



- (51) International Patent Classification:
B62K 19/40 (2006.01) *B62K 19/30* (2006.01)
B62J 9/00 (2006.01)
- (21) International Application Number:
PCT/CA2016/050625
- (22) International Filing Date:
2 June 2016 (02.06.2016)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
62/169,771 2 June 2015 (02.06.2015) US
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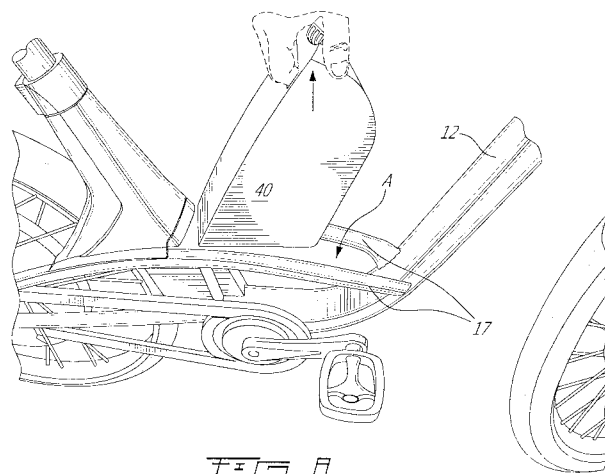
(81) Designated States (*unless otherwise indicated, for every
kind of national protection available*): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,
KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG,
MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM,
PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC,
SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ,
TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU,
TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE,
DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: BICYCLE FRAME WITH BATTERY MOUNT



(57) Abstract: An assembly of bicycle frame and battery mount comprises the bicycle frame including a downtube, and seat tube intersecting the downtube. A pair of guard rails extend from the seat tube to the downtube, the guard rails spaced apart from one another to form an opening configured for receiving a battery therethrough, the pair of guard rails being spaced apart from the intersection of the seat tube and the downtube. A receptacle is delimited at least by the downtube, the seat tube and the pair of guard rails and accessible via said opening. A battery mount is secured to the frame and located at least partly in the receptacle, the battery mount having a battery interface configured for being electrically coupled to the battery when the battery is received in the receptacle to powering a motorization apparatus of the bicycle. A method for installing a battery on a bicycle is also provided.

WO 2016/191876 A1

BICYCLE FRAME WITH BATTERY MOUNT

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority on United States Patent Application No. 62/169,771, filed on June 2, 2016 and incorporated herein by reference.

TECHNICAL FIELD

[0002] The present application relates to bicycle frames of the type supporting a battery that is part of an electrically-assisted propulsion system of the bicycle.

BACKGROUND OF THE ART

[0003] Electrically-assisted bicycle propulsion systems are now commonly provided in bicycles so as to aid the bicycle rider in propelling himself/herself. Electrical-assistance propulsion systems typically use battery power to help or to take over the propulsion of the bicycle, whether it be by driving the front or rear wheel. Hence, such bicycles have a propulsion machine or motor located in one of the wheels or in other locations in the bicycle, notably adjacent to the bottom bracket to drive the transmission (e.g., for instance, as coupled to the crank set, or to the chain).

[0004] These systems are commonly operated by a battery. The batteries are usually large to provide suitable autonomy to the propulsion system. A downside of such batteries is that they are not usually concealed, and this may result in some side effects. For example, the presence of the battery may impact the visual aspect of a bicycle, it may impact the thermodynamic properties of the bicycle, and/or may be cumbersome and exposed to impacts.

SUMMARY

[0005] It is therefore an aim of the present disclosure to provide a bicycle frame with battery mount that addresses issues related to the prior art.

[0006] Therefore, in accordance with a first embodiment of the present disclosure, there is provided an assembly of bicycle frame and battery mount comprising: the bicycle frame including a downtube, a seat tube intersecting the downtube, a pair of side-by-side guard rails extending from the seat tube to the downtube, the guard rails spaced apart from one another to form an opening configured for receiving a battery therethrough, the pair of guard rails being spaced

apart from the intersection of the seat tube and the downtube, and a receptacle delimited at least by the downtube, the seat tube and the pair of guard rails and accessible via said opening; a battery mount secured to the frame and located at least partly in the receptacle, the battery mount having a battery interface configured for being electrically coupled to the battery when the battery is received in the receptacle to powering a motorization apparatus of the bicycle.

[0007] Further in accordance with the first embodiment, a cover plate is for instance releasably positioned on the guard rails to close the opening of the receptacle.

[0008] Still further in accordance with the first embodiment, the cover plate has for instance ends merging onto the seat tube and the downtube.

[0009] Still further in accordance with the first embodiment, a fairing on the seat tube and the cover plate for instance form a continuous surface when the cover plate is on the guard rails.

[0010] Still further in accordance with the first embodiment, the guard rails for instance merge with seat stays.

[0011] Still further in accordance with the first embodiment, each of the guard rails forms for instance a monolithic tube with one of the seat stays, the monolithic tube being anchored to the seat tube.

[0012] Still further in accordance with the first embodiment, the battery mount has for instance a joint portion located in the receptacle and configured for forming a joint with the battery, the joint portion being located higher than the battery interface on the seat tube.

[0013] Still further in accordance with the first embodiment, the joint portion is for instance a hook of a pivoting mechanism concurrently formed by the battery and the battery mount.

[0014] Still further in accordance with the first embodiment, the battery is for instance releasably detachable from the battery mount.

[0015] Still further in accordance with the first embodiment, the battery has for instance a shape corresponding to that of the receptacle, such that a top edge surface of the battery is below a top surface of the guard rails when the battery is electrically coupled to the battery mount.

[0016] Still further in accordance with the first embodiment, the battery has for instance a handle at a forward end.

[0017] In accordance with a second embodiment of the present disclosure, there is provided for instance a method for installing a battery on a bicycle comprising: bringing a battery physically separated from bicycle toward the bicycle; forming a pivot joint between the battery and a battery mount on a seat tube of the bicycle; pivoting the battery about the pivot joint downwardly and toward the seat tube; and coupling a battery electric component to a battery interface of a motorization system of the bicycle, by abutment at an end of the pivoting movement.

[0018] Further in accordance with the second embodiment, the battery is for instance locked to the bicycle when the battery is coupled to the battery interface.

[0019] Still further in accordance with the second embodiment, pivoting comprises for instance inserting the battery in a receptacle defined between a pair of guard rails, the seat tube and a downtube of the bicycle.

[0020] Still further in accordance with the second embodiment, coupling comprises for instance positioning a top edge surface of the battery below a top surface of the guard rails.

[0021] Still further in accordance with the second embodiment, a cover is placed for instance onto an opening of the receptacle between the guard rails when the battery is coupled.

[0022] Still further in accordance with the second embodiment, the cover is locked for instance to the bicycle.

[0023] Still further in accordance with the second embodiment, forming the pivot joint and pivoting the battery comprises for instance manipulating a handle of the battery at an end away from the pivot joint.

[0024] In accordance with a third embodiment of the present disclosure, there is provided for instance a battery mount configured for interfacing a battery to a motorization apparatus on a bicycle, comprising: a body adapted to be fixed to a seat tube of a bicycle; a pivot joint portion on the body; and a battery interface adapted to be electrically coupled to a battery electric component and to the motorization apparatus to power the motorization apparatus, the battery interface, the pivot joint portion being located higher than the battery interface on the seat tube.

[0025] Further in accordance with the third embodiment, the pivot joint portion is for instance a hook adapted to receive a pivot of the battery therein.

[0026] Still further in accordance with the third embodiment, the body has for instance a post support and a battery support being fastened to one another around the seat tube.

[0027] Still further in accordance with the third embodiment, the post support has for instance a central wall and side walls projecting forwardly from the central wall, the central wall defining a concavity configured to accommodate a rear wheel of the bicycle.

[0028] Still further in accordance with the third embodiment, the battery support has for instance a central wall supporting the battery interface, and side walls projecting rearwardly from the central wall to merge with the side walls of the post support and form continuous surfaces.

DESCRIPTION OF THE DRAWINGS

[0029] Fig. 1 is a perspective view of a bicycle frame with battery mount and battery in accordance with the present disclosure;

[0030] Fig. 2 is a side elevation view of the bicycle frame of Fig. 1;

[0031] Fig. 3 is an assembly view of a battery mount of the assembly of Fig. 1;

[0032] Fig. 4 is a side view of a battery used with the battery mount of Fig. 3;

[0033] Fig. 5 is a rear view of the battery of Fig. 4;

[0034] Fig. 6 is a top plan view of the battery as received in the frame of Fig. 1 and secured to the battery mount of Fig. 3;

[0035] Fig. 7 is a perspective view illustrating a battery being removed from the bicycle frame of Fig. 1; and

[0036] Fig. 8 is a perspective view subsequent to that of Fig. 7 showing the battery removed.

DETAILED DESCRIPTION

[0037] Referring to the drawings and more particularly to Fig. 1, there is illustrated a bicycle frame in accordance with the present invention at 10. The frame 10 is shown as having a step-through like geometry, although other geometries are considered as well, such as a safety bike frame with horizontal or sloped top tube,

etc. The bicycle frame 10 is part of a bicycle having an electrically-assisted propulsion system 11 of the bicycle, generally known as a motorization system, and depicted in Fig. 1 as a rear wheel motorization system in which it is mounted to a rear wheel hub, in one of different configuration for the motorization apparatus.

[0038] Referring concurrently to Figs. 1 and 2, the frame 10 is shown as having a downtube 12. The downtube 12 is shown as being arcuate, i.e., it does not have a straight body. However, other shapes for the downtube 12 are considered, including a straight downtube, with a casing of a battery being shaped partly as a function of the shape of the downtube 12, as described hereinafter. A bottom bracket shell 13 (also known as bottom bracket tube) is located at an end of the downtube 12. The bottom bracket tube 13 is configured to received therein an axle of a crank set, and may have any appropriate configuration (e.g., outboard, BSA, BB30, PF30, etc). Other equipment may be in the vicinity or part of the bottom bracket tube 13, such as crank motorization components, as an example.

[0039] A seat tube 14 projects upwardly from the downtube 12, and may have a top open end in which a seat post is received. Alternatively, the seat post may be integrated in the seat tube 14, as one possibility. Chain stays 15 project rearwardly from the seat tube 14, as do seat stays 16. The chain stays 15 and the seat stays 16 converge at a rear end of the frame 10 and have hardware thereon by which a rear wheel is connected to the frame 10. As observed from Figs. 2 and 3, reinforcement beams 16A may project from the seat stays 16 to reach a seat tube 14 to reinforce the interconnection therebetween. These reinforcement beams 16A may be covered by fairings 16B, as in Fig. 1. As in Figs. 1 and 2, the seat stays 16 may rise lower along the seat tube 14 than conventional seat stays 16, whereby the reinforcement beams 16A assist in providing structural rigidity and stiffness to the assembly.

[0040] A pair of guard rails 17 extends from the seat tube 14 to the downtube 12. In the illustrated embodiment, the guard rails 17 each are an extension of the seat stays 16. More specifically, each of the guard rails 17 is a monolithic tube with the respective seat stay 16. This combination of guard rails 17 and seat stays 16 are connected to the seat tube 14, for instance by welding. Therefore, as seen in Figs. 6-8, a top opening A is defined between the guard rails 17 through which a battery may be inserted. The downtube 12, the seat tube 14, and the guard rail 17 define a receptacle in which the battery will be received. This receptacle provides

support for the battery, in addition to providing some form of guarding against impacts. The receptacle may also assist in the streamlining of the assembly, to limit the exposure of edges of the battery from a front view of the frame 10. A cover plate 18 may be positioned on top of the guard rails 17 to close the opening A between the guard rails 17, in such a way that the battery is held captive in the receptacle. The cover 18 may conceal any top depression formed between the guard rails 17 and the battery, to further enhance the streamlining of the assembly. For the same purpose, the rear end of the cover 18 may have a skirt or like tapered end (as illustrated) to merge with the fairings 16B to form a continuous and smooth surface. Although not shown, it is considered to provide a lock mechanism to lock the cover 18 to a remainder of the frame 10, for the battery to be locked into the receptacle. Alternatively, the battery may have its own locking mechanism to be selectively locked to the frame 10.

[0041] Referring to Fig. 3, a battery mount is generally shown in an assembly view, and is partly received in the receptacle, when the bicycle has such a receptacle (i.e., the battery mount being usable on bicycles having a different frame configuration than that shown in Fig. 1. The battery mount is constituted of a body including a post support 20 and a battery support 30, among one possible embodiment as the body may alternatively be a rigid member connected to a front derailleur hanger, among different options. The post support 20 assists in securing the battery mount to the seat tube 14, and also assists in reducing the drag of the frame 10. The battery support 30 is also used to secure the battery mount 20 to the seat tube 14, and is used as an interface for the battery.

[0042] The post support 20 has a central wall 21. Central wall 21 has a concave shape so as to define a clearance in which a part of a tire may be located. Side walls 22 project forwardly from the central wall 21 and define the flanks of the post support 20. A top wall 23 may connect the central wall 21 to the side walls 22 and may have a cut-out 24 therein. The cut-out 24 is shaped so as to conform to the seat tube 14, and abuts against a rear portion of the seat tube 14.

[0043] The battery support 30 also has a central wall, illustrated as 31. The central wall 31 abuts against a front portion of the seat tube 14, such that the seat tube 14 is sandwiched between the central walls 21 and 31, when the battery mount is mounted to the frame 10. Side walls 32 project rearwardly from the central wall 21

and are designed to form a generally continuous surface with the side walls 22 of the post support 20.

[0044] As shown in Fig. 3, fasteners are provided so as to secure the battery support 30 to the post support 20, with tapped bores being defined in end edges of the side wall 22 of the post support 20, although a reverse arrangement could also be used. A top hook 33 is located at a top end of the central wall 31 of the battery support 30. The top hook 33 has a trough-like receptacle acting as a pivot joint portion or pivot housing and transversely positioned relative to the longitudinal axis of the seat tube 14. A battery interface 34 is positioned lower into the central wall 31 of the battery support 30 and is configured to be electrically coupled to a port/coupler of the battery. Although not shown, the battery interface 34 is wired to the electrically-assisted propulsion system of the bicycle, for the battery to deliver power to the system.

[0045] Referring to Fig. 4, the battery is generally shown at 40. The battery may be any appropriate type of battery in terms of storage media (electrochemicals, polymers, etc). However, the casing of the battery 40 has an overall shape specifically designed for the battery 40 to be lodged in the receptacle formed by the downtube 12, the seat tube 14 and the guard rails 17, and covered by the cover plate 18. In an embodiment, a top surface of the battery is general flush with a top edge of the guard rail 17, with top edges of the battery 40 being within the receptacle of the frame 10. The battery 40 therefore has a body having the appropriate shape for being lodged in the receptacle, with a port 41 (or coupler) at its rear end along with a bar 42. The bar 42 will serve as pivot axis when received in the top hook 33, for the battery to be pivoted relative to the top hook 33. A reverse configuration is also considered, with the bar being on the battery mount and the hook being on the battery. In the presence of a pivot as described above with the top hook 33 and the bar 42, it is observed that the pivot axis may be above the electric coupling of the battery interface 34 with the battery 40, and secured to the seat tube 14. As yet another alternative, a sliding joint may be provided instead of a pivot joint, to lead the battery 40 into coupled arrangement with the battery interface 34.

[0046] The port 41 is positioned to be coupled to the battery interface 34 when the battery 40 is pivotally lodged into its receptacle in the frame 10. As observed from Fig. 6, a handle 43 (e.g., finger bore) may be provided at a front end of the

battery 40 for one's finger(s) to be inserted therein to pull on the battery 40. The body of the battery is also shown having a forward concavity so as to conform to the shape of the downtube 12.

[0047] In operation, starting with the configuration shown in Fig. 1, the cover plate 18 is firstly removed, if present. This may require the cover plate 18 to be unlocked. Once the cover plate 18 is removed, the user has access to the battery 40. It may be required to unlock the battery from its engaged position of the battery mount, if a lock is present on the battery 40. Once unlocked, the battery 40 may be pulled by its handle 43 and pivoted out of coupling engagement with the battery mount, as sequentially shown in Figs. 7 and 8. The battery 40 is then pulled upwardly for the bar 42 to exit the top hook 43.

[0048] To install the battery 40, its bar 42 is received in the top hook 33, so as to form a rotational joint. The battery 40 may then be pivoted until the battery 40 is electrically coupled to the battery interface 34. The battery 40 may then be locked into this coupled configuration, if there is a locking feature between battery 40 and frame 10. The cover plate 18 may then be positioned atop the opening in the receptacle, and locked if a locking feature is provided between in the cover plate 18.

[0049] Stated differently, the method for installing the battery 40 on a bicycle 10 comprises bringing the battery 40, physically separated from bicycle 10, toward the bicycle 10. A pivot joint is formed between the battery 40 and a battery mount on a seat tube 14 of the bicycle 10. The battery 40 is pivoted about the pivot joint downwardly and toward the seat tube 14. The battery electric component 41 is coupled to the battery interface 34, by abutment at an end of the pivoting movement, i.e., the coupling delimits the movement of the battery 40.

[0050] The method may include locking the battery to the bicycle when the battery is coupled to the battery interface, inserting the battery in a receptacle defined between a pair of guard rails, the seat tube and a downtube of the bicycle, positioning a top edge surface of the battery below a top surface of the guard rails, placing a cover onto an opening of the receptacle between the guard rails when the battery is coupled, locking the cover to the bicycle, and/or forming the pivot joint and pivoting the battery comprises manipulating a handle of the battery at an end away from the pivot joint.

[0051] Accordingly, the frame 10 as described herein defines a receptacle that acts as a guard against impacts on the battery 40 and streamlines the shape of the

frame in a forward direction. This may reduce the drag of the battery in comparison to frames in which the batteries are not concealed in such receptacles.

CLAIMS:

1. An assembly of bicycle frame and battery mount comprising:
the bicycle frame including
 - a downtube,
 - a seat tube intersecting the downtube,
 - a pair of guard rails extending from the seat tube to the downtube, the guard rails spaced apart from one another to form an opening configured for receiving a battery therethrough, the pair of guard rails being spaced apart from the intersection of the seat tube and the downtube, and
 - a receptacle delimited at least by the downtube, the seat tube and the pair of guard rails and accessible via said opening;a battery mount secured to the frame and located at least partly in the receptacle, the battery mount having a battery interface configured for being electrically coupled to the battery when the battery is received in the receptacle to powering a motorization apparatus of the bicycle.
2. The assembly according to claim 1, further comprising a cover plate releasably positioned on the guard rails to close the opening of the receptacle.
3. The assembly according to claim 2, wherein the cover plate has ends merging onto the seat tube and the downtube.
4. The assembly according to claim 3, further comprising a fairing on the seat tube, the fairing and the cover plate forming a continuous surface when the cover plate is on the guard rails.
5. The assembly according to any one of claims 1-4, wherein the guard rails merge with seat stays.
6. The assembly according to claim 5, wherein each of the guard rails forms a monolithic tube with one of the seat stays, the monolithic tube being anchored to the seat tube.
7. The assembly according to any one of claims 1-6, wherein the battery mount has a joint portion located in the receptacle and configured for forming a joint with

the battery, the joint portion being located higher than the battery interface on the seat tube.

8. The assembly according to claim 7, wherein the joint portion is a hook of a pivoting mechanism concurrently formed by the battery and the battery mount.

9. The assembly according to any one of claims 1-8, further comprising the battery releasably detachable from the battery mount.

10. The assembly according to claim 9, wherein the battery has a shape corresponding to that of the receptacle, such that a top edge surface of the battery is below a top surface of the guard rails when the battery is electrically coupled to the battery mount.

11. The assembly according to claim 10, wherein the battery has a handle at a forward end.

12. A method for installing a battery on a bicycle comprising:
bringing a battery physically separated from bicycle toward the bicycle;
forming a pivot joint between the battery and a battery mount on a seat tube of the bicycle;
pivoting the battery about the pivot joint downwardly and toward the seat tube; and
coupling a battery electric component to a battery interface of a motorization system of the bicycle, by abutment at an end of the pivoting movement.

13. The method according to claim 12, further comprising locking the battery to the bicycle when the battery is coupled to the battery interface.

14. The method according to any one of claims 12 and 13, wherein pivoting comprises inserting the battery in a receptacle defined between a pair of guard rails, the seat tube and a downtube of the bicycle.

15. The method according to claim 14, wherein coupling comprises positioning a top edge surface of the battery below a top surface of the guard rails.

16. The method according to any one of claims 14 and 15, further comprising placing a cover onto an opening of the receptacle between the guard rails when the battery is coupled.

17. The method according to claim 16, further comprising locking the cover to the bicycle.

18. The method according to any one of claims 12 to 17, wherein forming the pivot joint and pivoting the battery comprises manipulating a handle of the battery at an end away from the pivot joint.

19. A battery mount configured for interfacing a battery to a motorization apparatus on a bicycle, comprising:

a body adapted to be fixed to a seat tube of a bicycle;

a pivot joint portion on the body; and

a battery interface adapted to be electrically coupled to a battery electric component and to the motorization apparatus to power the motorization apparatus, the battery interface, the pivot joint portion being located higher than the battery interface on the seat tube.

20. The battery mount according to claim 19, wherein the pivot joint portion is a hook adapted to receive a pivot of the battery therein.

21. The battery mount according to any one of claims 19 and 20, wherein the body has a post support and a battery support being fastened to one another around the seat tube.

22. The battery mount according to claim 21, wherein the post support has a central wall and side walls projecting forwardly from the central wall, the central wall defining a concavity configured to accommodate a rear wheel of the bicycle.

23. The battery mount according to claim 22, wherein the battery support has a central wall supporting the battery interface, and side walls projecting rearwardly from the central wall to merge with the side walls of the post support and form continuous surfaces.

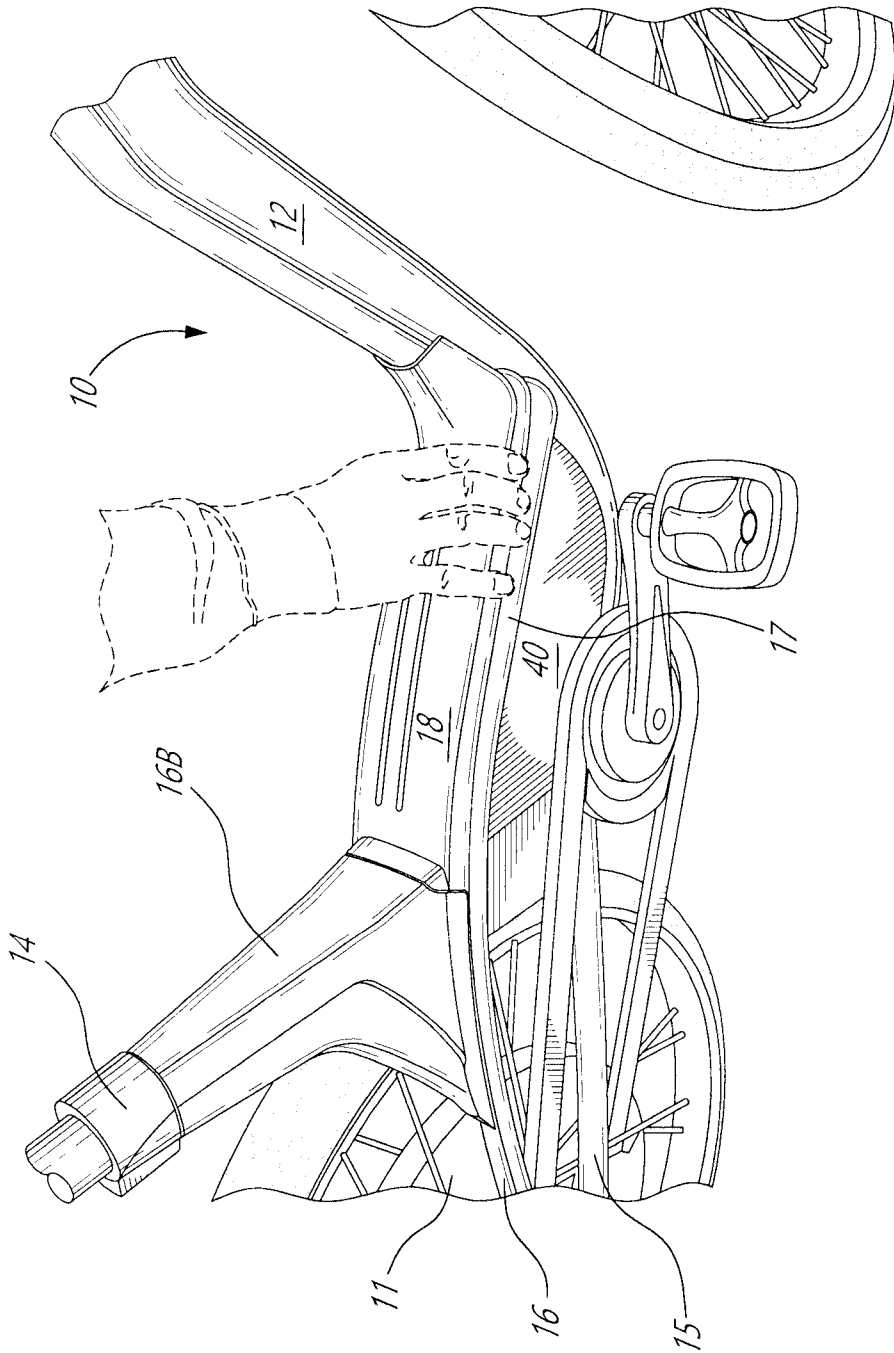


FIG - 1

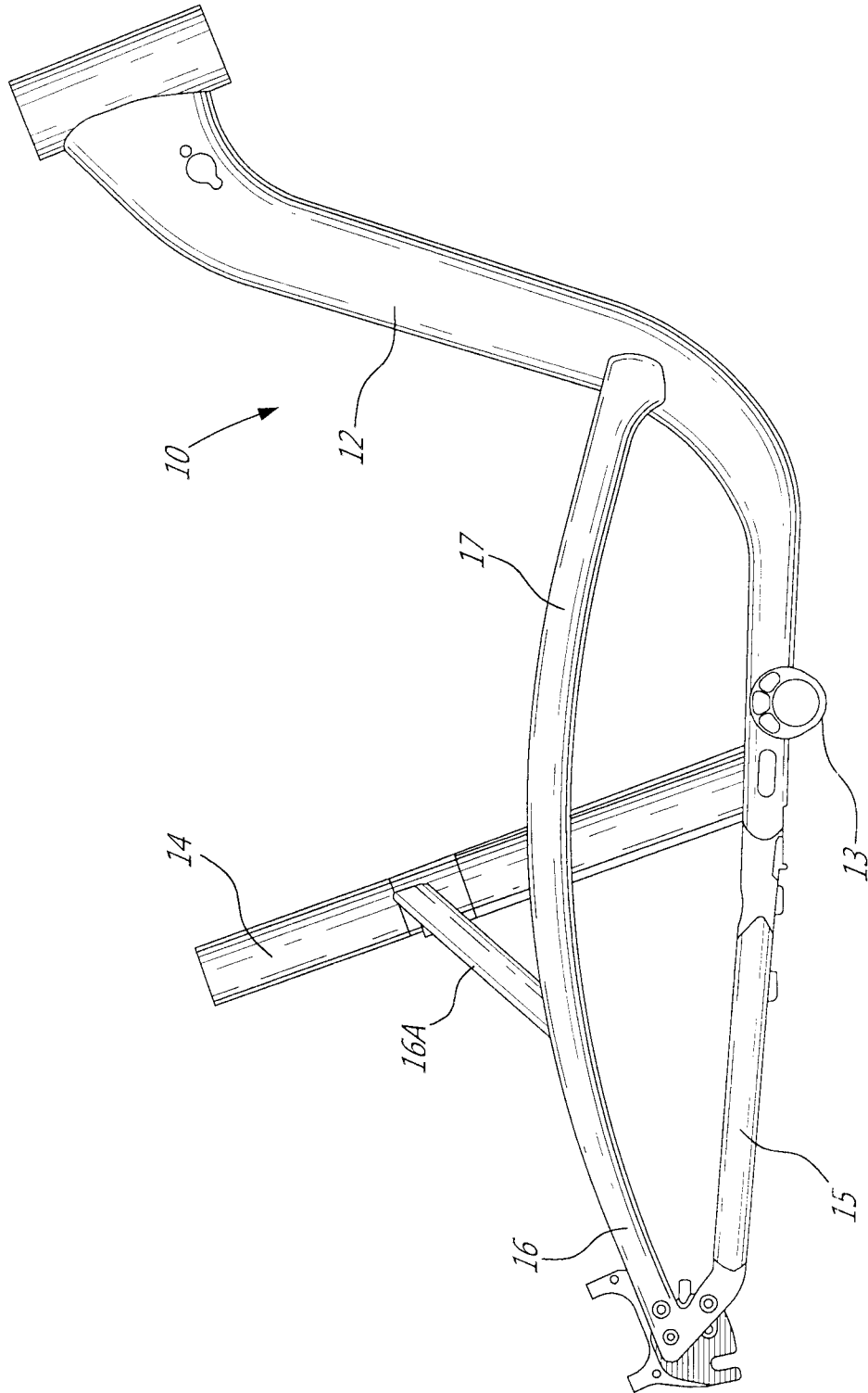


FIG. 2

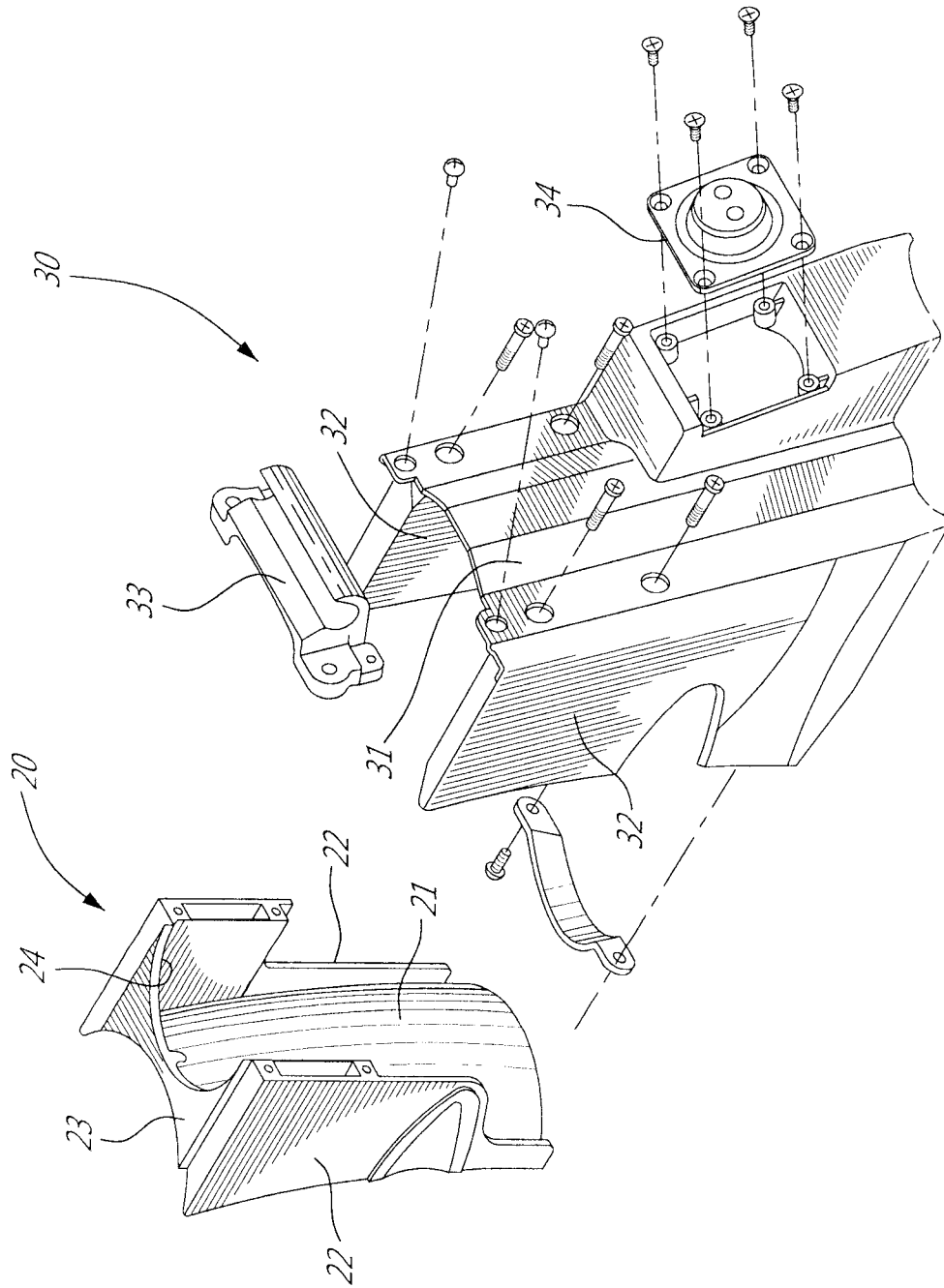


FIG. 3

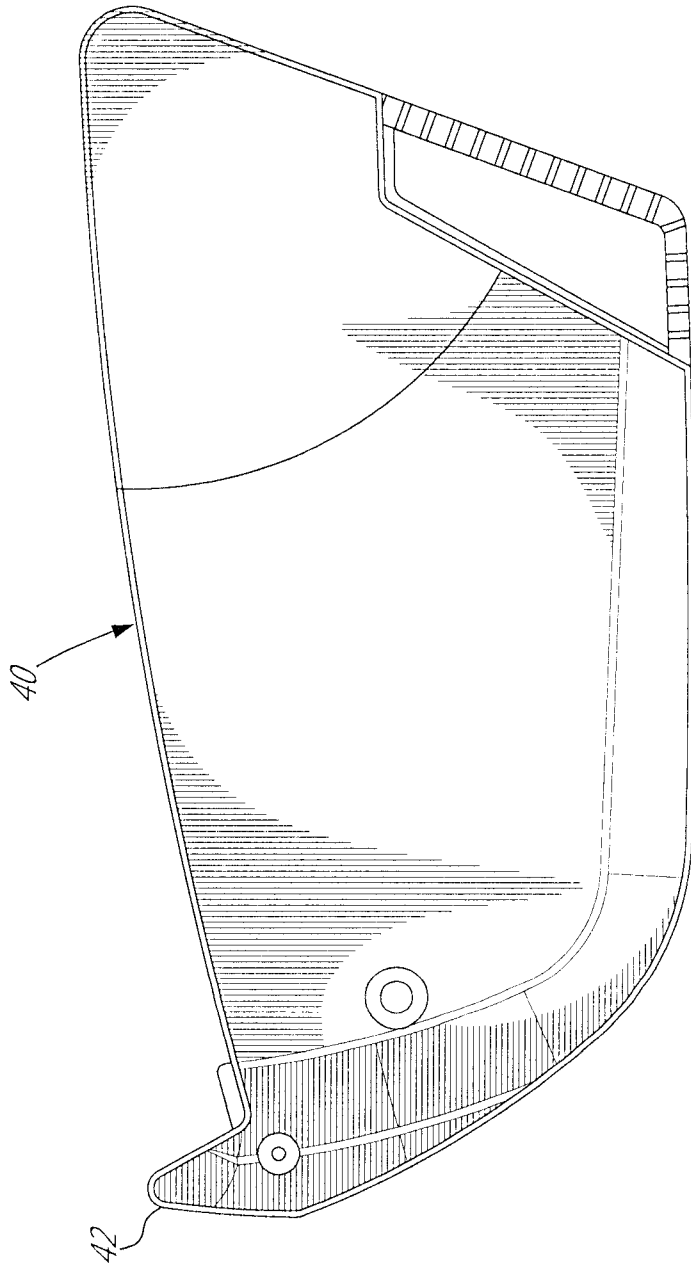


FIG. 4

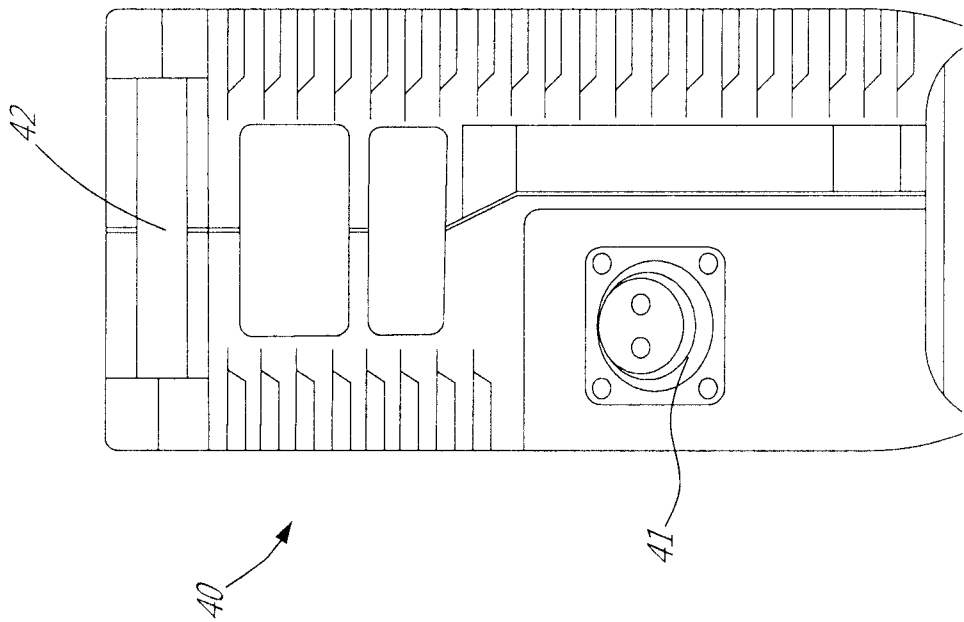


FIG. 5

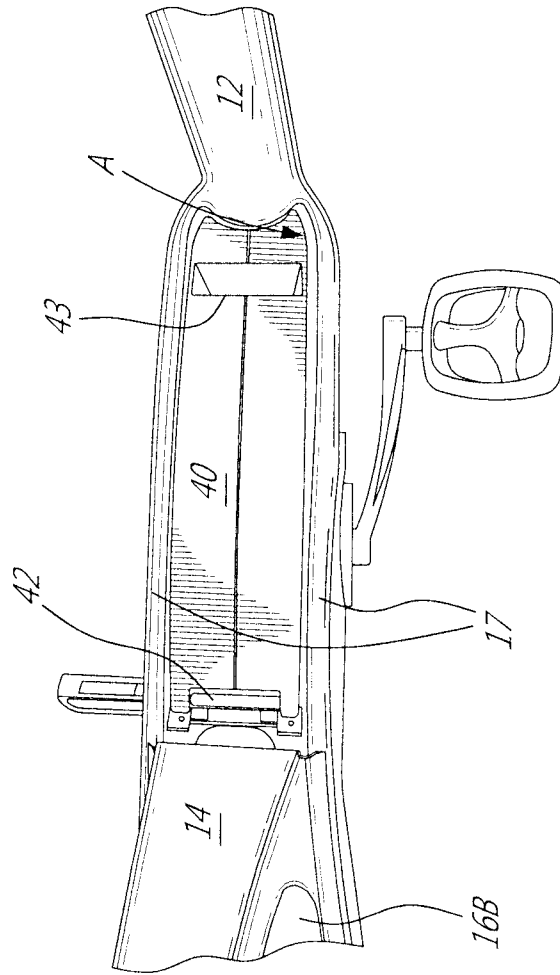


FIG. 6

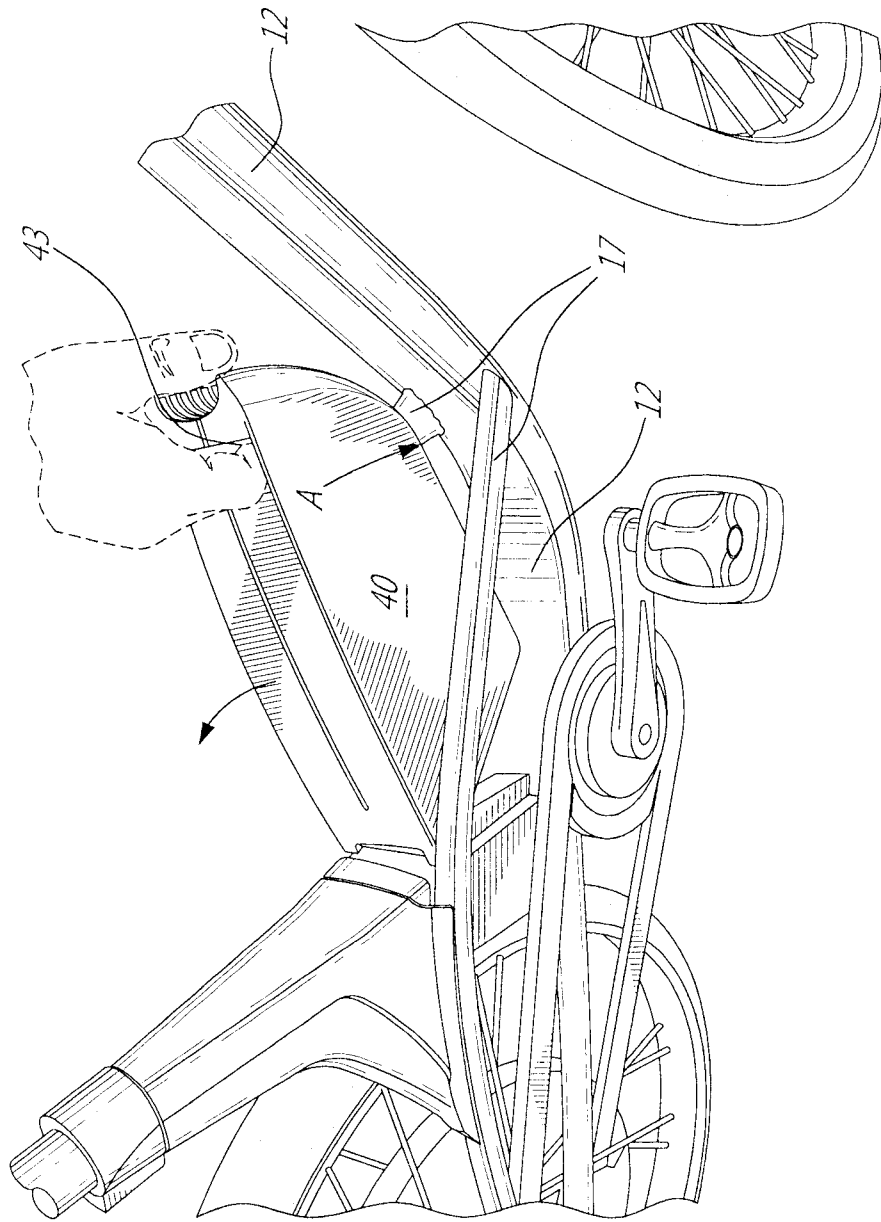


FIG. 7

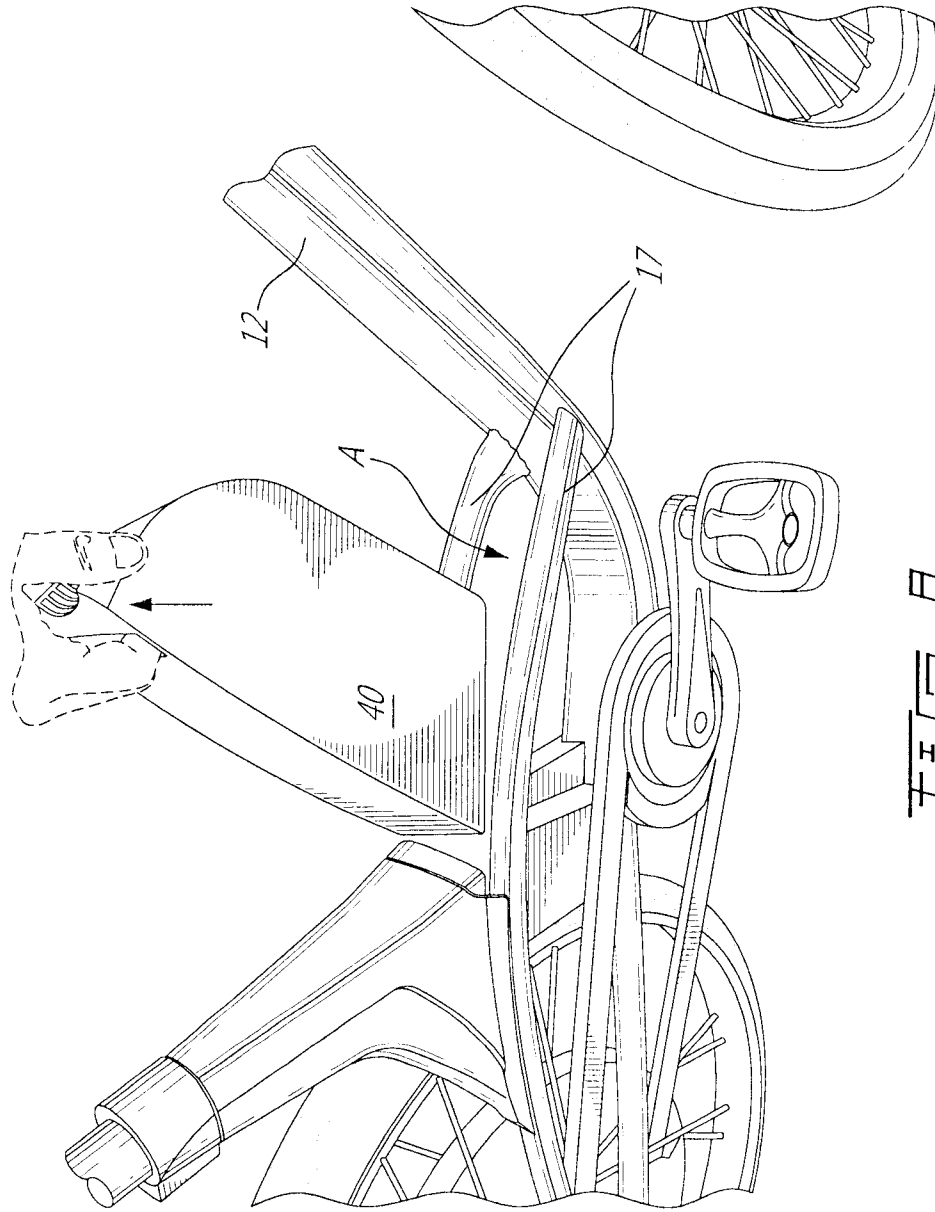


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CA2016/050625

A. CLASSIFICATION OF SUBJECT MATTER
 IPC: *B62K 19/40* (2006.01), *B62J 9/00* (2006.01), *B62K 19/30* (2006.01)

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 (2006.01): B62K 19/00; B62J 9/00; B62K 19/30

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

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
 Database: Canadian Patent Database (CPD); Questel™ Orbit™; Google™

Keywords: bicycle, cycle, battery, motor, housing, receptacle, pivot, quick, release, latch

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 2 371 105 Y (ZHENG CHAOYUAN) 29 March 2000 (29-03-2000) * fig. 1-4 *	12, 13, 18, 19 and 21
A	EP 0 712 779 A2 (ISHIKAWA SATOSHI et al.) 22 May 1996 (22-05-1996) * entire document *	1-23

Further documents are listed in the continuation of Box C.

See patent family annex.

* "A" "E" "L" "O" "P"	Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance earlier application or patent but published on or after the international filing date document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) document referring to an oral disclosure, use, exhibition or other means document published prior to the international filing date but later than the priority date claimed	"T" "X" "Y" "&"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art document member of the same patent family
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Date of the actual completion of the international search
5 August 2016 (05-08-2016)

Date of mailing of the international search report
17 August 2016 (17-08-2016)

Name and mailing address of the ISA/CA
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Authorized officer
 Jeffrey Butler (819) 934-0087

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2016/050625

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
CN2371105Y	29 March 2000 (29-03-2000)	None	
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