

EUROPEAN PATENT APPLICATION

Application number: 88111093.6

Int. Cl.4: **B61F 5/12 , B61F 5/14 ,
B61F 5/16**

Date of filing: 12.07.88

Priority: 30.07.87 IT 2150987

Date of publication of application:
01.02.89 Bulletin 89/05

Designated Contracting States:
CH DE FR LI

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Safety device for pneumatic suspensions.

A safety device (1) for pneumatic suspensions (2) comprises a flange (14) fixed under a sprung mass (4) and having an opening (15) around which is tightened the edge (8b) of a membrane (8) interposed between the sprung mass (4) and an unsprung mass (3), forming thus an enclosure (9) filled with a fluid under pressure.

A movable cap (19) is slidably guided vertically in the opening (15). A sealing element (22) is provided between the cap (19) and the flange (14). During normal working conditions the cap (19) is pushed towards the sprung mass (4) by the fluid pressure, against a spring (28) placed between the cap (19) and a plate (18) fixed to the sprung mass (4). Should the membrane burst, the cap (19) would be pushed by spring (28) against a checking element (11a) connected to the unsprung mass (3).

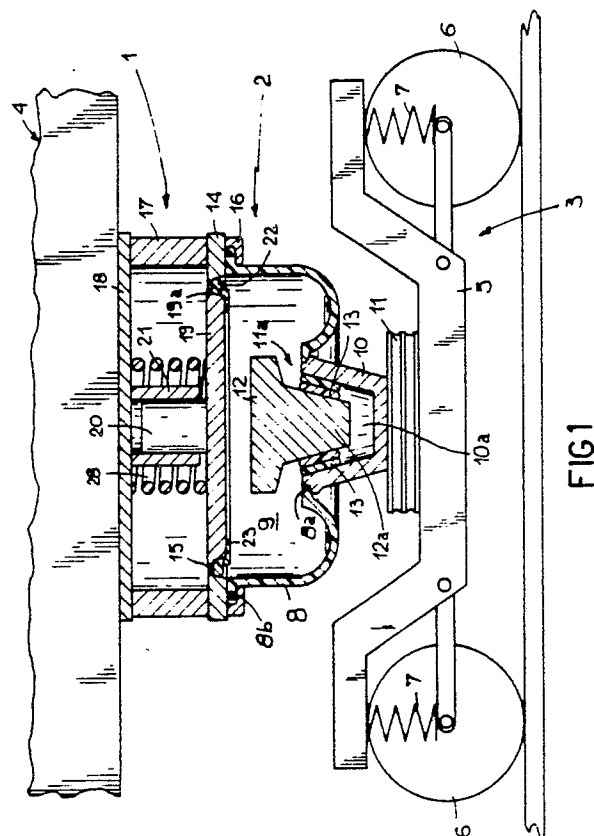


FIG.1

SAFETY DEVICE FOR PNEUMATIC SUSPENSIONS

The present invention relates to a safety device for pneumatic suspensions comprising a membrane hermetically closed in respect to the outer environment, filled with an operative fluid under pressure and working between an earth mass and a suspended mass to elastically sustain this latter in respect to the earth mass.

Particularly, said device is capable to be combined with pneumatic springs used for realizing secondary suspensions in railway waggons and likes.

This does not exclude the use of the device on pneumatic springs adopted for other purposes.

As it is known, to realize secondary suspensions for railway waggons and likes, the adoption of pneumatic springs has been proved advantageous.

The spring of this type consent, in fact, to obtain, in comparison with the springs of conventional type, many advantages such as, for instance, a substantial improvement as to the running comfort as well as the possibility of maintaining equal the height of the centre of gravity of the suspended mass in respect to the ground, independently from the load value.

These pneumatic springs conceptually foresee the employ of a flexible membrane duly shaped, so that to originate, at its own inside, a room hermetically closed in respect to the outer environment and in which an operative fluid is sent, generally air, under pressure.

When the pneumatic spring is utilized in a secondary suspension of a railway waggon, it works between a truck (which represents the earth mass of the system) and a case (representing the suspended mass) so that to elastically sustain this latter in respect to the truck.

Generally, to the pneumatic springs are also associated elastic means of mechanical type disposed in order to sustain the case when this latter, lacking of a suitable pressure at the inside of the membrane, descends towards the truck.

It is observed that the pneumatic suspensions obtained by the use of the above described springs are at present without devices capable to prevent derailments of the railway waggon in case of damage of one of the corresponding pneumatic springs.

More precisely, there is derailment risk when, for instance, due to an accidental burst of the membrane, the pressure exercised by the fluid to sustain the case is instantaneously lacking.

As a consequence of the above, the vertical load transmitted from the case to the truck, is stopped.

This transitory situation persists until when, in

connection with the gravitational fall of the case and of the contemporaneous lifting of the chassis of the truck due to the action of the primary suspensions, a transmission of vertical loads from the case to the same truck cannot be re-established.

The instantaneous reduction of the vertical load acting on the truck originates, in concomitance with stresses transversally acting towards the direction of motion owing to - for instance - centrifugal forces, to an increase of the transversal acceleration according which the same truck tends to be derailed from the railway.

If, as usually happens, taking into consideration the goals achieved by the technique up to-today, the time required to re-establish the transmission of the vertical loads from the case to the truck is major than the time in which the reaction of the primary suspensions is such as to transmit to the wheels vertical loads capable to maintain the transversal acceleration under a certain value, the derailment of the truck might take place.

For the time being it is possible that, always in connection with an instantaneous fall of the pressure in the pneumatic spring, the springs of the primary suspensions completely unload before that the transmission of vertical loads between the case and the truck can be re-established.

Consequently, the chassis of the truck, translating towards the up due to the push previously received, tends to lift the wheels from the railway.

It is evident that in such a situation the derailment of the truck can easily take place also in absence of transversal stresses during the run in rectilineal direction.

The main purpose of the present invention is that of eliminating the drawbacks of the known technique realizing a device that, should an instantaneous fall of pressure takes place at the inside of the pneumatic spring, is capable to instantaneously transmit to the truck a vertical load able to avoid any whatsoever derailment risk.

This purpose, together with others, which will become more apparent from the following detailed description, given hereinafter, are substantially achieved by a safety device for pneumatic suspensions, characterized by the fact of comprising:

- a flange fixed in respect to the suspended mass and presenting an opening around which is inferiorly tight-fixed the membrane in correspondence of its own perimetral edge;
- a cap, slidably guided in parallel direction to the axis of said membrane in correspondence of the above mentioned opening;
- at least a tight element working between the perimetral edges of the opening and the perimetral

edges of the cap;

- at least an operating spring working between the cap and a plate inferiorly fixed to the suspended mass in order to push the cap towards a checking element disposed at the inside of the membrane and connected to the earth mass;
- said cap, being pushed in working conditions, towards the suspended mass in contrast with the action of said operating spring, due to the effect of the fluid pressure contained in the membrane;

Further characteristics and advantageous will become more apparent from the following detailed description of preferred but not exclusive executions of a safety device for pneumatic suspensions according to the present invention, with reference to the accompanying drawings, given only for indicative and not limitative aim, in that:

- figure 1 schematically shows in section the device according to the invention, combined with a secondary suspension of a railway waggon;
- figure 2 shows, in enlarged scale, a particular of figure 1 with the device in function;
- figure 3 schematically shows in section an embodiment variation of the device in reference.

With reference to the cited figures, by 1 has been globally indicated a safety device for pneumatic suspensions according to the present invention.

In the embodiment example shown, the device is combined with a secondary suspension 2 of a railway waggon.

In a per se known way, the secondary suspension 2 works between a truck 3 and a case 4.

The truck 3 represents the earth mass of the system and substantially comprises a chassis 5 elastically sustained in respect to the wheels 6 by primary suspensions 7 schematically indicated.

The case 4, elastically sustained in respect to the truck 3 through the secondary suspension 2, represents the suspended mass of the system.

The secondary suspension 2 comprises a flexible membrane 8 which appears hermetically closed in respect to the outer environment so that to originate, at its own inside, a room 9 which is filled by an operative fluid, preferably compressed air, using the known feeding means.

More in particular, the membrane 8, having an annular development inferiorly presents a first perimetral edge 8a, rigidly tight engaged, for instance through a rubber-metal union, around to a basic element 10 fixed in respect to the chassis 5 previous interposition of an elastic supporting device 11 known and conventional.

In a per se known way, the basic element 11 belongs to a checking element 11a that comprises a supporting element 12 inferiorly presenting a tronco-conic 12a portion in correspondence of which the same supporting element is elastically

sustained, through interposition of one or more elastic rings 13, at the inside of a tronco-conic groove 10a presented by the basic element 10.

The membrane 8 also presents, on the opposite side in respect to the first edge 8a, a second perimetral edge 8b that, according to the present invention, appears rigidly engaged under a flange 14 and around to an opening 15 presented by this latter.

The connection between the perimetral edge 8b and the flange 14 is obtained by a first fastening collar 16 duly shaped, and solidal to the flange by threaded elements.

The flange 14 appears rigidly connected to the case 4 by a spacer sleeve 17 which makes it solidal to a checking plate 18 inferiorly fastened to the same case.

The device 1 comprises also a cap 19 parallelly extending to the flange 14 and disposed in correspondence of the opening 15.

The cap 19 is movable parallelly to the axis of the membrane 8 and, during its vertical displacements, it is guided through a bolt 20 extending towards the checking plate 18 and engaging in a guide collar 21 inferiorly fastened to this latter.

Between the cap 19 and the flange 14 works at least a tight element which exercises a fluid-tight between the cap and the flange in order to separate the room 9 from the outer environment.

In the embodiment referred to figures 1 and 2, the tight element is substantially constituted by a ring 22 in elastomeric material engaged around to the cap 19 and preferably presenting, as shown at figure 2, an essentially tronco-conic shape diverging in direction of the flange 14.

The fastening of the ring 22 to the cap 19 is obtained interposing the same ring between a perimetral relief 19a which peripherically protrudes from the cap and a closing element 23 inferiorly fastened to the cap by threaded elements or something else.

It is also foreseen that the ring 22 acts, in order to exercise the hermetic tight on flange 14, on a tronco-conic surface 14a obtained on the edge of the same flange in correspondence of the opening 15 and diverging towards room 9 (fig.2).

In the embodiment solution as per figure 3, the tight element is realized by a ring in elastomeric material marked with 24, presenting a section substantially "U" shaped and having a perimetral outer edge 24a tight fastened, through a second collar 25 similar to the first collar 16, on flange 14 around the opening 15, as well as an inner perimetral edge 24b tight fixed, through a third collar 26, on cap 19 in correspondence of the perimetral edge of this latter.

In the embodiment solution shown at figure 3 it is also foreseen that the cap 19 presents a first

shoulder relief 19b peripherically protruding from the same and a second shoulder protruding element 19c, peripherically protruding from a collar 27 coaxially fixed to the same cap.

The reliefs 19b and 19c are designed to act on shoulder on a checking relief 14b disposed on the flange 14 and inwardly protruding to the opening 15, in order to stop the slop run and the descent run of the cap 19.

The device 1 comprises also, at least, an operating spring 28 which works between the checking plate 18 and the cap 19 in order to push this latter towards the inner of the membrane 8.

The functioning of the device in reference foresees that, during working conditions, the air pressure sent to the room 9 in such a manner to push, overcoming the action of the operating spring 28, the cap 19 towards the checking plate 18.

The cap 19 is so maintained on shoulder, by the tight ring 22 or by the first checking relief 19b on the flange 14.

In such a situation, the safety device 1 appears prepared to enter into action in case, due to an accidental burst of the membrane 8, an immediate fall of pressure inside room 9 should occur.

Further to such a fall of pressure is immediately got, due to the action of the operating spring 28, the translation of cap 19 towards the inside of the membrane 8, so that the cap may go to shoulder on the bearing element 12.

It is foreseen that the operating spring 28 is structured in order to consent that the action of the cap 19 on the checking element 11a takes place as from when the fall of pressure occur, in a suitably short time in order that the primary suspensions 7, due to the immediate absence of the vertical forces transmitted by the weight of the case, cannot unload (lifting the chassis 5) reducing the vertical loads on the wheels 6 over a certain limit, to which would consist the derailment of the truck 3.

The vertical force transmitted by the spring 28 to the chassis 5, and so to the wheels 6, is such to avoid that the effects of the centrifugal forces, eventually applied on the truck 3 during the execution of curves, provoke the derailment.

During the moments which follow the action of the spring 28, the progressive lowering of the case due to gravity is obtained, so that the vertical forces due to the weight of this latter are transmitted again, through the checking element 11a, to the truck 3.

At this point the checking element 11a and the spring 28 elastically sustain the case 4 in respect to the truck 3, substituting the membrane 8 as regards the functions of secondary suspension.

The proposed purposes are achieved by the invention.

In fact, the safety device in reference, thanks to

the immediate intervention of the cap 19 on action of the spring 28, is able to avoid any derailment risk of the railway waggon, when, further to the burst of the membrane or for any other reason, an immediate fall of pressure takes place at the inside of one (or more) of its own secondary suspensions.

Obviously, the invention so conceived, includes any other embodiment deriving from the above mentioned inventive idea which characterizes the invention.

Claims

1) Safety device (1) for pneumatic suspensions (2) comprising a membrane (8) which defines at its own inner a hermetically closed room (9) in respect to the outer environment and filled with operative fluid under pressure, said membrane operating between an earth mass (3) and a suspended mass (4) to elastically sustain this latter in respect to the earth mass, characterized by the fact of comprising:

- a flange (14) fixed in respect to the suspended mass (4) and presenting an opening (15) around whose edges is inferiorly tight fixed the membrane (8) in correspondence of its own perimetral edge (8b);

- a cap (19) slidely guided in a parallel way to the axis of said membrane in correspondence of said opening;

- at least a tight element (22-24) acting between the perimetral edges of the flange in correspondence of the opening (15) and the perimetral edges of the cap;

- at least an operating spring (28) working between the cap (19) and a plate (18) inferiorly fixed to the suspended mass to push the cap towards a checking element (11a) disposed at the inside of the membrane and connected to the earth mass; said cap, being pushed - during working conditions - towards the suspended mass in contrast with the action of said operating spring due to the effect of the fluid pressure contained in the membrane.

2) Device according to claim 1 characterized by the fact that said tight element comprises a ring (22) in elastomeric material engaged (23,19a) around the cap (19) and designed to act against an edge of said flange (14) to obtain a hermetic tight between this latter and the cap.

3) Device according to claims 1 and 2, characterized by the fact that said ring (22) presents a substantially tronco-conic shape diverging in direction of the flange (14) and acting on this latter in correspondence of a tronco-conic surface (14a) diverging in direction of the room.

4) Device according to claim 1, characterized by the fact that said tight element comprises a ring (24) in elastomeric material presenting a section substantially "U" shaped and having an outer perimetral edge (24a) tight engaged on the flange (14) around the opening and an inner perimetral edge (24b) tight engaged around the cap (19).

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5) Device according to claim 1, characterized by the fact that said cap (19) is provided with at least a pin (20) extending in direction of the checking plate (18) and engaging in a guide collar (21) fixed to the checking plate.

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6) Safety device for pneumatic suspensions according to the previous claims and according to what described and shown, to the specified purposes.

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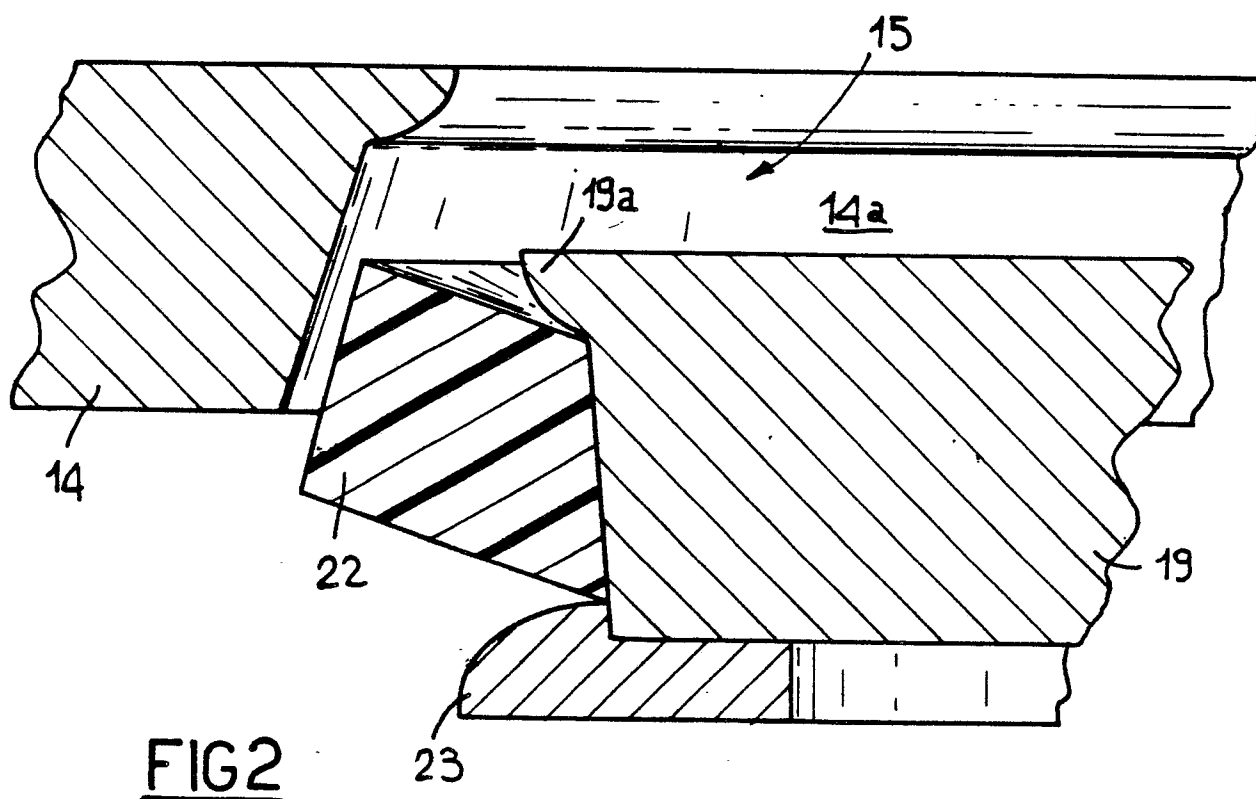
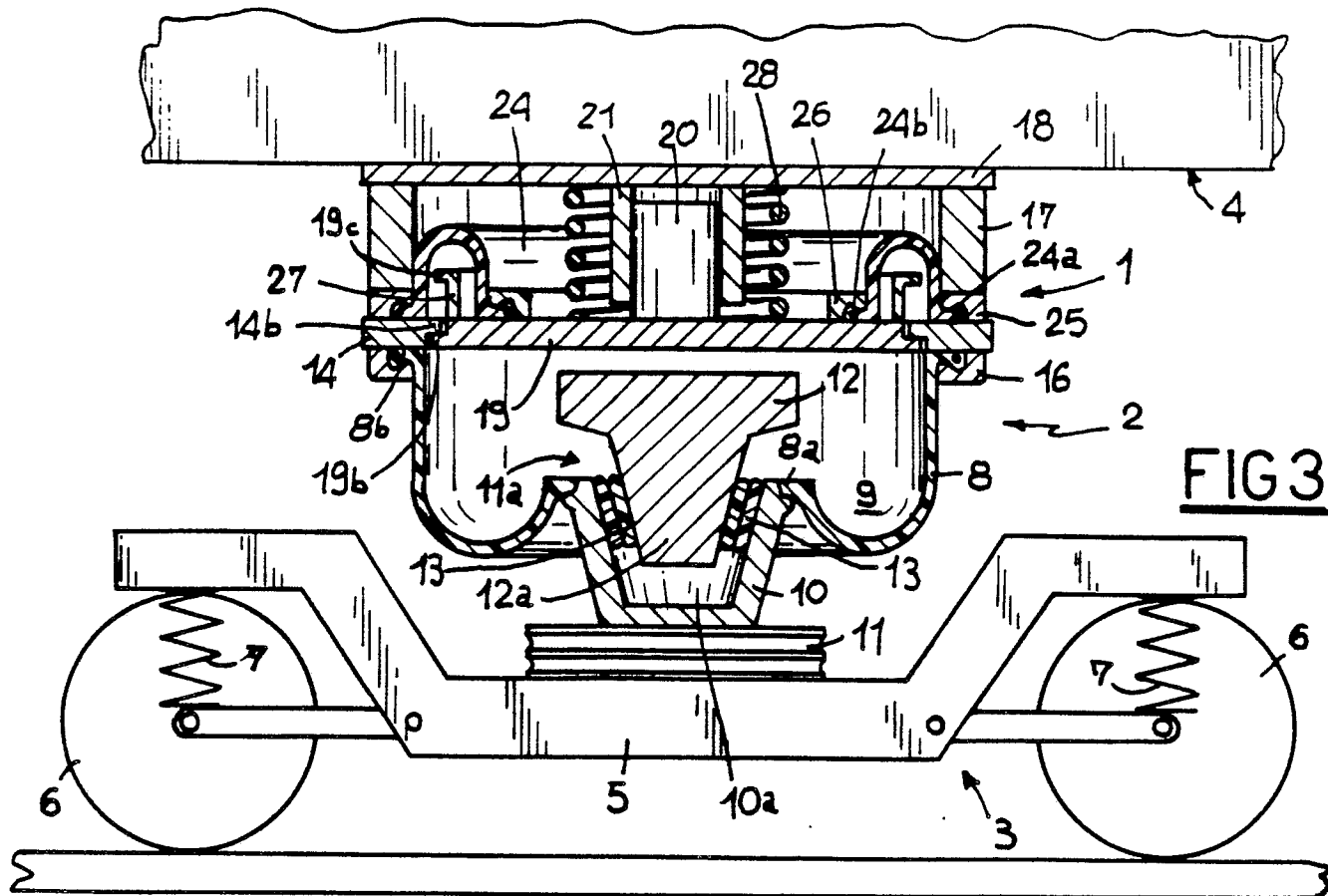
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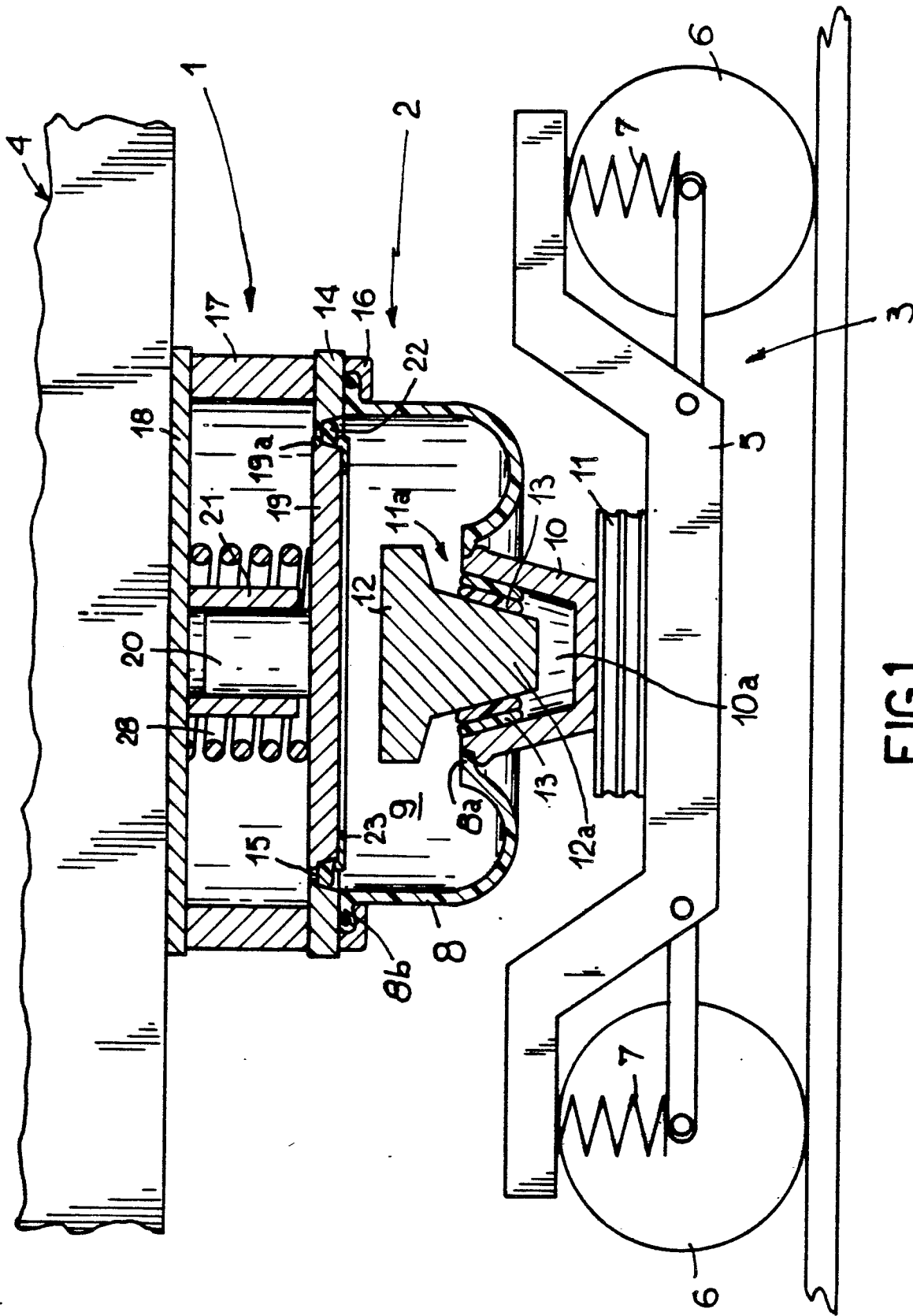


FIG 1



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
A	DE-B-2 711 348 (WEGMANN & CO.) * Whole document; especially figures 3,4 * ---	1	B 61 F 5/12 B 61 F 5/14 B 61 F 5/16
A	FR-A-2 502 089 (SAGA SOCIETA APPLICAZIONI GOMMA ANTIVIBRANTI SpA) * Figure 2 * ---	1	
A	US-A-3 904 181 (HARSY-VADAS) * Whole document * ---	1	
A	DE-A-2 604 769 (MASCHINENFABRIK AUGSBURG-NÜRNBERG AG) * Figure 6 * ---	1	
A	DE-A-1 959 268 (WAGGONFABRIK UERDINGEN AG) -----	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			B 61 F
Place of search THE HAGUE		Date of completion of the search 21-09-1988	Examiner SCHMAL R.
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