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(54) **Energy absorbing lift bracket**

Energieabsorbierender Heißausleger

Support de levage à absorption d'énergie

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Description

FIELD OF THE INVENTION

[0001] This invention relates to components for internal combustion engines. More specifically, this invention is related to components used to connect an engine with a hoist for lifting of the engine.

BACKGROUND OF THE INVENTION

[0002] Internal combustion engine handling, both during engine and vehicle assembly operations and during service, is typically accomplished by use of a hoist or crane for lifting and moving the engine. Engines typically have lift brackets, which are components that are attached to the engine that have "eye" openings. A hook that is connected to a hoist engages the eye opening. The eye openings are typically disposed toward the top of an engine to facilitate connection of the hoist thereto for lifting of the engine.

[0003] Typically, the hoist has chains connected to a lifting apparatus. On the distal end of the chain, there are typically hooks or other appropriate devices that engage the eye openings of the lift bracket on the engine. Two lifting brackets are usually used for a single engine so that the engine remains in a balanced and upright position during the lift.

[0004] Some manufacturers of engines and/or vehicles have standards requiring that a single lifting bracket be capable of supporting the weight of a given engine in the event that one of the two lifting brackets fail or the hook becomes disengaged. Due to space constraints inside the vehicle proximate the engine, there is inadequate room to enlarge the lifting bracket to the extent necessary to support the entire weight of the engine. Moreover, the lifting bracket do not perform a function once the engine is located in the vehicle, so it is not desirable to increase the weight or cost of the vehicle by significantly increasing the size of the lifting bracket. Therefore, it is desirable to have lifting brackets that are lightweight, low cost, and of simple design, but that are also strong enough to support the entire weight being lifted, which can include the transmission and the engine.

[0005] The Japanese patent application JP 2001 263096 A discloses a vibration damping structure for an end plate or an engine, to provide a structural member for reinforcing an overhung portion when an end plate is overhung over a cylinder head. Therefore, a support member is attached to sandwich an end plate with respect to a gear-housing in the overhung portion, and the support member fixed to the cylinder head side.

[0006] The French patent application FR 2818733 A1 discloses a lifting bracket that consists of a flat plate made from cut, pressed and/or folded sheet steel with a hole forming a ring at its upper end, a fastening such as a bolt connecting it to the engine, and a stop to prevent it rotating around the axis of the bolt. The stop has the shape

of a lug on the lower end of the bracket engaging with a recess in the body of the engine between two vertical faces.

SUMMARY OF THE INVENTION

[0007] A lift bracket includes a topmost portion having an opening arranged for engagement with an engagement portion of a lifting apparatus. The topmost portion is substantially flat and defines a first plane. A base portion of the lift bracket has at least one fastener opening for fastening the base portion to the engine. The base portion also lies in the first plane. A yield structure is disposed between the topmost portion and the base portion and includes a mid-portion that defines at least one second plane that is spaced and parallel to the first plane. When a tensile force is applied to the topmost portion, the yielding structure yields, the topmost portion displaces away from the base portion, and the second plane displaces towards the first plane.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is front view of an engine having two prior art lift brackets connected thereto.

[0009] FIG. 2 is a detail view of a cylinder head that engages a lift bracket.

[0010] FIG. 3 is a perspective view of a lift bracket in accordance with the invention.

[0011] FIG. 4 is a side view of the lift bracket of FIG. 3 in accordance with the invention.

[0012] FIG. 5 is an exploded view of a cylinder head and a lift bracket in accordance with the invention.

[0013] FIG. 6 is a front view of a lift bracket connected to an engine in accordance with the invention.

[0014] FIG. 7 is a perspective view of a second embodiment of lift bracket in accordance with the invention.

[0015] FIG. 8 is a perspective view of a third embodiment of lift bracket in accordance with the invention.

[0016] FIG. 9 is a perspective view of a fourth embodiment of lift bracket in accordance with the invention.

[0017] FIG. 10 is a perspective view of a fifth embodiment of lift bracket in accordance with the invention.

[0018] FIG. 11 is a perspective view of a sixth embodiment of lift bracket in accordance with the invention.

[0019] FIG. 12 is a perspective view of a seventh embodiment of lift bracket in accordance with the invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0020] The following describes a lift bracket on an internal combustion engine. The lift bracket is configured to support the entire weight of the internal combustion engine. The embodiments described herein use a dual lift bracket configuration for a single engine, but the advantages of the embodiments described herein can be realized in any lifting application, as will become evident to one having ordinary skill in the art.

[0021] A prior art engine 100, and a detail view of cylinder head 104, are shown in FIGS. 1 and 2 respectively. The engine 100 includes a crankcase 102. The engine 100 shown is of a "V" configuration having two banks. Each bank has a cylinder head 104 connected thereto. Each cylinder head 104 has a lower valve cover 106 connected to an upper valve cover 108 disposed thereon. Other components of the engine 100 are not shown in this figure for the sake of simplicity. A lift bracket 110 is connected onto each of the cylinder heads 104. Each lift bracket 110 forms an eye opening 112, which is advantageously a round opening used to connect a hook or other device to lift the engine 100 with a hoist or crane (not shown), however any type of opening is contemplated. Each lift bracket 110 is connected to each cylinder head 104 by use of two fasteners 114. Each fastener 114 threadably engages a fastener opening 202 formed in the cylinder head 104.

[0022] As shown in FIG. 2, each fastener opening 202 has a flat portion or pad 204 surrounding the opening 202. The pads 204 lie on a single plane and provide a flat interface for connection to the lift bracket 110.

[0023] The engine 100 has a center of gravity CG that lies on an axis that is perpendicular to a line connecting the two lift eye openings 112 and intersects the line at about the midpoint thereof. When the engine 100 is lifted with a hoist (not shown) that is connected to the engine 100 through the lift openings 112, the engine 100 remains level. In the event that one of the lifting brackets 110 fails while the engine 100 is being lifted, then the engine 100 will list on one side and rotate away from the lift bracket 110 that has not failed, and the engine will tend to pull away from the lift bracket 110. In addition to the stresses that act to pull the engine 100 away from the lift bracket 110, an impulse loading immediately following the instant of separation of the hoist will cause additional stresses at the connection between the engine 100 and the connected lift bracket 110.

[0024] An improved lift bracket 300 is shown in FIG. 3, and a side view of the lift bracket is shown in FIG. 4. The lift bracket 300 has an eye opening 302 formed in a topmost portion 304. The topmost portion 304 is disposed on a distal end of the bracket 300 and is substantially flat. A base portion 320 is substantially flat and defines a plane, A-A. The topmost portion 304 is also on plane A-A. Between the topmost portion 304 and the base portion 320 is a yield structure 305. In the embodiment of FIG. 3, the yield structure includes a first radiused portion 306, a first inclined portion 308, a second radiused portion 310, a mid-portion 312, a third radiused portion 314, a second inclined portion 316, and a fourth radiused portion 318. The first radiused portion is formed adjacent to the topmost portion 304. The first radiused portion 306 is connected to the first inclined portion 308 that lies on a plane that is at an angle, α , with respect to the topmost portion 304. The second radiused portion 310 connects an end of the first inclined portion 308 with the mid-portion 312. The mid-portion 312 is also at the angle α with re-

spect to the first inclined portion 308, and is advantageously substantially parallel with the top most portion 304. The third radiused portion 314 connects the mid-portion 310 with the second inclined portion 316. The second inclined portion 316 forms an angle, β , with the topmost portion 304. The angles α and β are advantageously supplemental angles, meaning, that the acute angle between the second inclined portion 316 and the topmost portion 304 is also equal to α . The fourth radiused portion 318 connects the second inclined portion 316 with the base portion 320. A plane, B-B, includes the mid-portion 312. The planes A-A and B-B are advantageously substantially parallel.

[0025] In the embodiment of FIG. 3 and FIG. 4, the base portion 320 has two openings 322 formed therein. A tab 324 protrudes from the base opening 320 in a substantially perpendicular fashion, and is connected to the bracket 300 at an outer edge 326 in an area adjacent to the base portion 320. A fifth radiused portion 328 connects the tab 324 with the outer edge 326.

[0026] The bracket 300 advantageously enables formation of all radiused and flat portions thereof from a single piece of sheet metal, that is, bracket 300 is advantageously integrally formed. However, other techniques may be employed for manufacturing a lift bracket in accordance with the invention.

[0027] An exploded view of a typical installation configuration for the lift bracket 300 onto a cylinder head 500 of an internal combustion engine is shown in FIG. 5. The cylinder head 500 has two threaded fastener cavities 502, at least a portion of each surrounded by a substantially flat mounting pad 504. Each mounting pad 504 lies on a common mounting plane that corresponds to the base portion 320 of the lift bracket 300 when the lift bracket 300 is mounted onto the cylinder head 500.

[0028] During assembly, a fastener 506 is inserted through a central opening 508 of an optional spacer 510, through one of the openings 322 in the lift bracket 300, and into a corresponding fastener cavity 502 in the cylinder head 500. In the embodiment shown, two fasteners 506 are used in a similar configuration. The optional spacer 510 having the central opening 508 is shown in this embodiment as a separate piece, but can advantageously be integrated with the bracket 300. The optional spacer 510 advantageously allows each fastener 506 to bend slightly when loaded and yield partially without loss of its retentive function. The optional spacer 510 can be used with any of the embodiments of the lift bracket.

[0029] While the lift bracket 300 is connected to the cylinder head 500, each of the two fasteners 506 is threadably engaged with its corresponding fastener cavity 502. Each mounting pad 504 is in contact with an area of the base portion 320 substantially continuously. Each spacer 510 contacts the base portion 320 of the bracket 300 substantially continuously around an area thereof that surrounds each of the openings 322.

[0030] Advantageously, a tab 324 protrudes from the base portion 320 of the bracket 300 and is configured to

be disposed within a slot or cutout 512 that is formed in the cylinder head 500. The disposition of the tab 324 into the slot 512 ensures that at times when the lift bracket 300 may be overloaded, for example when another such bracket fails, then rotation of the cylinder head 500 with respect to the lift bracket 300 is discouraged by an interference between the tab 324 and a wall or side portion of the slot 512.

[0031] Referring now to FIG. 6, the bracket 300 is connected to the cylinder head 500 of an engine 600. A force F is applied to the eye opening 302 of the lift bracket 300 to simulate a force condition that exists when the lift bracket 300 is supporting the entire weight of the engine 600. When two lift brackets 300 are used to lift the engine 600, the engine 600 remains relatively balanced, and each lift bracket 300 experiences a force roughly equal to half of the weight of the engine 600 (or a force equal to about F/2). In the event that one lift bracket 300 must hold the engine, the lift bracket must be capable of supporting an impulse load immediately following the failure, and then sustain the entire load of the engine 600, or alternatively, sustain the force F as shown in FIG. 6. Due to the location of the center of gravity of the engine that lies away from the axis of application of the force F, a bending moment M is created that acts on the connection interface between the bracket 300 and the cylinder head 500. This moment M is countered in a static condition by an equal and opposite counter-moment M' due to the connection of the bracket 300 to the cylinder head 500. The two fasteners 506 and interference between the tab 324 and the slot 512 sufficiently create the counter-moment M'.

[0032] The impulse loading due to a failure of one of the lifting brackets 300 typically causes subsequent failures in other components. In this case, the impulse loading and the distributed loading are advantageously absorbed by the lift bracket 300.

[0033] When the lift bracket 300 is required to absorb an impulse loading, the lift bracket 300 yields to absorb the force F at the yield structure 305, which tends to pull the topmost portion 304 away from the base portion 320. This yielding advantageously occurs at the radiused portions 306, 310, 314, and 318 that connect the first and second inclined portions 308 and 316 with the topmost portion 304, the mid-portion 312, and the base portion 320. This yielding at the yield structure 305 causes the angle α to be reduced, the lift bracket 300 to elongate, and the plane B-B of the mid-portion 312 to approach the plane A-A of the topmost and base portions 304 and 320.

[0034] Alternative embodiments for various designs for lift brackets are shown in FIG. 7 through FIG. 12. Each of these alternative embodiments is described in detail below.

[0035] A perspective view of a lift bracket 700 is shown in FIG. 7. The lift bracket 700 includes a topmost portion 704 having an eye opening 702 formed therein. A base portion 720 includes two fastener openings 722. The lift bracket 700 includes a yield structure 705 disposed be-

tween the topmost portion 704 and the base portion 720. A mid-portion 712 is in the middle of the yield structure 705. The yield structure 705 is advantageously capable of absorbing loading by transforming it to strain by elongation of at least two "wave" features that are formed between any one of a plurality of peaks 714 that are formed alternatively with a plurality of valleys 716. In the embodiment shown there are three (3) peaks 714 that smoothly merge with two valleys 716 formed therebetween resulting in a wave-shape to the yield structure 705. When the bracket 700 is subjected to a tensile load, the topmost portion 704 is advantageously capable of moving away from the base portion 720 through elongation or flattening of the waves formed by the peaks 714 and valleys 716 in the yield structure 705.

[0036] A perspective view of a lift bracket 800 is shown in FIG. 8. The lift bracket 800 is substantially similar to the lift bracket 300 shown in FIG. 3, but without the tab 324. The bracket 800 has a yield structure 805 and a mid-portion 812 disposed between a topmost portion 804 and a base portion 820. The topmost portion 804 forms an eye opening 802, and the base portion 820 forms two fastener openings 822. As described above for the embodiment shown in FIG. 3, the lift bracket 800 is advantageously capable of elongating in the yield structure 805 to absorb loading imparted on the bracket 800 when the topmost portion 804 is subjected to a tensile force that acts to pull the opening 802 away from the base portion 820.

[0037] A perspective view of a lift bracket 900 is shown in FIG. 9. The lift bracket 900 is substantially similar to the lift bracket 300 shown in FIG. 3, but with structural differences in the radiused portion 328 that forms the tab 324 thereof. The bracket 900 has a yield structure 905 and a mid-portion 912 disposed between a topmost portion 904 and a base portion 920. The topmost portion 904 forms an eye opening 902, and the base portion 920 forms two fastener openings 922.

[0038] As described above for the embodiment shown in FIG. 3, the lift bracket 900 is advantageously capable of elongating in the yield structure 905 to absorb loading imparted on the bracket 900 when the topmost portion 904 is subjected to a tensile force that acts to pull the opening 902 away from the base portion 920. An radiused portion 928 forms a tab 924 which has a "hook" shape. The tab 924 at least partially surrounds an inner cavity 926 that is capable of engaging an engine component (not shown) therewithin when the bracket 900 is installed on an engine. The bracket 900 is advantageously capable of using the structural rigidity of the engine component disposed in the inner cavity 926 of the hook 924 to augment its own structural rigidity and strength of connection to the engine. Examples of components that may be used for engagement with the hook 924 include intake manifolds, exhaust manifolds, cylinder heads, among other components.

[0039] Referring now to FIG. 10, a lift bracket 1000 is substantially similar to the lift bracket 300 shown in FIG.

3, but without the tab 324. The bracket 1000 has a yield structure including a mid-portion 1012 disposed between a topmost portion 1004 and a base portion 1020. The topmost portion 1004 forms an eye opening 1002, and the base portion 1020 forms two fastener openings 1022. The base portion 1020 forms an extension portion 1024 that includes a third fastener opening 1026. The third fastener opening 1026 advantageously acts to augment retention of the bracket 1000 onto an engine when an additional fastener is placed therein to connect the extension 1024 to the engine.

[0040] As described above for the embodiment shown in FIG. 3, the lift bracket 1000 is advantageously capable of elongating in the yield structure 1012 to absorb loading imparted on the bracket 1000 when the topmost portion 1004 is subjected to a tensile force that acts to pull the opening 1002 away from the base portion 1020, and is also capable of augmented retention of the base portion 1020 to the engine by an additional fastener (not shown) connected to the engine through the third fastener opening 1026.

[0041] A bracket 1100 is shown in FIG. 11 and includes a base portion 1120 having two fastener holes 1122 formed therein, and a topmost portion 1104 having an eye opening 1102 formed therein. A yield structure 1105 includes a mid-portion 1112 that is disposed between the topmost portion 1104 and the base portion 1120. The yield structure 1105 of the bracket 1100 comprises a first link 1124 and a second link 1126. The first and second links 1124 and 1126 are spaced apart in the plane generally perpendicular to the plane of the bracket 1100. Further, the first and second links 1124 and 1126 define an opening or slit 1128. The links 1124 and 1126 meet at a first junction 1130 adjacent to the topmost portion 1104 and at a second junction 1132 adjacent to the base portion 1120.

[0042] At times when a tensile force is applied to the eye opening 1102, the bracket 1100 is advantageously capable of a controlled deformation and absorption of strain at the yield structure 1105 without failure. During application of the tensile force, the top-most portion 1102 moves away from the base portion 1120, and the bracket 1100 elongates through deformation of the first link 1124 and the second link 1126. As the bracket 1100 elongates, the links 1124 and 1126 deform and move closer to each other (in the plane generally perpendicular to the plane of the bracket 1100), rotate at least in part around the first and second junctions 1130 and 1132, and reduce the opening of the slit 1128. Thus, the bracket 1100 is advantageously capable of absorbing energy in the form of strain of the links 1124 and 1126.

[0043] A bracket 1200 is shown in FIG. 12. The bracket 1200 includes a topmost portion 1204 having an eye opening 1202 formed therein. A base portion 1220 of the bracket 1200 has two fastener openings 1222 formed therein. Each of the topmost portion 1204 and base portion 1220 are substantially flat. In this embodiment, the topmost portion 1204 does not lie on the same plane as

the base portion 1220, but rather, the topmost portion 1204 lies on a plane that forms an angle, γ , with the plane on which the base portion 1220 lies. In other words, an orientation of the lift opening 1202 is at the angle γ with respect to the fastener openings 1222. The angle γ may be selected to suit particular shape requirements of the bracket 1200, and may advantageously be about 90 degrees such that mid-portion 1224 is on a plain that is parallel to the axis of bending moment. Under a loaded condition, the mid-portion 1224 will deform under the bending moment M (see FIG. 6).

[0044] Any of the features described in the aforementioned embodiments are not exclusive for any given lift bracket, and may be combined as can be appreciated. The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes that come within the meaning and range of equivalency of the claims are to be embraced within their scope.

Claims

1. A lift bracket (300) on an engine for engagement with a lifting apparatus and intended to be used in tandem with a second lift bracket (300), the lift bracket (300) comprising a topmost portion (304) having an opening (302) formed therein, wherein the opening (302) is arranged for engagement with the lifting apparatus, and wherein the topmost portion (304) is substantially flat and defines a first plane (A-A); the lift bracket (300) **characterized by:**

a base portion (320) having at least one fastener opening (322) for fastening the bracket to the engine, wherein the base portion (320) is substantially flat and lies in the first plane (A-A); and a yield structure (305) disposed between the topmost portion (304) and the base portion (320) and configured for absorbing energy when the second lift bracket on the engine fails, wherein the yield structure (305) includes a mid-portion (312) that defines at least one second plane (B-B) that is spaced and parallel to the first plane (A-A);

wherein when a tensile force is applied to the topmost portion (304), the yielding structure yields, the topmost portion (304) displaces away from the base portion (320), and the second plane (B-B) displaces towards the first plane (A-A).

2. The lift bracket (300) of claim 1, further comprising a first inclined portion (308) disposed between the

topmost portion (304) and the mid-portion (312), wherein the first inclined (308) portion is disposed at an angle α with respect to the first plane (A-A), and wherein a first radiused portion (306) connects the topmost portion (304) with the first inclined portion (308) and a second radiused (310) portion connects the first inclined portion (308) with the mid-portion (312).

3. The lift bracket (300) of claim 2, further comprising a second inclined portion (316) disposed between the mid-portion (312) and the base portion (320), wherein the second inclined portion (316) is disposed at an angle α with respect to the first plane (A-A), and wherein a third radiused (314) portion connects the mid-portion (312) with the second inclined portion (316) and a fourth radiused portion (318) connects the second inclined portion (316) with the base portion (320).
4. The lift bracket (300) of claim 1, further comprising a spacer (510) disposed on the base portion (320), wherein the spacer (510) has a central opening (508) aligned with the at least one fastener opening (322) of the base portion (320), and wherein the spacer (510) is connected to the base portion (320) along an area surrounding the at least one fastener opening (322).
5. The lift bracket (300) of claim 1, further comprising a tab (324) that is disposed at an outer edge of the base portion (320) and configured to have an interference fit with the engine for preventing a rotation of the engine with respect to the lift bracket (300) when the second lift bracket (300) fails.
6. The lift bracket (300) of claim 5, wherein the tab (324) extends substantially perpendicularly away from the first plane (A-A).
7. The lift bracket (300) of claim 5, wherein the tab (324) has a general "hook"-shape and defines a component cavity.
8. The lift bracket (300) of claim 1 wherein the yield structure (305) comprises a plurality of peaks that are formed alternatively with a plurality of valleys.
9. The lift bracket of (300) claim 1, further comprising an extension portion formed adjacent to the base portion (320), wherein the extension forms at least one additional fastener opening (322).
10. The lift bracket (300) of claim 1, wherein the topmost portion (304), the yield structure (305), and the base portion (320) are integrally formed.
11. The lift bracket (300) of claim 1, wherein the yield

structure (305) comprises a first link (1124) and a second link (1126), wherein the first link (1124) and the second link (1126) surround a slit opening, and wherein the first link (1124) meets the second link (1126) at a first junction (1130) adjacent to the topmost portion (304) and at a second junction (1132) adjacent to the base portion (320).

10 Patentansprüche

1. Hubträger (300) an einem Motor zur Verbindung mit einer Hebevorrichtung und dafür bestimmt, zusammen mit einem zweiten Hubträger (300) verwendet zu werden, wobei der Hubträger (300) einen obersten Abschnitt (304) mit einer darin ausgebildeten Öffnung (302) aufweist, wobei die Öffnung (302) zur Verbindung mit der Hebevorrichtung angeordnet ist, und wobei der oberste Abschnitt (304) im Wesentlichen flach ausgebildet ist und eine erste Ebene (A-A) definiert;
wobei der Hubträger (300) **gekennzeichnet ist durch:**
 - einen Basisabschnitt (320) mit zumindest einer Befestigungsmittelöffnung (322) zum Befestigen des Trägers an dem Motor, wobei der Basisabschnitt (320) im Wesentlichen flach ausgebildet ist und in der ersten Ebene (A-A) liegt; und eine nachgebende Struktur (305), die zwischen dem obersten Abschnitt (304) und dem Basisabschnitt (320) angeordnet ist und zum Aufnehmen von Energie konfiguriert ist, wenn der zweite Hubträger an dem Motor versagt, wobei die nachgebende Struktur (305) einen mittleren Abschnitt (312) beinhaltet, der zumindest eine zweite Ebene (B-B) definiert, die von der ersten Ebene (A-A) beabstandet ist und parallel zu derselben verläuft;
wobei, wenn eine Zugkraft auf den obersten Abschnitt (304) einwirkt, die nachgebende Struktur (305) nachgibt, der oberste Abschnitt (304) von dem Basisabschnitt (320) weg und die zweite Ebene (B-B) zur ersten Ebene (A-A) hin verschoben wird.
2. Hubträger (300) nach Anspruch 1, der ferner einen ersten geneigten Abschnitt (308) aufweist, der zwischen dem obersten Abschnitt (304) und dem mittleren Abschnitt (312) angeordnet ist, wobei der erste geneigte Abschnitt (308) an einem Winkel α in Bezug auf die erste Ebene (A-A) angeordnet ist, und wobei ein erster abgewinkelter Abschnitt (306) den obersten Abschnitt (304) mit dem ersten geneigten Abschnitt (308) verbindet und ein zweiter abgewinkelter Abschnitt (310) den ersten geneigten Abschnitt (308) mit dem mittleren Abschnitt (312) verbindet.

3. Hubträger (300) nach Anspruch 2, der ferner einen zweiten geneigten Abschnitt (316) aufweist, der zwischen dem mittleren Abschnitt (312) und dem Basisabschnitt (320) angeordnet ist, wobei der zweite geneigte Abschnitt (316) in einem Winkel α in Bezug auf die erste Ebene (A-A) angeordnet ist, und wobei ein dritter abgewinkelter Abschnitt (314) den mittleren Abschnitt (312) mit dem zweiten geneigten Abschnitt (316) verbindet und ein vierter abgewinkelter Abschnitt (318) den zweiten geneigten Abschnitt (316) mit dem Basisabschnitt (320) verbindet. 5
4. Hubträger (300) nach Anspruch 1, der ferner einen Abstandhalter (510) aufweist, der auf dem Basisabschnitt (320) angeordnet ist, wobei der Abstandhalter (510) eine mittige Öffnung (508) aufweist, die nach der zumindest einen Befestigungsmittelöffnung (322) des Basisabschnitts (320) ausgerichtet ist, und wobei der Abstandhalter (510) mit dem Basisabschnitt (320) entlang eines Bereichs, der die zumindest eine Befestigungsmittelöffnung (322) umgibt, verbunden ist. 10
5. Hubträger (300) nach Anspruch 1, der ferner einen Vorsprung (324) aufweist, der an einer äußeren Kante des Basisabschnitts (320) angeordnet ist und so konfiguriert ist, dass er mit dem Motor in Presspassung verbunden ist, um eine Drehbewegung des Motors in Bezug auf den Hubträger (300) zu verhindern, wenn der zweite Hubträger (300) versagt. 15
6. Hubträger (300) nach Anspruch 5, wobei der Vorsprung (324) im Wesentlichen senkrecht von der ersten Ebene (A-A) weg verläuft. 20
7. Hubträger (300) nach Anspruch 5, wobei der Vorsprung (324) im Allgemeinen hakenförmig ist und einen Komponentenhohlraum definiert. 25
8. Hubträger (300) nach Anspruch 1, wobei die nachgebende Struktur (305) eine Mehrzahl von Erhebungen aufweist, die sich mit einer Mehrzahl von Vertiefungen abwechselnd angeordnet sind. 30
9. Hubträger (300) nach Anspruch 1, der ferner einen Verlängerungsabschnitt aufweist, der neben dem Basisabschnitt (320) ausgebildet ist, wobei in der Verlängerung zumindest eine zusätzliche Befestigungsmittelöffnung (322) ausgebildet ist. 35
10. Hubträger (300) nach Anspruch 1, wobei der oberste Abschnitt (304), die nachgebende Struktur (305) und der Basisabschnitt (320) einstückig ausgebildet sind. 40
11. Hubträger (300) nach Anspruch 1, wobei die nachgebende Struktur (305) ein erstes Glied (1124) und ein zweites Glied (1126) aufweist, wobei das erste 45

Glied (1124) und das zweite Glied (1126) eine Schlitzöffnung umgeben, und wobei das erste Glied (1124) auf das zweite Glied (1126) an einer Verbindungsstelle (1130) neben dem obersten Abschnitt (304) und an einer zweiten Verbindungsstelle (2232) neben dem Basisabschnitt (320) trifft. 50

Revendications

1. Support (300) de levage sur un moteur destiné à coopérer avec une installation de levage et destiné à être utilisé en tandem avec un deuxième support (300) de levage, le support (300) de levage comprenant une partie (304) la plus haute ayant une ouverture (302) qui y est formée, l'ouverture (302) étant agencée pour coopérer avec l'installation de levage et la partie (304) la plus haute étant sensiblement plate et définissant un premier plan (A-A) ; le support (300) de levage étant **caractérisé par** : 5

une partie (320) de base ayant au moins une ouverture (322) pour une fixation pour fixer le support au moteur, la partie (320) de base étant sensiblement plate et se trouvant dans le premier plan (A-A) ; et

une structure (305) qui cède, qui est disposée entre la partie (304) la plus haute et la partie (320) de base et qui est configurée pour absorber de l'énergie lorsque le deuxième support de levage sur le moteur est défaillant, la structure (305) qui cède comprenant une partie (312) intermédiaire qui définit au moins un deuxième plan (B-B), qui est à distance du premier plan (A-A) et qui lui est parallèle ;

dans lequel, lorsque qu'une force de traction est appliquée à la partie (304) la plus haute, la structure qui cède cède, la partie (304) la plus haute s'écarte de la partie (320) de base et le deuxième plan (B-B) se déplace vers le premier plan (A-A) . 35

2. Support (300) de levage suivant la revendication 1, comprenant, en outre, une première partie (308) inclinée disposée entre la partie (304) la plus haute et la partie (312) médiane, la première partie (308) inclinée faisant un angle α avec le premier plan (A-A) et une première partie (306) arrondie reliant la partie (304) la plus haute à la première partie (308) inclinée et une deuxième partie (310) arrondie reliant la première partie (308) inclinée à la partie (312) médiane. 40
3. Support (300) de levage suivant la revendication 2, comprenant, en outre, une deuxième partie (316) inclinée, disposée entre la partie (312) médiane et la partie (320) de base, la deuxième partie (316) inclinée faisant un angle α avec le premier plan (A-A) et une troisième partie (314) arrondie relie la partie 45

(312) médiane à la deuxième partie (316) inclinée et une quatrième partie (318) inclinée relie la deuxième partie (316) inclinée avec la partie (320) de base.

4. Support (300) de levage suivant la revendication 1, comprenant, en outre, une entretoise (510), disposée sur la partie (320) de base, l'entretoise (510) ayant une ouverture (508) alignée avec la au moins une ouverture (322) de la partie (320) de base pour une fixation, l'entretoise (510) étant reliée à la partie (320) de base le long d'une zone entourant la au moins une ouverture (322) pour une fixation. 5
10
5. Support (300) de levage suivant la revendication 1, comprenant, en outre, une patte (324) qui est disposée sur un bord extérieur de la partie (320) de base et qui est configurée de manière à avoir un ajustement serré avec le moteur, pour empêcher une rotation du moteur par rapport au support (30) de levage, lorsque le deuxième support (300) de levage est défaillant. 15
20
6. Support (300) de levage suivant la revendication 5, dans lequel la patte (324) s'étend sensiblement perpendiculairement en s'éloignant du premier plan (A-A) . 25
7. Support (300) de levage suivant la revendication 5, dans lequel la patte (324) à une forme générale en "crochet" et définit une cavité pour une pièce. 30
8. Support (300) de levage suivant la revendication 1, dans lequel la structure (305) qui cède comprend une pluralité de sommets, qui sont formés en alternance avec une pluralité de dépressions. 35
9. Support (300) de levage suivant la revendication 1, comprenant, en outre, une partie de prolongement, formée au voisinage de la partie (320) de base, le prolongement formant au moins une ouverture (322) supplémentaire pour une fixation. 40
10. Support (300) de levage suivant la revendication 1, dans lequel la partie (304) la plus haute, la structure (305) qui cède et la partie (320) de base sont formées de manière intégrée. 45
11. Support (300) de levage suivant la revendication 1, dans lequel la structure (305) qui cède comprend un premier élément (1124) de liaison et un deuxième élément (1126) de liaison, le premier élément (1124) de liaison et le deuxième élément (1126) de liaison entourant une boutonnière, et le premier élément (1124) de liaison rencontre le deuxième élément (1126) de liaison en une première jonction (1130) voisine de la partie (304) la plus haute et en une deuxième jonction (1132) voisine de la partie (320) de base. 50
55

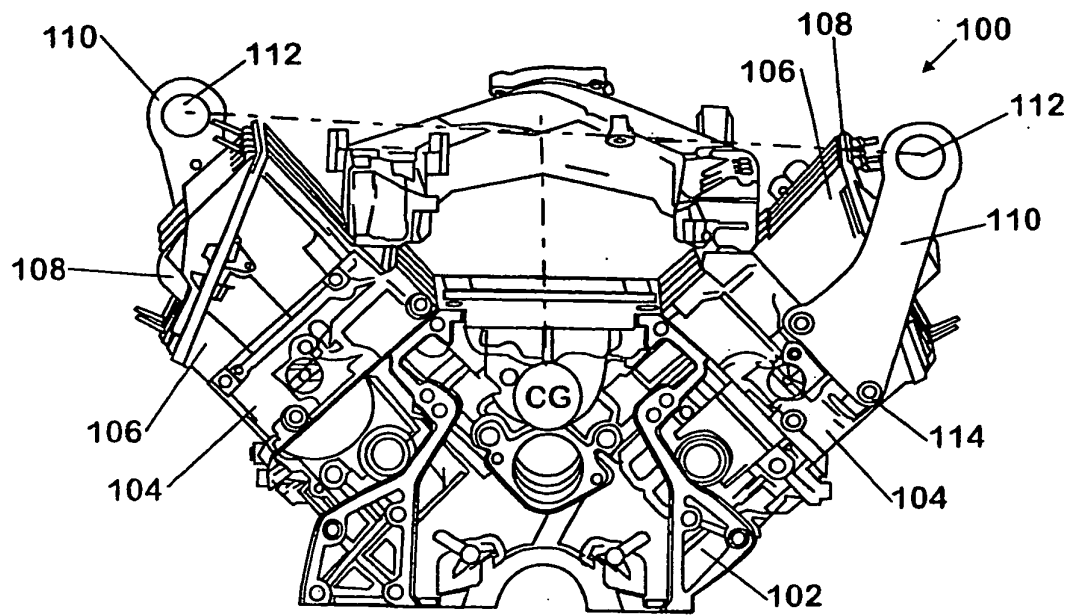


FIG. 1
PRIOR ART

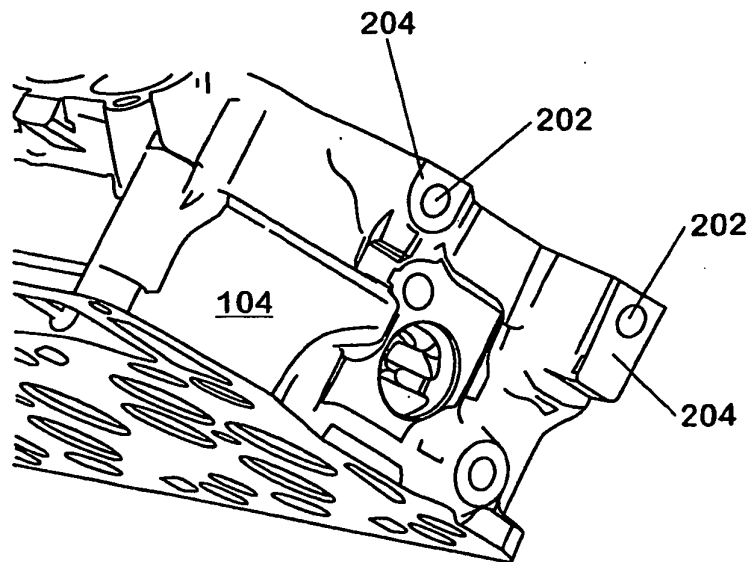
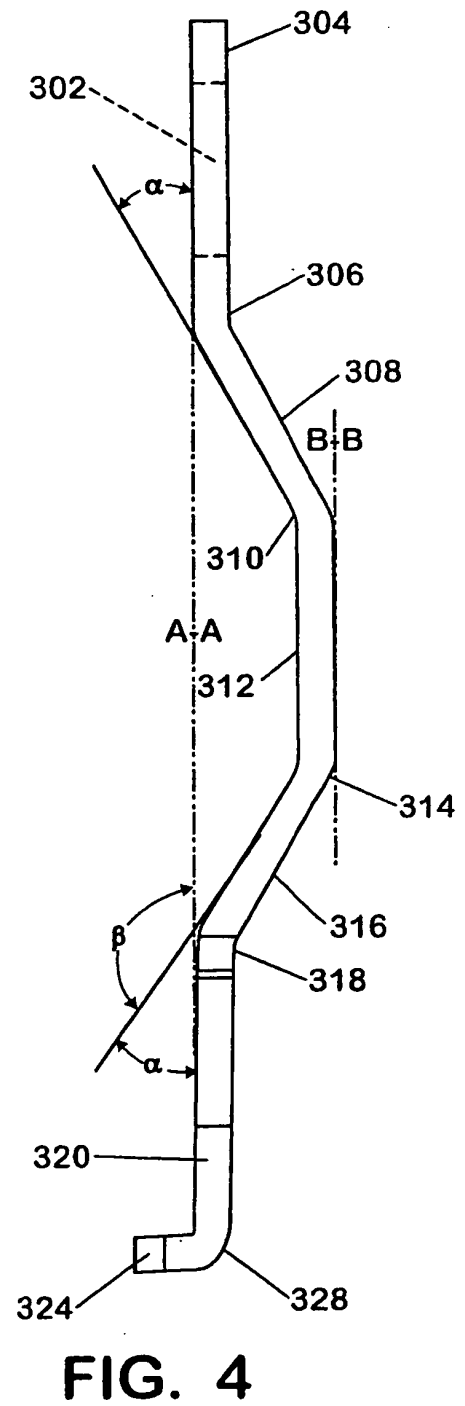
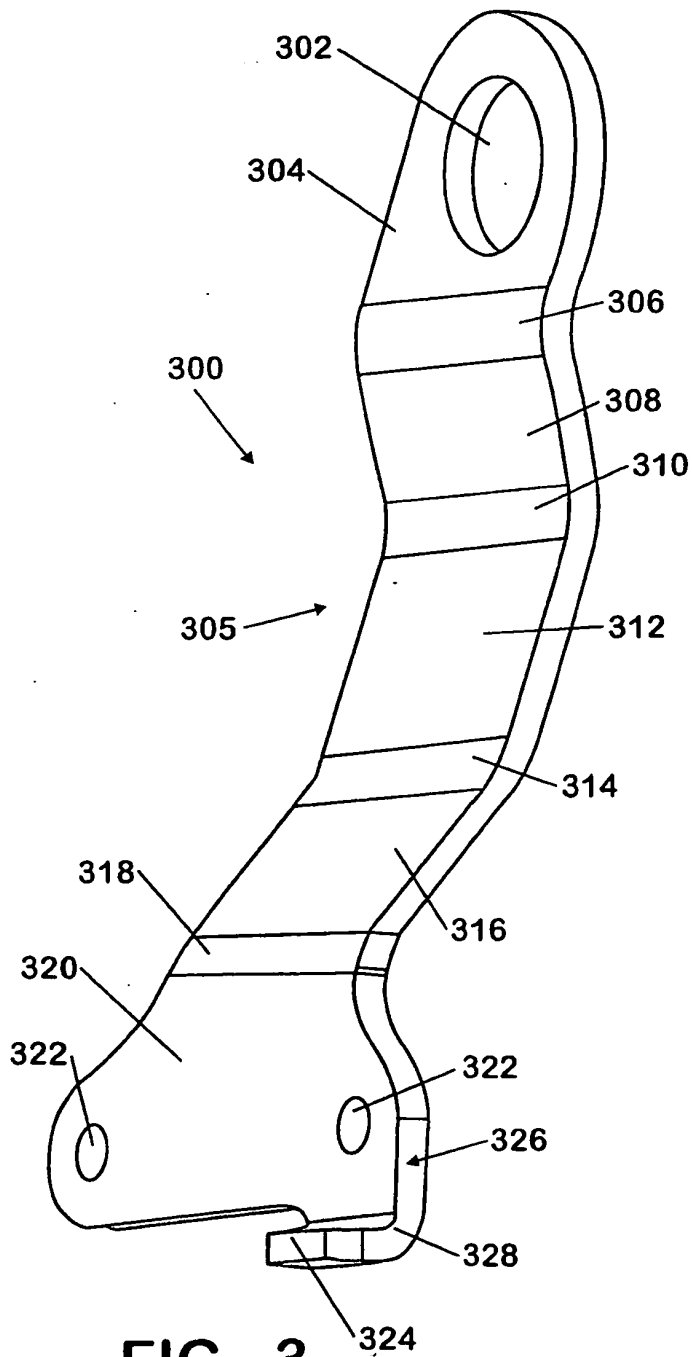


FIG. 2



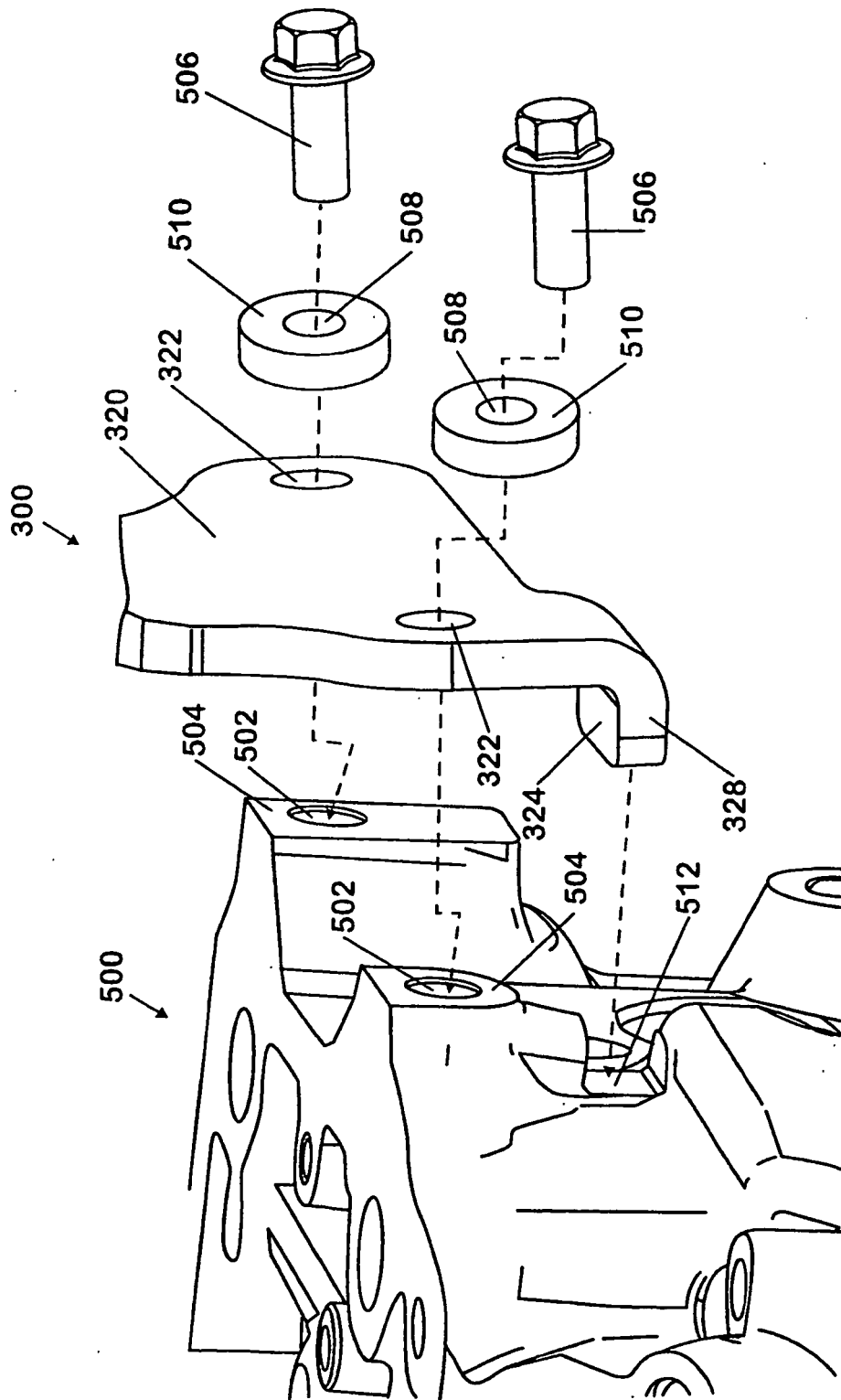


FIG. 5

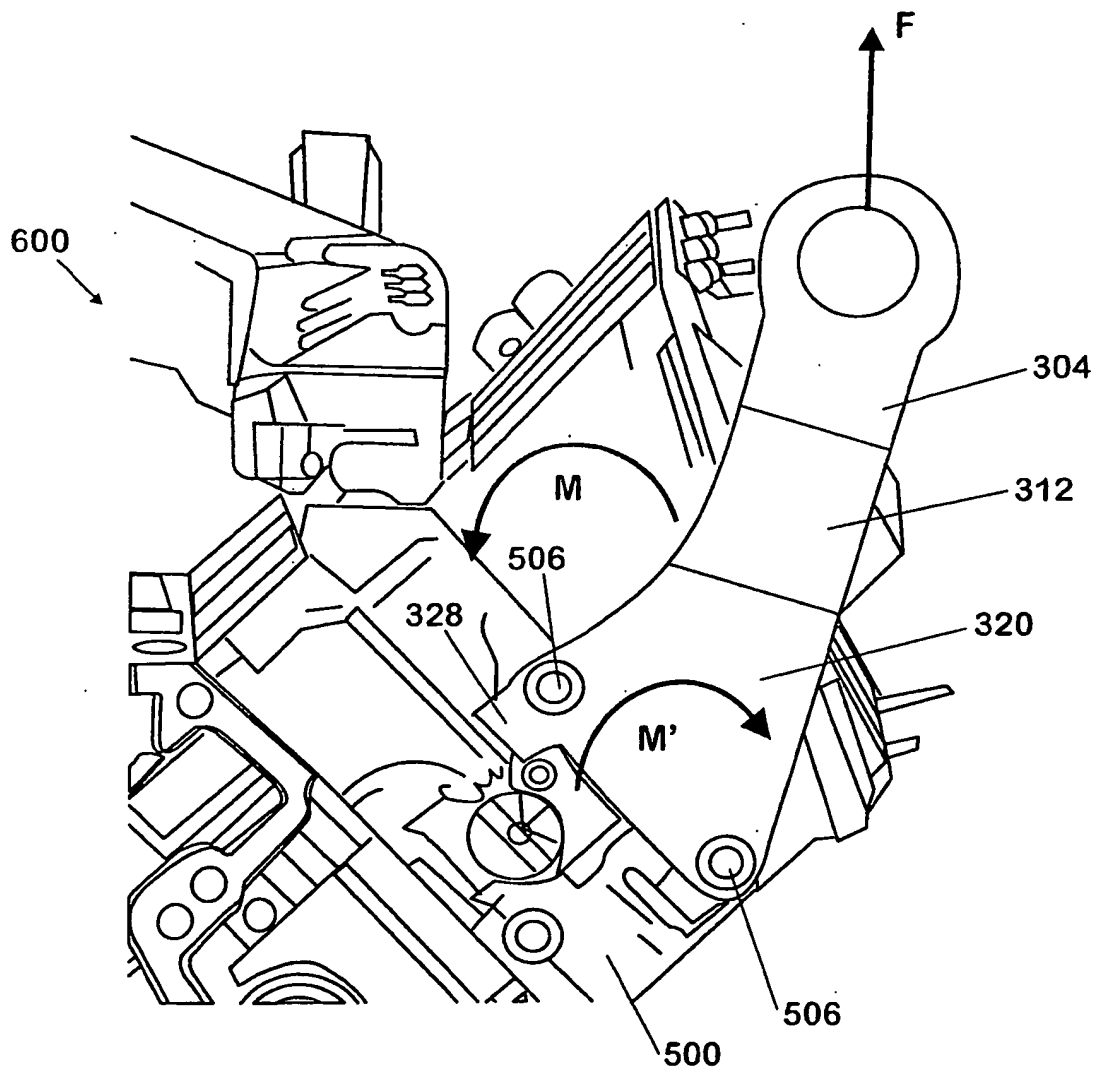


FIG. 6

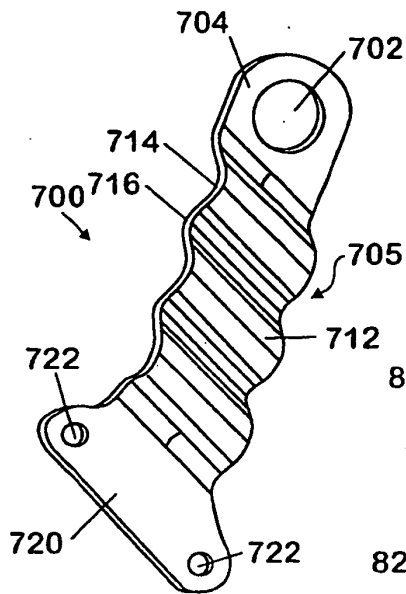


FIG. 7

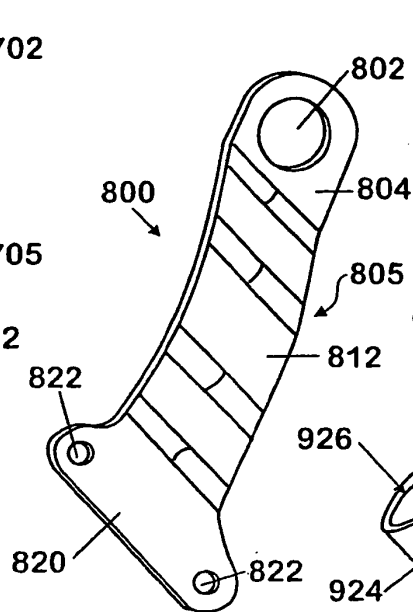


FIG. 8

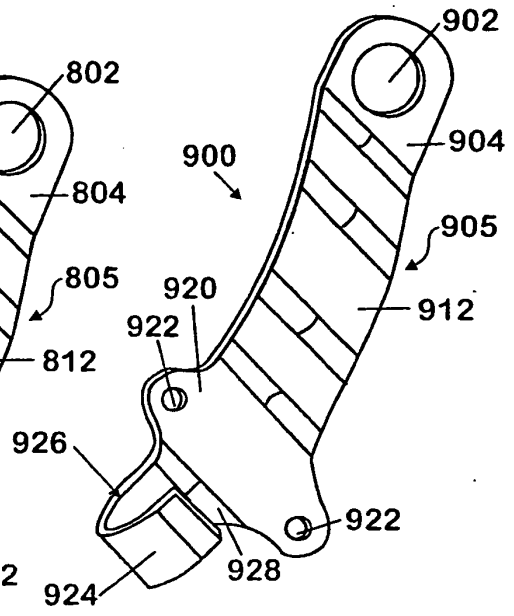


FIG. 9

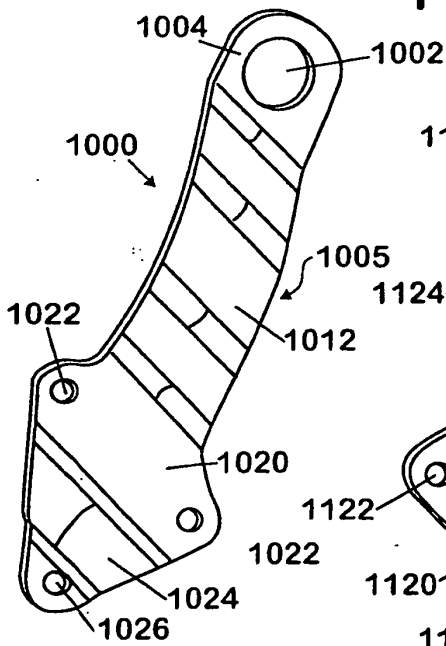


FIG. 10

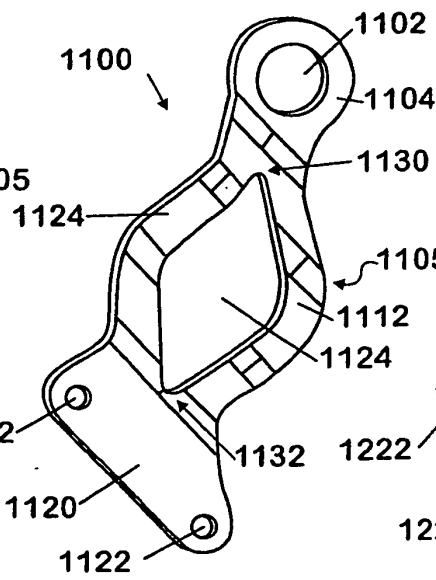


FIG. 11

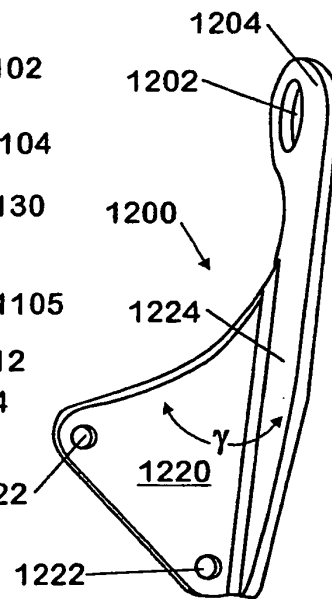


FIG. 12

REFERENCES CITED IN THE DESCRIPTION

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