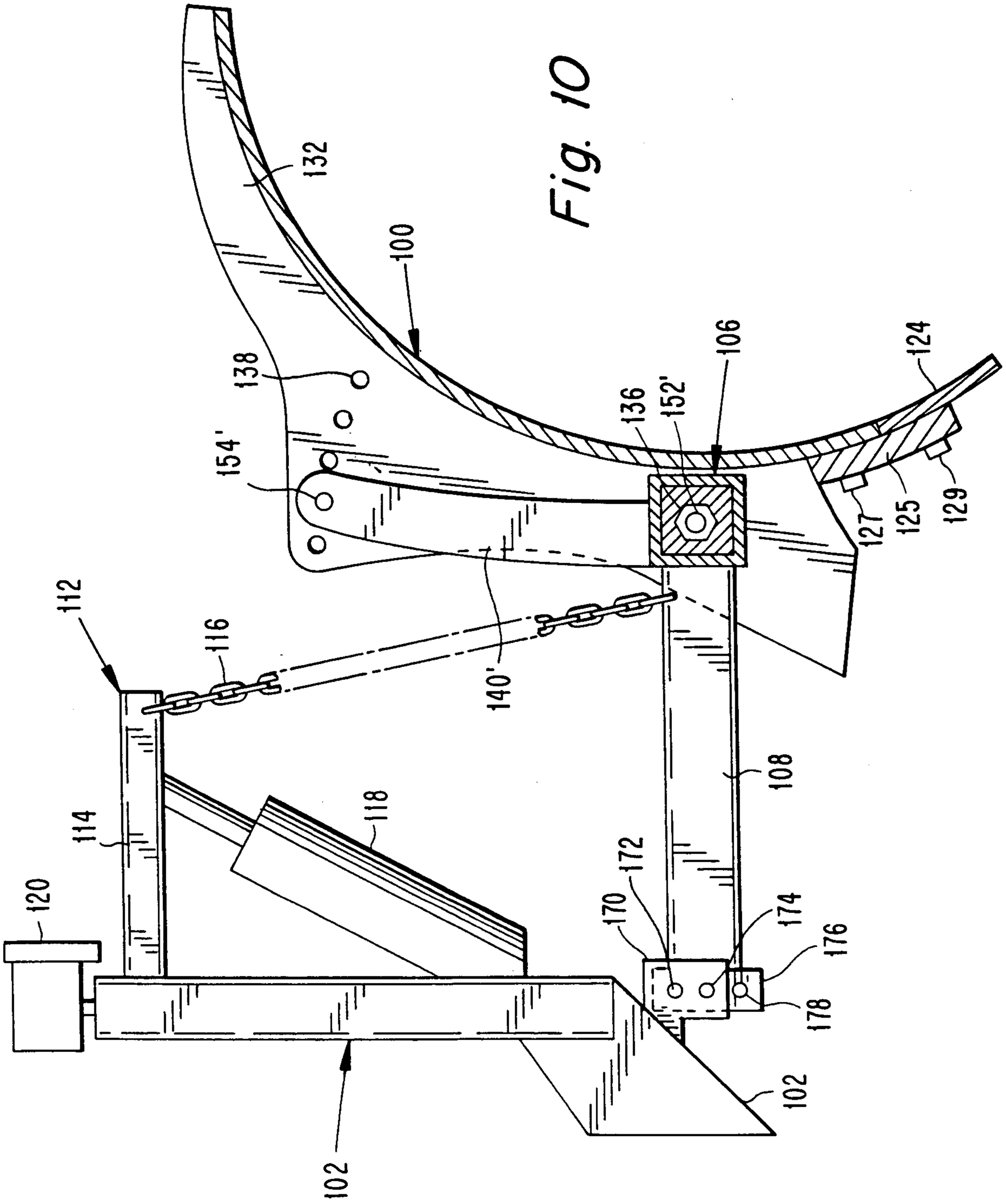
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Fig. 10

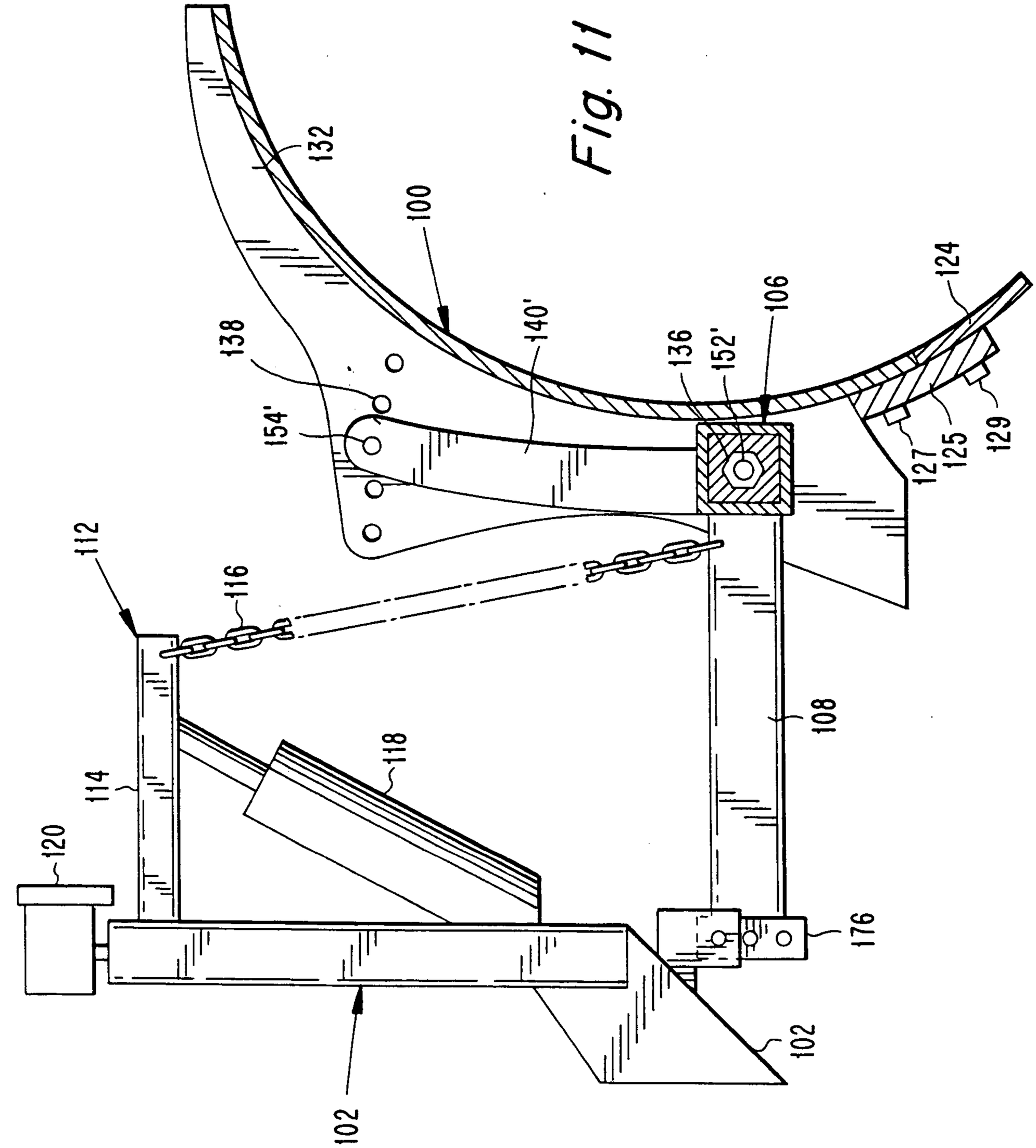
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Fig. 11

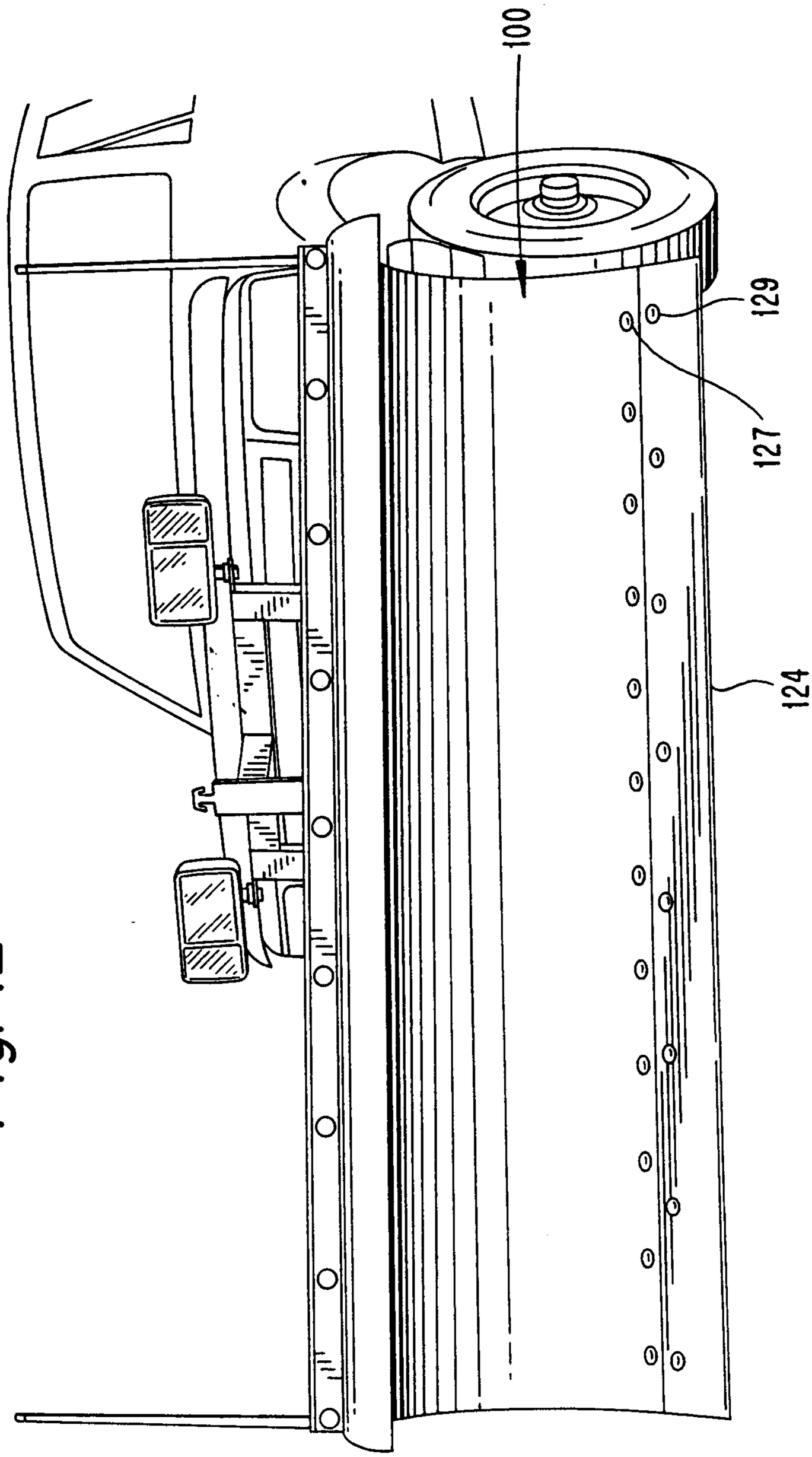
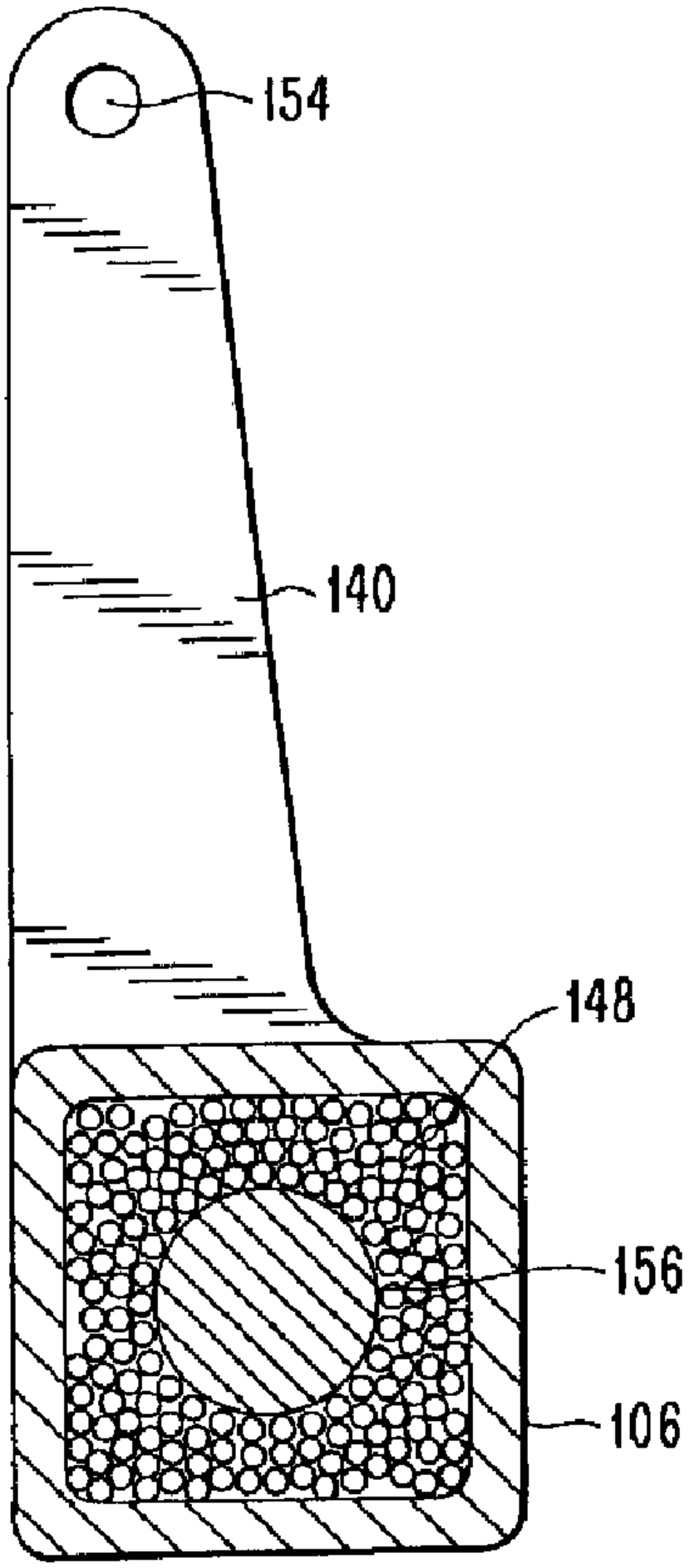


Fig. 12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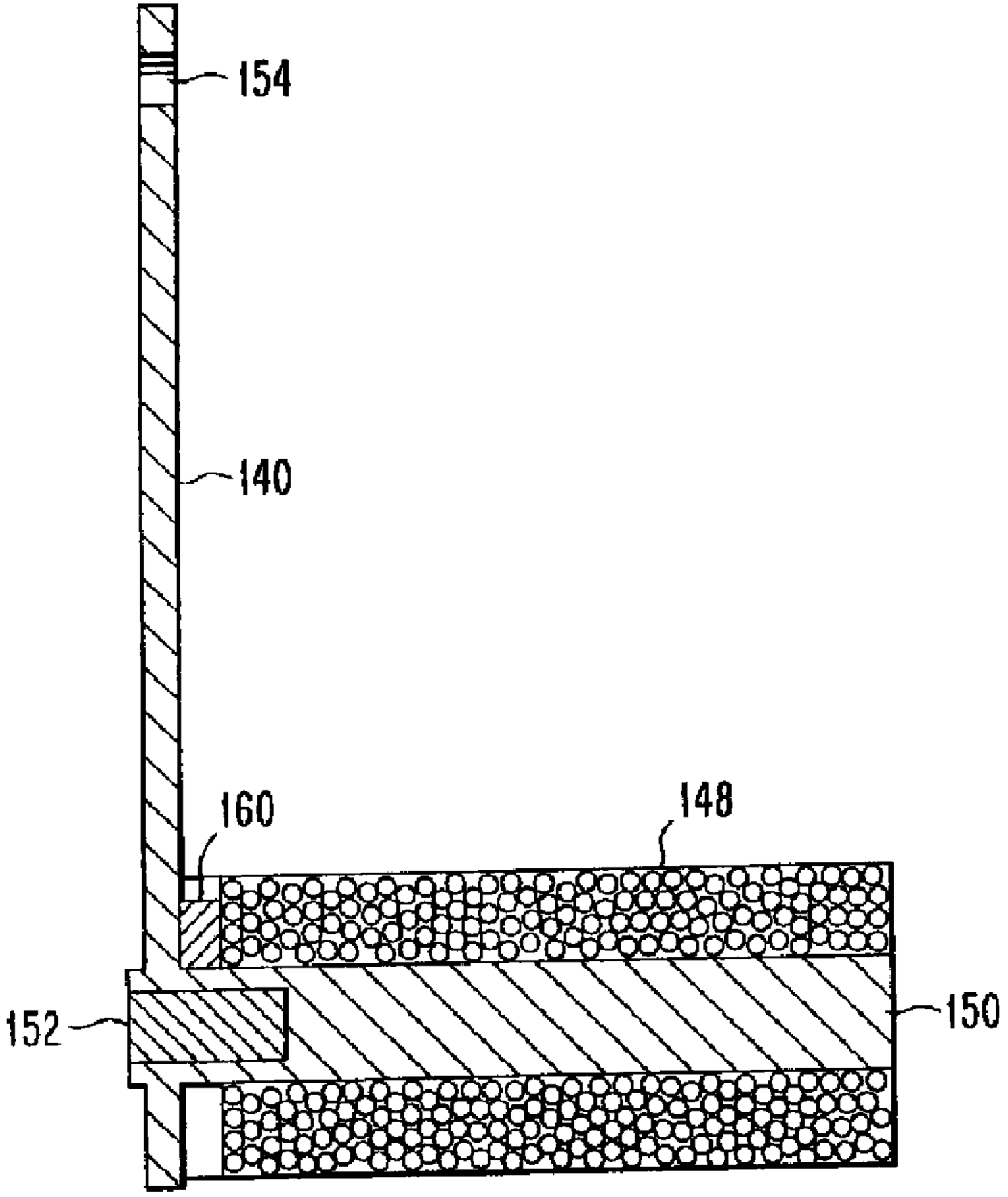
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