



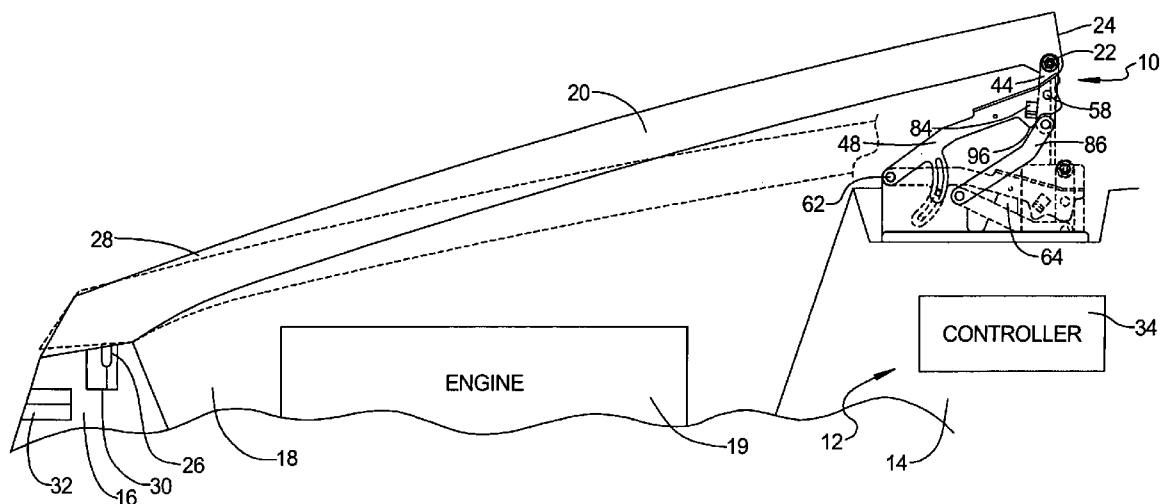
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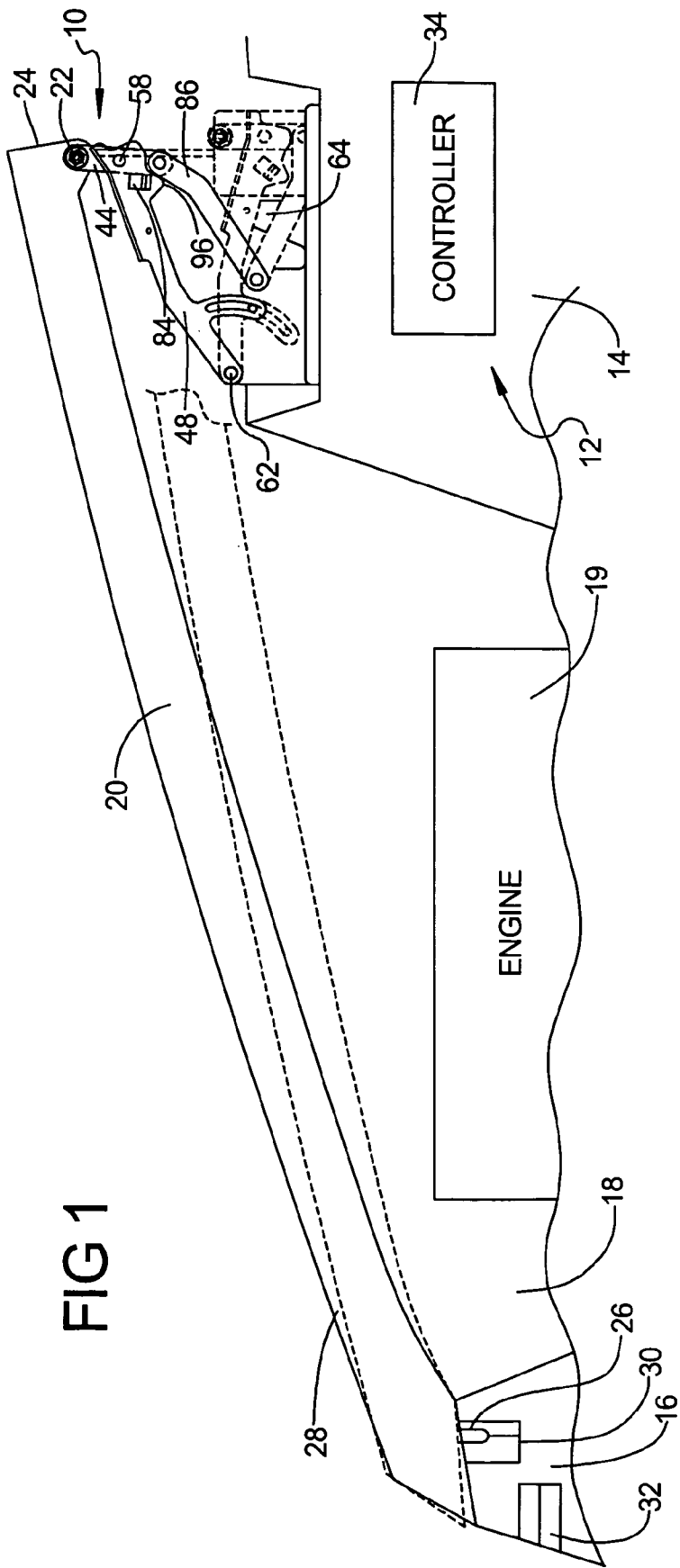
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Erwin(10) **Pub. No.: US 2007/0062747 A1**(43) **Pub. Date: Mar. 22, 2007**(54) **HOOD HINGE ASSEMBLY FOR VEHICLE****Publication Classification**(76) Inventor: **Gregory S. Erwin**, Shelby Township,
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LEGAL STAFF**MAIL CODE 482-C23-B21****P O BOX 300****DETROIT, MI 48265-3000 (US)**(57) **ABSTRACT**

A hood hinge assembly for operatively attaching a hood to a vehicle includes a base adapted to be operatively fixed to the vehicle. The hood hinge assembly also includes a mount bar adapted for pivotal attachment to the hood at a first pivot point. The hood hinge assembly includes a lever bar pivotally attached to the mount bar at a second pivot point and pivotally attached to the base at a third pivot point. The hood hinge assembly further includes an actuator operable to pivot the lever bar about the third pivot point to thereby move the first pivot point away from the vehicle.

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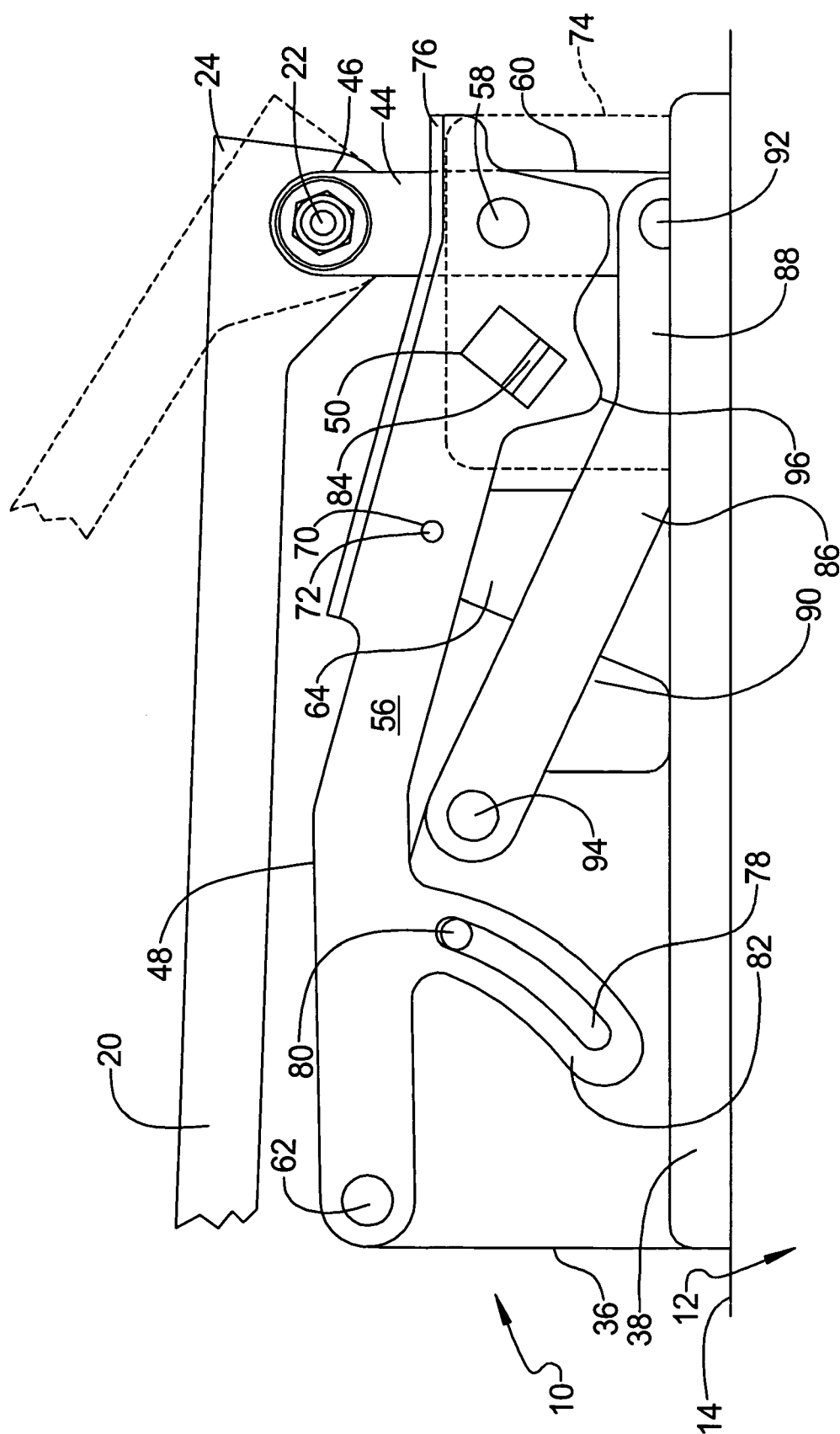
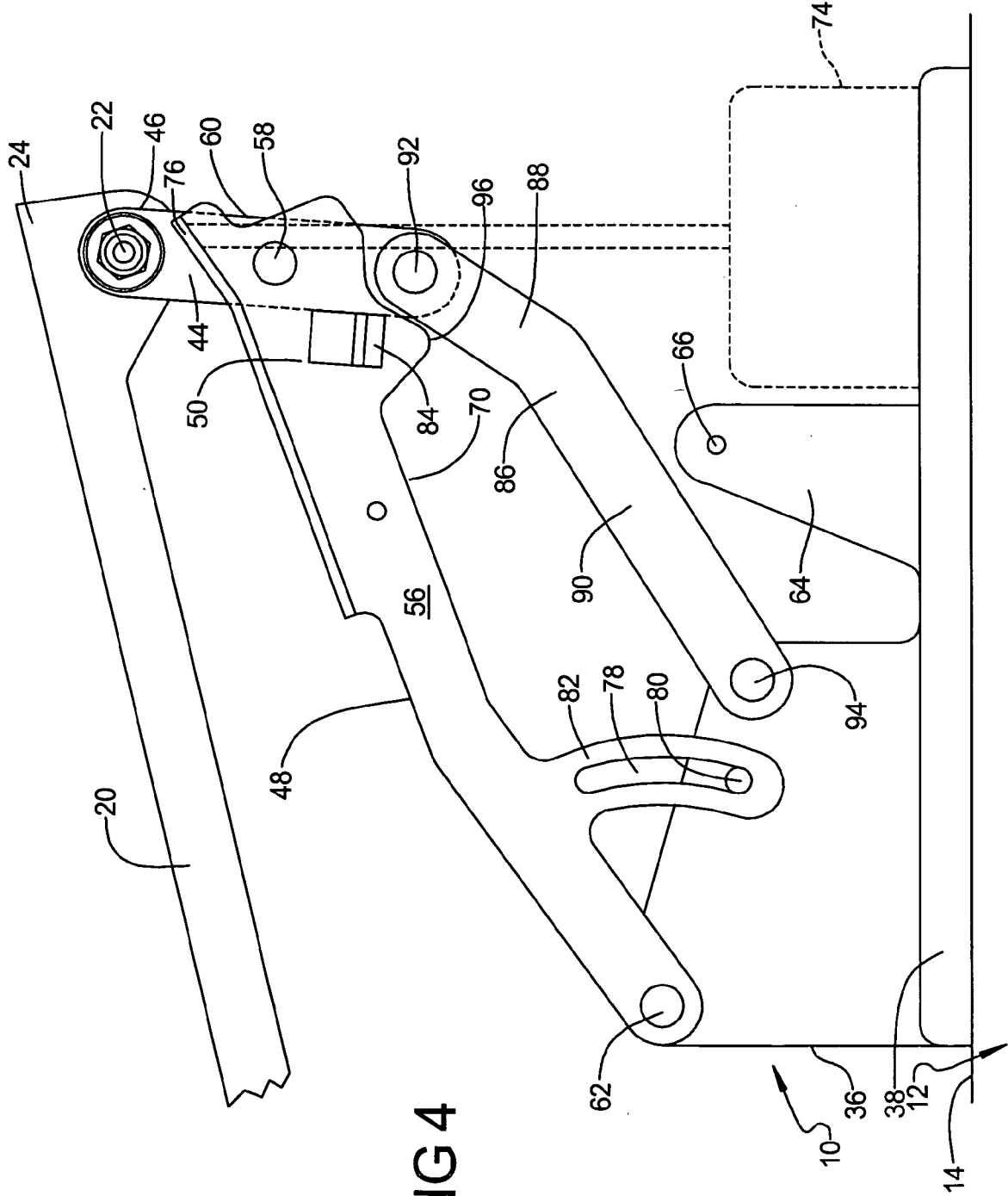


FIG 3



HOOD HINGE ASSEMBLY FOR VEHICLE

TECHNICAL FIELD

[0001] The present invention relates generally to hinges and, more particularly, to a hood hinge assembly for a vehicle.

BACKGROUND OF THE INVENTION

[0002] It is known to attach a hood to a body of a vehicle with a hinge. In many vehicles, the hood hinge allows the hood to be selectively opened for access to an engine and other components in an engine compartment of the vehicle.

[0003] However, a hood that is attached with a conventional hinge has several disadvantages. For instance, if an object impacts the vehicle, that object may ultimately impact the hood. Kinetic energy of the object is likely to dissipate by indirect impact with the vehicle engine block, which is typically directly underneath the hood. Indirect impact with the engine in this manner is likely to harm the object. Therefore, a need developed for a hood that could move the hood away from the engine block during a collision such that an impacted object is more likely to deform the hood to dissipate kinetic energy.

[0004] Partially in response to this need, hood hinge assemblies have been developed that pivotally attach the hood to the vehicle and that may be deployed to move the hood away from the engine block. However, these hinges can move the hood substantially in the fore and aft direction instead of moving the hood more directly vertical away from the vehicle body. Furthermore, these hood hinge assemblies can be relatively unstable when deployed such that the hood moves in an undesired manner. Furthermore, these movable hinges can be bulky and therefore difficult to incorporate into a vehicle because they can interfere with other components.

[0005] Thus, it is desirable to provide an improved movable hinge that moves the hood in a substantially vertical direction away from the vehicle body. It is also desirable to provide a hood hinge assembly that is more stable during deployment. It is further desirable to provide a hood hinge assembly that is more compact.

SUMMARY OF THE INVENTION

[0006] Accordingly, the present invention is a hood hinge assembly for operatively attaching a hood to a vehicle body of a vehicle including a base adapted to be operatively fixed to the vehicle body. The hood hinge assembly also includes a mount bar adapted for pivotal attachment to the hood at a first pivot point. The hood hinge assembly includes a lever bar pivotally attached to the mount bar at a second pivot point and pivotally attached to the base at a third pivot point. The hood hinge assembly further includes an actuator operable to pivot the lever bar about the third pivot point to thereby move the first pivot point away from the vehicle. The hood hinge assembly includes a support bar pivotally attached to the mount bar at a fourth pivot point. The support bar is operable to support the mount bar at the fourth pivot point as the mount bar pivots about the second pivot point.

[0007] One advantage of the present invention is that a new hood hinge assembly is provided for a vehicle for moving a hood of the vehicle away from a body of the

vehicle. Another advantage of the present invention is that the hood hinge assembly moves the hood in a substantially vertical direction away from the body of the vehicle. Yet another advantage of the present invention is that the hood hinge assembly is substantially robust and maintains substantially stable movement when deploying. Still another advantage of the present invention is that the hood hinge assembly is substantially compact such that the hood hinge assembly can be incorporated into the vehicle and is less likely to interfere with other components.

[0008] Other features and advantages of the present invention will be readily appreciated, as the same becomes better understood, after reading the subsequent description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is an elevational view of a hood hinge assembly, according to the present invention, illustrated in operational relationship with a vehicle in an extended and a retracted position.

[0010] FIG. 2 is a perspective view of the hood hinge assembly of FIG. 1 illustrated in a retracted position.

[0011] FIG. 3 is an elevational view of the hood hinge assembly of FIG. 1 illustrated in the retracted position and illustrated with a hood of the vehicle in an opened and closed position.

[0012] FIG. 4 is an elevational view of the hood hinge assembly of FIG. 1 illustrated in an extended position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0013] Referring to the drawings and in particular FIG. 1, one embodiment of a hood hinge assembly 10, according to the present invention, is shown for a vehicle such as a motor vehicle, generally indicated at 12. Such vehicles 12 typically include a body 14 (partially shown) forming an engine compartment 16. The engine compartment 16 has a recess 18 in which an engine, schematically shown at 19, can be disposed. The vehicle 12 also includes a hood 20 that closes and opens the recess 18. The hood 20 is operatively attached to the vehicle 12 by at least one, and preferably a plurality of laterally spaced hood hinge assemblies 10. It should be appreciated that only one hood hinge assembly 10 is illustrated in FIG. 1 and will be subsequently described. It should also be appreciated that, except for the hood hinge assembly 10, the vehicle 12 is conventional and known in the art.

[0014] The hood hinge assembly 10 is adapted for pivotal attachment to the hood 20 at a first pivot point 22. In the embodiment illustrated, the first pivot point 22 is located on a rear corner 24 of the hood 20. The hood 20 also includes a striker 26 illustrated in FIG. 1. In the embodiment illustrated, the striker 26 is longitudinally spaced from the first pivot point 22 and is located on a front end 28 of the hood 20. When the hood 20 is in a closed position (shown in phantom lines in FIG. 1), the hood 20 generally covers the recess 18. In this position, the striker 26 is secured to the body 14 by a latch assembly 30 attached to the body 14. The hood 20 is opened by releasing the striker 26 from the latch assembly 30 and pivotally moving the hood 20 about the first pivot point 22.

[0015] The hood hinge assembly 10 can be positioned in a retracted position (shown in phantom lines in FIG. 1), and an extended position (shown in solid lines in FIG. 1). In the retracted position, the hood hinge assembly 10 retains the first pivot point 22 generally adjacent the body 14 for normal opening and closing of the hood 20 as previously described. In the extended position, the hood hinge assembly 10 generally moves the first pivot point 22 away from the body 14 such that the hood 20 pivots about the striker 26, which remains secured to the latch assembly 30.

[0016] The vehicle 12 also includes at least one sensor 32, shown schematically in FIG. 1. The sensor 32 is operable to detect when the vehicle 12 impacts an object. The sensor 32 is in communication with a controller 34, also shown schematically in FIG. 1. The controller 34 is in electrical communication with the sensor 32. The controller 34 is operable to receive a signal from the sensor 32, indicating that an object (not shown) has impacted the vehicle 12. In response, the controller 34 transmits a signal to an actuator which fires, causing the hood hinge assembly 10 to move from the retracted position to the extended position in a manner to be described. It should be appreciated that the hood hinge assembly 10 creates space between the hood 20 and the engine 19 such that if an object impacts the vehicle 12, the object can more readily deform the hood 20 to dissipate kinetic energy.

[0017] As illustrated in FIGS. 2 through 4, the hood hinge assembly 10 includes a base 36. The base 36 is a plate that is bent so as to define a first portion 38 and second portion 40. The second portion 40 is substantially perpendicular to the first portion 38. The first portion 38 includes a plurality of apertures 42 (FIG. 2) used to operatively fix the base 36 to the body 14 by a suitable mechanism such as fasteners (not shown). It should be appreciated that the base 36 could be integral to the body 14.

[0018] The hood hinge assembly 10 also includes a mount bar 44. The mount bar 44 is generally elongate and is adapted for pivotal attachment to the hood 20. The mount bar 44 defines a first end 46 and the rear corner 24 of the hood 20 is pivotally attached to the first end 46 to define the first pivot point 22 of the hood 20. The mount bar 44 can include any suitable component for pivotally attaching to the hood 20 at the first pivot point 22, such as a hinge pivot weld nut (not shown).

[0019] The hood hinge assembly 10 includes a lever bar 48. The lever bar 48 is generally flat and elongate so as to define a first end 50, a second end 52, a first side 54 (FIG. 2), and a second side 56. The first end 50 of the lever bar 48 is pivotally attached to the mount bar 44 so as to define a second pivot point 58. The axis of the second pivot point 58 extends through a middle portion 60 (FIGS. 3 and 4) of the mount bar 44, and the mount bar 44 is adjacent the first side 54 of the lever bar 48. The second end 52 of the lever bar 48 is pivotally attached to the second portion 40 of the base 36 so as to define a third pivot point 62. The second portion 40 of the base 36 is substantially coplanar and adjacent to the first side 54 of the lever bar 48. The lever bar 48 may include any suitable component for pivotally attaching to the mount bar 44 and the base 36. In the embodiment illustrated, the mount bar 44 is restricted against substantially all linear movement relative to the lever bar 48 at the second pivot point 58. Likewise, the lever bar 48 is restricted against substantially

all linear movement relative to the base 36 at the third pivot point 62. It should be appreciated that the hood hinge assembly 10 is more stable when moving from the retracted position toward the extended position.

[0020] The hood hinge assembly 10 also includes a retainer bar 64. The retainer bar 64 is generally planar and is fixed to the base 36. In the embodiment illustrated, the retainer bar 64 is integrally attached to the base 36 and extends perpendicularly from the first portion 38 of the base 36. The retainer bar 64 is operable to be secured to the lever bar 48 to thereby retain the lever bar 48 against pivoting about the third pivot point 62. In the embodiment illustrated, the retainer bar 64 includes an aperture 66 (FIG. 4) extending through the retainer bar 64. The lever bar 48 also includes an aperture 70 that is aligned with the aperture 66 when the hood hinge assembly 10 is in the retracted position.

[0021] The hood hinge assembly 10 further includes a pin 72 (FIG. 3). When the hood hinge assembly 10 is in the retracted position, the pin 72 extends through both the aperture 66 (FIG. 4) of the retainer bar 64 and the aperture 70 of the lever bar 48 to thereby secure the lever bar 48 to the retainer bar 64. The pin 72 is also operable to release the lever bar 48 so that the lever bar 48 is free to pivot about the third pivot point 62 and move the hood hinge assembly 10 toward the extended position.

[0022] The hood hinge assembly 10 also includes an actuator 74 (FIG. 2). The actuator 74 is operable to pivot the lever bar 48 about the third pivot point 62 to move the hood hinge assembly 10 from the retracted position toward the extended position. In the embodiment illustrated, the lever bar 48 includes an attachment flange 76 disposed at the first end 50 of the lever bar 48 and extending perpendicularly away from the second side 56 of the lever bar 48. The actuator 74 is operatively attached to the attachment flange 76, such as by a pivotal attachment. The actuator 74 is operable to supply an actuation force to the lever bar 48 to thereby pivot the lever bar 48 about the third pivot point 62. The actuator 74 may be of any suitable type, such as a piston slidably attached to a cylinder or a bellows chamber, which expands due to air introduced into the actuator 74. In one embodiment, the actuation force provided by the actuator 74 is sufficient to destruct the pin 72. In another embodiment, the actuator 74 applies a biasing force to the lever bar 48 away from the base 36 even when the hood hinge assembly 10 is in the retracted position, and hood hinge assembly 10 moves to the extended position only when the pin 72 destructs by some independent mechanism. Also, in one embodiment, the actuator 74 continues to apply force to the lever bar 48 when the hood hinge assembly 10 is in the extended position to hold the hood 20 away from the body 14 during a vehicular collision.

[0023] In the embodiment illustrated, at least one of the base 36 and lever bar 48 defines a curved slot 78, and the other of the base 36 and lever bar 48 includes a pin 80 that is disposed within the curved slot 78 as the lever bar 48 pivots about the third pivot point 62. In the embodiment illustrated, the lever bar 48 includes a curved leg 82 extending from the second end 52 of the lever bar 48 and downward toward the base 36. The curved slot 78 is formed in the leg 82. The pin 80 is fixed to the second portion 40 of the base 36. The pin 80 is disposed within the curved slot 78 when the hood hinge assembly 10 is in the retracted position,

and as the lever bar **48** pivots about the third pivot point **62**, the pin **80** remains inside the curved slot **78**. It should be appreciated that abutment between the pin **80** and the curved slot **78** guides and supports the movement of the lever bar **48**.

[0024] The hood hinge assembly **10** also includes a support bar **86**. The support bar **86** is generally planar and elongate. The support bar **86** includes a first portion **88** and a second portion **90**. The second portion **90** is disposed at a positive angle relative to the first portion **88**. The first portion **88** of the support bar **86** is pivotally attached to the mount bar **44** at a fourth pivot point **92**. The second portion **90** is pivotally attached to the second portion **40** of the base **36** at a fifth pivot point **94**. The support bar **86** is generally disposed between the lever bar **48** and the first portion **38** of the base **36**. In the embodiment illustrated, the support bar **86** is restricted against substantially all linear movement relative to the mount bar **44** at the fourth pivot point **92**. Likewise, the support bar **86** is restricted against substantially all linear movement relative to the base **36** at the fifth pivot point **94**. It should be appreciated that the hood hinge assembly **10** is more stable when moving from the retracted position toward the extended position.

[0025] When the hood hinge assembly **10** is in the retracted position, the support bar **86** substantially restricts the mount bar **44** from pivoting about the second pivot point **58**. Also, as the hood hinge assembly **10** moves toward the extended position, the support bar **86** supports the mount bar **44** by pushing and/or pulling the mount bar **44** at the fourth pivot point **92** as the mount bar **44** pivots about the second pivot point **58**. By supporting the mount bar **44** in this manner, the support bar **86** maintains the mount bar **44** in a position substantially perpendicular to the first portion **38** of the base **36** as the hood hinge assembly **10** moves toward the extended position such that the first pivot point **22** moves in a substantially arcuate path in a vertical direction to pivot about the striker **26**. It should be appreciated that the rear corner **24** of the hood **20** lifts higher away from the body **14** due to the support bar **86**.

[0026] The hood hinge assembly **10** also includes at least one stop member operable to limit pivotal movement of the mount bar **44** about the second pivot point **58**. In the embodiment illustrated, there is a plurality of stop members to be described that each limits the pivotal movement of the mount bar **44**. As will be explained in greater detail below, each of the stop members cause the first pivot point **22** to move in a predetermined direction as the hood hinge assembly **10** moves from the retracted position toward the extended position, thereby moving the hood **20** of the vehicle **12** in a predetermined manner.

[0027] In the embodiment illustrated, one stop member is an abutment member **84** operable to abut against the mount bar **44** to thereby limit pivotal movement of the mount bar **44** above the second pivot point **58**. In the embodiment illustrated, the lever bar **48** supports the abutment member **84**. More specifically, the abutment member **84** is a portion of the lever bar **48** at the first end **50** that is integrally attached to the lever bar **48** at both ends and with a middle portion that bends outward from the first side **54** of the lever bar **48** (FIG. 2). The abutment member **84** is oriented relative to the mount bar **44** such that the mount bar **44**

eventually abuts against the abutment member **84** as the mount bar **44** pivots about the second pivot point **58** as illustrated in FIG. 4.

[0028] In the embodiment illustrated, another stop member is an abutment surface **96** included on the lever bar **48**. As illustrated in FIGS. 3 and 4, the abutment surface **96** is generally curved and projects from the lever bar **48** toward the support bar **86**. As the hood hinge assembly **10** moves from the retracted position towards the extended position, the support bar **86** will eventually abut against the abutment surface **96** of the lever bar **48**. It should be appreciated that the abutment surface **96** and the abutment member **84** cooperate to limit the pivotal movement of the mount bar **44** about the second pivot point **58**.

[0029] As the hood hinge assembly **10** moves toward the extended position, the abutment surface **96** abuts against the support bar **86**, and the abutment member **84** abuts against the mount bar **44**, to hold the hood hinge assembly **10** against the force applied by the actuator **74**. In one embodiment, the abutment surface **96** and the abutment member **84** limit the mount bar **44** in a substantially perpendicular position in relation to the base **36** such that the first pivot point **22** increases the distance between the rear corner **24** of the hood **20** and the body **14**. It should also be appreciated that, in another embodiment, the relationship between the mount bar **44** and the base **36** may be adjusted such that the mount bar **44** is at an angle relative to the base **36**.

[0030] In operation of the hood hinge assembly **10**, when the sensor **32** of the vehicle **12** detects a vehicular impact, the sensor **32** sends a signal to the controller **34**. The controller **34**, in turn, sends a signal to the actuator **74**, and the actuator **74** supplies a force to the lever bar **48** of the hood hinge assembly **10**. Force from the actuator **74** causes destruction of the pin **72**, thereby freeing the lever bar **48** for pivotal movement about the third pivot point **62** such that the hood hinge assembly **10** can move from the retracted position towards the extended position. As the lever bar **48** moves away from the body **14** of the vehicle **12**, the lever bar **48** moves the mount bar **44**, and thus the rear corner **24** of the hood **20**, away from the body **14**. As the mount bar **44** moves away from the body **14** of the vehicle **12**, the support bar **86** maintains the mount bar **44** in a substantially perpendicular position relative to the base **36** such that the first pivot point **22** moves in a substantially vertical direction away from the body **14**. Also, as the hood hinge assembly **10** approaches the extended position, the abutment member **84** and the abutment surface **96** cooperate to limit the rotation of the mount bar **44** about the second pivot point **58** and maintain the mount bar **44** substantially perpendicular to the base **36**. It should be appreciated that the first pivot point **22** travels in a substantially vertical direction away from the body **14** of the vehicle **12** for increased space between the rear corner **24** of the hood **20** and the engine **19**. It should also be appreciated that an object that impacts the vehicle **12** is more likely to deform the hood **20** and dissipate kinetic energy due to the hood hinge assembly **10** of the present invention.

[0031] The hood hinge assembly **10** of the present invention is substantially robust and maintains substantially stable movement. This is because the first, second, third, fourth, and fifth pivot points **22**, **58**, **62**, **92**, **94** each allow for pivotal movement, but are each restricted from linear movement.

Also, the pin **80** and curved slot **78** add further support to the hood hinge assembly **10**. The hood hinge assembly **10** is also substantially compact. Thus, the hood hinge assembly **10** can be more easily incorporated into a vehicle **12** without interfering with other components.

[0032] The present invention has been described in an illustrative manner. It is to be understood that the terminology, which has been used, is intended to be in the nature of words of description rather than of limitation.

[0033] Many modifications and variations of the present invention are possible in light of the above teachings. Therefore, within the scope of the appended claims, the present invention may be practiced other than as specifically described.

1. A hood hinge assembly for operatively attaching a hood to a vehicle comprising:

- a base adapted to be operatively fixed to the vehicle;
- a mount bar adapted for pivotal attachment to the hood at a first pivot point;
- a lever bar pivotally attached to said mount bar at a second pivot point and pivotally attached to said base at a third pivot point;
- an actuator operable to pivot said lever bar about said third pivot point to thereby move said first pivot point away from the vehicle; and
- a support bar pivotally attached to said mount bar at a fourth pivot point, said support bar operable to support said mount bar at said fourth pivot point as said mount bar pivots about said second pivot point.

2. A hood hinge assembly as set forth in claim 1 further comprising at least one abutment member operable to abut against said mount bar to limit pivotal movement of said mount bar about said second pivot point.

3. A hood hinge assembly as set forth in claim 2 wherein said at least one abutment member is supported by said lever bar.

4. A hood hinge assembly as set forth in claim 1 wherein said lever bar is restricted against substantially all linear movement relative to said base at said third pivot point.

5. A hood hinge assembly as set forth in claim 1 wherein said actuator is operatively attached to said lever bar.

6. A hood hinge assembly as set forth in claim 1 further comprising an abutment surface included on said lever bar and operable to abut against said support bar to thereby limit pivotal movement of said mount bar about said second pivot point.

7. A hood hinge assembly as set forth in claim 1 further comprising a retainer bar fixed to said base and operable to be secured to said lever bar to thereby retain said lever bar against pivotal movement about said third pivot point.

8. A hood hinge assembly as set forth in claim 7 further comprising a pin operable to secure said lever bar to said retainer bar and also operable to release said lever bar for pivoting about said third pivot point.

9. A hood hinge assembly as set forth in claim 1 wherein at least one of said base and said lever bar defines a curved slot and the other of said base and said lever bar includes a pin disposed within said curved slot as said lever bar pivots about said third pivot point.

10. A hood hinge assembly for operatively attaching a hood to a vehicle comprising:

- a base adapted to be operatively fixed to the vehicle;
- a mount bar adapted for pivotal attachment to the hood at a first pivot point;
- a lever bar pivotally attached to said mount bar at a second pivot point and pivotally attached to said base at a third pivot point, wherein said lever bar is restricted against substantially all linear movement relative to said base at said third pivot point;
- an actuator operatively attached to said lever bar and operable to pivot said lever bar about said third pivot point to thereby move said first pivot point in an arcuate path away from the vehicle; and
- at least one stop member operable to limit pivotal movement of said mount bar about said second pivot point.

11. A hood hinge assembly as set forth in claim 10 wherein said at least one stop member is an abutment member operable to abut against said mount bar to thereby limit pivotal movement of said mount bar about said second pivot point.

12. A hood hinge assembly as set forth in claim 10 further comprising a support bar that is pivotally attached to said mount bar at a fourth pivot point, said support bar operable to support said mount bar at said fourth pivot point as said mount bar pivots about said second pivot point.

13. A hood hinge assembly as set forth in claim 12 wherein said at least one stop member is an abutment surface included on said lever bar and operable to abut against said support bar to thereby limit pivotal movement of said mount bar about said second pivot point.

14. A hood hinge assembly as set forth in claim 10 further comprising a retainer bar fixed to said base and operable to be secured to said lever bar to thereby retain said lever bar against pivoting about said third pivot point.

15. A hood hinge assembly as set forth in claim 14 further comprising a pin operable to secure said lever bar to said retainer bar and also operable to release said lever bar for pivoting about said third pivot point.

16. A hood hinge assembly as set forth in claim 10 wherein at least one of said base and said lever bar defines a curved slot and the other of said base and said lever bar includes a pin disposed within said curved slot as said lever bar pivots about said third pivot point.

17. A vehicle comprising:

- a body;
- a hood;
- at least one base operatively fixed to said body;
- at least one mount bar adapted for pivotal attachment to said hood at a first pivot point;
- at least one lever bar pivotally attached to said at least one mount bar at a second pivot point and pivotally attached to said at least one base at a third pivot point;
- at least one actuator operable to pivot said at least one lever bar about said third pivot point to thereby move said first pivot point in an arcuate path away from said body;

at least one support bar pivotally attached to said at least one mount bar at a fourth pivot point and pivotally attached to said at least one base at a fifth pivot point, said at least one support bar operable to support said at least one mount bar at said fourth pivot point as said at least one mount bar pivots about said second pivot point; and

at least one abutment member supported by said at least one lever bar and operable to abut against said at least one mount bar to thereby limit pivotal movement of said at least one mount bar about said second pivot point.

18. A vehicle as set forth in claim 17 further comprising at least one abutment surface included on said at least one lever bar and operable to abut against said at least one

support bar to thereby limit pivotal movement of said at least one mount bar about said second pivot point.

19. A vehicle as set forth in claim 17 further comprising at least one retainer bar fixed to said at least one base and operable to be secured to said at least one lever bar to thereby retain said lever bar against pivoting about said third pivot point.

20. A vehicle as set forth in claim 19 further comprising at least one pin operable to secure said at least one lever bar to said at least one retainer bar and also operable to release said at least one lever bar for pivoting about said third pivot point.

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