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Hayes

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(54) **ROBUST ROCKER GUARD WITH AUTOMATIC STEP**

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(52) **U.S. Cl.**
CPC ***B60R 3/02*** (2013.01)
USPC **280/163**; 280/166

(58) **Field of Classification Search**
USPC 280/166, 163
See application file for complete search history.

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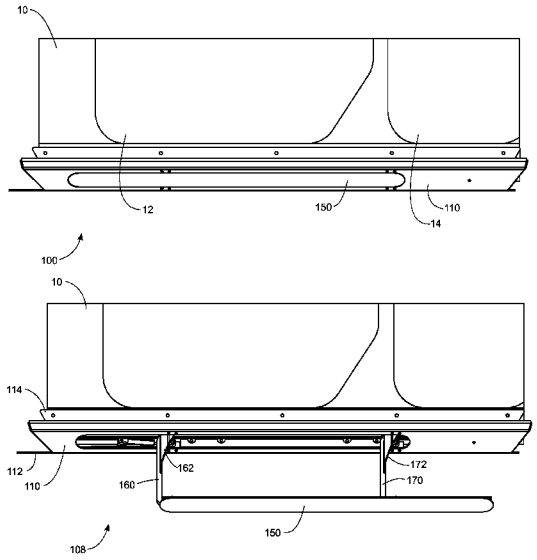
(57) **ABSTRACT**

Rocker guards with automatic step are disclosed that provide robust protection from damage due to rock obstacles to rocker panels and also provide an automatic step to facilitate easy entry and exit from a lifted vehicle. Some embodiments of a rocker guard with automatic step for a vehicle (rocker) can include a body formed to protect rocker panels of a vehicle without damaging the rocker or a step located within the body when the step is in a retracted position, mounts attached to the body for attaching to a vehicle, and an actuator coupled to the step and the body, the actuator being configured to automatically lower the step out of the body to an extended position and retract the step to the retracted position.

21 Claims, 7 Drawing Sheets



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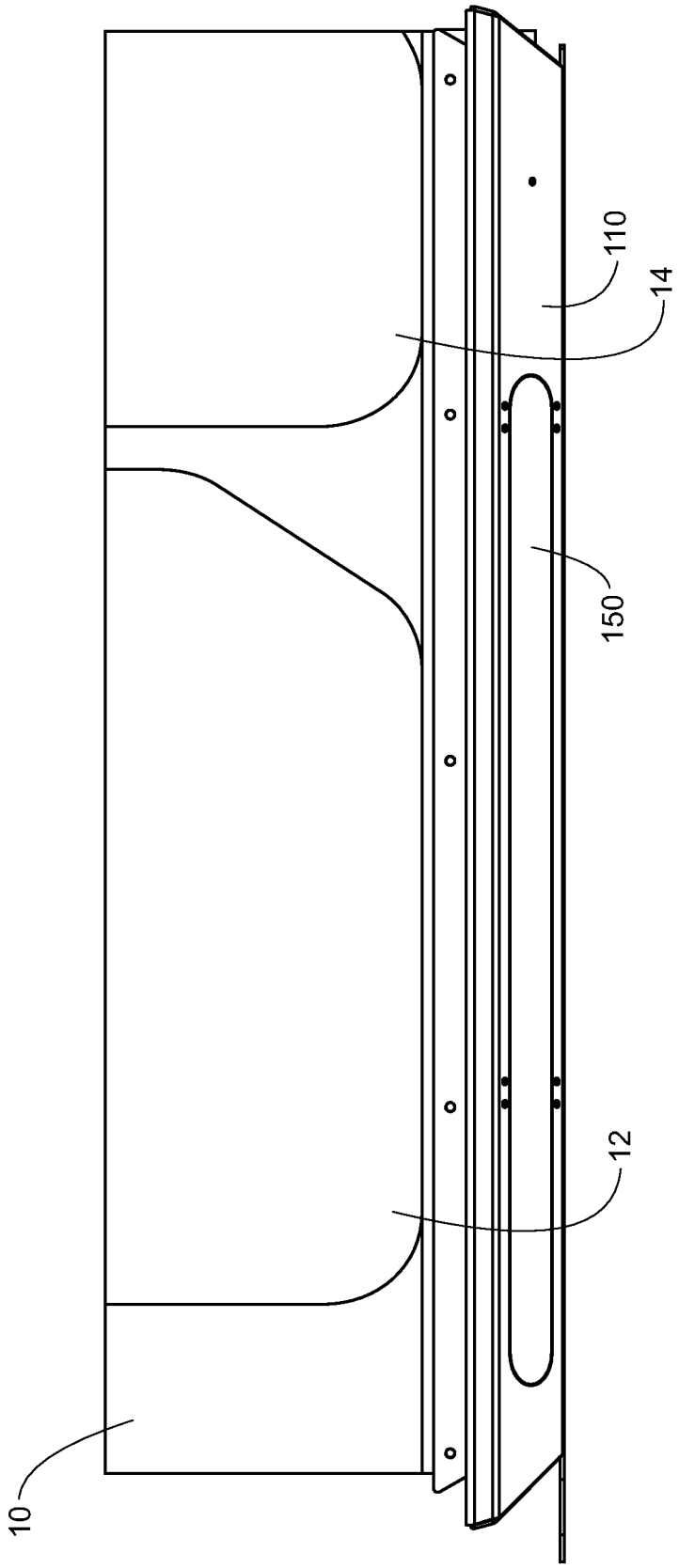

FIG. 1

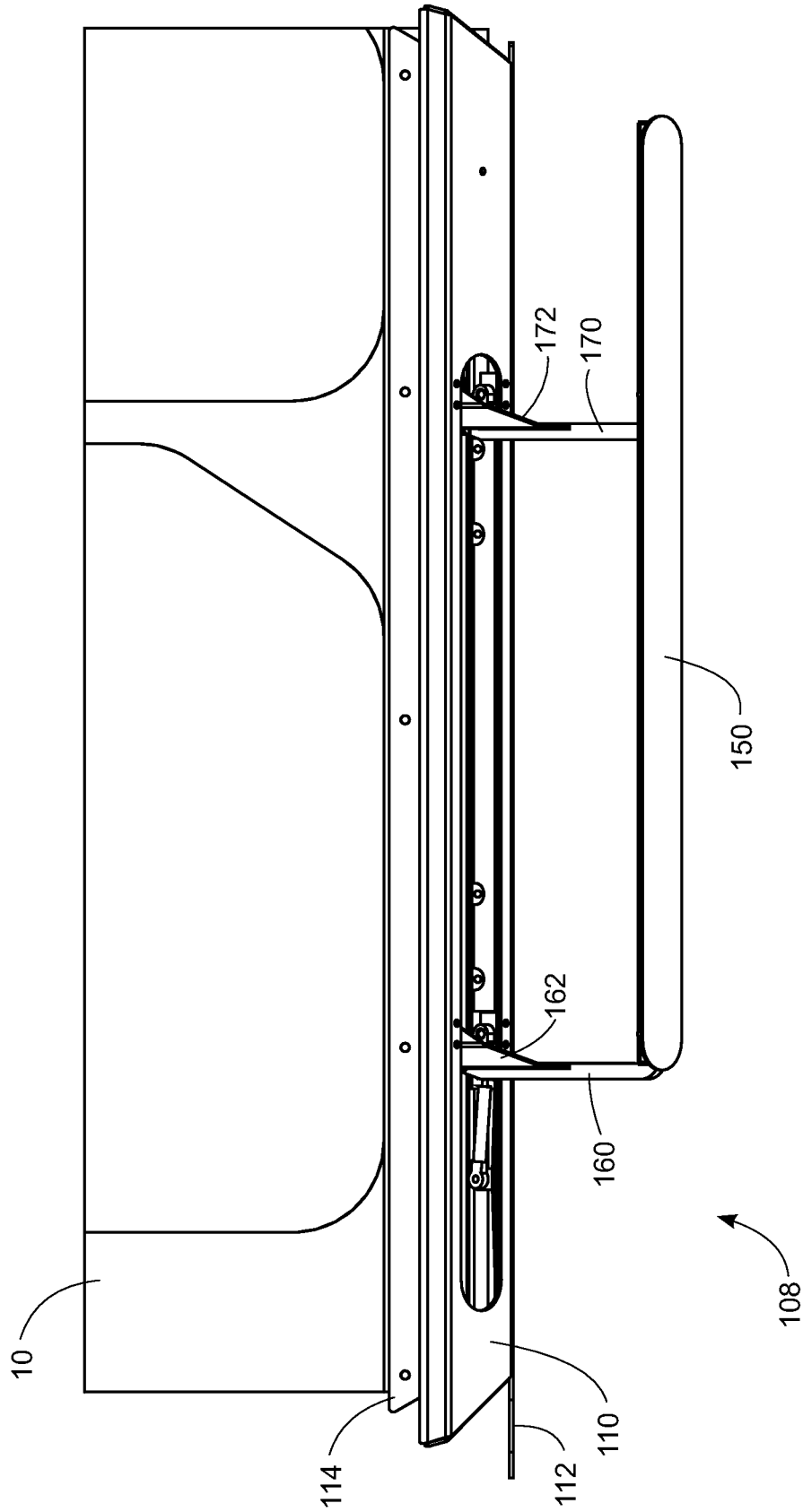

FIG. 2

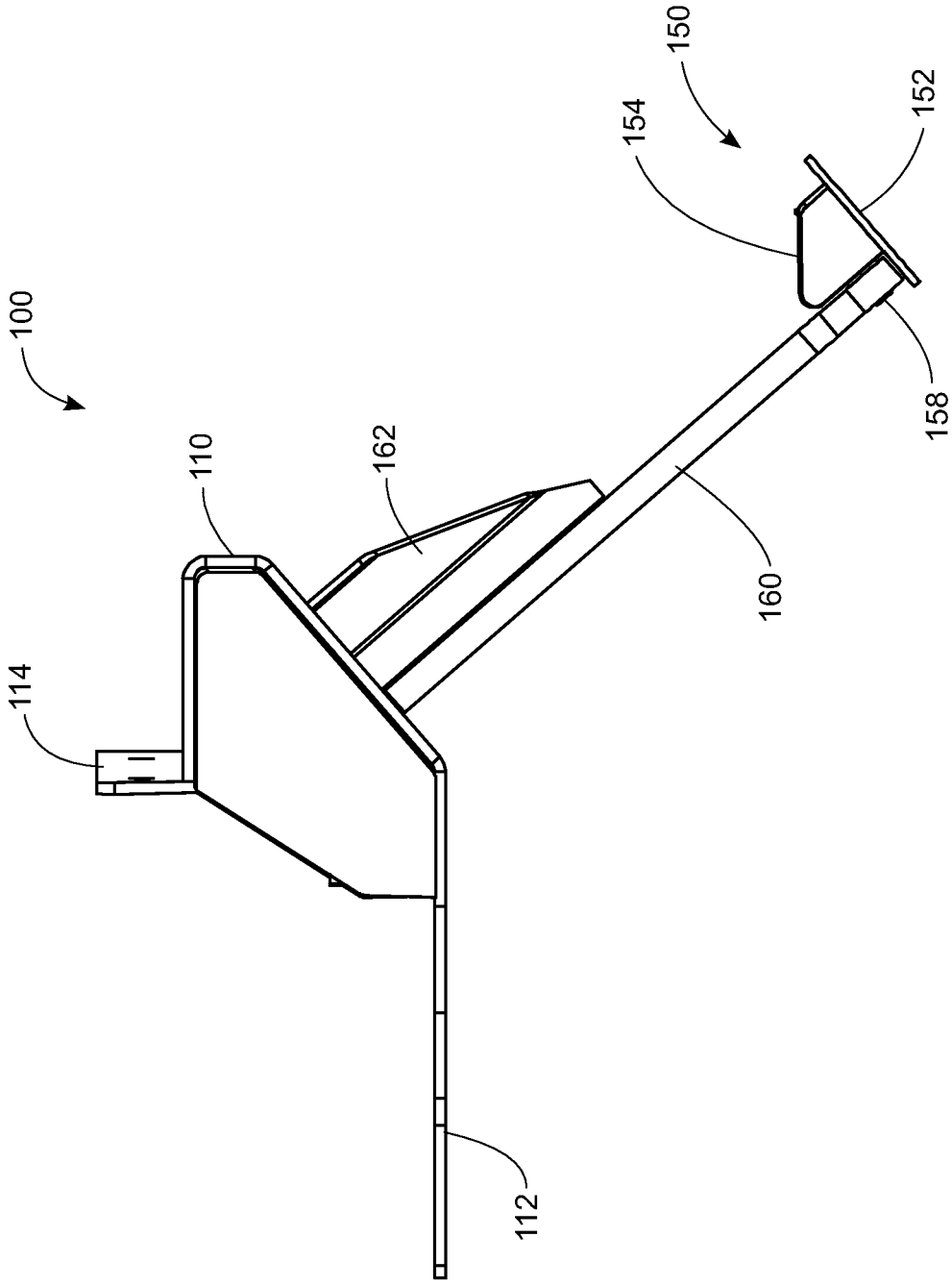

FIG. 3

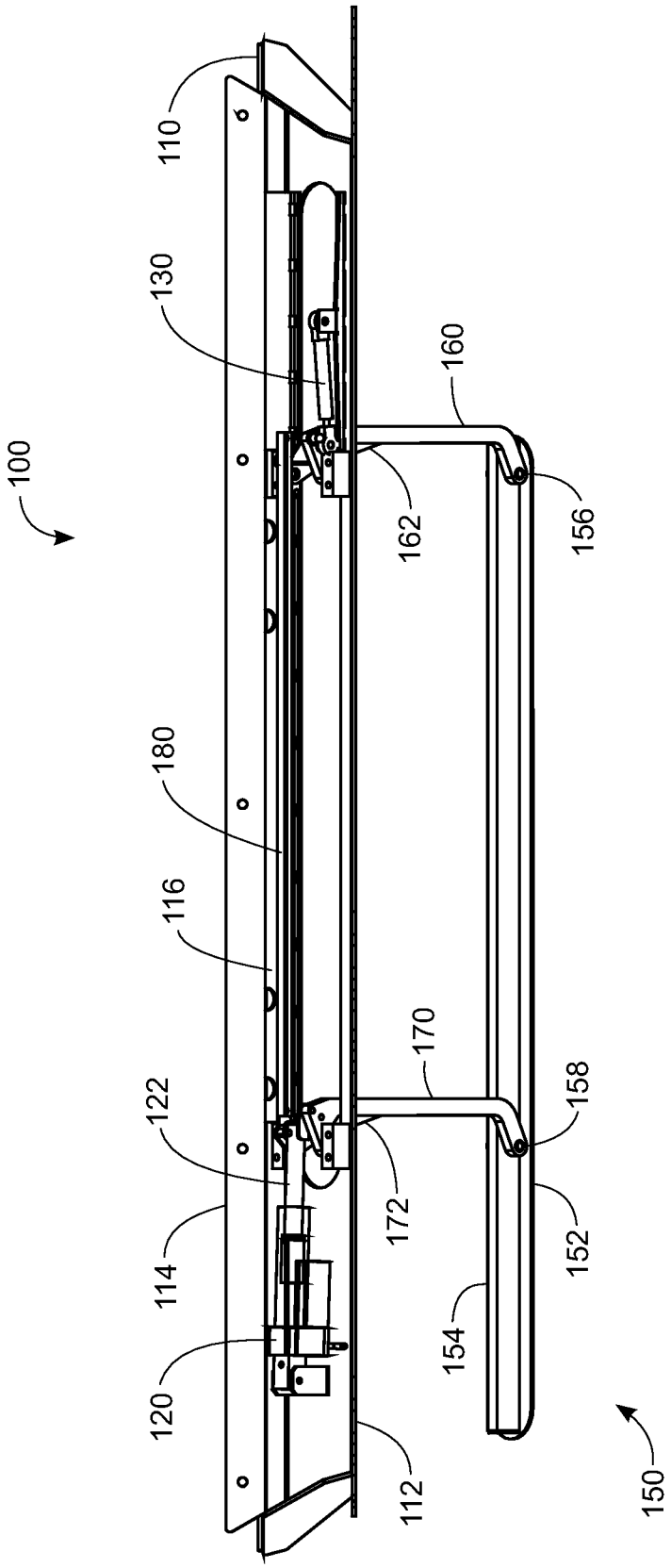
100
110
130
160
162
156
180
116
170
122
158
172
114
152
154
120
112
150

FIG. 4

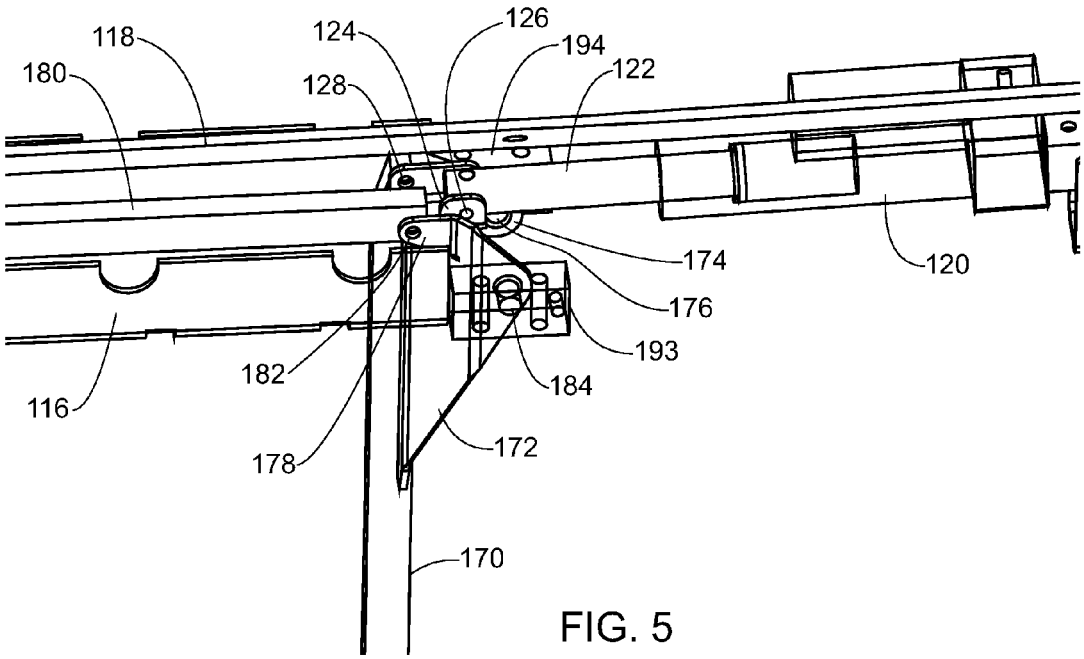
118
124
126
194
180
128
122
174
120
176
193
182
184
116
178
172
170

FIG. 5

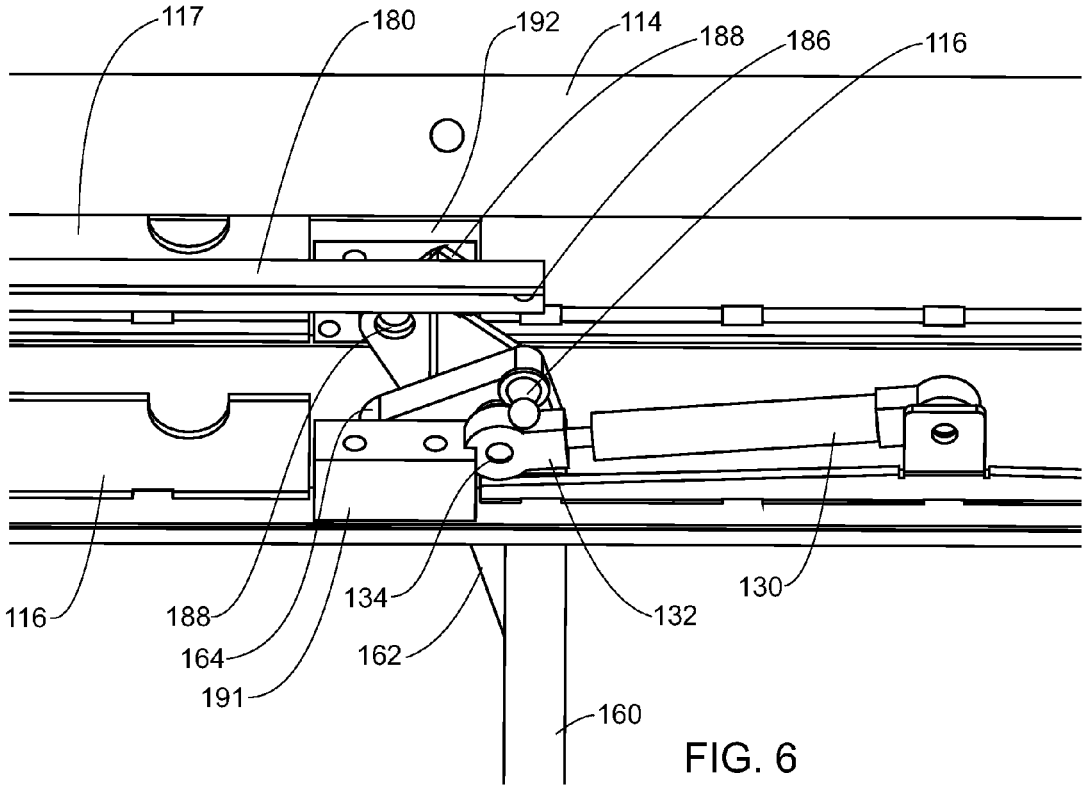
117
180
192
114
188
186
116
116
188
134
132
130
164
162
191
160

FIG. 6

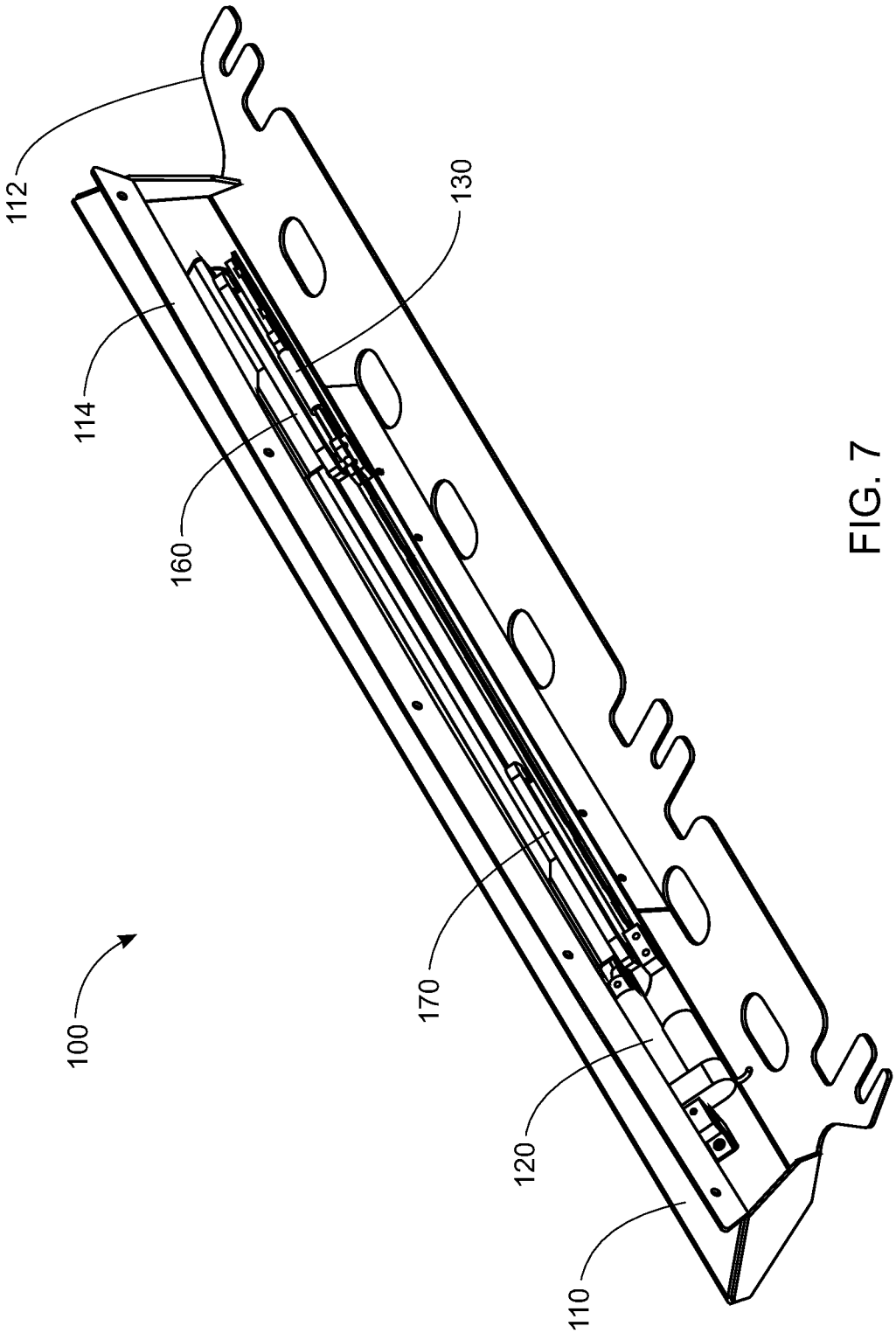

FIG. 7

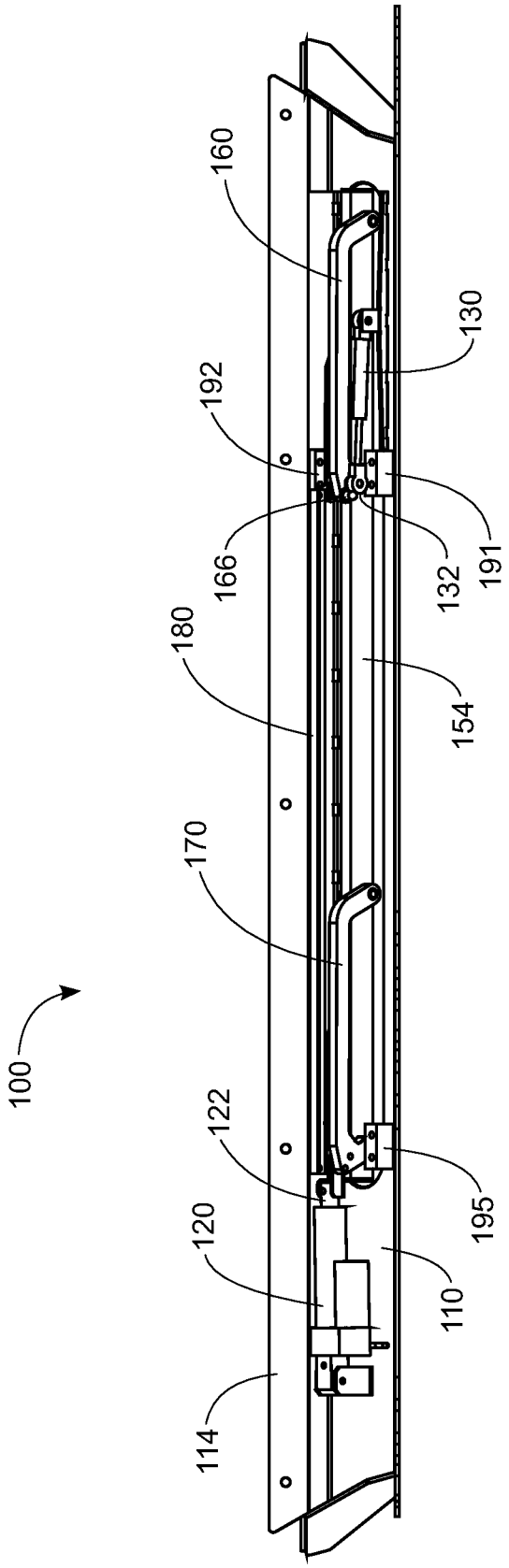

FIG. 8

ROBUST ROCKER GUARD WITH AUTOMATIC STEP

FIELD

This application relates generally to vehicle accessories, and particularly to accessories for sport utility vehicles and other off-road vehicles.

BACKGROUND

Off-road driving is growing in popularity. Places with off-road trails such as Moab, Utah have become very popular vacation destinations for people with off-road vehicles such as Jeeps®, SUVs, rock crawlers, trucks, and other off-road vehicles. Many thousands of off-roading destination miles invite those who want to get away from civilization. For example, tens of thousands of vehicles are driven on Moab's many off-road trails each year. Off-road destinations like Moab offer a variety of trails with varying difficulties. Some trails cannot be navigated without vehicle modifications to allow for greater grip, clearance, power, braking power, etc.

As such, many vehicles used off-road are modified to achieve greater off-road performance and to allow the vehicle to conquer and attempt difficult obstacles and trails. Some trails include rock obstacles that may come into contact with various parts of the underside of a vehicle. Running boards and rocker guards are often added to off-road vehicles to limit damage to rocker panels and other body panels by the rock obstacles. Another common modification is lifting the vehicle and adding larger wheels and tires to increase grip and clearance. Lifting the vehicle makes entering and exiting more difficult, requiring passengers to climb up into the vehicle with significant effort.

One solution to facilitating easy entry and exit from a lifted vehicle is an automatic step, such as the Powerstep offered by AMP research. However, such products are significantly more vulnerable to damage from contact with rock obstacles than fixed running boards and rocker guards, making it impractical to use vehicles equipped with automatic steps on more difficult off-road trails and obstacles, limiting the utility of the lifted vehicle. Such automatic steps also make it difficult or impossible to protect rocker panels with fixed running boards and rocker guards, lessening the off-road utility of vehicles equipped with automatic steps.

SUMMARY

Rocker guards with automatic step are disclosed that provide robust protection from damage due to rock obstacles to rocker panels and also provide an automatic step to facilitate easy entry and exit from a lifted vehicle. Some embodiments of a rocker guard with automatic step for a vehicle (rocker) can include a body formed to protect rocker panels of a vehicle, a step located within the body when the step is in a retracted position, mounts attached to the body for attaching to a vehicle, and an actuator coupled to the step and the body, the actuator being configured to automatically lower the step out of the body to an extended position and retract the step to the retracted position.

The guard can also include a dampener operably coupled to the body and the step. The dampener may be configured to hold at least a portion of the step in the retracted position. The guard can be a linear actuator such as a hydraulic actuator, pneumatic actuator, or any other suitable actuator. Guard **100** may also include door sensor **12**, **14** configured to signal the step to automatically extend to the extended position when door sensor **12**, **14** indicates an open door and automatically retract the step to the retracted position when the door sensor indicates a closed door.

The guard can also include at least two support legs coupling the step to the body. A tie rod operably connecting the at least two support legs to each other may be provided such that force applied to one support leg results in movement of each other support leg. Each of the at least two support legs may have a fixed length and be each rotationally coupled to the step and to the body. The at least two support legs can extend the step to the extended position by rotating about axis perpendicular to the length of the step.

A bottom surface of the step may be formed to provide a continuous surface appearance with the body when the step is in the retracted position. Each of the support legs may include a structural reinforcement to resist bending of the support legs when a load is placed on the step. The body and step may form the general shape of a rocker guard when the step is in the retracted position.

The guard may also include at least one attachment flange extending from the body along the entire length of the body and structural supports affixed to an inside surface of the body. The guard may be configured such that the rocker guard with automatic step can support the weight of a vehicle over a rock obstacle without damaging the functionality of the step.

BRIEF DESCRIPTION OF THE DRAWINGS

The following description can be better understood in light of Figures, in which:

FIG. **1** is a drawing of an exemplary rocker guard with automatic step in a retracted position;

FIG. **2** is a drawing of an exemplary rocker guard with automatic step in an extended position;

FIG. **3** is a side view of the rocker guard with automatic step of FIG. **2**;

FIG. **4** is a back view with partial cut-away of the rocker guard with automatic step of FIG. **2**;

FIG. **5** is close-up view with partial cut-away of a portion of the rocker guard with automatic step of FIG. **2**;

FIG. **6** is a close up view with partial cut-away of a portion of the rocker guard with automatic step of FIG. **2**;

FIG. **7** is a rear perspective view with partial cut-away of the rocker guard with automatic step of FIG. **1**; and

FIG. **8** is a rear view with partial cut-away of the rocker guard with automatic step of FIG. **1**.

Together with the following description, the Figures demonstrate and explain the principles of rocker guards with automatic step and methods for using and employing them. In the Figures, the size, number and configuration of components may be exaggerated for clarity. In some Figures, components have been omitted to allow for illustration of internal components. The same reference numerals in different Figures represent the same component.

DETAILED DESCRIPTION

The following description supplies specific details in order to provide a thorough understanding. Nevertheless, the skilled artisan would understand that embodiments of rocker guards with automatic step and associated methods of using them can be implemented and used without employing these specific details. Indeed, exemplary embodiments and associated methods can be placed into practice by modifying the illustrated units and associated methods and can be used in conjunction with any other devices and techniques conven-

tionally used in the industry. For example, while the description below generally focuses on an embodiment with two support legs, more than two legs may be used for longer vehicles such as pickup trucks and large SUVs.

One exemplary embodiment of a rocker guard with automatic step (guard) **100** is illustrated in FIGS. **1-8**. Guard **100** may include a body with a first integrally formed step (see FIGS. **7** & **3**) **110**, a second step **150**, and support legs **160**, **170**. Guard **100** can be attached to vehicle **10** with mounts **112** and **114**. Each of mounts **112**, **114** may be formed as part of body **110**, or may be attached to body **110** by welding or other fastening methods. Mounts **112** and **114** may extend along generally the entire length of body **110** to provide multiple attachment points to attach guard **100** to vehicle **10**.

Additionally, mounts **112**, **114** may extend from body **110** to provide additional structural support to resist bending. Mounts **112**, **114** along with body **110** may also provide additional structural support to a frame of vehicle **10** with multiple attachment points, or continuous attachment when welded to the frame, by effectively increasing the maximum dimensions for loading of the frame or body where guard is attached. Vehicle **10** can thereby gain frame stiffness, improving off-road capability and potentially reducing the advent of stress and fatigue failure in various parts of vehicle **10**.

Step **150** may include bottom plate **152** and step member **154**. Step **150** may be pivotably attached to support legs **160**, **170** by pins **156**, **158** respectively, allowing step **150** to remain parallel with body **110** as support legs **160**, **170** extend between a retracted position, such as is shown in FIGS. **1**, **7**, and **8**, and an extended position as shown in FIGS. **2-6**. Step **150** may extend downwardly and laterally from body **110** and vehicle **10** to provide a step extended laterally from vehicle **10** to facilitate entry and exit of passengers. In some embodiments, step **150** can extend directly down. Similarly, step **150** may extend to any desired point by adjusting the length and angle of the various components, as will be apparent to one of ordinary skill. In various embodiments, step **150** is configured as a stirrup step, having front and back openings above and adjacent to step member **154**.

Step member **154** may include a textured surface to provide slip resistant properties for people entering and exiting vehicle **10**. The textured surface may be machined or otherwise formed into the step surface of step member **154**, or may be in the form of grip tape, textured paint or adhesive, or any other slip resistant applied materials.

Bottom plate **152** may be formed such that a continuous surface is displayed with body **110** and step **150** when step **150** is fully retraced in the retracted position, such as shown in FIG. **1**. As also shown in FIG. **1**, in the fully retracted position, step **150** may be positioned entirely within body **110**, with bottom plate showing to the exterior of body **110**. In some embodiments, Bottom plate **152** may be the entire visible portion, or some portion of body **110** such that it appears that all or a significant portion of guard **100** lowers to be step **150** when extended. For example, step **150** may include the bottom exterior half of guard **100** as seen from outside of vehicle **10**.

Step **150** can be extended and retracted by actuator **120**. Actuator **120** may be a linear actuator such as a pneumatic or hydraulic cylinder and rod **122**. In some embodiments, an electric motor, solenoid, or other type of actuator may be used as desired. Of course, any of several actuator types may be used to extend and retract step **150**. In the illustrated embodiments, actuator **120** is pivotably mounted to body **110**, with rod **122** attached to structural reinforcement **172**.

Support leg **170**, and similarly support leg **160**, may be formed with a fixed length and from a single piece of material. Support leg may be formed from steel, aluminum, carbon fiber, or any other suitable material. Support leg **170** can be rotatably attached to block **193**. Support leg **170** may rotate about pin **176**, which holds leg **170** to block **194**. Block **194** may be attached to body **110**. Pin **176** may be oriented perpendicular to the length of body **110** to allow step **150** to rotate away from body **110**.

Structural reinforcement **172** may provide additional support to resist bending and deflection of support leg **170**. Support reinforcement **172** may be attached to support leg **170** and block **193**. Support reinforcement may be welded or otherwise affixed to support leg **170** and pivotably attached to block **193** through pin **184**. Pin **184** and pin **176** may share a common axis to allow support leg **170** and support reinforcement **172** to rotate as a single unit about a single axis. Block **193** may be attached to body **110**.

Rod **122** may be attached to carrier **124** by pin **126**. Carrier **124** may be pivotably attached to support leg **170** by pin **128**. The axis of pin **128** can be offset from the axis of pin **176** such that when rod **122** is travels in and out of actuator **120**, support leg **170** rotates about pins **176** and **184**.

Tie rod **180** may connect leg **170** to leg **160** through support reinforcement **162**, which is connected to support leg **160** similar to the connection of support reinforcement **172** and support leg **170** as described above. Support leg **160** may be pivotably attached to block **191** by pin **164**, and support reinforcement **162** may be pivotably attached to block **192** by pin **188**, similar to the connection arrangement of blocks **193** and **194**, pins **176**, **184**, support leg **170**, and support reinforcement **172** described above. Tie rod **180** may transfer force from actuator **120** to support leg **160** such that support leg **160** and support leg **170** rotate in unison when actuator **120** is activated.

As best shown in FIGS. **1**, **3**, and **7**, body **110** is formed to encase and protect the means for operating the automatic step and the step's functionality when the body is attached to a vehicle. So, configured, the step and its components are protected from impact with obstacles such as rocks.

Dampener **130** may be attached between body **110** and support leg **160** to smooth operation of the retraction and extension of step **150**. Dampener **130** may be pivotably attached to support leg **160** through connector end **132** and pin **134**. As best shown in FIG. **6**, stop **166** may follow along an exterior contour of connector **132** such that when step **150** is fully extended to the extended position, stop **166** cannot travel further, providing a fixed travel limit for leg **160** and, thereby, to step **150**. Dampener **130** may provide additional force to hold leg **160** in a fully retracted position to maintain step **150** in the retracted position.

Additional reinforcement members such as reinforcements **117**, **118** can be provided with guard **100** to provide sufficient structural support to allow guard sufficient strength to protect vehicle **10** from rock obstacles. Guard **100** may be sufficiently strong to support the weight of vehicle **10** on a rock obstacle without damaging vehicle **10** or disrupting the functionality of step **150**. For example, on a difficult trail or obstacle, it may be necessary to for guard to slide along a rock or rock obstacle, supporting the weight of the vehicle on that side while the wheels on the opposite side move the vehicle along and past the obstacle.

The various components of guard **100** may be formed from any suitable material or combination of materials to achieve the structural and functional objectives as described above, such as steel, aluminum, carbon fiber, etc.

Of course, vehicle **10** may have a guard **100** on both the driver's and passenger's sides, with the components arranged to provide similar functioning on each side. Actuator **120** may

be activated with at least one sensor for detecting when a door above guard **100** is opened or closed. For example, a vehicle with a front and rear door over guard **100** can have sensors in both doors that activate actuator to extend step **150** when either door is open and retract step **150** when both doors are closed. Similarly, the sensor may be located only in the front door. The sensors can be a switch, optical sensor, or any other switch or sensor suitable to determine whether or not a door is opened or closed. Similarly, the actuator may utilize sensors already installed in the doors of vehicle **10**, such as are commonly provided in factory-built vehicles.

In addition to any previously indicated modification, numerous other variations and alternative arrangements can be devised by those skilled in the art without departing from the spirit and scope of this description, and appended claims are intended to cover such modifications and arrangements. Thus, while the information has been described above with particularity and detail in connection with what is presently deemed to be the most practical and preferred aspects, it will be apparent to those of ordinary skill in the art that numerous modifications, including, but not limited to, form, function, mariner of operation and use can be made without departing from the principles and concepts set forth herein. Also, as used herein, examples are meant to be illustrative only and should not be construed to be limiting in any manner.

The invention claimed is:

1. A rocker guard with automatic step for a vehicle, the rocker guard with automatic step comprising:

a body formed to protect rocker panels of a vehicle;

a first step integrally formed on the outside of the body;

a second step located within the body when the second step is in a retracted position, and further capable of extending to a position substantially below said body;

mounts attached to the body for fixedly attaching the body to a vehicle; and

an actuator coupled to the second step and the body, the actuator being configured to automatically lower the second step out of the body to an extended position and retract the second step to the retracted position.

2. The rocker guard with automatic step of claim **1**, further comprising a dampener operably coupled to the body and the second step.

3. The rocker guard with automatic step of claim **2**, wherein the dampener is configured to hold at least a portion of the second step in the retracted position.

4. The rocker guard with automatic step of claim **1**, wherein the actuator is a linear actuator.

5. The rocker guard with automatic step of claim **4**, wherein the actuator is a hydraulic actuator.

6. The rocker guard with automatic step of claim **4**, wherein the actuator is a pneumatic actuator.

7. The rocker guard with automatic step of claim **1**, further comprising a door sensor configured to signal the second step to automatically extend to the extended position with the door sensor indicates an open door and automatically retract the second step to the retracted position when the door sensor indicates a closed door.

8. The rocker guard with automatic step of claim **1**, further comprising at least two support legs coupling the second step to the body.

9. The rocker guard with automatic step of claim **8**, further comprising a tie rod operably connecting the at least two support legs to each other such that force applied to one support leg results in movement of each other support leg.

10. The rocker guard with automatic step of claim **9**, wherein the actuator is a single actuator and wherein the second step is configured to be moved between the extended position and the retracted position by the actuator.

11. The rocker guard with automatic step of claim **8**, wherein each of the at least two support legs have a fixed length and are each rotationally coupled to the second step and to the body.

12. The rocker guard with automatic step of claim **11**, wherein the at least two support legs extend the second step to the extended position by rotating about axis perpendicular to the length of the step.

13. The rocker guard with automatic step of claim **8**, wherein each of the support legs includes a structural reinforcement to resist bending of the support legs when a load is placed on the second step.

14. The rocker guard with automatic step of claim **1**, wherein a bottom surface of the second step is formed to provide a continuous surface appearance with the body when the second step is in the retracted position.

15. The rocker guard with automatic step of claim **1**, wherein the body and second step form the general shape of a rocker guard when the second step is in the retracted position.

16. The rocker guard with automatic step of claim **1**, further comprising at least one attachment flange extending from the body along the entire length of the body.

17. The rocker guard with automatic step of claim **1**, further comprising structural supports affixed to an inside surface of the body.

18. The rocker guard with automatic step of claim **1**, wherein the rocker guard with automatic step is configured such that the rocker guard with automatic step can support the weight of a vehicle over a rock obstacle without damaging the functionality of the step.

19. The rocker guard with automatic step of claim **1**, wherein the second step forms a stirrup step when extended.

20. The rocker guard with automatic step of claim **1**, wherein the body forms a barrier to encase means for extending the second step when the second step is retracted.

21. A rocker guard with automatic step for a vehicle, the rocker guard with automatic step comprising:

a body formed to protect rocker panels of a vehicle, the body having a first step integrally formed on the outside of the body and a plurality of integrally formed mounts for fixedly attaching the body to a vehicle, the body further being formed as a barrier to encase automatic step means;

a second step located within the body when the second step is in a retracted position, and further capable of extending to a position substantially below said body; and

an actuator coupled to the second step and the body, the actuator being configured to automatically lower the second step out of the body to an extended position and retract the second step to the retracted position.

* * * * *