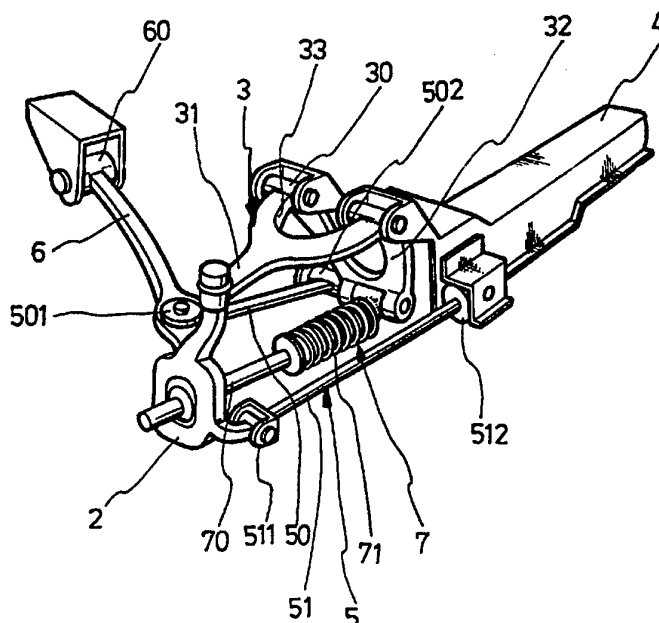




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(54) Title: SUSPENSION SYSTEM FOR A VEHICLE



(57) Abstract

A suspension system for a vehicle which has a wheel carrier (2), an upper control link (3) having a horizontal arm (31), a vertical arm (32) and a hinge portion (30) therebetween, the hinge portion of the upper control link (3) being hingedly connected to a subframe (4) of a vehicle body, front and rear lower control links for connecting a lower portion of the wheel carrier (2) to the subframe (4), a trailing arm (6) disposed in a longitudinal direction of the vehicle and mounted between the vehicle body and the wheel carrier, and a shock absorber assembly (7) mounted between the wheel carrier (2) and the vertical arm (32) of the upper control link (3) improves ride comfort by reducing the impact from the wheel and provides an advantage in additional space for the passengers or a trunk.

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SUSPENSION SYSTEM FOR A VEHICLE

BACKGROUND OF THE INVENTION

5 (1) Field of the Invention

The present invention relates to a suspension system for non-driven wheels of a vehicle, and more particularly to a suspension system for a vehicle which
10 can improve ride comfort by absorbing the vibrations from the wheel to the vehicle body by means of a shock absorber assembly disposed horizontally, can maximize the inner space of the vehicle for passengers or a trunk, and improve cornering stability by pushing the
15 lower portion of the wheel.

(2) Description of the Conventional Art

The common designs for a suspension system of a
20 vehicle are Wishbone and MacPherson types. Fig. 7A shows a conventional MacPherson type suspension system which comprises a steering knuckle 104, a strut 106 having a shock absorber 101 and a spring 102, and a lower arm 108.

25 Fig. 7B shows a conventional Wishbone type suspension system which comprises a steering knuckle 111, upper and lower control links 112 and 113, a spring assembly 114 disposed between the upper and lower
30 control links 112 and 113.

In the conventional MacPherson and Wishbone type suspension systems, since the shock absorber assembly is disposed vertically, though somewhat inclined, impact
35 from the wheel is transmitted directly in the vertical direction of the vehicle body. Thus, there is a limit

in reducing the impact and to improving ride comfort, and it is therefore difficult to design the suspension. Also, since the camber changes toward positive (+) when the wheel bumps against the road condition, the tire efficiency decreases and cornering stability is not good.

SUMMARY OF THE INVENTION

Therefore, the present invention has been made in an effort to solve the above-described problems.

It is an object of the present invention to provide a suspension system for a vehicle which improves ride comfort when the wheel moves in bounce and rebound.

It is another object of the present invention to provide a suspension system which can enlarge the space for passengers or a trunk.

It is still another object of the present invention to provide a suspension system which has an improved cornering stability.

In order to achieve the above objects, the invention provides a suspension system which comprises a wheel carrier, an upper control link having a horizontal arm, a vertical arm, and a hinge portion disposed therebetween, the hinge portion of the upper control link hingedly connected to a subframe of a vehicle body, front and rear lower control links for connecting a lower portion of the wheel carrier to the subframe, a trailing arm disposed in the longitudinal direction of the vehicle and connected to the vehicle body and the wheel carrier, and a shock absorber assembly having a shock absorber and a spring, mounted

between the wheel carrier and the vertical arm of the upper control link.

5 The impact from the wheel is not transmitted to the vehicle body directly but in reduced value because of this configuration. Thus, ride comfort is improved. And the lower portion of the wheel carrier is pushed by the shock absorber assembly, during bumping of the wheel, to improve the cornering stability and driving
10 stability. Further, the horizontally disposed absorber can enlarge the space for the passengers and a trunk. Still further, the trailing arm contributes to increasing the stiffness of the whole structure of the suspension system.

15

Other and further objects of this invention will become obvious upon an understanding of the illustrative embodiments about to be described or will be indicated in the appended claims, and various advantages not
20 referred to herein will occur to one skilled in the art upon employment of the invention in practice.

BRIEF DESCRIPTION OF THE DRAWINGS

25 Fig. 1 is a perspective view of the suspension system of the present invention.

Fig. 2 is a bottom view thereof.

30 Fig. 3 is a plan view thereof.

Fig. 4 shows an operation of the suspension system of the invention.

35 Fig. 5 is a bottom view of the suspension of a second embodiment according to the present invention.

Fig. 6 shows an operation of the suspension of the second embodiment according to the present invention.

5 Figs. 7A and 7B are schematic views of conventional suspension systems.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

10 The preferred embodiments will be described in detail with reference to the drawings. Figs. 1 through 4 show an embodiment of the suspension system according to the present invention. The wheel carrier 2 rotatably supports the wheel, having upper and lower portions to which upper and lower control links 3 and 5 are
15 connected, respectively.

The upper control link 3 for connecting the upper portion of the wheel carrier 2 to the sub-frame or the vehicle body 4 has horizontal and vertical arms 31 and
20 32 and a pair of hinge portions 30 therebetween. The horizontal arm 31 diverges to form a pair of hinge portions 30 and from there the vertical arm 32 converges to the lower portion thereof. The horizontal arm 31 is connected to the upper portion of the wheel carrier 2 by
25 a ball joint (not shown) and the hinge portions 30 are hingedly connected to the subframe or the vehicle body 4 via an elastic bushing (not shown).

30 Angle between the horizontal and vertical arms 31 and 32 is preferred to be more than 90 degrees. The divergence and convergence of the upper control link 3 allows a passageway for a drive shaft, if it is applied to a driving wheel, and at least contributes to structural stability of the suspension system.

35

The lower control link 5 includes a front lower

control link 50 and a rear lower control link 51.

5 The rear lower control link 51 is connected to the wheel carrier 2 at a connecting portion 511 and to the subframe 4 at a connecting portion 512 via an elastic bushing, while the front lower control link 50 is connected to the trailing arm 6 at a connecting portion 501 and to the subframe 4 at a connecting portion 502 via an elastic bushing.

10

The trailing arm 6 having front and rear ends 60 and 61 is disposed in the longitudinal direction of the vehicle, and the front and rear ends 60 and 61 are connected to the vehicle body and the wheel carrier 2, respectively, via an elastic bushing. The trailing arm 6 absorbs impact in the longitudinal direction of the vehicle.

15 The shock absorber assembly 7 having a shock absorber 70 and a spring 71 is pivotally connected to the lower portion of the wheel carrier 2 at one end thereof via an elastic bushing and hingedly connected to the lower end of the vertical arm 32 of the upper control link 3 via an elastic bushing at the other end.

20 The shock absorber assembly 7 is almost horizontally disposed.

The elastic bushing and the ball joint used in the suspension system according to the present invention are conventional and the descriptions thereof will be omitted.

30 Operation of the suspension system according to the present invention will be described with reference to Fig. 4. When the wheel bumps, the wheel carrier 2 moves upward in connection with the upper and lower control

35

links 3 and 5, as indicated in the imaginary line of Fig. 4. The upper control link 3 rotates about the hinge portion 30 in a clockwise direction and the vertical arm 32 of the upper control link 3 compresses the shock absorber assembly 7 such that the impact or vibration is dampened.

By this operation, the impact or vibration which is transmitted directly to a shock absorber is transmitted to the shock absorber assembly 7 and the subframe 4 via the upper control link 3 having a pair of hinge portions 30. Thus, the impact or vibration transmitted to the vehicle body are relatively reduced and ride comfort is improved.

Further, when the wheel bumps, the shock absorber assembly 7 pushes the lower portion of the wheel carrier 2 outwardly and controls camber to a negative (-) state, which enhances cornering stability and driving stability.

Still further, the horizontally disposed shock absorber assembly 7 provides an advantage in package space for passengers or the trunk. The trailing arm 6 contributes to increasing the stiffness of the whole structure of the suspension system.

Another embodiment according to the present invention is illustrated in Fig. 5, wherein the same elements as those in the previously described embodiments are designated by the same reference numerals and the description thereof will be omitted.

In this embodiment, the shock absorber assembly 7 is connected to a portion near the middle portion of a coupler 81 for connecting the vertical arm 32 to a

vertical link 80 hingedly connected to the subframe 4.

Referring to Fig. 6, when the wheel bumps, the upper control link 3 rotates about the hinge portion 30 in a clockwise direction and the coupler 81 and the vertical link 80 rotate in accordance with the movement of the upper control link 3. Then the coupler 81 pushes the shock absorber assembly 7. Since the operation of this embodiment is similar to that of the first embodiment, other descriptions of the operation will be omitted.

It should be readily apparent from the foregoing description that the second embodiment according to the invention provides a suspension system having the similar effects to that of the first embodiment.

WHAT IS CLAIMED IS;

1. A suspension system for a vehicle comprising
5 a wheel carrier having upper and lower portions;

an upper control link having a horizontal arm, a
vertical arm, and at least one hinge portion
therebetween, the hinge portion of the upper control
10 link being hingedly connected to a vehicle body, the
horizontal arm being connected to the upper portion of
the wheel carrier;

front and rear lower control links, each for
15 connecting a lower portion of the wheel carrier to the
vehicle body;

a trailing arm disposed in the longitudinal
direction of the vehicle and connected to the vehicle
20 body and the wheel carrier; and

a shock absorber assembly mounted between the lower
portion of said wheel carrier and the vertical arm of
the upper control link.
25

2. The suspension system for a vehicle according
to claim 1, wherein the horizontal arm of said upper
control link diverges to form a pair of hinge portions
30 and from the hinge portion the vertical arm of said
upper control link converges.

3. The suspension system for a vehicle according
to claim 1, wherein the horizontal and vertical arms of
35 said upper control link meet by an obtuse angle.

4. The suspension system for a vehicle according to claim 1, wherein the front lower control link is connected to said wheel carrier via said trailing arm.

5 5. The suspension system for a vehicle according to claim 1, wherein said shock absorber assembly is disposed substantially horizontally.

10 6. A suspension system for a vehicle comprising
a wheel carrier having upper and lower portions;

15 an upper control link having a horizontal arm, a vertical arm, and at least one hinge portion therebetween, the hinge portion of the upper control link being hingedly connected to a vehicle body, the horizontal arm being connected to the upper portion of the wheel carrier;

20 front and rear lower control links, each for connecting a lower portion of the wheel carrier to the subframe;

25 a trailing arm disposed in the longitudinal direction of the vehicle and connected to the vehicle body and the wheel carrier; and

30 a vertical link having a first end hingedly connected to the vehicle body and a second end;

a coupler for connecting the second end of said vertical link to a lower portion of the vertical arm of said upper control link; and

35 a shock absorber assembly mounted between the lower portion of said wheel carrier and said coupler.

7. The suspension system for a vehicle according to claim 6, wherein the horizontal arm of said upper control link diverges to form a pair of hinge portions
5 and from the hinge portion the vertical arm of said upper control link converges.

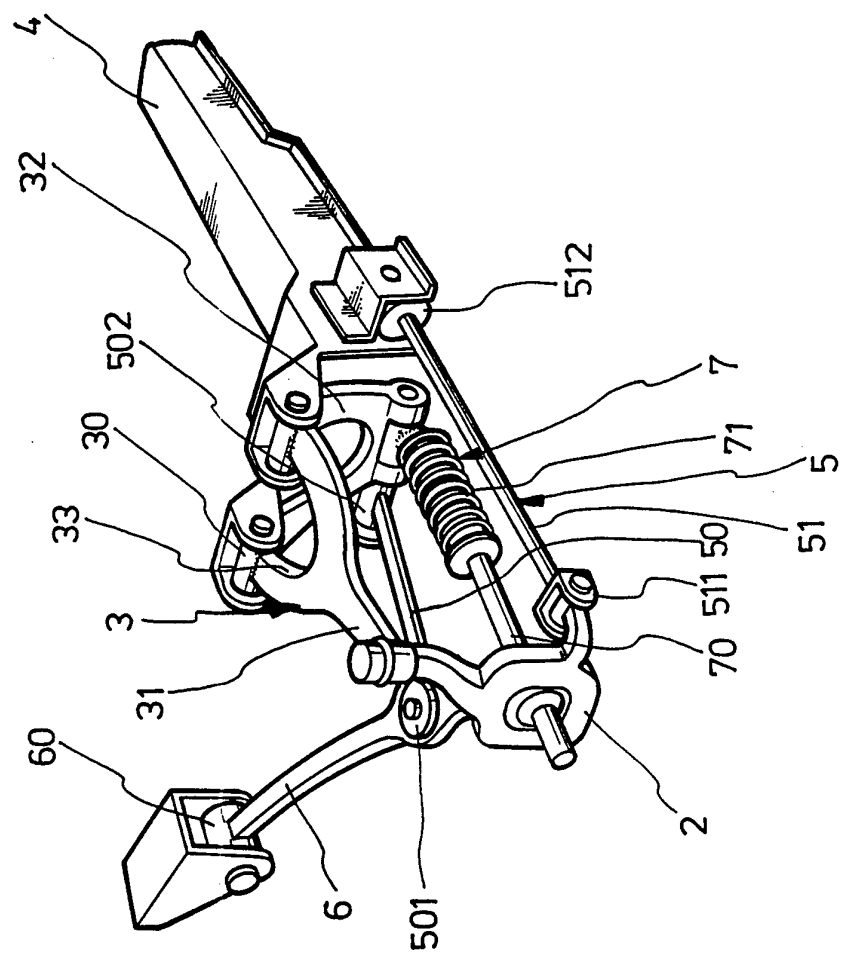
8. The suspension system for a vehicle according to claim 6, wherein the horizontal and vertical arms of
10 said upper control link meet by an obtuse angle.

9. The suspension system for a vehicle according to claim 6, wherein the front lower control link is connected to said wheel carrier via said trailing arm.
15

10. The suspension system for a vehicle according to claim 6, wherein said shock absorber assembly is disposed substantially horizontally.

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FIG. 1



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FIG. 2

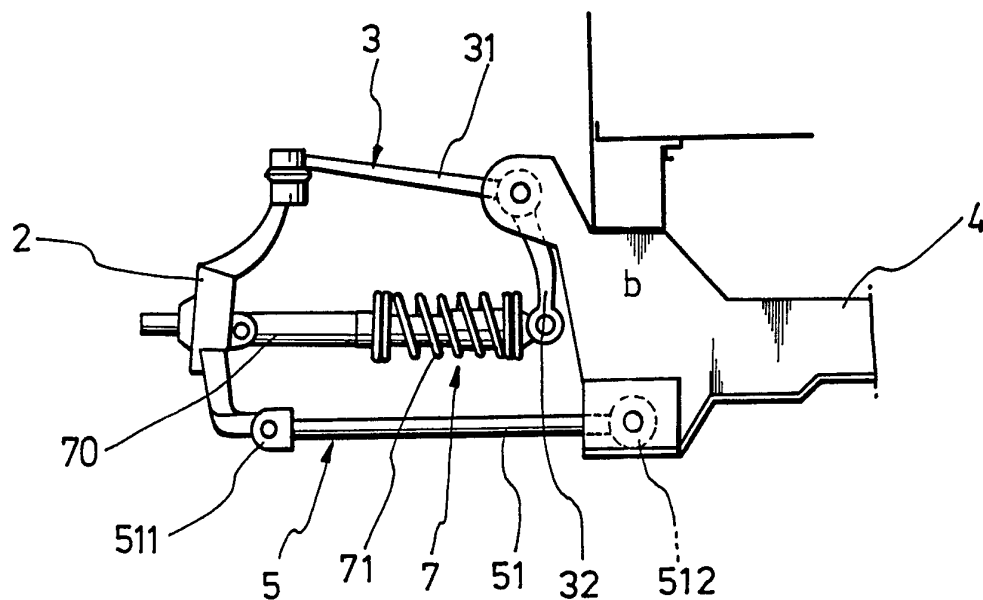
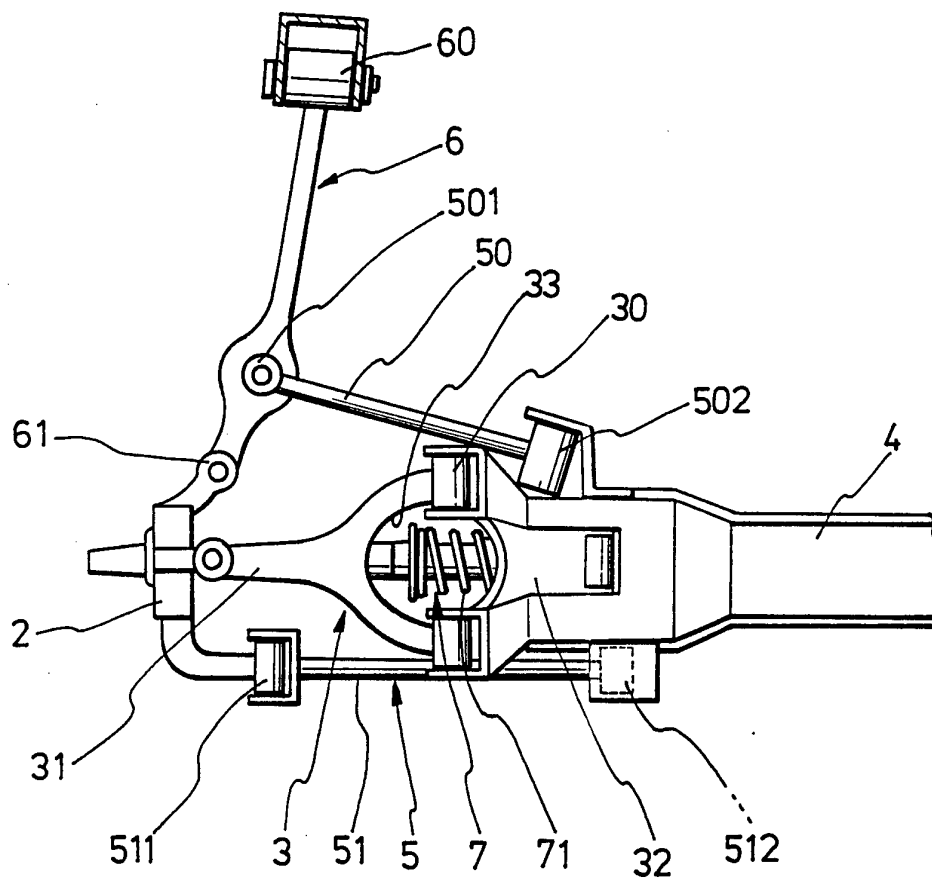


FIG. 3



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FIG.4

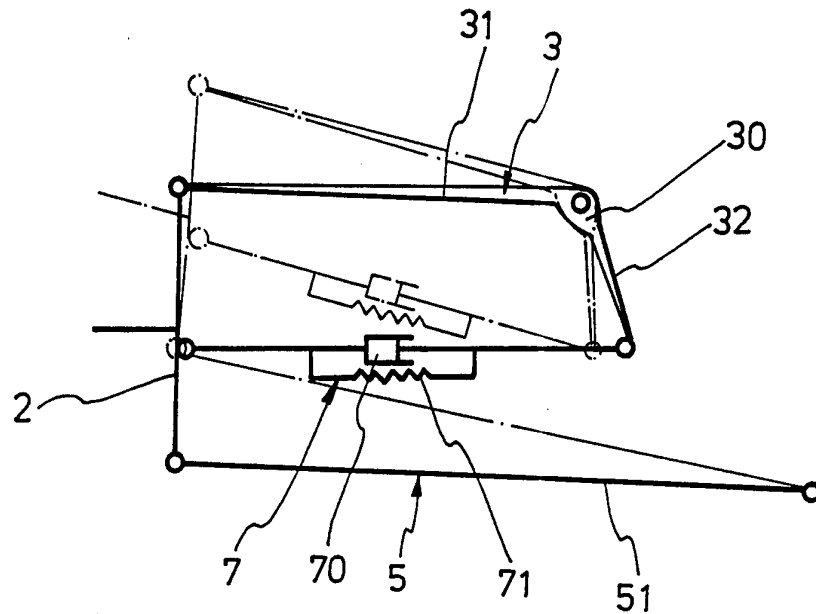
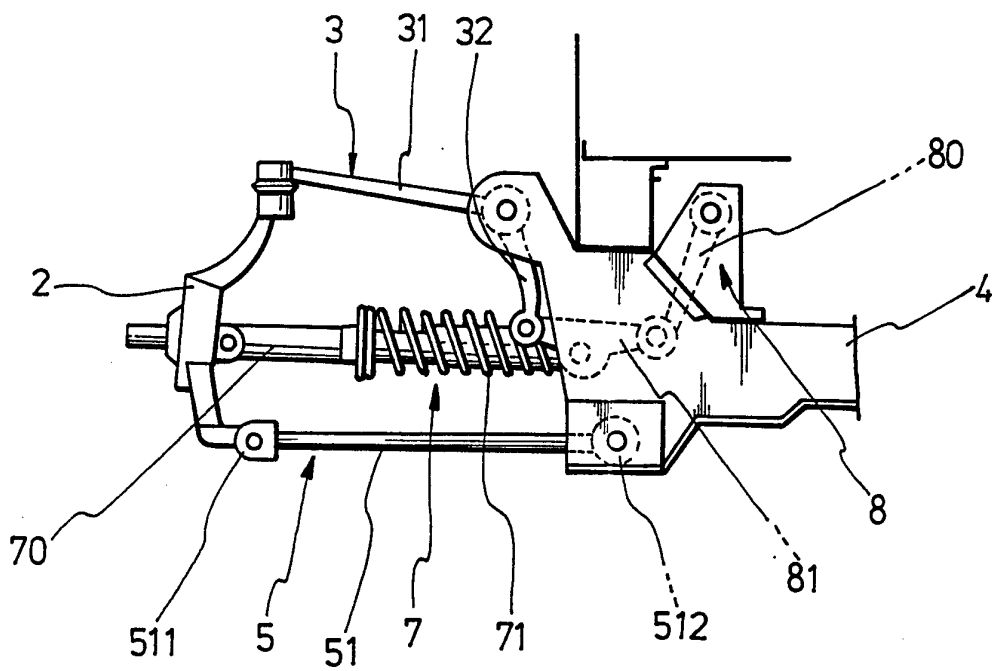
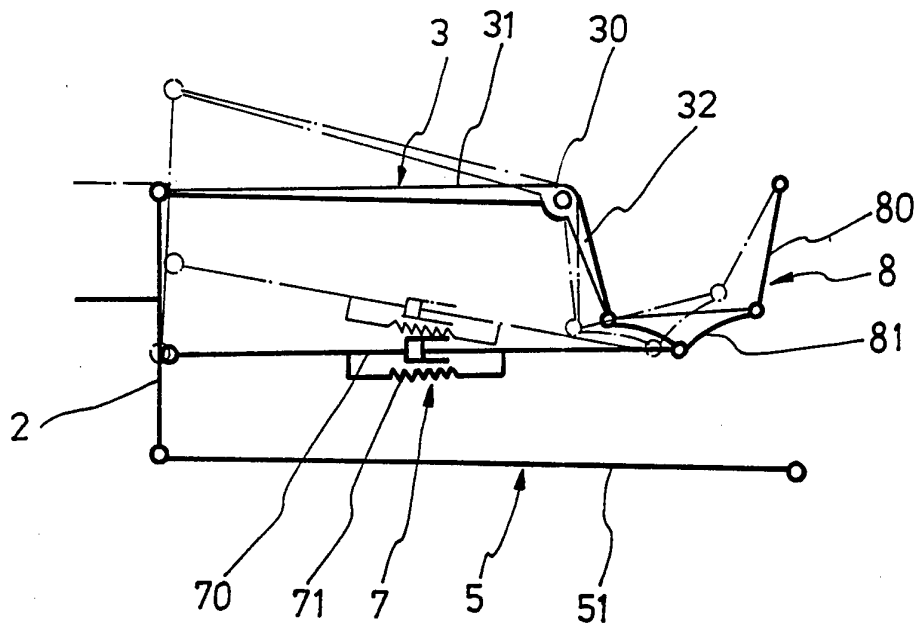


FIG.5

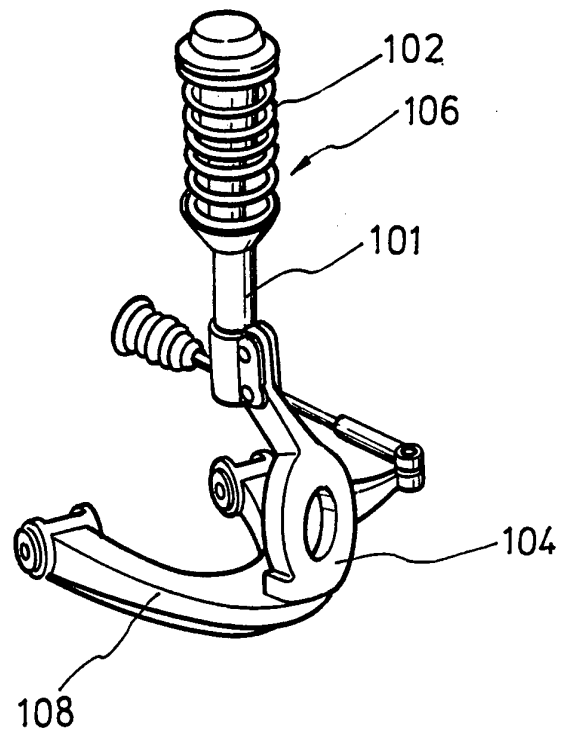
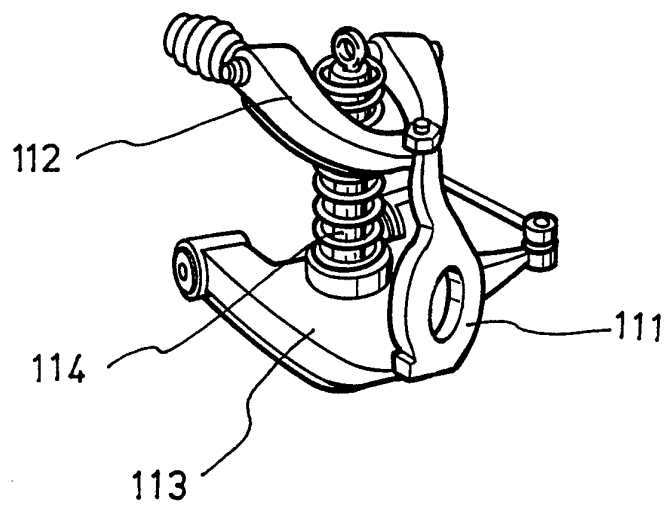


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FIG. 6



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FIG. 7A (Conventional Art)**FIG. 7B** (Conventional Art)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR 94/00152

A. CLASSIFICATION OF SUBJECT MATTER

⁶
 IPC : B 60 G 3/20

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)

⁶
 IPC : B 60 G 3/00, 3/18, 3/20, 3/26

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 practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 51 08 126 A (BANSE) 28 April 1992 (28.04.92), figs. 2-5; abstract.	1,6
A	FR 26 36 568 A (PEUGEOT) 23 March 1990 (23.03.90), figs. 1,2.	1,6
A	EP 02 70 399 A1 (CLAUX) 08 June 1988 (08.06.88), fig.1. -----	1,6

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

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Date of mailing of the international search report

20 February 1995 (20.02.95)

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Im Recherchenbericht angeführtes Patentedokument Patent document cited in search report Document de brevet cité dans le rapport de recherche		Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
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