

Nov. 29, 1966

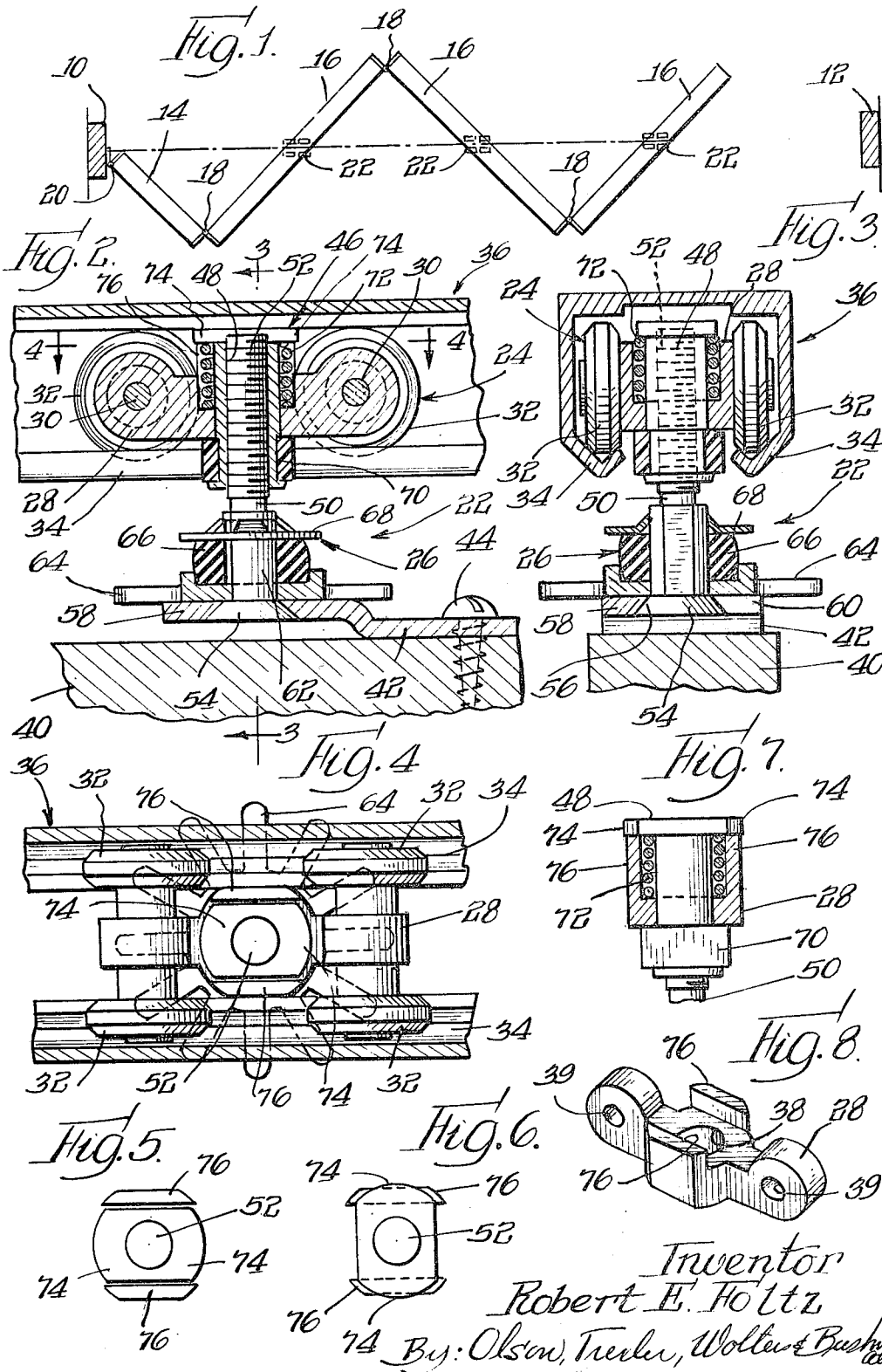
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CONVERTIBLE SUSPENSION ARRANGEMENT FOR SLIDING DOORS

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2 Sheets-Sheet 1



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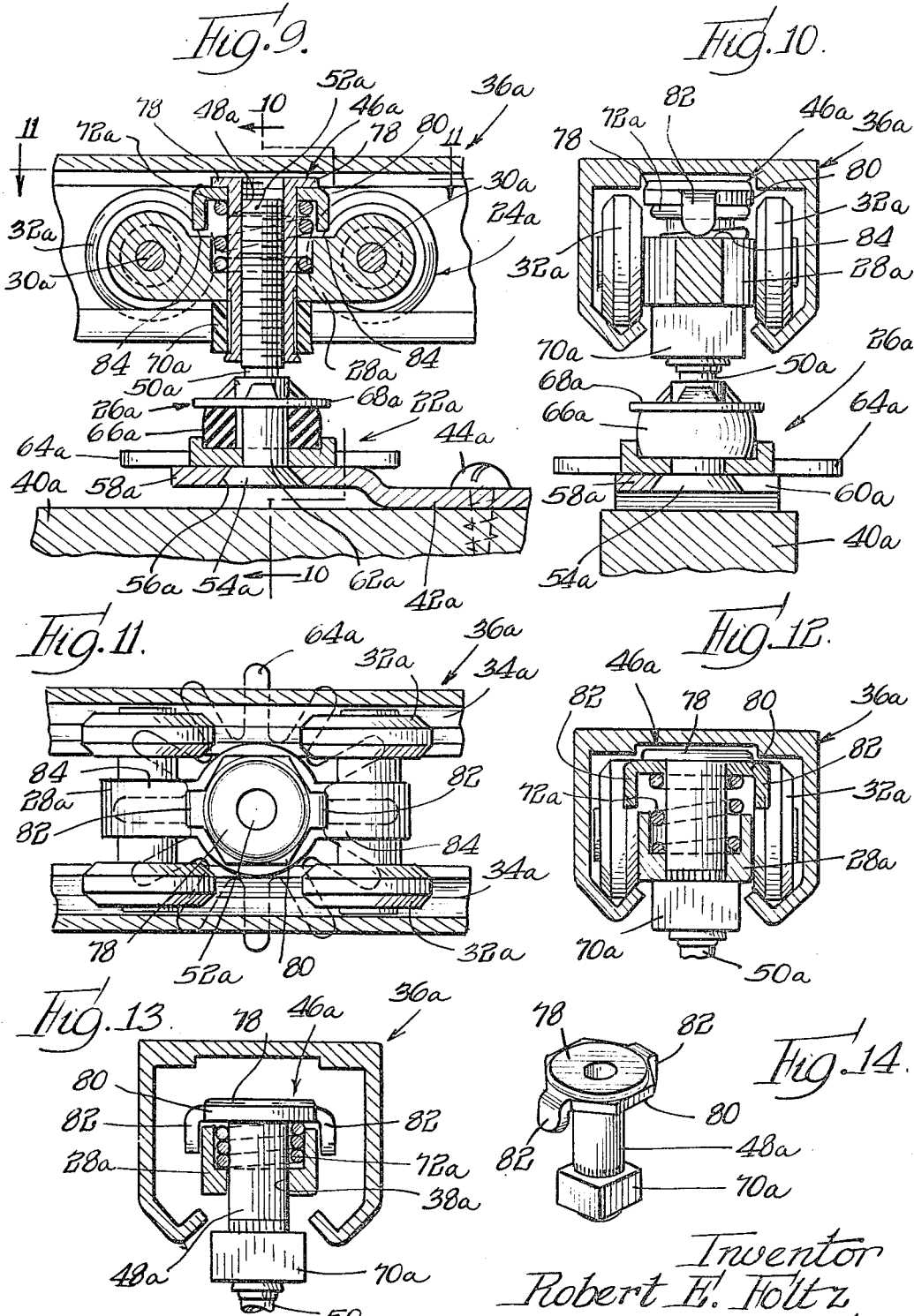
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1

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CONVERTIBLE SUSPENSION ARRANGEMENT
FOR SLIDING DOORS

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Filed Sept. 21, 1964, Ser. No. 397,816
6 Claims. (Cl. 16-87)

This invention relates generally to hardware for use in sliding door installations and especially to suspension arrangements for supporting a sliding door.

Interior doorways are closed in a variety of ways, and among the more popular are sliding doors of the accordion-fold and the by-passing types. Suspension arrangements are employed in supporting the doors in both of these types of installations, but somewhat different tasks are to be performed in the respective units. In the past, this latter fact has led to the provision of different kinds of suspension arrangements, each being adapted specifically for only one type of installation. Correspondingly, there has been a temptation to use an available suspension even though not particularly adapted to the job at hand. Unsatisfactory performance has often resulted.

Therefore, an important object of the present invention is to provide a suspension arrangement for supporting sliding doors that is convertible for use with doors of either the accordion-fold or the by-passing type.

A more general object of the invention is to provide a new and improved suspension arrangement for supporting a sliding door.

Another object of the invention is to provide a suspension arrangement that is convertible between a configuration cushioningly suspending the supported door and a configuration rigidly suspending the door.

These and other objects and features of the invention will become more apparent from a consideration of the following descriptions.

A sliding door suspension arrangement in accord with the invention includes a carriage that is adapted for transportable relocation in a horizontally disposed guide track, further including a door hanger that is provided with an upright member which slidably and rotatably engages the carriage. A compressibly resilient member is situated overlying the carriage and between the carriage and the upper end of the upright member. First and second selectively interengageable arrangements are mounted respectively on the carriage and on the upright member to be directed into engaged relationship in one relative position of rotation of the upright member whereby to lock the door hanger with respect to the carriage for rigidly suspending a supported door. The first and second selectively interengageable arrangements are additionally directable into disengaged relationship in a different position of relative rotation of the upright member whereby to release the door hanger to the action of the resilient member for cushioningly suspending the door from the carriage.

In order that the principles of the invention may be readily understood, two embodiments thereof, but to which the application is not to be restricted, are shown in the accompanying drawing wherein:

FIG. 1 is a top plan view of an accordion-fold door installation incorporating suspension arrangements constructed in compliance with the invention and shown with the overhead track removed;

FIG. 2 is a side elevational view of the top portion of the door installation of FIG. 1 showing the overhead track cut away to reveal details of one of the suspension arrangements, the suspension arrangement being shown in vertical cross-section to disclose details of the cooperating components;

2

FIG. 3 is an end elevational view taken substantially along the line 3-3 of FIG. 2 and showing the upright member rotated to permit relative sliding action between the carriage and the upright member and release of the door hanger to the action of the compressibly resilient member;

FIG. 4 is a top plan view of the suspension arrangement of the invention, taken substantially along the line 4-4 of FIG. 2 and showing the configuration of the parts in which the door hanger is released to the action of the compressibly resilient member;

FIG. 5 is a fragmentary, top plan view of the upright member and the abutment members rising from the carriage, the showing being of the position of FIG. 4 wherein the carriage and the upright member are permitted to slide relative each other;

FIG. 6 is a view similar to the showing of FIG. 5 but illustrating a rotated position of the upright member for engagement of the several abutment members whereby to lock the door hanger with respect to the carriage, as for use in a sliding door installation of the type having by-passing doors;

FIG. 7 is an end elevational view of the configuration of FIG. 6;

FIG. 8 is a perspective view of the carriage body, shown on a somewhat reduced scale and illustrating the abutment members provided on the carriage body;

FIG. 9 is a side elevational view similar to the showing of FIG. 2 but illustrating a modified embodiment of the invention;

FIG. 10 is an end elevational view taken substantially along the line 10-10 of FIG. 9 and showing the upright member rotated to obstruct relative sliding action between the carriage and the upright member;

FIG. 11 is a top plan view taken substantially along the line 11-11 of FIG. 9;

FIG. 12 is a fragmentary, end elevational view similar to the showing of FIG. 10 but illustrating the upright member rotated so as to permit relative sliding action between the carriage and the upright member;

FIG. 13 is a view similar to the showing of FIG. 12 but illustrating the compressed condition of the resilient member resulting from relative sliding action between the carriage and the upright member; and

FIG. 14 is a perspective view of the sleeve component of the upright member and the formed washer element which is secured thereto for defining the abutments.

Referring now in detail to the drawing, specifically to FIG. 1, a sliding door installation incorporating doors of the accordion-fold type is seen to include a hinge jamb 10 and a lock or catch jamb 12, jambs 10 and 12 being spaced to define the span of the door opening. A half door 14 and a suitable number of full doors 16 are swingably interconnected by means of butt hinges 18. The half door 14 is pivotally mounted to the jamb 10 in a suitable manner such as by means of butt hinges 20; and each of the full doors 16 is supported at its central vertical axis by a suspension arrangement 22.

In sliding door installations of the accordion-fold type, such as is illustrated in FIG. 1, it is necessary that each of the suspension arrangements 22 provide support for the interconnected doors. If each of the suspension arrangements does not carry a part of the door load, those suspension arrangements that do will define therebetween a span. The weight of the doors between this span frequently will be appreciable, causing twisting at the butt hinges and resultant sagging of the doors. Operation of such improperly hung doors is difficult and unsatisfactory. In order to insure that each suspension arrangement 22 carries its share of the door load, the suspension arrangements 22, in accordance with the features of the invention, are arranged for cushioningly suspending the doors.

On the other hand, sliding door installations of the by-passing type sometimes include a floor guide arrangement which tends to bind slightly resulting in a somewhat sticky action of the doors. Where a suspension arrangement providing a cushioned support of the door to be used in such instance, sliding movement of the door would proceed with a dancing action. In order to prevent this undesirable situation from occurring, the suspension arrangement 22, in compliance with the features of the invention, is arranged for conversion from cushioned suspension to rigid suspension. The construction and operation of the suspension arrangement 22 will now be described with reference to FIGS. 2-8.

Considering FIGS. 2 and 3, the suspension arrangement 22 will be seen to include a carriage 24 and a door hanger unit 26. The carriage 24 includes a carriage body 28, spaced axles 30, and two pairs of wheels 32. Wheels 32 are mounted on the axles 30 to roll in spaced parallel channels 34 which are provided in a horizontally disposed guide track member 36. The guide track member 36 is adapted to be mounted to the top jamb of a door frame; and considering FIG. 8 for the moment, the carriage body 28 is seen to be fashioned with a vertical bore 38 and with horizontal bores 39 for receiving the axles 30. The purpose of the vertical bore 38 will appear presently.

Returning to FIGS. 2 and 3, the door hanger unit 26 suspendingly supports a door 40, a door mounting bracket 42 being fastened to the top edge of the door by wood screws 44, bracket 42 being employed in coupling the door hanger unit 26 to the door 40. The door hanger unit 26 includes an upright member 46 composed of an internally threaded sleeve 48 and a stud 50. The sleeve 48 passes slidably and rotatably through the bore 38, and the stud 50 has a threaded upper end 52 which is turned into the sleeve 48. At its lower end, the stud 50 is provided with a beveled head 54 which fittedly engages a cooperatively beveled seat 56 fashioned in an upwardly offset section 58 of the bracket 42, bracket 42 being provided with a lateral slot 60 which communicates the seat 56 with an edge of section 58.

Between the head 54 and the threaded upper end portion 52, the stud 50 defines a smooth walled shank portion 62; and in order to hold the head 54 in engagement with the seat 56, a spoked retainer 64 is slidably and non-rotatably mounted on the smooth walled shank portion 62 in conjunction with a resiliently compressible tube 66 of a suitable elastomeric material, together with a one-way washer 68 which serves to compress the tube 66 and thereby bias the retainer 64 against the upper surface of the door mounting bracket 42, thus holding the head 54 in engagement with the seat 56. A nut 70 is fixed on the lower end of sleeve 48 beneath the carriage 24 in order to define a stop which acts to hold the carriage against the action of a compression spring 72 that is disposed overlying the carriage and surrounding an upper end portion of the sleeve.

In compliance with an important feature of the invention, first and second selectively interengageable means are mounted respectively on the carriage and on the upright member 46 which is defined by the stud 50 and the sleeve 48. These means are directable into engaged relationship in one relative position of rotation of the upright member 46 to lock the hanger unit 26 to the carriage 24. In a different relative position of rotation of the upright member, these means are directed into disengaged relationship to release the hanger unit to the action of the spring 72 for cushioningly suspending the hanger unit 26 and the door 40. Specifically, a pair of diametrically disposed abutment members taking the form of flange segments 74 are mounted on the sleeve 48 to project radially outwardly therefrom at a position above the carriage body 28. The flange segments 74 are well shown in FIGS. 2, 4 and 5. Cooperatively, diametrically disposed abutment members taking the form of shoulders 76 are raised upwardly from the carriage body 28 as is

best illustrated in FIG. 8. The flange segments 74 extend outwardly a sufficient distance to overlap or overlie the annulus defined by rotating the shoulders 76, and the shoulders 76 are raised upwardly from the carriage body 28 by a sufficient distance to underlie and approximately touch the plane defined by the lower surface of the flange segments. Advantageously, the shoulders 76 are cast integral with the carriage body 28 while the flange segments 74 are desirably formed integral with the sleeve 48.

In operation of the suspension arrangement 22 in a door installation of the accordion-fold type, the upright member 46 which is defined by the threaded engaged sleeve 48 and stud 50 is rotated relative to the carriage 24 and into the configuration shown in FIGS. 2-5. There, the shoulders 76 and the flange segments 74 are positioned arcuately to permit the flange segments to pass downwardly between the shoulders 76. Thus, the flange segments ride on the upper end of the spring 72, and the hanger unit 26 is cushioningly suspended from the compression spring. The freedom of action thus permitted to the compression spring insures that the suspension arrangement 22 will bear its proportionate share of a door load.

When the suspension arrangement 22 is to be employed in a sliding door arrangement wherein it is desired to immobilize the hanger unit 26 relative to the carriage 24, such as for example in a by-passing type of sliding door installation, the upright member 46 will be rotated relative to the carriage so that the flange segments 74 overlie the shoulders 64 as is shown in FIGS. 6 and 7. Contact of the flange segments with the shoulders locks the door hanger unit 26 to the carriage 24, rigidly suspending the door hanger from the carriage. Any tendency for dancing action of the suspended door due to the presence of a resilient suspension is thus precluded.

While a particular embodiment of the invention has been thus far shown and described, it should be understood, of course, that the invention is not limited thereto since many modifications may be made. Therefore and in order to enhance the understanding of the invention, a modified form thereof is illustrated in FIGS. 9-14. Since the embodiment of FIGS. 9-14 incorporates numerous elements which are similar to those found in the embodiment of FIGS. 1-8, like numerals have been used to designate like parts with the suffix letter "a" being employed to distinguish those elements associated with the embodiment of FIGS. 9-14.

The embodiment of FIGS. 9-14 is characterized by the nature of the selectively interengageable means that are employed in alternatively obstructing and releasing the carriage 24a to the action of the compression spring 72a. Specifically and with particular reference to FIG. 14, the sleeve 48a is seen to be fashioned with a head 78 at its upper end. In order to provide the necessary abutment members, a formed washer 80 is pressed onto the sleeve 48a to be non-rotatable therewith and to be disposed in contact with the head 78. The washer 80 is fashioned to take a diameter approximating that of the head 78, and pendent fingers 82 extend downwardly from the edge of washer 80 at diametric positions.

The pendent fingers, as is well illustrated in FIGS. 12 and 13, are spaced horizontally apart by a sufficient distance to pass over the central core of the carriage body 28a whereby to permit the unit 26a to be released to the action of the compression spring 72a. In addition and with reference to FIGS. 9-11, the fingers 82 will be seen to extend downwardly from the washer 80 by a sufficient distance to nearly abut upper surfaces 84 of the longitudinally extending arms of the carriage body 28a, that is the diametric arms of the carriage body which carry the axles 30a and the wheels 32a. It will be realized that, when the pendent fingers 82 are rotated into position overlying these arms, the carriage 24a and the hanger unit 26a are substantially locked together, the only relative vertical movement being that permitted by

the slight clearance between the lower surface of the pendent fingers and the upper surfaces of the longitudinal arms of the carriage body. Thus, it will be recognized that the upper surfaces 84 of the carriage arms define second selectivity interengageable means for cooperation with the first interengageable means that are defined by the pendent fingers 82. The washer 80 is fashioned with a generally hexagonal periphery for facility in rotating the sleeve 48a and the pendent fingers 82 between the two operative positions.

In other respects, the carriage and the hanger unit of FIGS. 9-14 cooperate in a manner similar to the carriage and hanger unit of FIGS. 2-8.

The specific examples herein shown and described are to be considered as being primarily illustrative. Various changes will, no doubt, occur to those skilled in the art; and such changes are to be understood as forming a part of this invention insofar as they fall within the spirit and scope of the appended claims.

The invention is claimed as follows:

1. A suspension arrangement for supporting a sliding door comprising: a carriage adapted for transportable relocation in a horizontally disposed guide track; door hanger means including an upright member slidably and rotatably engaging said carriage; first and second relatively rotatable and selectively engageable abutment means mounted respectively on said carriage and on said upright member, and resilient means acting between the carriage and the door hanger means in one relative position of rotation of said upright member disengaging said abutment means to cushioningly suspend the door hanger means from said carriage through said resilient means, said abutment means being relatively rotatable to another position of rotation interengaging said abutment means to lock said door hanger means with respect to said carriage for rigidly suspending said door hanger means from said carriage independently of said resilient means, one of said selectively engageable abutment means having

a first region of predetermined major transverse dimension and a second region of lesser, minor transverse dimension, the other of said selectively engageable abutment means having opposite portions spaced apart to admit said second region therebetween in one position of relative rotation and to confront said first region in a second position of relative rotation.

2. A suspension arrangement according to claim 1 wherein said opposite portions project upwardly from said carriage and wherein said first and second regions project radially outwardly from said upright member.

3. A suspension arrangement according to claim 1 wherein said opposite portions comprise fingers depending from said upright member and wherein said first and second regions comprise carriage surfaces projecting laterally outwardly from said upright member.

4. A suspension arrangement according to claim 1 wherein said resilient means comprises a compressibly resilient member and wherein said suspension arrangement further includes stop means on said upright member beneath said carriage acting to hold said carriage against said compressibly resilient means.

5. A suspension arrangement according to claim 1 wherein said opposite portions are diametrically opposite and wherein said major and minor dimensions are disposed at substantially right angles to each other.

6. A suspension arrangement according to claim 1 wherein said carriage includes a body defining a bore and wherein said upright member is slidably and rotatably disposed in said bore.

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