

AUSTRALIA  
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010062

**PATENT REQUEST : STANDARD PATENT**

The person identified below as the Applicant requests the grant of a patent to the person identified below as the Nominated Person, for an invention described in the accompanying standard complete specification.

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Invention Title: Seating Suspension Arrangement  
Name of Actual Inventor: Gordon Lewis  
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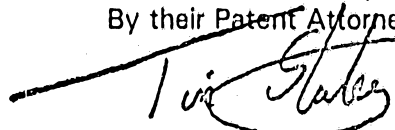
**ASSOCIATED PROVISIONAL APPLICATION DETAILS**

Application No: PL8316  
Date: 15th April, 1993  
Drawing number recommended to accompany the abstract: 1

DATED this 15th day of April 1994

**S 045408 150494**

G and J Lewis Enterprises Pty Ltd  
By their Patent Attorney



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**NOTICE OF ENTITLEMENT**

We G and J Lewis Enterprises Pty Ltd (A.C.N. No. 002 263 121)

of Unit 9, 108 Percival Road, SMITHFIELD NEW SOUTH WALES 2164,  
AUSTRALIA

being the Applicant and Nominated Person, in respect of Application No. 60501/94,  
entitled Seating Suspension Arrangement state the following:

Gordon Lewis is the actual inventor of the invention.

This application is associated with the following provisional application:

Applicant	Application No	Application Date
G and J Lewis Enterprises Pty Ltd	PL8316	15th April, 1993

The inventor made the invention for and on behalf of the nominated person in the  
course of his duty as a Director and an employee of the nominated person.

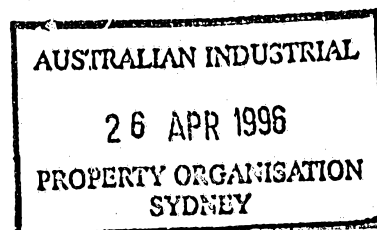
DATED this 26th day of April 1996

G and J Lewis Enterprises Pty Ltd

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OUR REF: P21151-H:PJT/AS





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SEATING SUSPENSION ARRANGEMENT
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- (56) Prior Art Documents  
WO 93/19950  
DE 4127274  
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- (57) Claim

1. A suspension arrangement for a seat, comprising a frame arranged to mount the seat, an actuating arm mounted to the frame in a position arranged to be directly underneath the seat, the actuating arm being mounted for motion in a substantially horizontal plane, a resilient means arranged to resist motion of the actuating arm, and a first linkage connected between the arm and a first mounting member arranged to support at least a portion of the seat and being arranged for vertical motion relative to the frame, the arrangement being such that relative vertical motion of the first mounting member is transmitted by the first linkage to cause horizontal motion of the actuating arm, which horizontal motion is resisted by the resilient means, whereby to reduce the shock of vertical motion transmitted to the portion of the seat supported by the first mounting member.

5. A suspension arrangement for a seat, comprising first and second seat mounting brackets, the first seat mounting bracket being arranged to support a front part of the seat and the second seat mounting bracket being arranged to support a rear part of the seat, a frame for supporting the first and second seat mounting brackets, by way of a first rocker arm pivotally mounted to the frame and connected at one end to the first seat mounting bracket and a second rocker arm pivotally mounted to the frame and connected to the second seat bracket, the respective brackets being arranged for vertical motion in response to shock applied to the seat or frame, the respective rocker arms pivoting in response to motion of the respective brackets in a downwards direction so that a part of the rocker arm on the side of the pivot opposite the connection to the bracket rises as the bracket moves downwards, an actuator arm pivotally mounted to the frame between the first and second brackets for pivotal motion about a substantially vertical pivot axis, the actuating arm being connected to the first rocker arm by a webbing member connected to the actuating arm on one side of the pivot axis and to the first rocker member, a second webbing member connected to the actuating arm on the other side of the pivot axis and to the second rocker member, a resilient means connected to resist motion of the actuating arm about the pivot axis, whereby motion of each respective bracket in a downwards direction relative to the frame is transmitted via the rocker arm and webbing to the actuating arm and is resisted by the resilient means, whereby to reduce shock transmitted to the seat.

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**ORIGINAL**  
**COMPLETE SPECIFICATION**  
**STANDARD PATENT**



Invention Title:            Seating Suspension Arrangement

The following statement is a full description of this invention, including  
the best method of performing it known to us:

GH&CO REF: P21151-H:TJS:JM

SEATING SUSPENSION ARRANGEMENT

The present invention relates to a suspension arrangement for seating, particularly, but not exclusively, a suspension arrangement for vehicle seating, more particularly, but not exclusively, a suspension arrangement for seating in vehicles such as trucks and four wheel drive vehicles which are subject to a substantial amount of shock.

It is known to mount vehicle seats on a pair of front and rear seat support brackets which run transversely to the seat and support the front and rear of the vehicle seat respectively. The seat support brackets are mounted on a frame, which may be the vehicle chassis or a separate frame for mounting the seat in an adjustable manner, by way of front and rear pairs of rocker arms. The rocker arms are pivotally mounted to the frame, such that upper ends of the rocker arms are connected to the seat support brackets. Lower ends of the rocker arms, on the opposite side of the rocker arm pivot to the seat support bracket, are connected to powerful springs which run generally horizontally and are mounted at their other end to the frame. The springs resist pivoting motion of the rocker arms and therefore resist vertical motion of the seat support brackets. In other words, they act as suspension to reduce the amount of shock transmitted from the vehicle to the seat.

A problem with this prior art arrangement is that a significant amount of vertical dimension space is required to house the arrangement. The rocker arms are generally required to be quite long, such that a significant amount of vertical space is taken up by each rocker arm, and the springs are required to be quite powerful and mounted at the extreme end of the rocker arm opposite the connection to the seat support bracket. Because the springs are so large, even though they run horizontally they still take up a significant amount of vertical space because of the fact that they are placed at the base of the arrangement.

The amount of space required for such a suspension arrangement can cause problems, particularly in vehicles with very little head room.

Another problem with this sort of arrangement is "cabin nod". In the prior art arrangement, the front and rear seat support brackets are rigidly connected to each other. Shock occurring at the front part of the seat, for example, will therefore be transmitted to the rear part of the seat. This results in transmission of shock to the seat back which causes discomfort to the user.

The present invention provides a suspension arrangement for a seat, comprising a frame arranged to mount the seat, an actuating arm mounted to the frame in a position arranged to be directly underneath the seat, the actuating arm being mounted for motion in a substantially horizontal plane, a resilient means arranged to resist motion of the actuating arm, and a first linkage connected between the arm and a first mounting member arranged to support at least a portion of the seat and being arranged for vertical motion relative to the frame, the arrangement being such that relative vertical motion of the first mounting member is transmitted by the first linkage to cause horizontal motion of the actuating arm, which horizontal motion is resisted by the resilient means, whereby to reduce the shock of vertical motion transmitted to the portion of the seat supported by the first mounting member.

Preferably, the linkage comprises a webbing member which is attached at one end to the actuating arm and at the other end to a rocker arm pivotally mounted to the frame and also attached to the mounting member. The mounting member is preferably a front or rear seat support bracket. On vertical motion of the mounting member, the rocker arm pivots. This motion is transmitted by the webbing to the actuating arm and the motion is resisted by the resilient member, reducing shock to a seat supported by the mounting member.

An advantage of at least a preferred embodiment of

the present invention is that the actuating arm and resilient means can be positioned in any desired horizontal plane, and preferably positioned in a space underneath the seat and on the same level as the rocker arm. The amount of vertical space required for the suspension arrangement is therefore minimised.

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Preferably, the actuating arm is mounted on a pivot, the pivot having a substantially vertical axis, and on the opposite side of the pivot to the first linkage a second linkage is connected which is connected to a further mounting member supporting another portion of the seat. The further linkage also operates together with the actuating arm and resilient means to reduce shock to the further portion of the seat. The further linkage is preferably mounted to a seat support bracket as the mounting member which is the rear seat support bracket, the first linkage being mounted to a seat support bracket which is the front support bracket.

In a preferred embodiment, a front support bracket and rear support bracket as the first and second mounting member are not rigidly connected together. The only connection is via the linkages and the actuating arm. This advantageously reduces cabin nod.

Preferably, damping means are provided, preferably connected to the actuating arm, to damp motion of the actuating arm.

The present invention further provides a suspension arrangement for a seat, comprising first and second seat mounting brackets, the first seat mounting bracket being arranged to support a front part of the seat and the second seat mounting bracket being arranged to support a rear part of the seat, a frame for supporting the first and second seat mounting brackets, by way of a first rocker arm pivotally mounted to the frame and connected at one end to the first seat mounting bracket and a second rocker arm pivotally mounted to the frame and connected to the second seat bracket, the respective brackets being arranged for vertical motion in response



to shock applied to the seat or frame, the respective rocker arms pivoting in response to motion of the respective brackets in a downwards direction so that a part of the rocker arm on the side of the pivot opposite the connection to the bracket rises as the bracket moves downwards, an actuator arm pivotally mounted to the frame between the first and second brackets for pivotal motion about a substantially vertical pivot axis, the actuating arm being connected to the first rocker arm by a webbing member connected to the actuating arm on one side of the pivot axis and to the first rocker member, a second webbing member connected to the actuating arm on the other side of the pivot axis and to the second rocker member, a resilient means connected to resist motion of the actuating arm about the pivot axis, whereby motion of each respective bracket in a downwards direction relative to the frame is transmitted via the rocker arm and webbing to the actuating arm and is resisted by the resilient means, whereby to reduce shock transmitted to the seat.

Features and advantages of the present invention will become apparent from the following description of an embodiment they are of, by way of example only, with reference to the accompanying drawings, in which;

Figure 1 is a schematic plan view of a seating suspension arrangement in accordance with an embodiment of the present invention;

Figure 2 is a schematic end view from the front end of the seating arrangement of Figure 1, and

Figure 3 is a schematic side view from the left side of the seating arrangement of Figure 1.

With reference to the Figures, a suspension arrangement in accordance with an embodiment of the invention comprises a frame 1 arranged to mount a seat (not shown) on seat mounting members 2 and 3. The seat mounting members 2 and 3 in this embodiment comprise front 2 and rear 3 seat support brackets, for supporting the front and rear of a seat, respectively. The mounting

members 2 and 3 are connected to the frame via pivotally mounted rocker arms 4, 5, 6, 7. Mounting members 2 and 3 are arranged to move vertically in response to shock to the frame and/or seat causing a consequent pivoting of the rocker arms 4, 5, 6, 7. The rocker arms 4, 5, 6, 7 are mounted on respective front and rear transverse rocker pivot shafts 8 and 9 which are connected at respective ends to the frame 1.

An actuating arm 10 is mounted between the front 2 and rear 3 mounting members, underneath the seat.

The actuating arm is mounted for pivotal motion about a substantially vertical axis pivot point 12. The pivot point 12 is located approximately on the fore and aft centre line A running through the arrangement and approximately mid-way between the front 2 and rear 3 mounting members. A compression spring 13 abuts one end of the actuating arm 10, the other end of the compression spring 13 abutting the frame 1. The compression spring 13 resists motion of the actuating arm 10 in a clockwise direction in the horizontal plane about the pivot point 12.

Webbing means 15 and 16 respectively, connect the left and right sides of the actuating arm 10 to the left front rocker arm 5 and right rear rocker arm 6 respectively. The webbings 15 and 16 run under front roller 17 and rear roller 18, respectively, both rollers being mounted to the frame 1.

Referring to the front right hand rocker arm 5, the arrangement here is such that when the front mounting member 2 is depressed in a downward direction relative to the frame 1, because of a shock travelling from the frame 1 to the seat, for example, the rocker arm 5 pivots so that the end opposite the end connected to the mounting member 2 rises. The webbing 15 is attached proximate that end and the motion of rocker arm 5 is transmitted via the webbing 15 to the actuating arm 10 to cause it to move in a clockwise direction (plan view). This motion is resisted by compression spring 13 and

shock to the seat is therefore reduced.

The linking arrangement connected to the rear right hand side rocking arm 6 operates in a similar manner.

Damping means, in the form of a cylinder and piston arrangement 20 may be provided to damp the motion of the actuating arm 13.

Two damping means 20A and 20B are shown in Figure 1. In operation, only one would be required. 20A shows an arrangement which provides heavy damping and 20B shows an arrangement which provides lighter damping. Each arrangement is connected between the actuating arm 10 and frame 1. Adjustment holes 21 are provided in the actuating arm 10 to enable adjustment of the damping between heavy and light damping, by way of adjusting the position of a damping abutment mount 22.

As can be seen from Figure 2, the suspension arrangement of this embodiment can be arranged to take up very little vertical space.

Further, because the front 2 and rear 3 mounting members are not rigidly connected and are only connected in a more "flexible" fashion via the linking means and the actuating arm, cabin nod is also advantageously reduced.

The elements 23 shown in Figure 2 are runners used for adjustment of the seat frame 1 relative to the vehicle. Such runners 23 are standard for vehicles.

This seating suspension arrangement is not limited for use on vehicles only. It can be used in any situation where shock to a seat is a problem and a seating suspension is required.

Variations and modifications may be made in respect of the invention as above described and defined in the following statement of claim.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A suspension arrangement for a seat, comprising  
a frame arranged to mount the seat, an actuating arm  
mounted to the frame in a position arranged to be  
5 directly underneath the seat, the actuating arm being  
mounted for motion in a substantially horizontal plane, a  
resilient means arranged to resist motion of the  
actuating arm, and a first linkage connected between the  
arm and a first mounting member arranged to support at  
10 least a portion of the seat and being arranged for  
vertical motion relative to the frame, the arrangement  
being such that relative vertical motion of the first  
mounting member is transmitted by the first linkage to  
cause horizontal motion of the actuating arm, which  
15 horizontal motion is resisted by the resilient means,  
whereby to reduce the shock of vertical motion  
transmitted to the portion of the seat supported by the  
first mounting member.

2. A suspension arrangement in accordance with  
20 claim 1, the actuating arm being pivotally mounted to the  
frame about a substantially vertical pivot axis, a second  
linkage being connected to the actuating arm, on the  
opposite side of the pivot to the first linkage, and a  
second mounting member arranged to support a further  
25 portion of the seat and arranged for vertical motion  
relative to the frame, the arrangement being such that  
relative vertical motion of the second mounting member is  
transmitted by the second linkage to cause horizontal  
motion of the actuating arm about the pivot, which  
30 horizontal motion is resisted by the resilient means,  
whereby to reduce the shock of vertical motion  
transmitted to the portion of the seat supported by the  
second mounting member.

3. A suspension arrangement in accordance with  
35 claim 1 or 2, wherein damping means are provided to damp  
the motion of the actuating arm.

4. A suspension arrangement in accordance with any  
one of claims 1, 2 or 3, wherein the or each linkage

comprises a rocker arm pivotally mounted to the frame and connected to the respective mounting member at one end, and a webbing member connected at one end to the rocker arm on the side of the rocker arm pivot opposite the connection to the mounting member, and at the other end to the actuating arm, the webbing running in a substantially horizontal plane.

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5. A suspension arrangement for a seat, comprising first and second seat mounting brackets, the first seat mounting bracket being arranged to support a front part of the seat and the second seat mounting bracket being arranged to support a rear part of the seat, a frame for supporting the first and second seat mounting brackets, by way of a first rocker arm pivotally mounted to the frame and connected at one end to the first seat mounting bracket and a second rocker arm pivotally mounted to the frame and connected to the second seat bracket, the respective brackets being arranged for vertical motion in response to shock applied to the seat or frame, the respective rocker arms pivoting in response to motion of the respective brackets in a downwards direction so that a part of the rocker arm on the side of the pivot opposite the connection to the bracket rises as the bracket moves downwards, an actuator arm pivotally mounted to the frame between the first and second brackets for pivotal motion about a substantially vertical pivot axis, the actuating arm being connected to the first rocker arm by a webbing member connected to the actuating arm on one side of the pivot axis and to the first rocker member, a second webbing member connected to the actuating arm on the other side of the pivot axis and to the second rocker member, a resilient means connected to resist motion of the actuating arm about the pivot axis, whereby motion of each respective bracket in a downwards direction relative to the frame is transmitted via the rocker arm and webbing to the actuating arm and is resisted by the resilient means, whereby to reduce shock transmitted to the seat.

6. A suspension arrangement in accordance with claim 5, a damping member being connected between the actuating arm and the frame to damp motion of the actuating arm.

5 7. A suspension arrangement in accordance with claim 5 or 6, further comprising a first roller mounted to the frame and under which passes the webbing member connected to the first rocker arm, and a second roller mounted to the frame under which passes the webbing member mounted to the second rocker arm.  
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8. A suspension arrangement for a seat, comprising a frame arranged to mount the seat, a first mounting member arranged to support at least a portion of the seat and being arranged for vertical motion relative to the  
15 frame, and a webbing member connected between the first mounting member and an anchoring member, the arrangement being such that relative vertical motion of the first mounting member is resisted by the webbing member and substantially horizontal motion of the anchoring member,  
20 whereby to reduce the shock of vertical motion transmitted to the portion of the seat supported by the first mounting member.

DATED this 26th day of April 1996

G & J LEWIS ENTERPRISES PTY LTD

By their Patent Attorney

GRIFFITH HACK & CO



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ABSTRACT

SEATING SUSPENSION ARRANGEMENT

The present invention is a novel seat suspension arrangement for vehicle seating.

5 A vehicle seat is mounted on a pair of front and rear support brackets which are in turn resiliently connected to a frame by pivoting rocker arms. An actuating arm positioned underneath the seat and pivoting about a vertical axis is linked to the rocker arms and is  
10 resiliently mounted to damp motion of the rocker arms. A substantially horizontal arrangement of the actuating arm allows reduction in dimension of the suspension arrangement over prior art arrangements.



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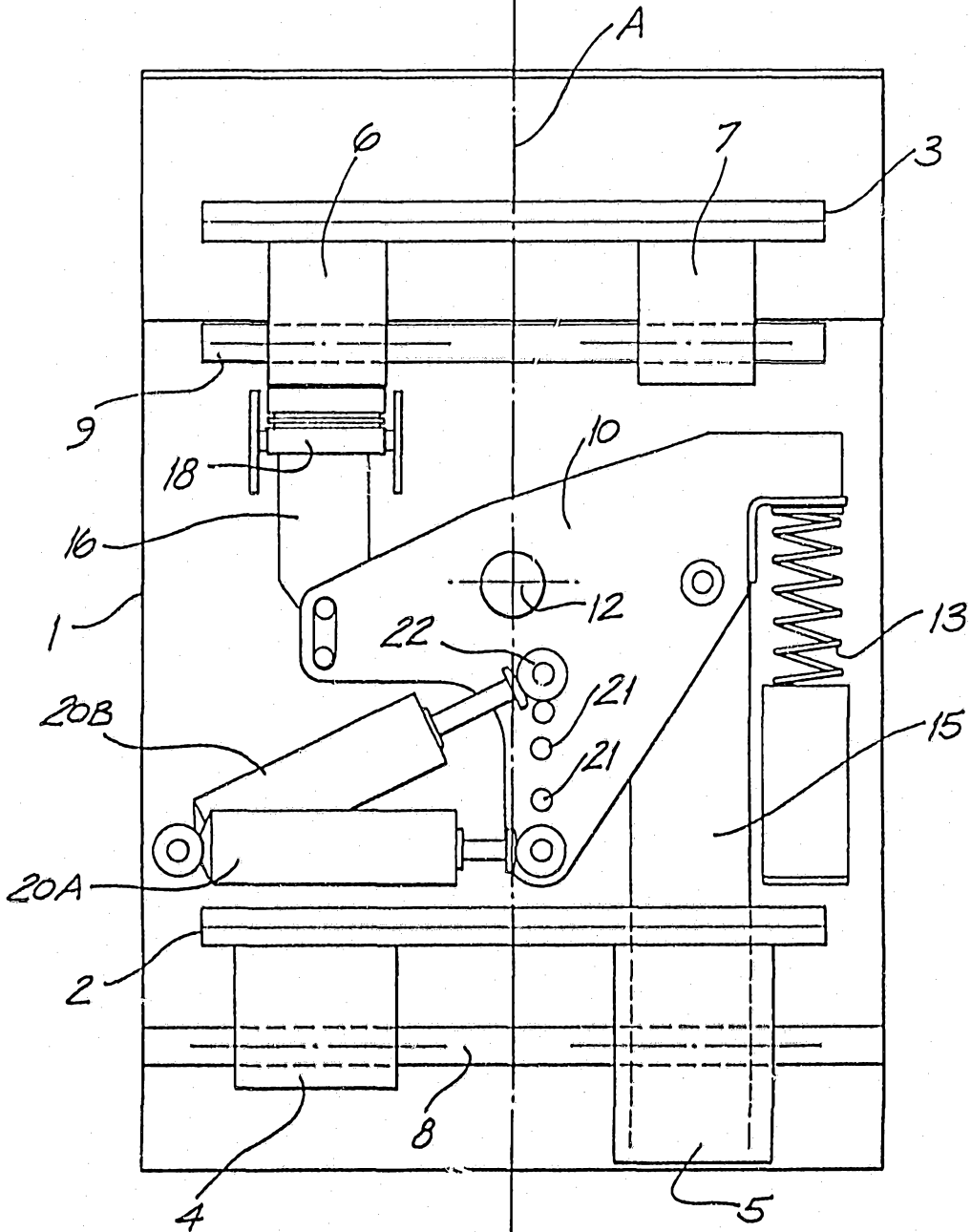


FIG. 1



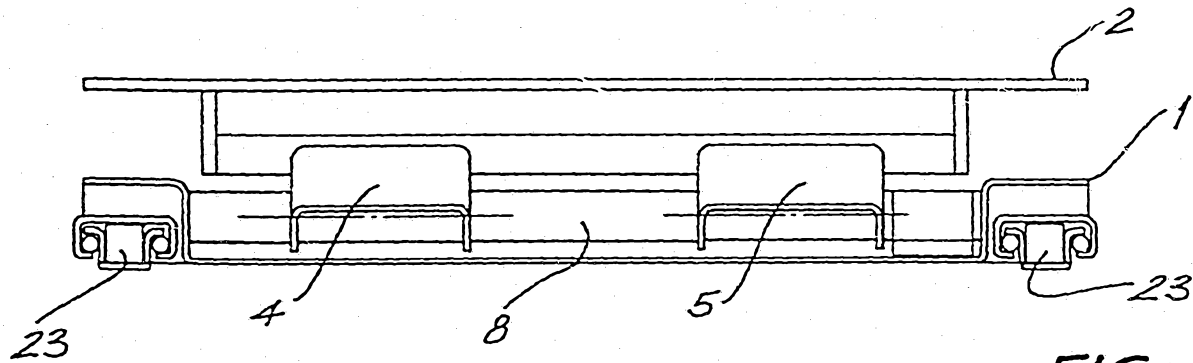


FIG. 2

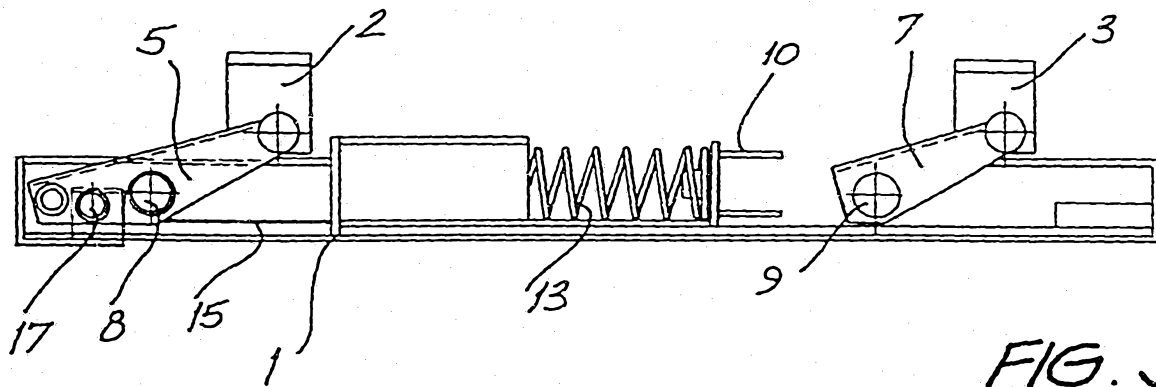


FIG. 3

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