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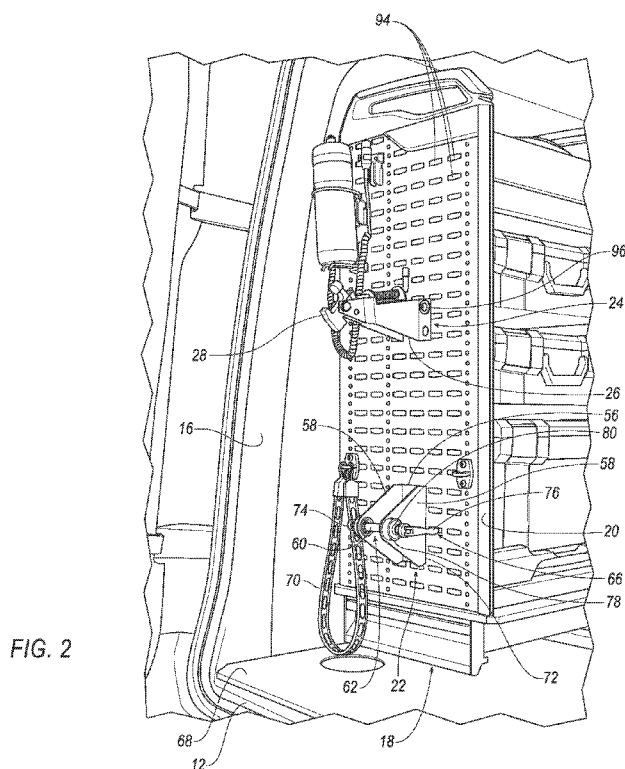
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[Continued on next page]

(54) Title: INTERNAL VEHICLE MOUNTING SYSTEM FOR A BICYCLE



(57) Abstract: A multi-modal trans-
portation system includes a vehicle and
a bicycle that may be transported and
stored in an interior of the vehicle. The
vehicle includes a compartment and a
bulkhead disposed in the compartment.
A bottom mount and a top mount are
mounted to the bulkhead. The top
mount includes a base mounted to the
bulkhead above the bottom mount and a
bracket rotatably coupled to the base. A
lock is supported on the base and is en-
gaged with the bracket. The bicycle is
releasably engaged with the bottom
mount and the bracket of the top mount.



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GW, KM, ML, MR, NE, SN, TD, TG).

INTERNAL VEHICLE MOUNTING SYSTEM FOR A BICYCLE

BACKGROUND

[0001] Bicycles are often transported with vehicles for use at various destinations. Packaging bicycles in or on a vehicle during transportation creates difficulties. An interior of a vehicle may be reconfigurable, e.g., seats may be folded, to accommodate a bicycle in the interior of the vehicle. However, the bicycle disadvantageously consumes valuable interior space of the vehicle and can disadvantageously move within the vehicle during unexpected acceleration or deceleration.

[0002] Bicycles can alternatively be stored on an exterior of a vehicle during transportation. For example, after-market racks are available for mounting to vehicles and supporting one or more bicycles. However, assembly of the after-market rack to the vehicle and assembly of the bicycle onto the rack is also disadvantageously physically strenuous and time consuming. Further, these after-market racks are expensive to purchase and disrupt airflow around the vehicle during travel, thereby disadvantageously decreasing fuel economy of the vehicle. These after-market racks may also leave the bicycle exposed to theft or vandalism. Accordingly, there remains an opportunity to design a system that easily and compactly stores bicycles in vehicles.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] Figure 1 is a perspective view a multi-modal transportation system including a vehicle and a bicycle disposed outside of the vehicle.

[0004] Figure 2 is a perspective view of a mounting system in an interior compartment of the vehicle including a bulkhead.

[0005] Figure 3A is a side view of a top mount of the mounting system in an unloading position.

[0006] Figure 3B is a side view of the top mount in a stowed position.

[0007] Figure 4 is a perspective view of the bicycle showing an orifice that receives the top mount.

[0008] Figure 5 is a perspective view of the bicycle in a folded position and supported on the mounting system and stowed in the vehicle.

[0009] Figure 6 is a perspective view of the vehicle with the bulkhead moved rearwardly in the vehicle to expose the bicycle, and with the bicycle partially unfolded and supported on the top mount and the bottom mount.

[0010] Figure 7 is a perspective view of the vehicle with the bicycle fully unfolded.

[0011] Figure 8 is a perspective view of the vehicle with the bicycle disengaged from the top mount and supported by the bottom mount.

[0012] Figure 9 is a perspective view of the bicycle disengaged from the vehicle.

[0013] Figure 10 is a schematic of an electrical connector and battery of the bicycle that is connectable with an electrical connector and battery of the vehicle.

DETAILED DESCRIPTION

[0014] With reference to the Figures, wherein like numerals indicate like parts throughout the several views, a multi-modal transportation system 10 including a vehicle 12 and a bicycle 14 is generally shown. The bicycle 14 may be stored and transported in the vehicle 12 and may be removed from the vehicle 12 for operation outside of the vehicle 12. The bicycle 14 outside of the vehicle 12 is shown in Figure 1.

[0015] With reference to Figure 2, the vehicle 12 defines an interior compartment 16 and a mounting system 18 disposed in the interior compartment 16 for storing the bicycle 14. The mounting system 18 includes a bulkhead 20 disposed in the interior compartment 16. A bottom mount 22 and a top mount 24 are mounted to the bulkhead 20 to support the bicycle 14 in the compartment 16 of the vehicle 12, as shown in Figures 6-10.

[0016] The bottom mount 22 and the top mount 24 may be mounted to the bulkhead 20 in any suitable location and in any suitable fashion. The bottom mount 22 and the top mount 24 may be selectively moveable along the

bulkhead 20 to fit bicycles 14 of varying size and configuration. For example, the bulkhead 20 may include a plurality slots 94 that receive a portion of the bottom mount 22 and/or the top mount 24. The bottom mount 22 and the top mount 24 may be moved to any suitable slot 94. The bottom mount 22 and the top mount 24 may also be fastened to the bulkhead 20 with a fastener 96.

[0017] The top mount 24 includes a base 26 mounted to the bulkhead 20 above the bottom mount 22 and includes a bracket 28 rotatably coupled to the base 26. With reference to Figures 3A and 3B, a lock 30 is supported on the base 26 and is engaged with the bracket 28. The bicycle 14 is releasably engaged with the bottom mount 22 and the bracket 28 of the top mount 24.

[0018] The bracket 28 may rotate relative to the base 26 between an unloading position, shown in Figure 3A, and a stowed position, shown in Figure 3B. With continued reference to Figures 2-3B, the bracket 28 may be connected to the base 26 with a pin 32, e.g., a threaded fastener, that extends through a pivot point of the bracket 28. Alternatively, the bracket 28 may be rotatably coupled to the base 26 in any suitable fashion.

[0019] The bracket 28 includes a finger 34 that extends upwardly and a second finger 36 spaced from the finger 34 and extending upwardly. As set forth further below, in the unloading position, the finger 34 and the second finger 36 may be positioned to allow the bicycle 14 to be assembled onto or disengaged with the bracket 28. In the stowed position, the finger 34 and the second finger 36 may be positioned to retain the bicycle 14 on the bracket 28. The finger 34 and the second finger 36 may, for example, extend generally vertically when the bracket 28 is in the stowed position to retain the bicycle 14 on the bracket 28, and may extend away from the bulkhead 20 in the unloading position to allow the bicycle 14 to be loaded onto and unloaded from the bracket 28.

[0020] One or both of the finger 34 and the second finger 36 may include a covering 38 for protecting the bicycle 14 as the bicycle 14 is loaded onto and unloaded from the bracket 28. The finger 34 and the second finger 36 may extend in parallel with each other, as shown in the figures.

[0021] The bracket 28 may include a locking feature (not shown) for locking the bicycle 14 to the bracket 28. The locking feature may be locked/unlocked with a

mechanical key or combination, electronic key or combination, a proximity sensor, etc.

[0022] With continued reference to Figures 3A-B, the lock 30 may include the pin 32 supported by the base 26 and a spring 40 urging the pin 32 toward the bracket 28. Specifically, the pin 32 may be moved between the locked position, as shown in Figure 3B, and an unlocked position, as shown in Figure 3A. The base 26 may, for example, include eyelets 42 through which the pin 32 extends. The pin 32 is slideably engaged with the eyelets 42 for sliding between the locked and unlocked positions. In other words, at rest, the spring 40 biases the pin 32 toward the locked position. An operator may slide the pin 32 against the bias of the spring 40 from the locked position to the unlocked position.

[0023] The spring 40 may be disposed about the pin 32 between the eyelets 42. The spring 40 may be, for example, a coil spring. The pin 32 may include a straight portion engaged with the eyelets 42 and a handle portion extending from the straight portion. A retainer 44 may extend from the pin 32 and engage the spring 40. The handle portion may be grasped by the operator to slide the pin 32 through the eyelets 42 away from the bracket 28 to move the pin 32 to the unlocked position so that the bracket 28 may freely pivot relative to the base 26 about the pivot point.

[0024] In the locked position, the pin 32 retains the bracket 28 in the stowed position. In the unlocked position, the pin 32 is disengaged with the bracket 28 and allows the bracket 28 to move between the stowed position and the unloading position.

[0025] The bracket 28 may define a recess 46 receiving the pin 32 in the locked position when the bracket 28 is in the stowed position, as shown in Figure 3A. The recess 46 is configured to receive the pin 32 when the bracket 28 is in the stowed position. When the pin 32 is disposed in the recess 46, the pin 32 prevents the bracket 28 from pivoting from the stowed position to the unloading position. Specifically, the bracket 28 includes a locking surface 48 extending along the recess 46. The locking surface 48 engages the pin 32 in the locked position. The finger 34 may extend transversely to the locking surface 48. Specifically, the

finger 34 may extend perpendicularly to the locking surface 48, as shown in the figures.

[0026] With reference to Figure 3B, the bracket 28 may define another recess 98 receiving the pin 32 in the locked position when the bracket 28 is in the unloading position. The recess 98 is configured to receive the pin 32 when the bracket 28 is in the unloading position. When the pin 32 is disposed in the recess 98, the pin 32 prevents the bracket 28 from pivoting from the stowed position to the unloading position. Specifically, the bracket 28 includes a locking surface 99 extending along the recess 98. The locking surface 99 engages the pin 32 in the locked position. The finger 34 may extend transversely to the locking surface 99.

[0027] With reference to Figure 4, the bicycle 14 may define an orifice 50 for receiving the finger 34 when the bicycle 14 is loaded onto the bracket 28. The orifice 50 may, for example, be defined in a fork 52 of the bicycle 14. When the finger 34 is engaged in the orifice 50, the second finger 36 may abut a front surface 54 of the fork 52 to pinch the fork 52 between the finger 34 and the second finger 36. The bracket 28 may include a retention device (not shown), e.g., a set screw, a strap, etc., for retaining the bicycle 14 to the bracket 28. The front surface 54 of the fork 52 may include a hole (not shown) and/or other feature (not shown) that engages the pin 32 when the pin is in the locked position.

[0028] The bottom mount 22 and the top mount 24 are fixed to the bulkhead 20 and are fixed relative to each other along the bulkhead 20. With reference to Figure 2, the bottom mount 22 may include a mounting base 72 supported on the bulkhead 20 and a releasable lock 62 supported on the mounting base 72.

[0029] The mounting base 72 includes a spine 56 and two sides 58 extending from the spine 56. The mounting base 72 may be fixed to the bulkhead 20 in any suitable fashion.

[0030] The lock 62 may releasably lock the fork 52 of the bicycle 14 to the bottom mount 22. The lock 62 may be of the type referred to in industry as a “bicycle wheel quick release.” Specifically, the lock 62 may include a rod 64 that is supported on the mounting base 72 and receives the fork 52 of the bicycle 14.

[0031] A cammed handle 66 may be fixed to one end of the rod 64 and a threaded cap 74 may be fixed to the other end of the rod 64. The rod 64 may be

inserted into holes (not numbered) in the sides 58 of the mounting base 72, and the rod 64 may be threadedly engaged with the threaded cap 74 with the sides 58 between the cammed handle 66 and the threaded cap 74, as shown in Figure 2.

[0032] The cammed handle 66 may include a lever 76 and an end cap 78. The lever 76 is configured to move the end cap 78 toward the threaded cap 74 when the lever 76 is rotated. In operation, the fork 52 of the bicycle 14 may be supported on the rod 64. The threaded cap 74 may then be tightened by hand to pinch the fork 52 between the sides 58 of the mounting base 72. The lever 76 may then be rotated relative to the rod 64 to tighten the pinch of the fork 52 between the sides 58 of the mounting base 72. In other words, the cammed handle 66 may be pivoted about a pivot point to pinch the sides 58 toward each other to pinch the fork 52 therebetween.

[0033] The lock 62 may include springs 80 for urging the sides 58 of the mounting base 72 away from the fork 52 when the lever 76 is loosened. The springs 80 may be supported on the rod 64. The springs 80 may be, for example, coil springs.

[0034] The bulkhead 20 may be slideably engaged with a floor 68 of the vehicle 12. Specifically, the floor 68 may define tracks 82 that the bulkhead 20 engages such that the bulkhead 20 may move forward and rearward in the vehicle 12 for loading, unloading, and storing the bicycle 14. The bulkhead 20 may be selectively locked along the tracks 82.

[0035] The bulkhead 20 may include one or more straps 70 for engaging the bicycle 14. The strap 70 may have a fixed end fixed to the bulkhead 20 and a free end that may be wrapped around the bicycle 14 and engaged with the bulkhead 20 or another component of the vehicle 12 to retain the bicycle 14 in the compartment 16.

[0036] The mounting system 18 may be configured to lift and store the bicycle 14. In the configuration where the bicycle 14 is an electric bicycle 14, the mounting system 18 may charge the electric bicycle 14 while the electric bicycle 14 is mounted to the mounting system 18, as set forth further below. The bicycle 14 may be manually engaged with the bottom mount 22 and the top mount 24. The mounting system 18 may also include lift assistance, e.g., a motor

(not shown), belts (not shown), etc., for assisting an operator in lifting the bicycle 14 onto the bottom mount 22 and/or the top mount 24.

[0037] The vehicle 12 may include two bulkheads 20 arranged side-by-side in the compartment 16 such that each bulkhead 20 may support a separate bicycle 14. Alternatively, the vehicle 12 may include any suitable number of bulkheads 20 for storing any suitable number of bicycles.

[0038] As shown in Figures 5-9, the bicycle 14 may be foldable, as shown. The bicycle 14 of the Figures may be foldable, for example, in a similar fashion as the non-electric bicycle 14 commercially available from Dahon North America Inc. under the tradename Jifo. However, the bicycle 14 may be foldable in any suitable way. In the configuration where the bicycle 14 is foldable, the bicycle 14 may include a front portion and a rear portion that are foldable about a pivot point. For example, the bicycle 14 is shown unfolded in Figure 1 and is shown folded in Figure 6.

[0039] As set forth above, the bicycle 14 may be electrically powered. For example, with reference to Figure 10, the bicycle 14 may include a battery 82 and a motor 84. The bicycle 14 may include an electrical connector 86 in communication with the battery 82 and may be used to charge the battery 82. For example, the electrical connector 86 may be connected with an electrical connector 88 of the vehicle 12. The electrical connector 88 of the vehicle 12 may be supported on the bracket 28 on the top mount 24 and the electrical connector 86 of the bicycle 14 may be supported in the orifice 50 of the bicycle 14 when the bicycle 14 is mounted to the bracket 28. In such a configuration, the connection between the electrical connector 86 and the electrical connector 88 may be automatic when the bracket 28 is positioned in the orifice 50.

[0040] With continued reference to Figure 10, the vehicle may include a bicycle interface module 93 in communication with the electrical connector 88. The bicycle interface module 93 may be connected to a communication bus of the vehicle 12, such as a controller area network (CAN) bus 93. The bicycle 14 may be in communication with components of the vehicle 12 through the CAN bus 93. For example, through the electrical connector 88 and the bicycle interface module 91, components of the vehicle 12 may diagnose charge level in the

battery 82 of the bicycle 14, may sense presence of the bicycle 14 being connected to the electrical connector 88, etc.

[0041] Information from the bicycle interface module 91 may be displayed on a human-machine interface 95. The human-machine interface 95 may be, for example, displayed on an instrument panel of the vehicle 12. Information from the bicycle interface module 91 may be shared with other modules of the vehicle 12 for use to, for example, balance power demand across the vehicle 12, e.g., for quickly charging one of multiple bicycles 14 mounted to the vehicle 12 and/or for simultaneous charging of multiple bicycles 14 mounted to the vehicle 12 without exceeding current limits on any one part of a high voltage network of the vehicle or overly reducing power supplied to other components of the vehicle, e.g., heated seats, window defroster, etc.

[0042] The electrical connector 88 of the vehicle 12 may be in communication with a battery 90 of the vehicle 12. The battery 90 of the vehicle 12 may charge the battery 82 of the bicycle 14 through the electrical connectors 86, 88. The electrical connector 86 and the electrical connector 88 may be of any suitable type.

[0043] As shown in Figure 5, the bicycle 14 may be folded and engaged with the mounting system 18 in the compartment 16 of the vehicle 12. In Figure 5, the bulkhead 20 is moved forwardly along the tracks 82 to fit the bicycle 14 in the compartment 16. The strap 70 is wrapped around the bicycle 14 to hold the bicycle 14 to the bulkhead 20. The bottom of the fork 52 of the bicycle 14 is engaged with the bottom mount 22 and the top of the fork 52 of the bicycle 14 is engaged with the top mount 24. The bracket 28 of the top mount 24 is in the stowed position and the lock 62 is in the locked position.

[0044] In Figure 6, the bulkhead 20 is moved rearwardly along the track to expose the bicycle 14. The wheels 92 of the bicycle 14 are supported on the bulkhead 20. In Figure 7, the bicycle 14 is partially unfolded and supported by the bottom mount 22 and the top mount 24 of the bulkhead 20. In Figure 8, the bicycle 14 is fully unfolded and the rear wheel 92 is engaged with the bicycle 14 while the bicycle 14 is supported on the bottom mount 22 and the top mount 24.

[0045] In Figure 8, the lock 62 has been moved to the unlocked position, the bracket 28 has been moved to the unloading position, and the fork 52 of the bicycle 14 is removed from the top bracket 28. The rear wheel 92 of the bicycle 14 is supported on the ground and the fork 52 of the bicycle 14 is mounted to the bottom mount 22. In Figure 9, the fork 52 is disengaged with the bottom mount 22 and the front wheel 92 is engaged with the fork 52. In this configuration, the bicycle 14 is operational to be driven to locations remote from the vehicle 12. When the bicycle 14 returns to the vehicle 12, the bicycle 14 may be stowed in the vehicle 12 by reversing the steps set forth above with reference to Figures 6-11.

[0046] The disclosure has been described in an illustrative manner, and it is to be understood that the terminology that has been used is intended to be in the nature of words of description rather than limitation. Many modifications and variations of the present disclosure are possible in light of the above teachings, and the invention may be practiced otherwise than as specifically described.

REPLACEMENT PAGE 1

**INTERNAL VEHICLE MOUNTING SYSTEM FOR A
BICYCLE****CROSS-REFERENCE TO RELATED APPLICATIONS**

[0001] The subject patent application claims priority to and all the benefits of U.S. Provisional Patent Application No. 62/121,872 filed on February 27, 2015, which is herein incorporated by reference in its entirety.

BACKGROUND

[0002] Bicycles are often transported with vehicles for use at various destinations. Packaging bicycles in or on a vehicle during transportation creates difficulties. An interior of a vehicle may be reconfigurable, e.g., seats may be folded, to accommodate a bicycle in the interior of the vehicle. However, the bicycle disadvantageously consumes valuable interior space of the vehicle and can disadvantageously move within the vehicle during unexpected acceleration or deceleration.

[0003] Bicycles can alternatively be stored on an exterior of a vehicle during transportation. For example, after-market racks are available for mounting to vehicles and supporting one or more bicycles. However, assembly of the after-market rack to the vehicle and assembly of the bicycle onto the rack is also disadvantageously physically strenuous and time consuming. Further, these after-market racks are expensive to purchase and disrupt airflow around the vehicle during travel, thereby disadvantageously decreasing fuel economy of the vehicle. These after-market racks may also leave the bicycle exposed to theft or vandalism. Accordingly, there remains an opportunity to design a system that easily and compactly stores bicycles in vehicles.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] Figure 1 is a perspective view a multi-modal transportation system including a vehicle and a bicycle disposed outside of the vehicle.

REPLACEMENT PAGE 1a

[0005] Figure 2 is a perspective view of a mounting system in an interior compartment of the vehicle including a bulkhead.

[0006] Figure 3A is a side view of a top mount of the mounting system in an unloading position.

[0007] Figure 3B is a side view of the top mount in a stowed position.

CLAIMS

What is claimed is:

1. A multi-modal transportation system comprising:
 - a vehicle including a compartment and a bulkhead disposed in the compartment;
 - a bottom mount mounted to the bulkhead;
 - a top mount including a base mounted to the bulkhead above the bottom mount and a bracket rotatably coupled to the base;
 - a lock supported on the base and engaged with the bracket; and
 - a bicycle releasably engaged with the bottom mount and the bracket of the top mount.
2. The system of claim 1 wherein the bracket includes a finger that extends upwardly.
3. The system of claim 2 wherein the bracket includes a second finger spaced from the finger and extending upwardly.
4. The system as set forth in claim 1 wherein the bottom mount and the top mount are fixed relative to each other.
5. The system as set forth in claim 1 wherein the lock includes a pin supported by the base and being movable relative to the base between a locked position engaged with the bracket and an unlocked position disengaged with the bracket.
6. The system as set forth in claim 5 wherein the bracket is rotatable between an unloading position and a stowed position, the bracket defining a recess configured to receive the pin in the locked position when the bracket is in the stowed position.

7. The system as set forth in claim 6 wherein the bracket defines another recess configured to receive the pin in the locked position when the bracket is in the unloading position.

8. The system as set forth in claim 5 wherein the lock includes a spring urging the pin toward the bracket.

9. The system as set forth in claim 5 wherein the bracket includes a first locking surface engaging the pin in the locked position when the bracket is in the stowed position, and another locking surface engaging the pin in the locked position when the bracket is in the unloading position.

10. The system as set forth in claim 9 wherein the bracket includes a finger that extends upwardly to engage the bicycle and wherein the first locking surface extends transversely to the finger.

11. The system as set forth in claim 10 wherein the bracket includes a second finger spaced from the finger and extending upwardly, the finger and the second finger being configured to receive a portion of the bicycle therebetween.

12. A bicycle mount comprising:
a base;
a bracket being configured to engage a bicycle, the bracket being rotatably coupled to the base and rotatable relative to the base between a stowed position and an unloading position; and
a lock supported on the base and engaged with the bracket.

13. The bicycle mount as set forth in claim 12 wherein the lock includes a pin supported by the base, the pin being movable relative to the base between a locked position engaged with the bracket and an unlocked position disengaged with the bracket.

14. The system as set forth in claim 13 wherein the bracket defines a recess configured to receive the pin in the locked position when the bracket is in the stowed position.

15. The system as set forth in claim 14 wherein the bracket defines another recess configured to receive the pin in the locked position when the bracket is in the unloading position.

16. The system as set forth in claim 13 wherein the lock includes a spring urging the pin toward the bracket.

17. The system as set forth in claim 13 wherein the bracket includes a locking surface engaging the pin in the locked position when the bracket is in the stowed position,

18. The system as set forth in claim 17 wherein the bracket includes a finger that extends upwardly to engage the bicycle and wherein the locking surface extends transversely to the finger.

19. The system as set forth in claim 18 wherein the bracket includes a second locking surface engaging the pin in the locked position when the bracket is in the unloading position.

20. The system as set forth in claim 10 wherein the bracket includes a second finger spaced from the finger and extending upwardly, the finger and the second finger being configured to receive a portion of the bicycle therebetween.

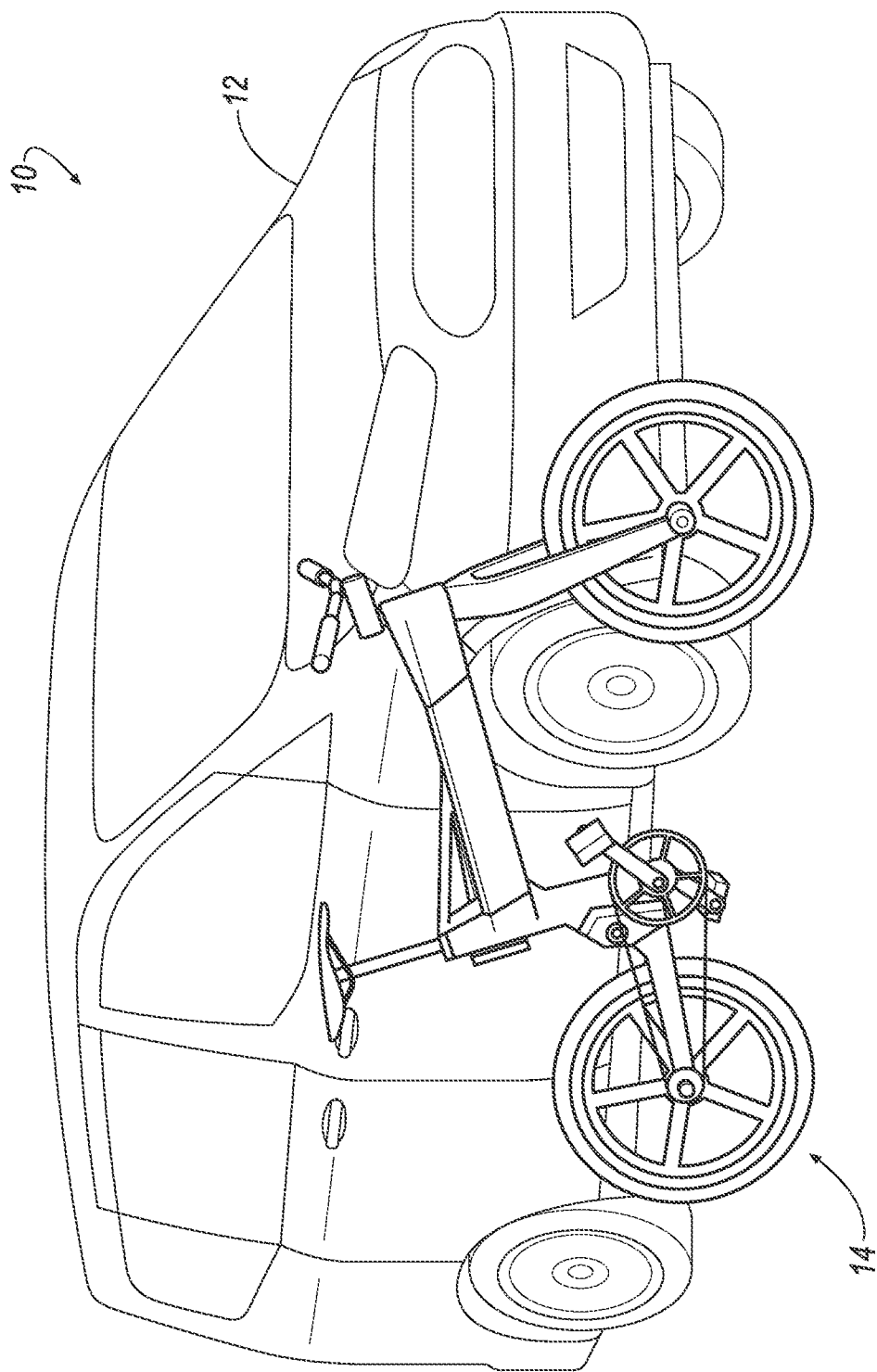


FIG. 1

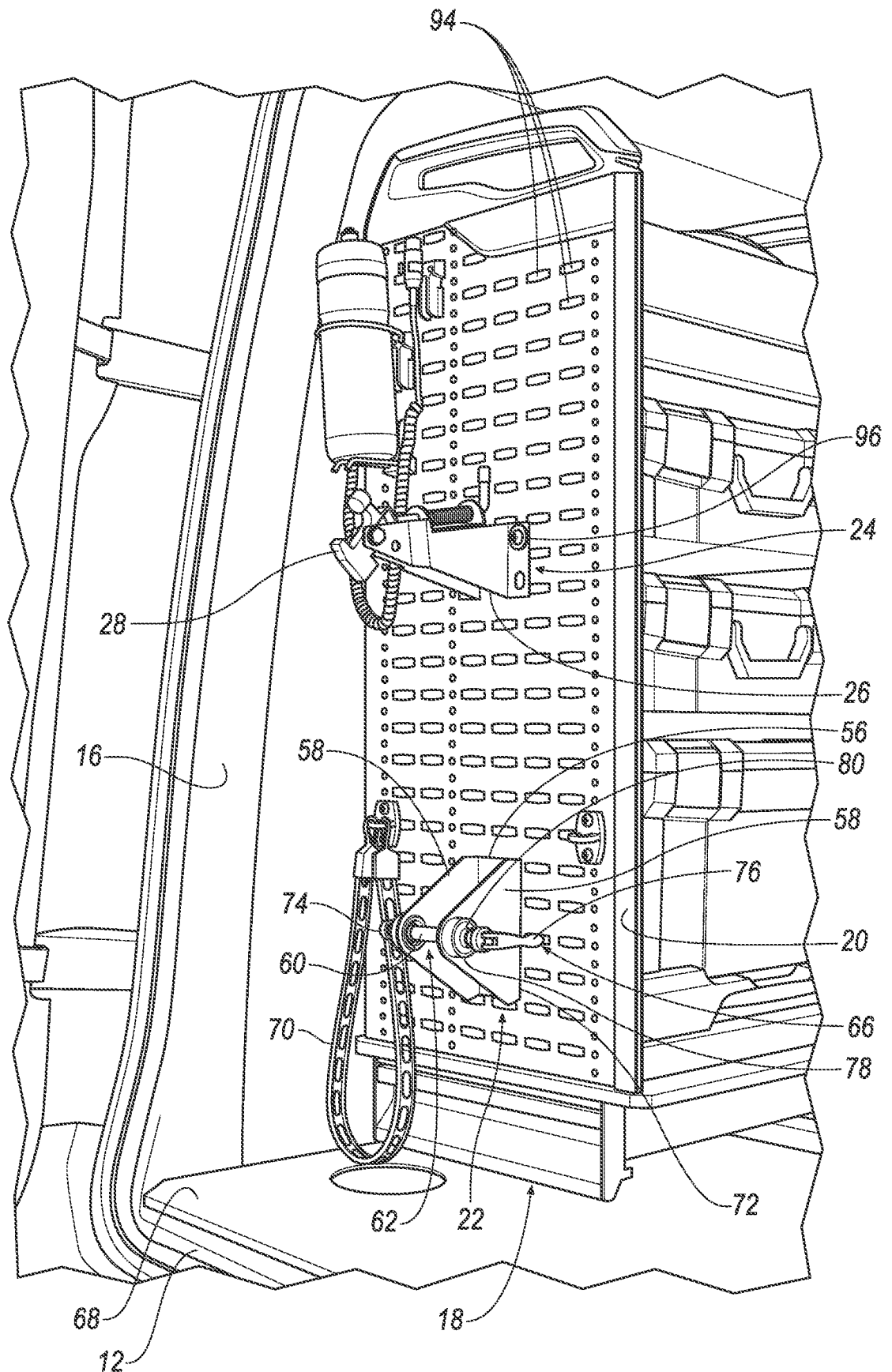


FIG. 2

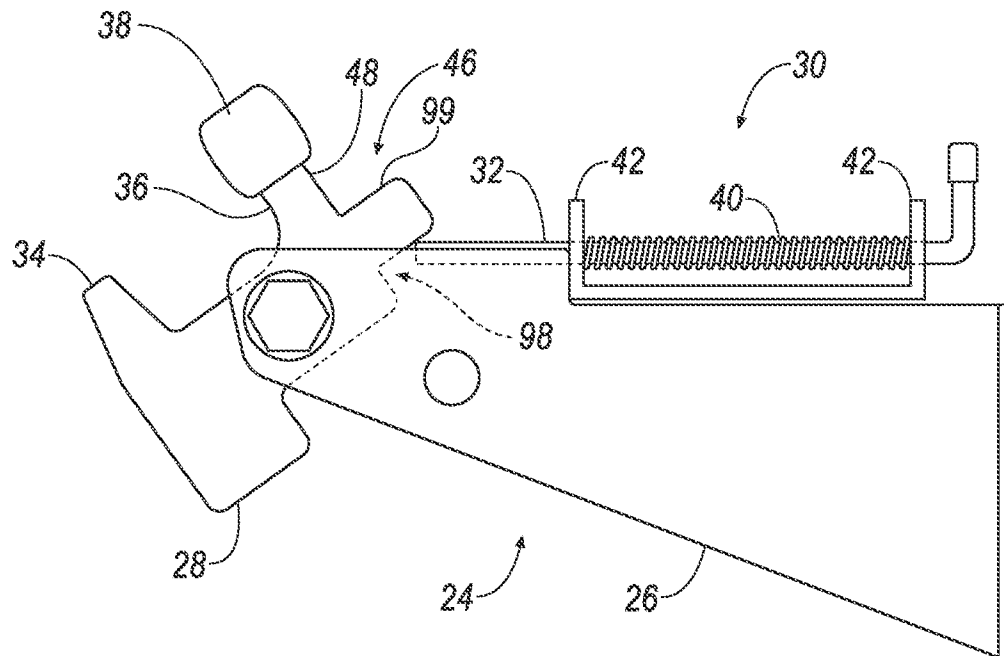


FIG. 3A

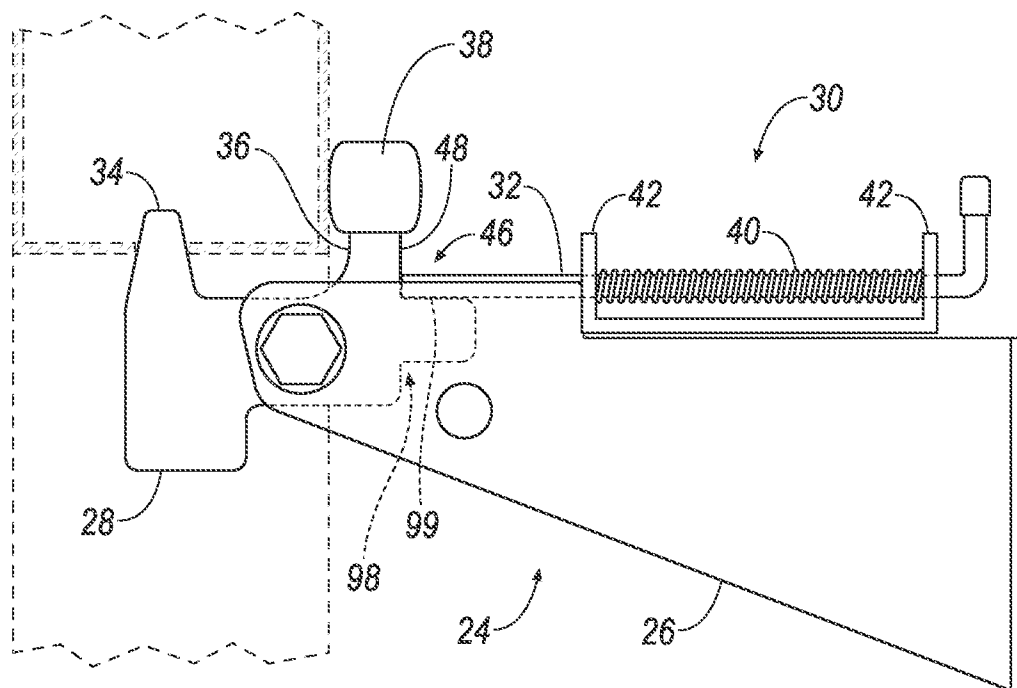
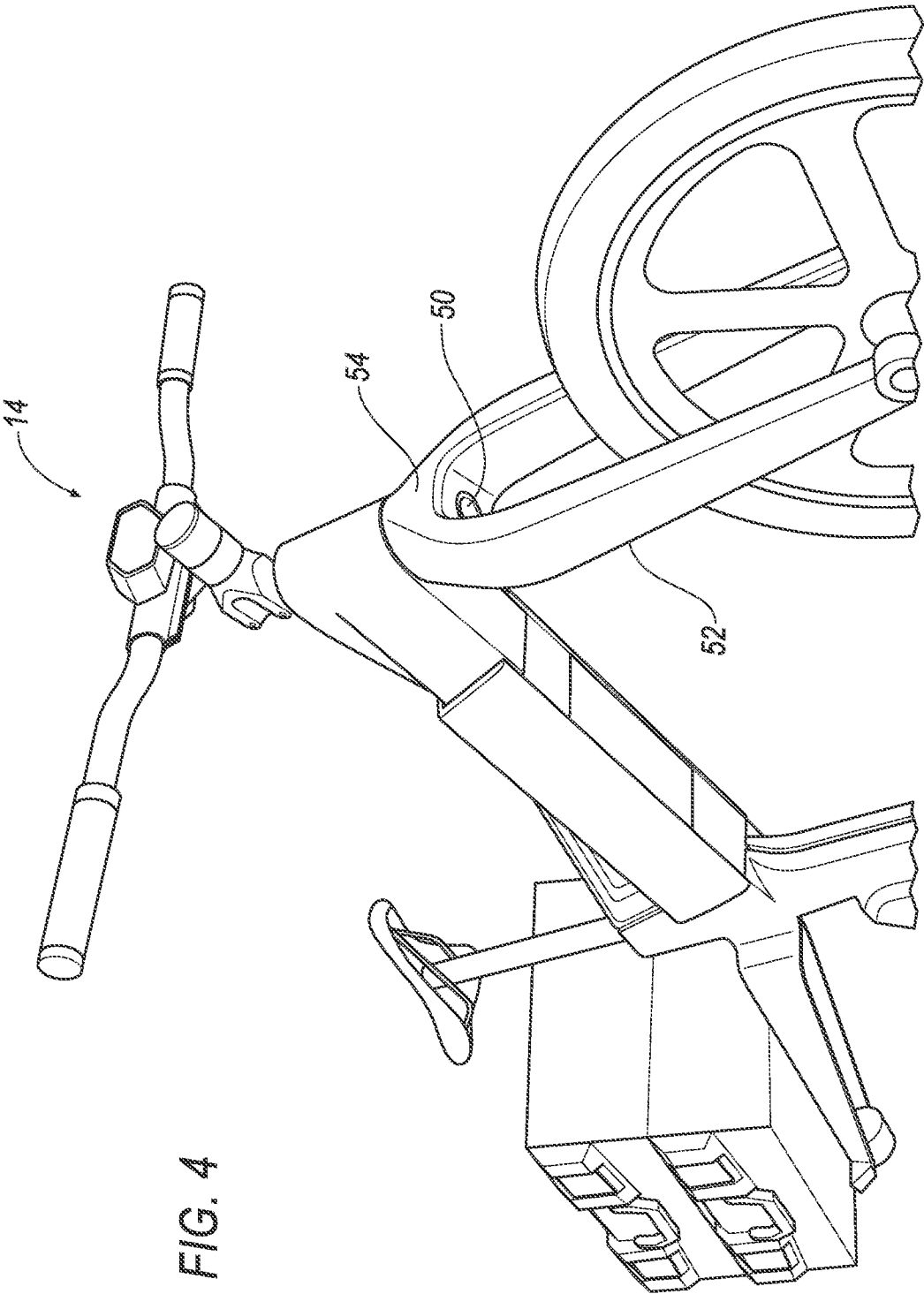


FIG. 3B



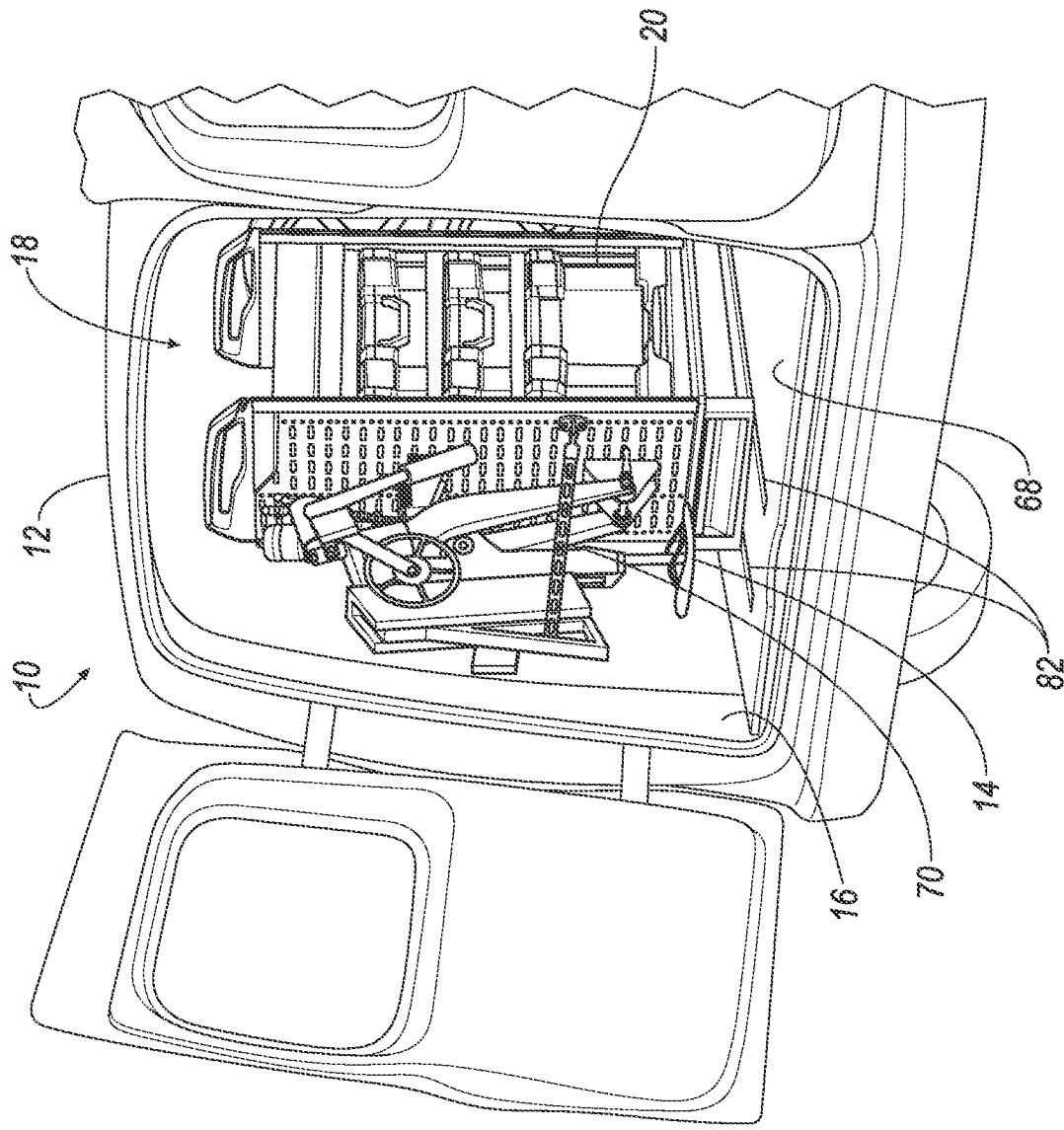


FIG. 5

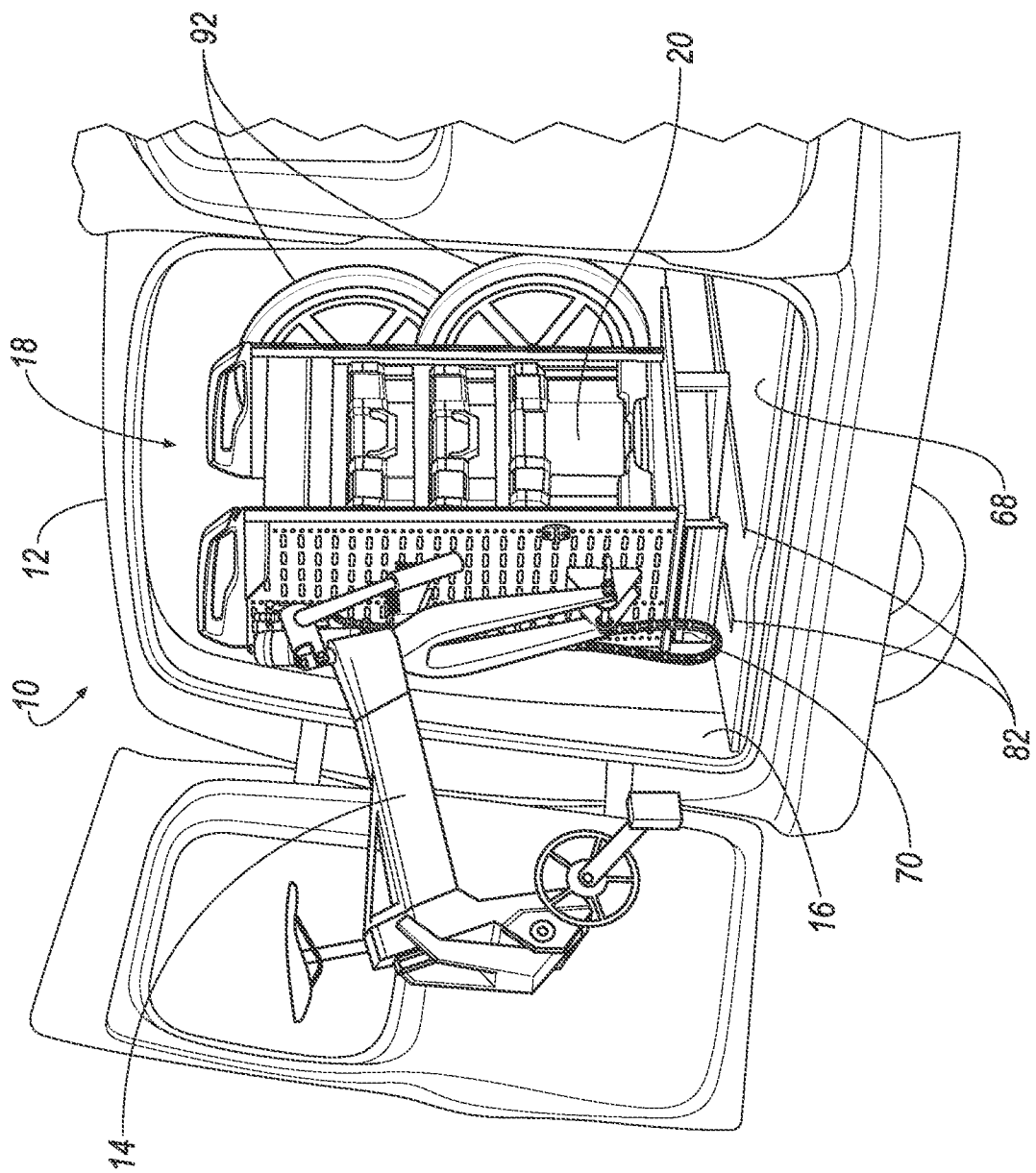


FIG. 6

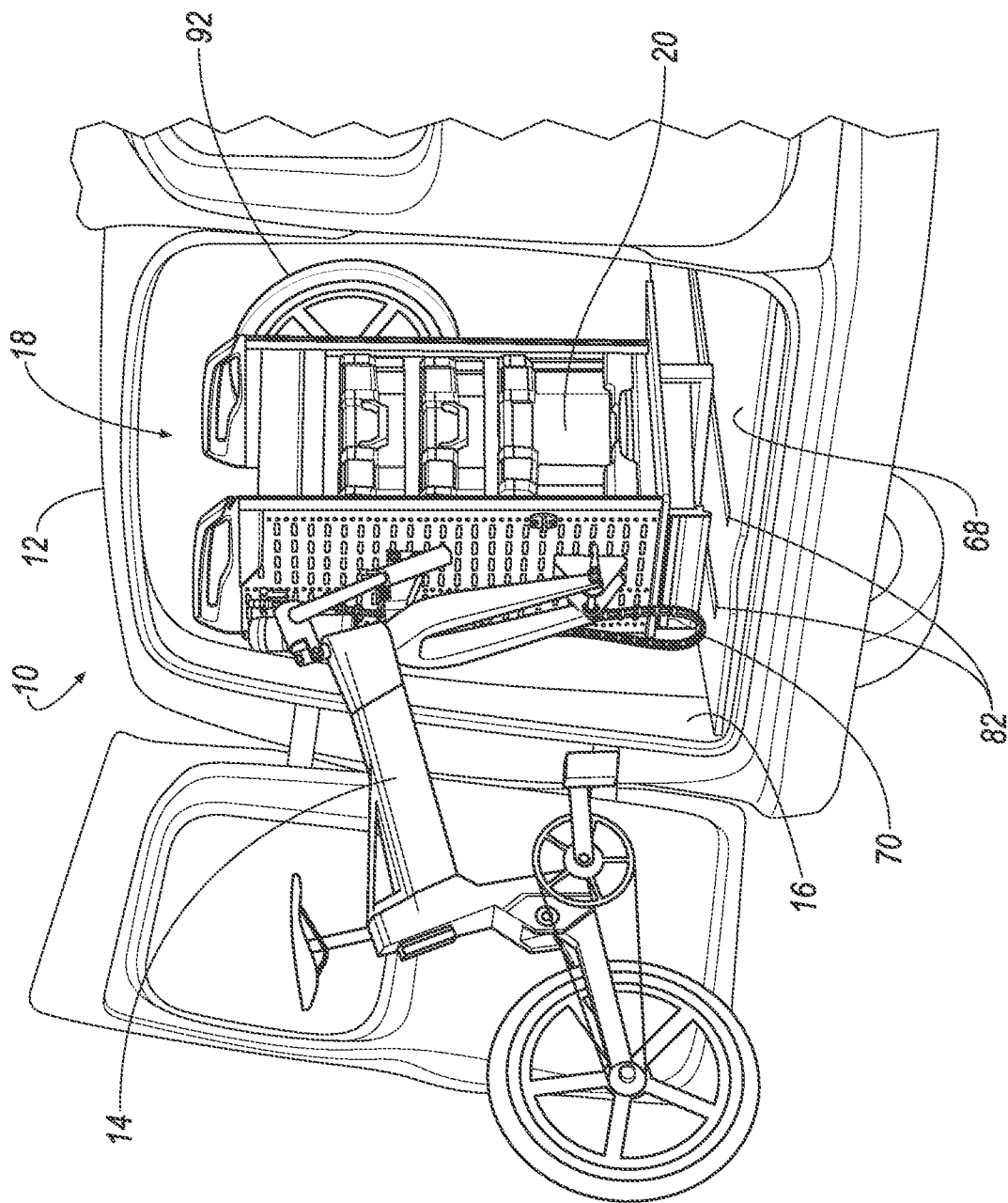


FIG. 7

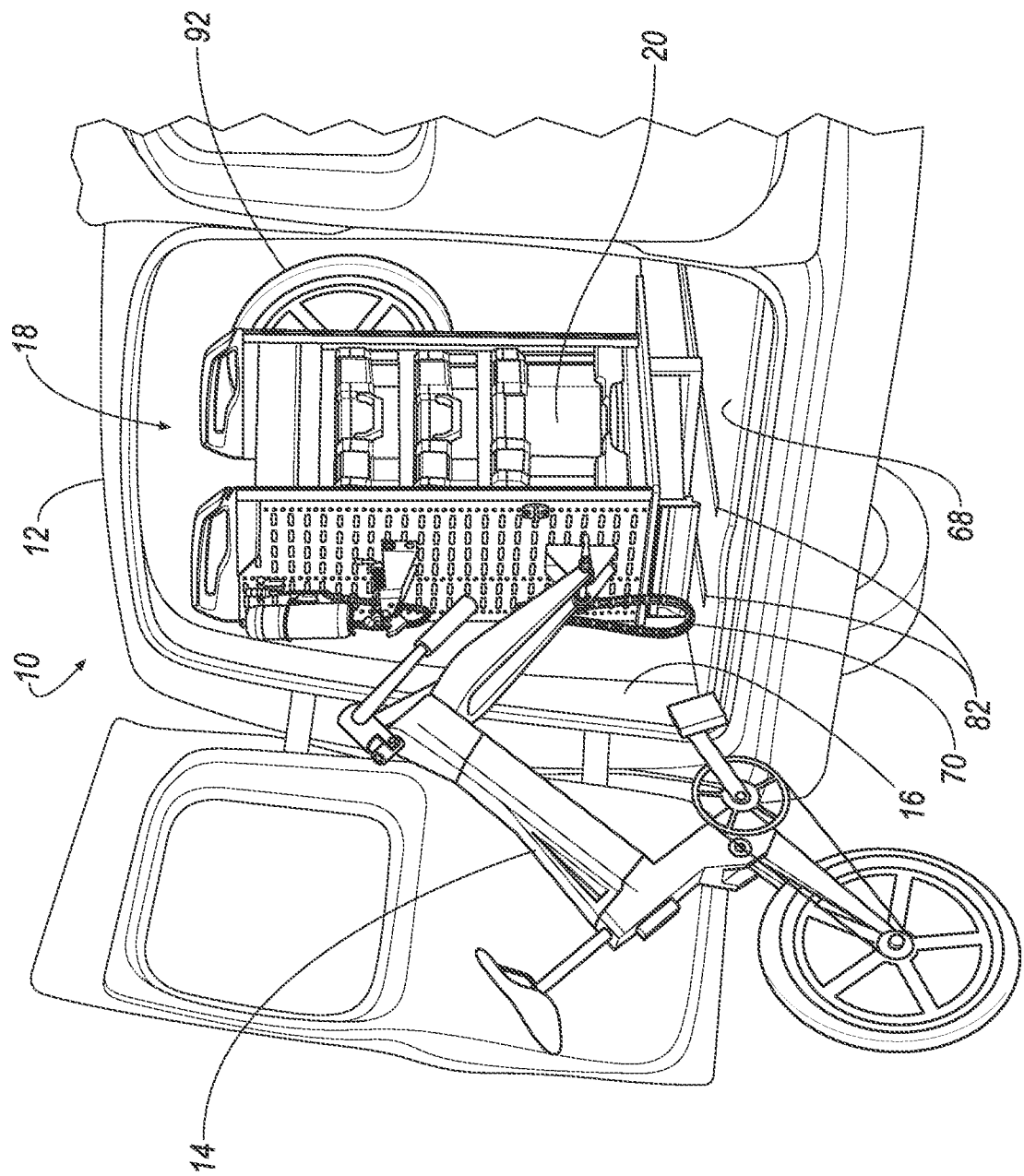


FIG. 8

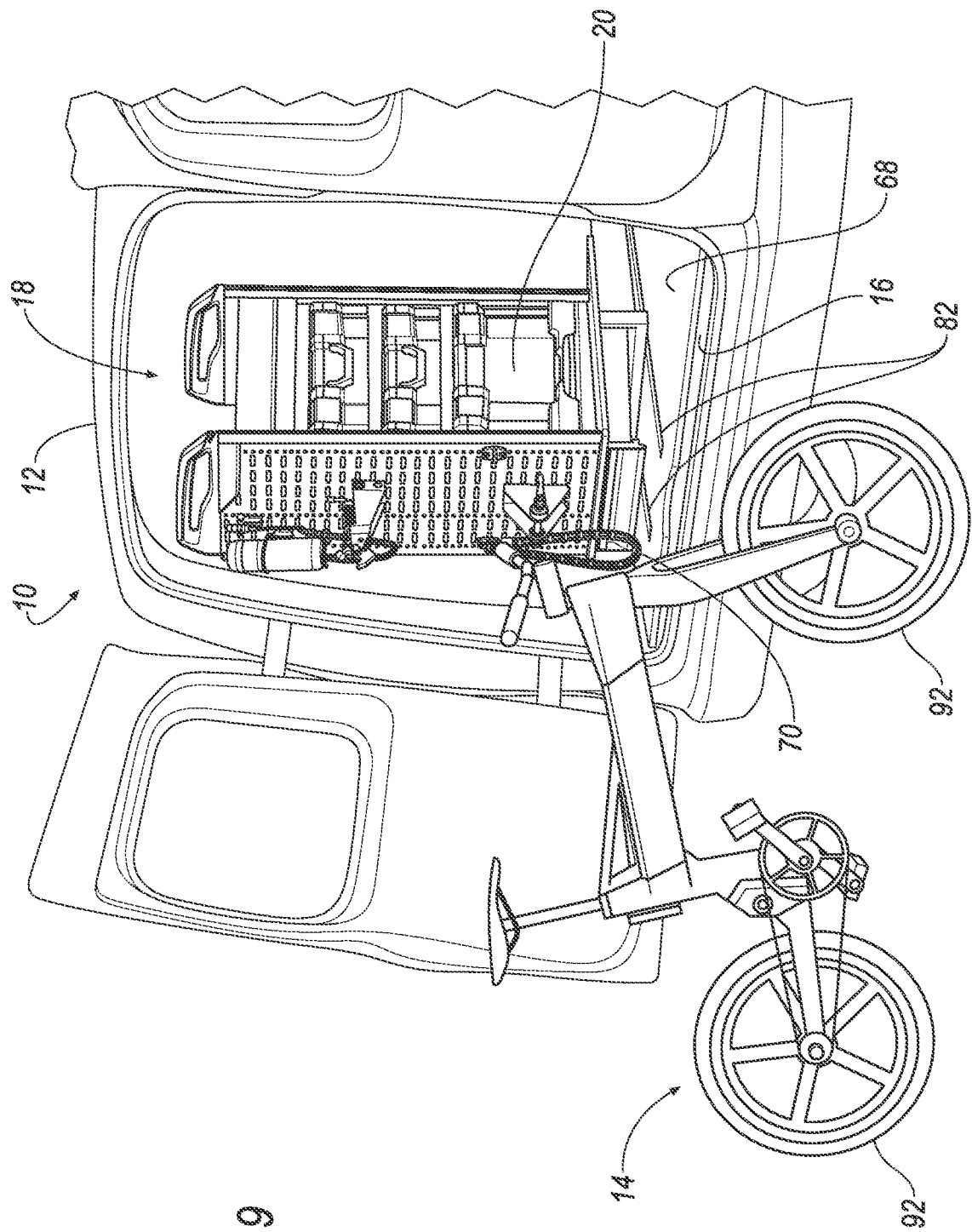


FIG. 9

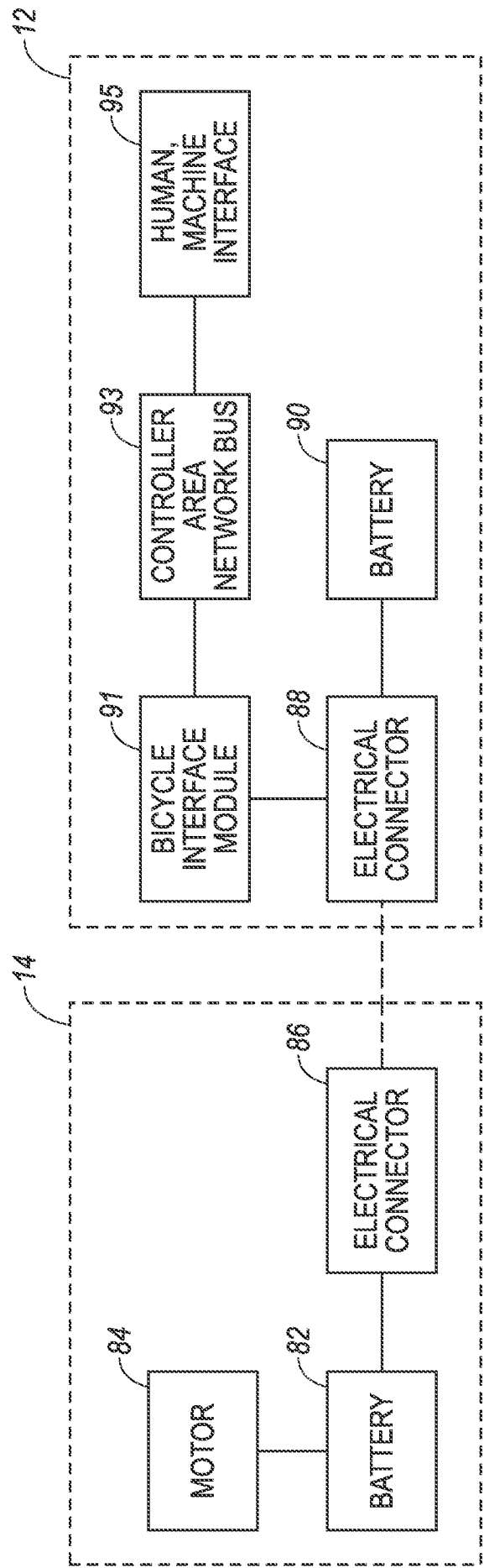


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 15/56610

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B62H 3/00 (2015.01)

CPC - B62H 3/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC (8): B62H 3/00 (2015.01);

CPC: B62H 3/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

IPC (8): B62H 3/00, B60R 9/00, B62H 3/02, B25H 1/00, B25H 5/00, B62H 3/00, B62H 3/02, B62H 3/10, B62H 5/00, E05B 71/00, F16B 7/00, B62H 3/00, B62H 5/00, E05B 71/00 (2015.01); CPC: B62H 3/00, B60R 9/06, B62H 3/02, B62H 3/04 (keyword limited; terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase; Google Patents; Google Web;

Search Terms Used: vehicle van car automobile truck bicycle bike bracket support mount* lever hinge latch* pawl lock* secure* fasten* mount* stow* store* bulkhead divider partition wall rack spring coil base unload* internal inside interior compartment pin rotat* turn *

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/0286789 A1 (JOHANNES KOIJMANS) 24 November 2011 (24.11.2011), entire document, especially Fig. 1, Fig. 2, Fig. 3, Fig. 4; para [001], [0013], [0014].	12-20
Y		1-11
Y	US 2012/0111911 A1 (REMPE) 10 May 2012 (10.05.2012), entire document, especially Fig. 1.	1-11
A	US 1,232,501 A (COLEN) 10 July 1917 (10.07.1917), entire document.	1-20

☐ Further documents are listed in the continuation of Box C.

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Date of the actual completion of the international search

04 December 2015

Date of mailing of the international search report

29 DEC 2015

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