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(54) Title: STAMPED LINK FOR SUPPORTING AN ENGINE

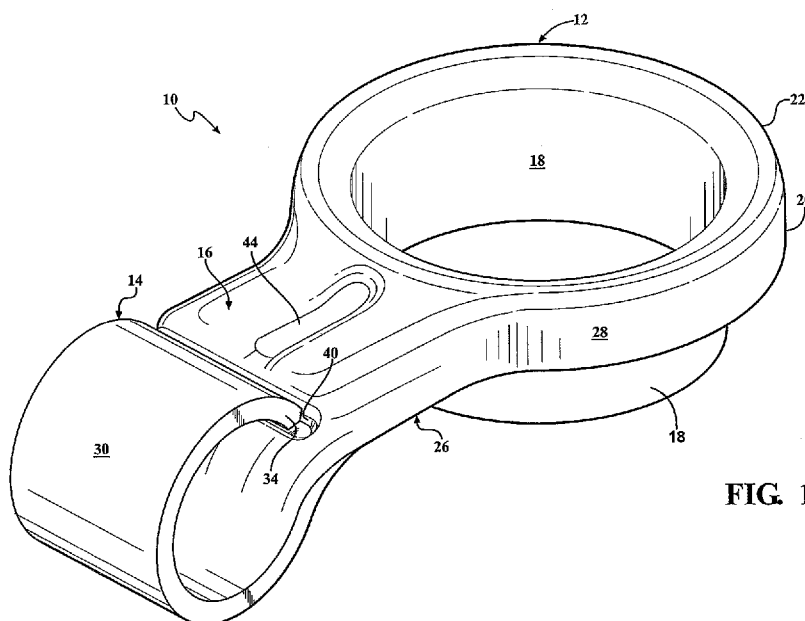


FIG. 1

(57) Abstract: A torque arm (10) for securing the position of a power train relative to a motor vehicle includes a first mount (14) and a second mount (12). The first mount (14) and the second mount (12) are spaced by a body portion (16). The first mount (14) is formed by a continuous ring defining a first central opening and is integral with the body portion (16). The second mount (12) is formed by a loop (30) defining a second central opening and the loop (30) extends from the body portion (16) at an opposite end of the body portion (16) from the continuous ring.

## STAMPED LINK FOR SUPPORTING AN ENGINE

### BACKGROUND OF THE INVENTION

[0001] Vehicle engine systems generate substantial amounts of torque when transferring motor energy generated in an internal combustion engine or the like through drive shaft to wheels that propel the vehicle. Torque generated by the engine is known to rotate the engine inside the motor compartment of the vehicle. Therefore, various devices have been produced to secure the engine within the vehicle compartment to prevent the engine from pivoting as a result of the torque transferred to the wheels.

[0002] One such device is known as a cast link or torque arm that is bolted between an engine block and a frame of a motor vehicle. These cast links have typically been manufactured through a casting process so that mass or thickness can be easily distributed or transferred to various parts of the link for both providing additional strength, and managing engine harmonics to prevent vibration from being transferred through the vehicle frame to the passenger compartment. While the transfer of mass around a cast link is known to provide the desired characteristics, the use of the casting process, due to its slow cycle time, is known to be cost prohibitive. Furthermore, a cast link having variable thickness used to achieve necessary performance, adds a significant amount of mass to a motor vehicle adversely affecting vehicle mileage performance. Therefore, there is a need to provide a low mass, quick cycle time torque arm that provides required strength characteristics along with necessary damping of engine harmonics.

## SUMMARY OF THE INVENTION

[0003] A torque arm secures the position of a power train relative to a motor vehicle. A first mount is spaced from a second mount by a body portion. The first mount is formed by a continuous ring defining a central opening and is integrally formed with the body portion. The second mount is formed by a loop that defines a second central opening. The loop extends from the body portion at an opposite end of the body portion from the continuous ring. The torque arm is formed from a sheet of material having a substantially constant thickness throughout.

[0004] The torque arm of the present invention provides necessary strength characteristics of being formed from a sheet of material, which substantially reduces the mass associated with a cast metal torque arm. Furthermore, forming a torque arm from a sheet of material provides rapid cycle times by way of a progressive or equivalent type die eliminating the time associated with waiting for cast metal parts to cool, which is a known production bottle neck.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Other advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with accompanying drawings, wherein:

[0006] Figure 1 shows a perspective view of the inventive arm of the present invention;

[0007] Figure 2 shows a plan view of the present invention;

[0008] Figure 3 shows a cross-sectional view of the arm of the present invention taken along line 3-3 as shown in Figure 2;

[0009] Figure 4 shows an expanded view of section 4-4 as shown in Figure 3; and

[0010] Figure 5 shows an environmental view of the arm of the present invention located in an engine compartment of a motor vehicle.

### DETAILED DESCRIPTION OF THE INVENTION

[0011] The link of the present invention is generally shown in Figure 1 at 10. The link includes a first mount 12 and a second mount 14. The mounts 12, 14 are interconnected by a body portion 16. The link, including the first mount 12 and the second mount 14, and body portion 16, is formed from a continuous sheet of metal having a generally constant thickness. The link 10 having been formed from a continuous sheet of metal with a generally constant thickness retains the generally constant thickness after forming.

[0012] The first mount 12 is defined by an inner annular wall 18 and an outer annular wall 20. The inner annular wall 18 and the outer annular wall 20 are interconnected by a mating wall 22 having a radial shape as will be explained further below. As best represented in Figure 3, the first mount 12 defines a first axis 24 so that the inner annular wall 18 and the outer annular wall 20 are coaxially and concentrically aligned with the first axis 24. As best represented in Figure 3, the inner annular wall 18 includes an axial length that exceeds the axial length of the outer annular wall 20. As such, the inner annular wall 18, the outer annular wall 20 and the mating wall 22 define a J-shaped cross-section to provide strength and dimensional stability to the first mount 12.

[0013] Referring again to Figure 1, the body portion 16 includes opposing flanges 26 that extend along a length of the body portion 16. The opposing flanges 26 provide strength and dimensional stability to the body portion 16. Furthermore, the outer annular wall 20 of the first

mount 12 defines a continuous surface 28 with the opposing flanges 26 further providing strength and dimensional stability to the link 10 in its entirety.

[0014] The second mount 14 is formed from a loop 30 as best seen in Figures 2 and 3. The second mount 14 defines a second axis 32. The second axis 32 is oriented in a substantially perpendicular relationship to the first axis 24, the purpose of which will become more evident further below. Referring now to Figure 4, the loop 30 includes a distal end 34 that defines a mating face 36. The mating face 36 includes a chamfered edge 38 providing manufacturing benefits when forming the second mount 14 from the loop 30 facilitating the annular formation of the loop. It has been determined by the inventors the chamfered edge 38 allows the loop 30 to be formed. If the chamfered edge 38 is absent, forming the loop 30 is greatly inhibited. In one embodiment, the chamfered edge 38 is formed by coining operation prior to forming the loop 30. Other methods of forming the chamfered edge 38 are also contemplated by the inventor. The body portion 16 defines a receptor having a substantially mirrored configuration to the mating surface 36 of the distal end 34 of the loop 30. As represented in Figure 4, a weld material 42 or equivalent is applied to the interface between the mating surface 36 and the receptor 40 to secure and enclose the loop 30 to the body portion 16. Further dimensional stability is provided to the body portion 16 by a rib or contour 44 having a lengthwise orientation to the body portion 16 in one embodiment for stiffening purposes. Other embodiments include a rib 44 having an orientation normal, or generally normal to the lengthwise orientation of the body portion 16. A still further embodiment includes a rib or contour disposed anywhere between the first mount 12 a distal end of the second mount 14 including the body portion 16 and the loop 30. As best represented in Figure 2, opposing flanges 26 transition toward the second mount 14 via opposing

corners 46 after which, the flanges terminate into the loop 30 of the second mount 14. The radial dimension of the corners 46 can vary as necessary for manufacturing process control.

[0015] Referring now to Figure 5, where the inventive link 10 is shown installed in a vehicle engine compartment mating an engine 48 to a frame 50 of a motor vehicle (not shown). In this embodiment, the frame 50 is represented as a shock tower. However, it should be understood that the link 10 of the present invention can mount the engine 48 to other frame components of the motor vehicle. A first grommet 52 is received by the first mount 12 and includes a substantially similar thickness to the axial length of the inner annular wall 18 of the first mount 12. A first fastening system 54 is received by the grommet 52 and secures the grommet 52, and therefore the link 10, to the engine 48 of the motor vehicle. In this embodiment, the first fastening system 54 is represented as a bolt or screw. However, it should be understood by those of ordinary skill in the art that alternative fastening systems may be used to secure the link 10 to the engine 48.

[0016] A second grommet 56 is received by the second mount 14 and includes a perpendicular orientation to the first grommet 52 in a similar manner as the axial orientation between the first and second mounts 12, 14. A frame bracket 58 receives a second fastening system 60 to secure the link 10 via the second grommet 56 to the frame bracket 58. In this embodiment, the second fastening system 60 is represented as a bolt or screw. However, it should be understood to those of ordinary skill in the art that alternative fastening systems may be used to secure the link 10 to the frame 50.

[0017] The first and second grommets 52, 56 are formed from an elastomeric material having a necessary durometer to both secure the link between the engine 48 and the frame 50 and provide necessary damping characteristics to reduce the amount of vibration transferred from the

engine 48 to the frame 50 of the motor vehicle. Alternative methods of securing the grommets 52, 56 to the link 10 are contemplated by the inventor, including injection molding the elastomeric material into the link, or premolding the grommets 52, 56 for subsequent installation into the first and second mounts 12, 14.

[0018] While the invention has been described with reference to an exemplary embodiment, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.

## CLAIMS

What is claimed is:

1. A link securing the position of a motor relative to a motor vehicle frame, comprising:

a first mount and a second mount spaced from said first mount by a body portion;

said first mount formed by a continuous ring defining a first central opening and being integral with said body portion;

said second mount formed by a loop defining a second central opening and said loop extending from said body portion at an opposite end of said body portion from said continuous ring; and

said link defining a substantially constant thickness throughout.

2. The link set forth in claim 1, where said loop includes a distal end located in an abutting relationship to said body portion thereby defining said second central opening.

3. The link set forth in claim 1, wherein said body portion includes opposing flanges extending along a length of said body portion.

4. The link set forth in claim 1, wherein said first mount defines an outer annular wall defining a continuous surface with said opposing flanges of said body portion.

5. The link set forth in claim 1, wherein said first mount defines an inner annular wall spaced concentrically inwardly to said outer annular wall.

6. The link set forth in claim 5, wherein said inner annular wall defines a continuous surface with said outer annular wall.

7. The link set forth in claim 1, wherein said body portion defines a stiffening rib located between said opposing flanges thereby increasing the stiffness of said link.



8. The link set forth in claim 1, including a stiffening rib defined in either said body portion or said loop thereby increasing the stiffness of said link.
9. The link set forth in claim 1, where said loop defines a distal end having a mating portion and said body portion defines a receptor configured to receive said mating portion thereby forming said loop of said second mount.
10. The link set forth in claim 9, wherein said mating portion includes a chamfered edge.
11. The link set forth in claim 1, wherein said first mount, said second mount and said body portion define a substantially uniform thickness with a monolithic construction.
12. The link set forth in claim 1, wherein said first mount defines a first axis and said second mount defines a second axis being substantially perpendicular to said first axis.

13. An engine mounting assembly for securing a vehicle engine to a frame of a vehicle body; comprising:

a link having a first mount and a second mount spaced from said first mount by a body portion, said link having a substantially uniform thickness throughout, said first mount receiving a first resilient connector and said second mount receiving a second resilient connector;

a first fastening element connected to the frame of vehicle body and being received by said first resilient connector of said first mount, and a second fastening element connected to the vehicle engine and being received by said second resilient connector of said second mount thereby securing the vehicle engine to the frame of the vehicle.

14. The assembly set forth in claim 13, wherein said first fastening element and said second fastening element each include a fastener assembly for securing said assembly between the vehicle frame and the vehicle engine.

15. The assembly set forth in claim 13, wherein said first mount defines a first axis and said second mount defines a second axis being perpendicular to said first axis.

16. The assembly set forth in claim 13, wherein said first mount is defined by a by a loop having a distal end mated to said body portion thereby defining a first mount annular wall.

17. The assembly set forth in claim 13, wherein said second mount is defined by an inner annular wall and an outer annular wall, said inner annular wall being spaced concentrically inwardly from said outer annular wall.

18. The assembly set forth in claim 13, wherein said inner annular wall and said outer annular wall are interconnected by a connecting wall.

19. The assembly set forth in claim 18, wherein said inner annular wall includes an axial dimension greater than an axial dimension of said outer annular wall.

20. The assembly set forth in claim 17, wherein said body portion of said assembly includes opposing flanges defining a continuous surface with said outer wall of said second mount.

21. A link assembly for affixing a motor to a motor vehicle frame, comprising:  
a first mount defining a first annular opening and a second mount defining a second annular opening, said first mount having an axial orientation generally perpendicular to an axial orientation of said second mount, said first mount being connected to said second mount by a body portion, said assembly being defined by a continuous sheet of material having a substantially constant thickness throughout.
22. The assembly set forth in claim 21, wherein said first annular opening receives a first elastomeric grommet and said second annular opening receives a second elastomeric grommet.
23. The assembly set forth in claim 21, wherein said first mount is defined by an inner annular wall and an outer annular wall.
24. The assembly set forth in claim 21, wherein said inner annular wall is adjoined to said outer annular wall by a mating wall.
25. The assembly set forth in claim 21, wherein said inner annular wall includes an axial length greater than an axial length of said outer annular wall thereby defining a J-shaped cross-section.
26. The assembly set forth in claim 21, wherein said second mount defines a loop having a distal end mated to said body portion.
27. The assembly set forth in claim 21, wherein said loop includes a distal end having a mating surface for mating to a receptor of said body portion.
28. The assembly set forth in claim 27, wherein said mating surface includes a chamfered edge.

29. The assembly set forth in claim 21, wherein said body portion includes a stiffening rib disposed between said first mount and said second mount.

30. The assembly set forth in claim 21, wherein said first mount or said second mount includes a stiffening rib.

31. The assembly set forth in claim 21, wherein said body portion includes opposing flanges forming a continuous surface with said outer annular wall of said first mount.

32. The assembly set forth in claim 21, including a weld joint mating one of said first mount or said second mount to said body portion.

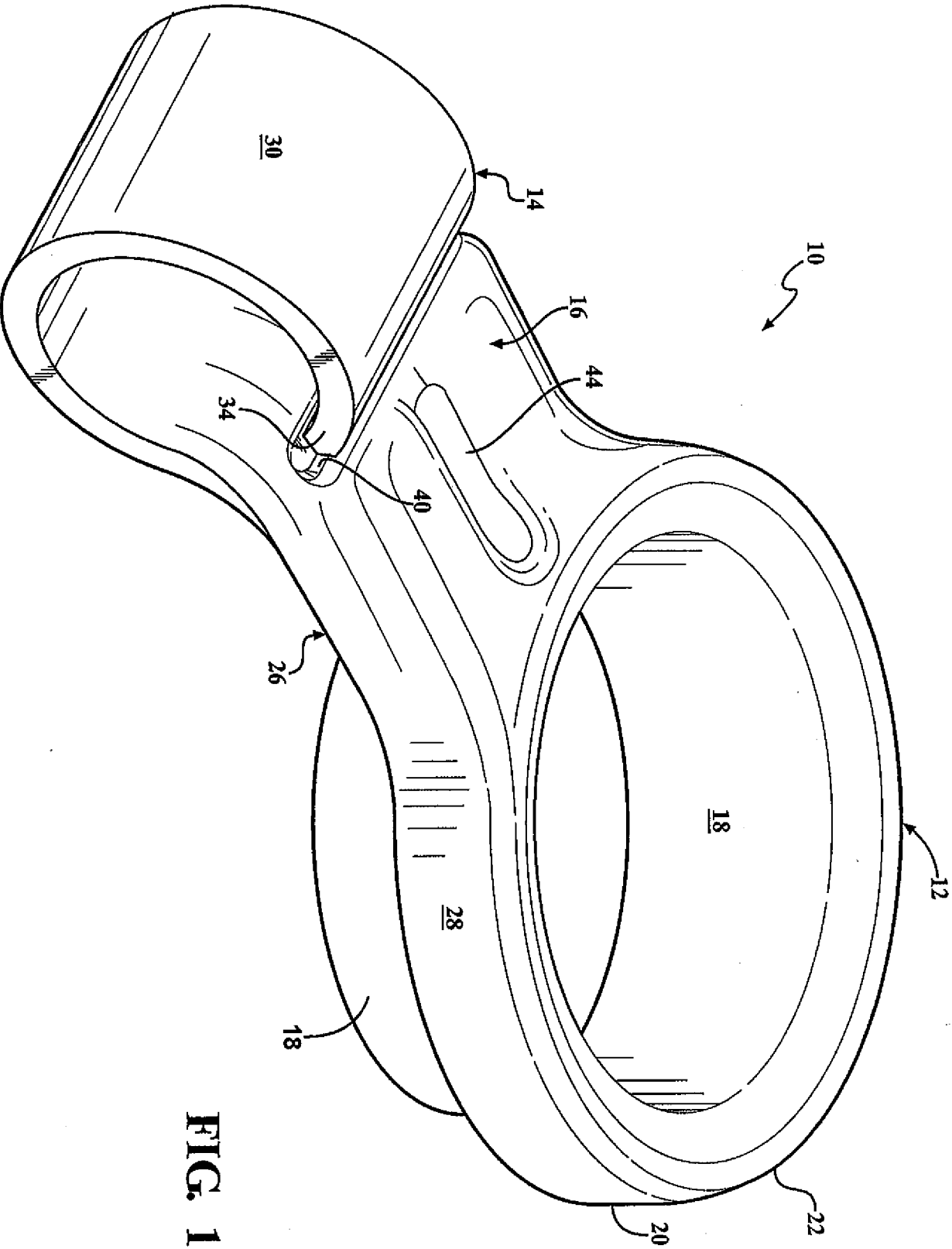
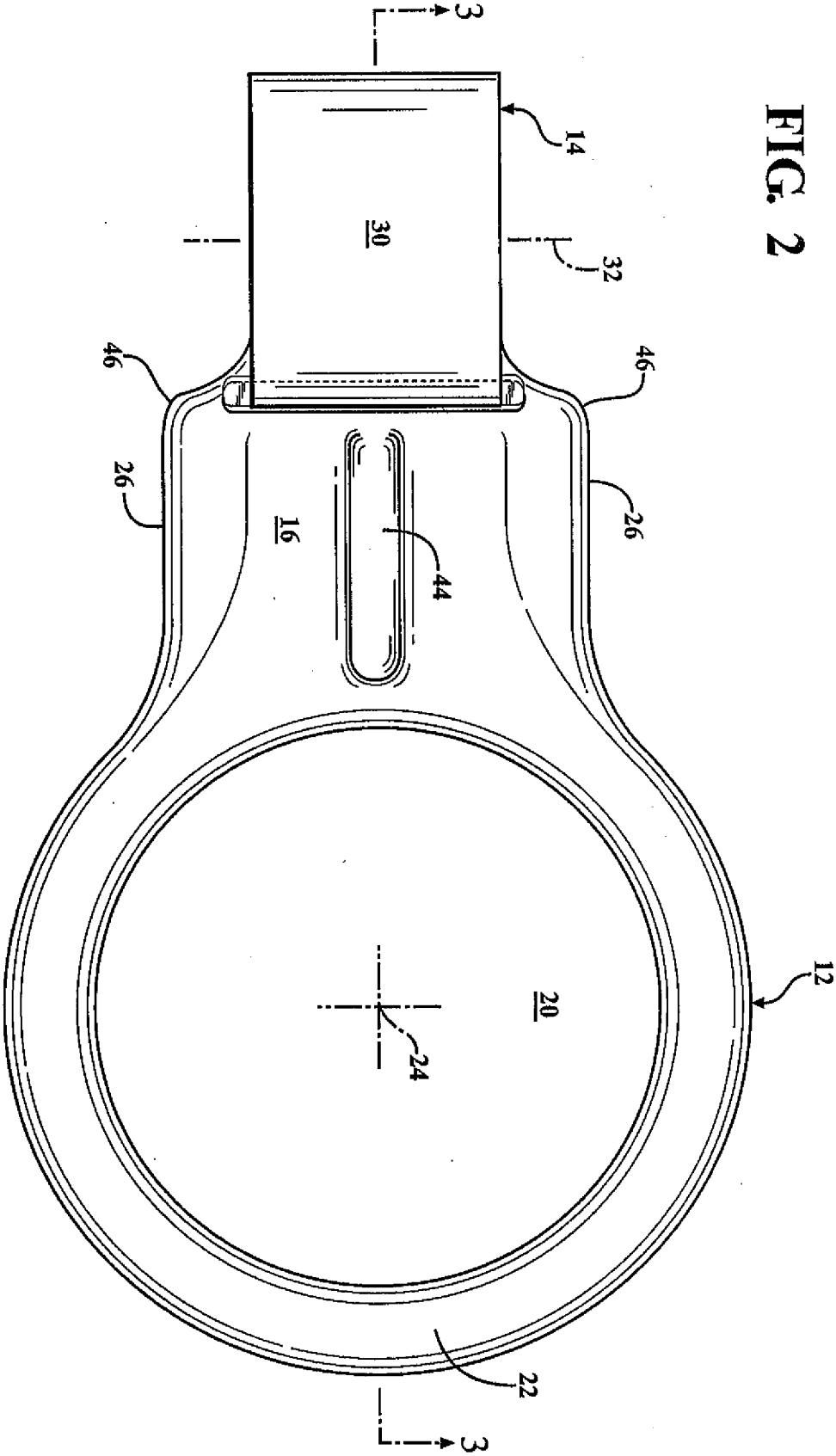


FIG. 1

FIG. 2



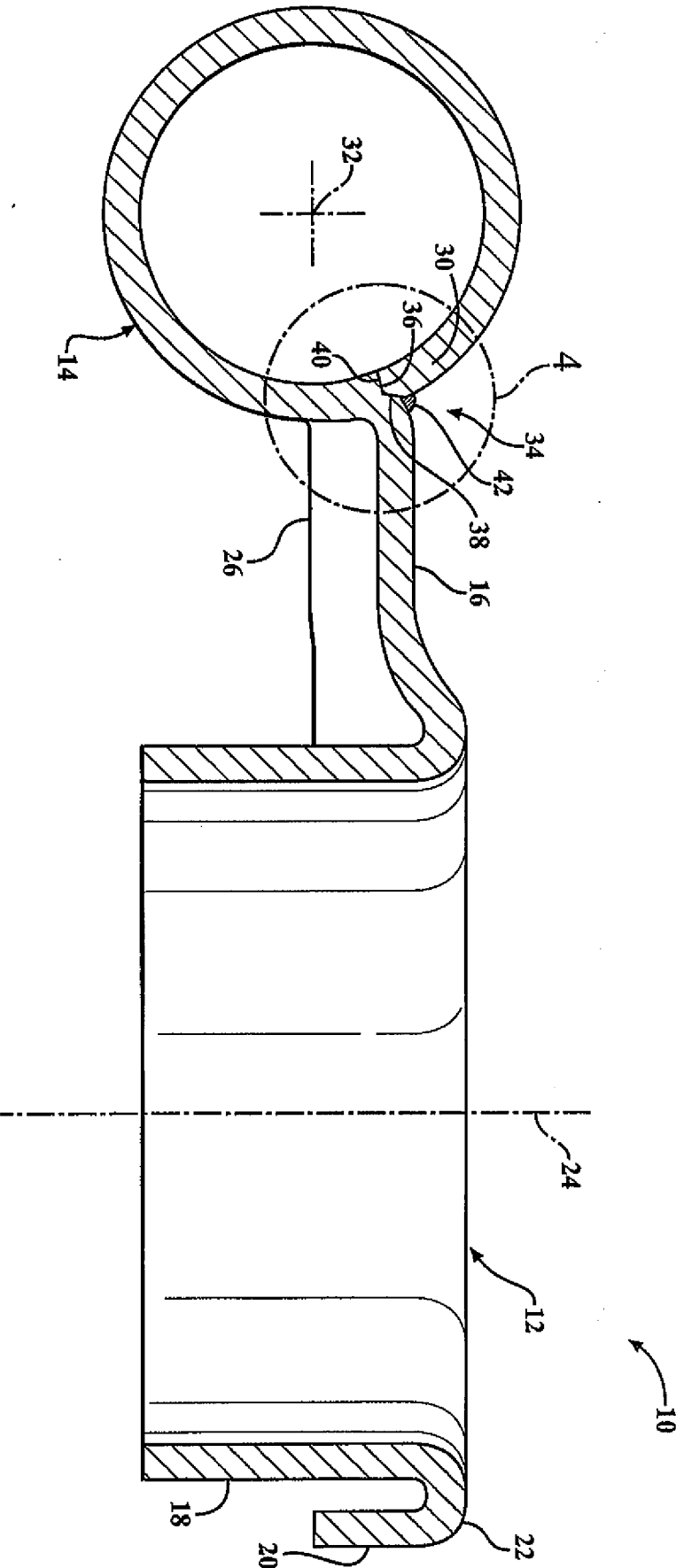
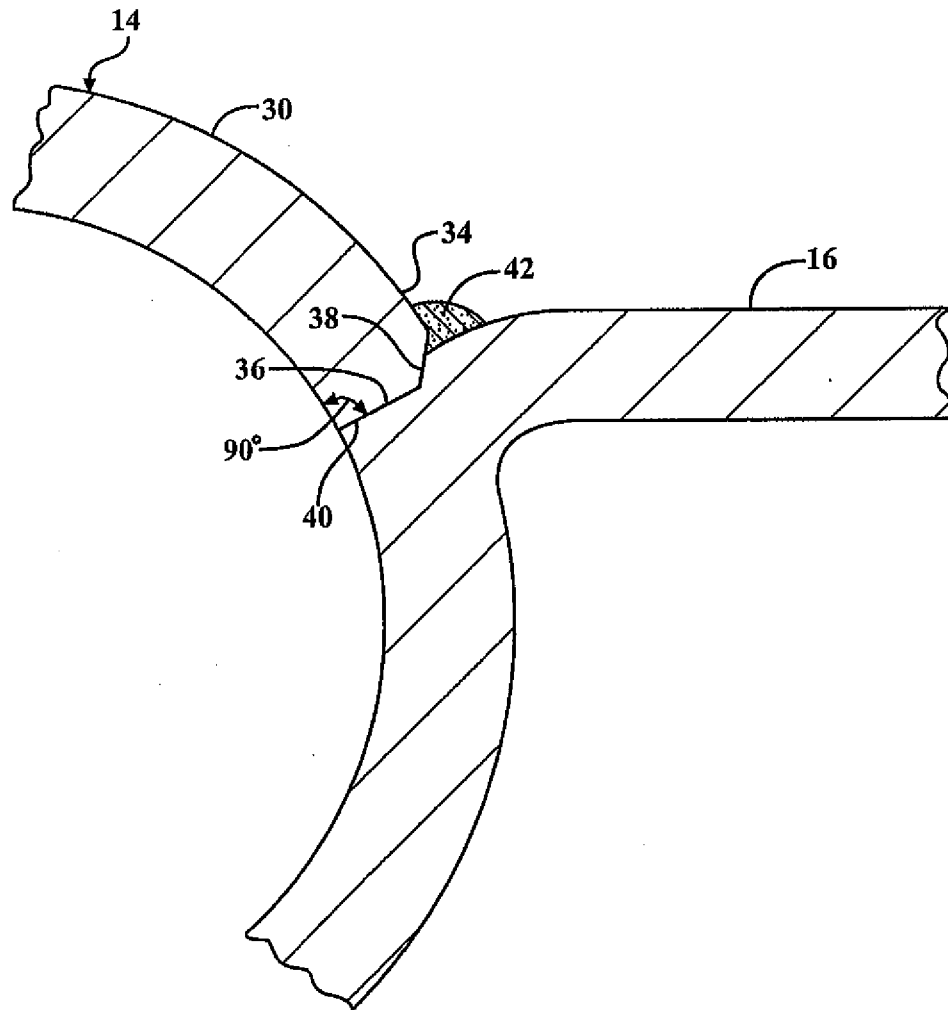
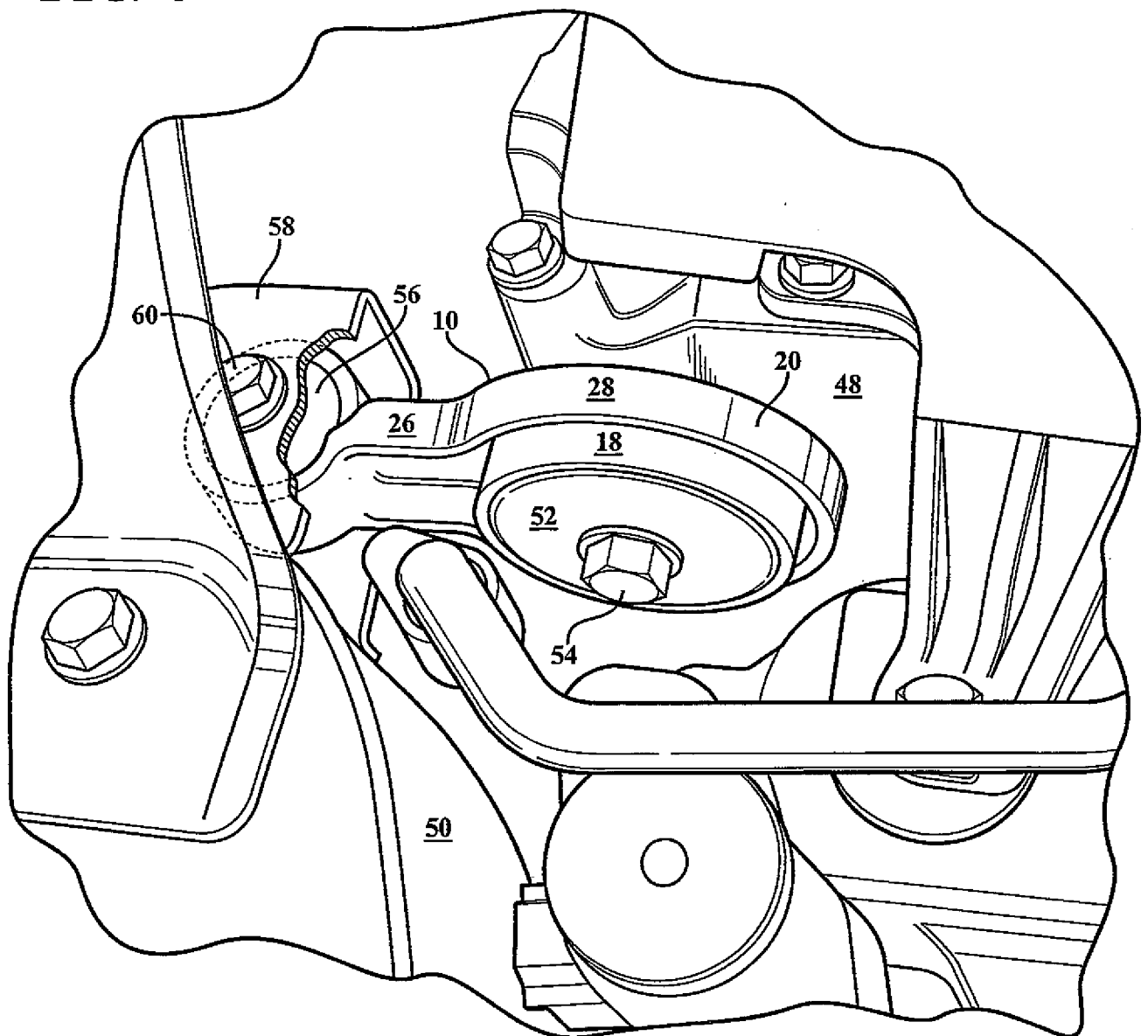


FIG. 3



**FIG. 4**

**FIG. 5**



# INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2010/037474

**A. CLASSIFICATION OF SUBJECT MATTER**  
INV. F16C7/04 B60K5/12 F16F1/38  
ADD.

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)

F16C B60K F16F B60G

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

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

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 794 502 A1 (HUTCHINSON [FR]) 8 December 2000 (2000-12-08)	13-15, 17-25, 29-31
Y	page 1, line 3 - line 21 page 2, line 21 - page 4, line 8 figures 1,2	1-12,16, 26-28,32
Y	JP 61 233214 A (MITSUBISHI STEEL MFG) 17 October 1986 (1986-10-17) * abstract figures 2,3	1-12,16, 26-28,32
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

\* Special categories of cited documents :

\*A\* document defining the general state of the art which is not considered to be of particular relevance

\*E\* earlier document but published on or after the international filing date

\*L\* 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)

\*O\* document referring to an oral disclosure, use, exhibition or other means

\*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* 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

\*X\* 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

\*Y\* 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.

\*A\* document member of the same patent family

Date of the actual completion of the international search

20 October 2010

Date of mailing of the international search report

29/10/2010

Name and mailing address of the ISA/

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# INTERNATIONAL SEARCH REPORT

International application No

PCT/US2010/037474

## C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 196 31 893 A1 (METZELER GIMETALL AG [DE] TRELLEBORG AUTOMOTIVE TECH CT [DE]) 12 February 1998 (1998-02-12) column 5, line 34 - column 6, line 25 column 7, line 18 - line 36 figures 10,11 claim 1	13
Y	JP 60 178655 U (-) 27 November 1985 (1985-11-27) figures 1,2	7

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2010/037474

### Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

### Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

#### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/SA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-12

relate to a link having a mount formed by a continuous ring  
and a mount formed by a loop  
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2. claims: 13-20

relate to a mounting assembly with a link having resilient  
connectors and fastening elements fixed to the mounts  
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3. claims: 21-32

relate to a link assembly made out of sheet metal where the  
axis of the mounts are perpendicular to each other  
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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No

PCT/US2010/037474

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
FR 2794502	A1	08-12-2000	NONE	
JP 61233214	A	17-10-1986	NONE	
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