June 4, 1957 E. C. BULLOCK 2,794,690

EXPANSIBLE DRAWER SUPPORTS

Filed Oct. 1, 1952 2 Sheets-Sheet 1

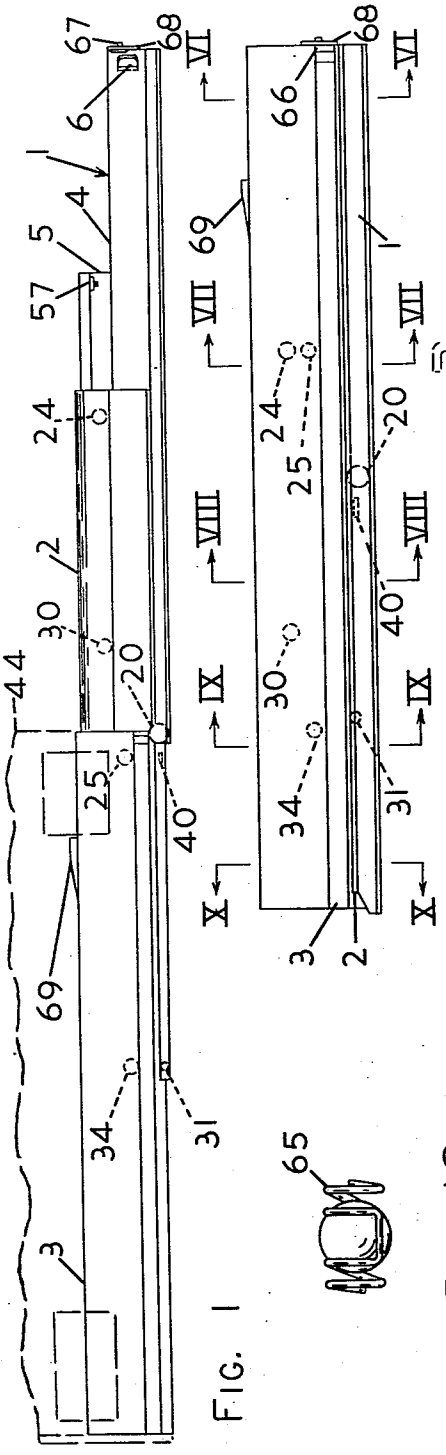


FIG. 1

FIG. 2

FIG. 12

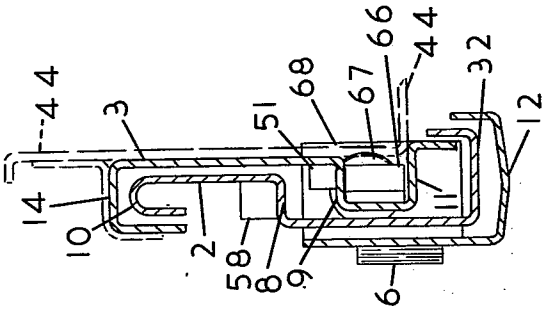


FIG. 6

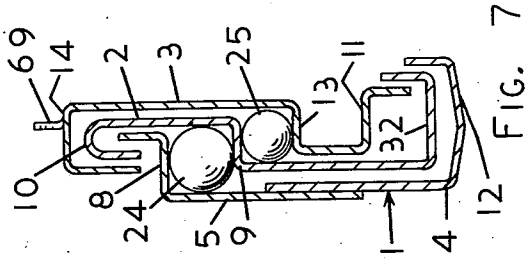


FIG. 7

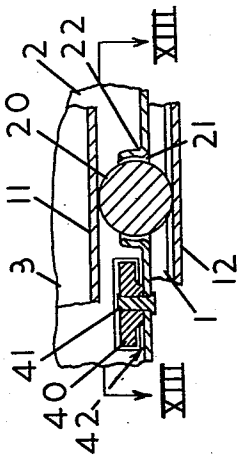


FIG. 11

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EXPANSIBLE DRAWER SUPPORTS

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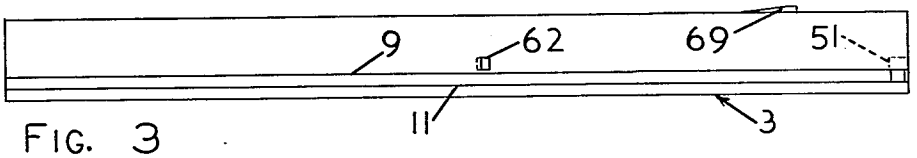


FIG. 3

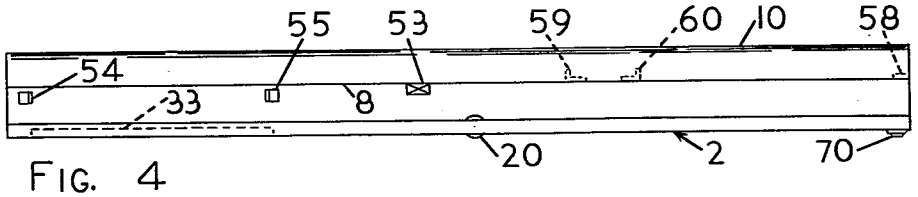


FIG. 4

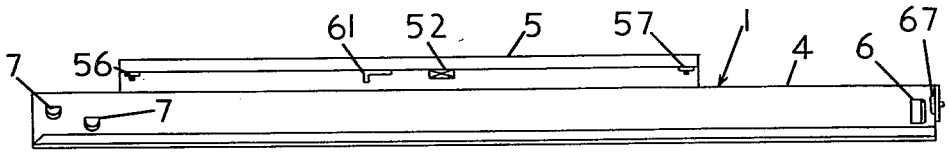


FIG. 5

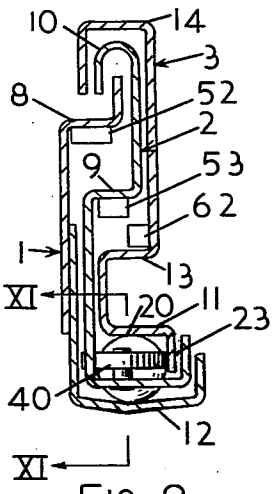


FIG. 8

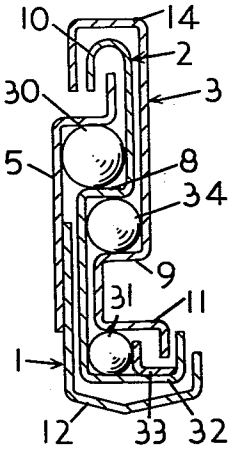


FIG. 9

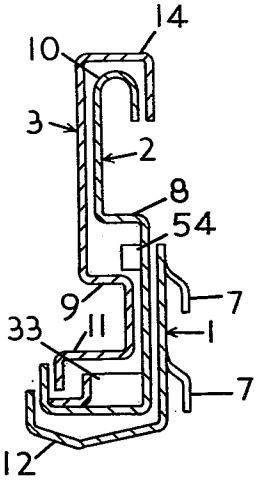


FIG. 10

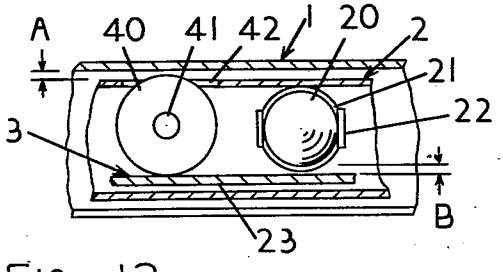


FIG. 13

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EXPANSIBLE DRAWER SUPPORTS

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Application October 1, 1952, Serial No. 312,531

3 Claims. (Cl. 308—3.8)

This invention relates to improvements in progressive suspensions or slides for slidably supporting file drawers and similar slidable elements, and more particularly to a construction comprised of a stationary or case rail, a rail attached to and travelling with the drawer, and an intermediate extension rail which, when the drawer is moved in or out, automatically travels in the same direction but at half the speed while maintaining the drawer in a horizontal position. My invention relates to such a suspension in which the sliding members are mounted on ball bearings.

One of the objects of the invention is to provide a rigid and strong construction that will adequately support a loaded drawer when extended from the cabinet, and which will operate easily and quietly during drawer movement.

A further object of the invention is to provide a practical, more freely operating and more economical method of preventing horizontal frictional contact between the case rail and intermediate rail, and the intermediate rail and the drawer rail. In my invention all side thrust, as well as vertical load, is transmitted by ball bearings or rollers interposed between the sliding members, thereby eliminating direct frictional sliding contact between the flat metal surfaces, usually present in this type of suspension. In this manner, the drawer is caused to operate more accurately, easily and quietly, with less wear and without excessive side play.

These and other objects and purposes of my invention will be seen by those acquainted with the design and construction of drawer suspensions upon reading the following specification and the accompanying drawings.

In the drawings:

Figure 1 is a side elevation view of my drawer suspension in extended position.

Figure 2 is a side elevation view of my drawer suspension in closed position.

Figure 3 is a side elevation view of the drawer rail for my drawer suspension.

Figure 4 is a side elevation view of the suspension rail for my drawer suspension.

Figure 5 is a side elevation view of the case rail for my drawer suspension.

Figure 6 is a sectional view taken along the plane VI—VI of Figure 2.

Figure 7 is a sectional view taken along the plane VII—VII of Figure 2.

Figure 8 is a sectional view taken along the plane VIII—VIII of Figure 2.

Figure 9 is a sectional view taken along the plane IX—IX of Figure 2.

Figure 10 is a sectional view taken along the plane X—X of Figure 2.

Figure 11 is a fragmentary sectional view taken along the plane XI—XI of Figure 8.

Figure 12 is an enlarged view of the bumpers used on certain of the balls in my drawer suspension.

Figure 13 is a fragmentary sectional view taken along the plane XIII—XIII of Figure 11.

In executing the objects and purposes of my invention, I have provided a drawer suspension having a case rail, a suspension rail and a drawer rail, each telescopically related to the other. The loads imposed by the drawer upon the drawer rail are transmitted to the case rail and suspension rail by means of balls. These same balls are so arranged that they prevent side play between the drawer rail and the suspension member and the suspension member and the case rail. Thus any side thrust imposed upon the drawer is transmitted through the balls and roller **40** to the case rail, preventing any flat surface metal to metal contact between the telescoping members of the suspension.

In the following description the terms "inwardly" and "outwardly" are frequently used and are to be taken to mean "inwardly" toward the geometric center of the cabinet and "outwardly" away therefrom. The terms "forwardly" and "rearwardly" are also frequently used and are to be taken to mean "forwardly" in the direction of movement of the drawer as it is opened and "rearwardly" away therefrom.

The drawer suspension consists of three telescoping parts, the case rail **1**, the suspension rail **2** and the drawer rail **3**. The case rail **1** consists of a generally J-shaped member **4** having attached to its long leg an upwardly directed flange **5** (Figs. 1 and 7). The attachment of the flange **5** to the J-shaped member **4** is preferably made by welding. The case rail **1** is provided with a large horizontally directed tab **6** (Figs. 1, 5 and 6) on its rearward end and a pair of smaller vertical tabs **7** on its forward end (Fig. 5). The tabs **6** and **7** secure the case rail **1** to the frame of the cabinet. Adjacent its upper end, the flange **5** is offset inwardly to form a shoulder **8**. The bottom of the J-shaped member is formed with a shallow, V shape groove to provide a track **12** for the hereinafter described main ball **20**.

The suspension member **2** is nested within the case rail **1**, its lower portion being generally J-shaped and seating down within the lower portion of the case rail **1**. At a point substantially midway between its upper and lower extremities the suspension member **2** is offset inwardly to form a shoulder **9** below the shoulder **8** on the frame member **5**. The upper end **10** of the suspension member **2** is bent over upon itself in an outwardly direction and hooks over the upper end of the flange **5**.

Nested within the lower portion of both the case rail **1** and the suspension member **2** is the lower portion of the drawer rail **3**. The drawer rail **3** adjacent its lower end is offset outwardly to form a shoulder **11** above the track portion **12** of the case rail **1**. At a point slightly above the shoulder **11** the drawer rail is offset inwardly to provide a shoulder **13** facing the shoulder **9** on the suspension member. The upper end **14** of the drawer rail is hooked outwardly and seats over the hooked upper end **10** of the suspension member **2**.

In the following description of the location of the ball bearings transmitting the loads between each of the three members of the drawer suspension, it will be assumed that the drawer suspension is in closed position and the balls are located as they are indicated in Fig. 2 and as they appear in Figs. 6 through 10.

Primary support for the suspension member **2** and drawer rail **3** is provided by means of the main ball **20** (Figs. 2, 8 and 11). The main ball **20** is located substantially midway between the forward and rearward ends of the suspension. The main ball is nested within an opening **21** formed in the lower portion of the suspension member **2** and is guided in its fore and aft motion by the upturned lips **22**. The ball **20** is of such diameter that its lower portion rests upon the track portion **12** of the case rail **1** and its upper surface supports the drawer rail **3** by bearing against the lower face of the shoulder

11. Thus, the primary weight of the drawer is transmitted directly from the drawer rail to the case channel, by-passing the suspension member. The main ball 20 is of such diameter that, it may contact the vertical wall of the suspension member 2 but does not touch the lower vertical leg 23 of the drawer rail (Fig. 13). Thus the main ball is designed to transmit vertical loads only. The remaining balls used in the suspension structure, although at times transmitting a substantial portion of the weight of the drawer to the case channel, are also utilized to maintain proper horizontal alignment between the three members of the drawer suspension as the drawer is opened and closed, as described hereinafter.

Rearwardly of the main ball 20 is an auxiliary ball 25 (Fig. 7), and forwardly from the main ball 20 is an auxiliary ball 34 (Fig. 9). Both of these balls are mounted in the raceway or track formed between the shoulder 9 on the suspension member and the shoulder 13 on the drawer rail. Inasmuch as ball 20 passes through the opening 21 of suspension member 2, it is apparent that ball 20 supports drawer rail 3 by bearing against the lower face of shoulder 11, and drawer rail 3 in turn supports the suspension member 2 by the balls 20 and 25 bearing against the upper face of shoulder 13 of the drawer rail and the lower face of shoulder 9 of the suspension member.

Rearwardly of the main ball 20 is auxiliary ball 24 (Fig. 7), and forwardly from the main ball 20 is auxiliary ball 30 (Fig. 9). Both of these balls are mounted in the raceway or track formed between the shoulder 9 of the suspension member 2 and the shoulder 8 of the case rail 1. Inasmuch as the drawer rail 3 is pivotally supported by main ball 20, and suspension member 2 is supported on drawer rail 3 by balls 25 and 20, suspension member 3 is also pivotally supported by main ball 20. Therefore, when the drawer is heavily loaded in the rear, throwing the balance of weight to the rear of ball 20, ball 30 will take the thrust and prevent the suspension and drawer rail from tipping up at the front and down at the rear; conversely, when the drawer is heavily loaded at the front, or the drawer is extended, throwing the balance of the weight forwardly from the ball 20, ball 24 will take the thrust and prevent the suspension and drawer from tipping down at the front and up at the rear.

In addition to the vertical thrust carried by balls 25 and 34, these balls are of such diameter that each contacts the vertical walls of both the drawer rail 3 and the suspension member 2, transmitting side thrust from the drawer rail to the suspension member. Also, in addition to the vertical thrust carried by balls 24 and 30, these balls are of such diameter that they both contact the vertical walls of suspension member 2 and case rail 1, transmitting side thrust from the suspension member to the case rail. These four balls take all sidewise or horizontal thrust of the upper part of the suspension, preventing frictional contact of the vertical flat surfaces.

Forwardly from the main ball 20 is also auxiliary ball 31 (Fig. 9), which is located between the lower track portion 32 of the suspension member 2 and the lower shoulder 11 of the drawer rail 3. Ball 31 is retained in position by a nesting wall 33. The nesting wall 33 constitutes an angle welded to the top surface of the lower track portion 32 of the suspension member 2 adjacent to and just forward of the main ball 20. The roller 40 extends thru a clearance opening 42 (Fig. 11) in the vertical wall of the suspension member. The roller 40 is of such diameter that it projects beyond the main ball 20 to contact the vertical flange 23 of the drawer rail 3. The roller 40 projects through the opening 42 to contact the vertical wall of the case rail 1 and assure a minimum clearance A (Fig. 13) between the case rail 1 and the suspension member 2. The roller 40 also assures a minimum clearance B between the main ball 20 and the vertical flange 23. The roller 40 provides the only means in the lower portion of the suspension assembly for transmitting horizontal side thrust from drawer rail 3 to the case rail 1. Thus, the main ball 20 is by-passed on side thrust loads. When the roller 40 is transmitting side thrust, it has a tractive engagement with the suspension member 2, thru the axle 41. Thus, any movement of the drawer rail with outward side pressure moves the roller in the same direction at half the speed, and the tractive engagement with the suspension member 2 thru the axle 41, causes the suspension member to travel with the roller which in effect becomes a propeller roller the same as main ball 20.

When the suspension assembly is extended, the limit of travel of the suspension member 2 relative to the case rail 1 is determined by the stop 52 on the case rail and the stop 58 on the suspension member with the auxiliary ball 24 between them. Forward travel of the drawer runner with respect to the suspension member is limited by the stop 53 on the suspension member and the stop 51 on the drawer rail with the ball 25 therebetween. Direct contact between the stops and the auxiliary balls is prevented by the buffer spring 65 (Fig. 12) a portion of which buffer spring projects both forwardly and rearwardly of each of these auxiliary balls 24 and 25. That portion of the buffer spring 65 connecting its forward and rearward portions mounts the buffer spring 65 on the ball. This is desirable to cushion impact when the drawer is opened or closed sharply and thus has appreciable momentum when it reaches the limit of its travel.

The forward travel of the auxiliary ball 30 is controlled by the removable limiter 56 mounted on the case rail 1. As the suspension assembly is extended, the positioner 59 causes the auxiliary ball 30 to travel the full distance to the limiter 56. Positioners such as the positioner 59 are necessary in situations where the auxiliary ball is not at all times under a compression load to cause it to travel with the suspension. Travel of the auxiliary ball 30 is controlled by the limiter 61 when the suspension is moved rearwardly.

Forward travel of auxiliary ball 24 is controlled by the stop 52. The stop 58 on the suspension member 2 serves as a positioner for auxiliary ball 24. Rearward travel of auxiliary ball 24 is controlled by a removable limiter 57 on the case channel when the suspension assembly is closed. Auxiliary ball 24 is positioned by the positioner 60 on the suspension member when the suspension assembly is closed.

Forward travel of the auxiliary ball 34 is controlled by the limiter 54 on the suspension member. The auxiliary ball 34 is positioned by the positioner 62 on the drawer runner 3 when the suspension assembly is extended. Rearward travel of the ball 34 is controlled by the limiter 55 on the suspension member.

Forward travel of the auxiliary ball 25 is limited by the stop 53 when the suspension assembly is extended. Auxiliary ball 25 is positioned by the stop 51. No positioner or limiter is provided for auxiliary ball 25 when the suspension assembly is moved to its closed position since auxiliary ball 25 is always under load and, therefore, travel with the suspension assembly is assured.

The limiters 56 and 57 are removably attached to the flange 5 by means of screws, or other suitable means. Removal of the limiters 56 and 57 permits the auxiliary balls 24 and 30 to be removed and the entire suspension assembly to be taken apart.

At its rearward end, the drawer runner 3 is provided with a stop 66 (Fig. 6). The stop 66 contacts the resilient bumper 67 mounted on the upturned flange 68 at the rearward end of the case channel 1 (Figs. 1 and 6). The stop 66 and bumper 67 provide a positive stop for backward travel of the drawer. The drawer 44 is attached to the suspension assembly by being seated upon the drawer rail 3 with the prong 69 of the drawer runner extending up through a matching slot in the drawer.

Operation

The purpose of the suspension assembly is to provide a positive horizontal support for the heavy drawer permitting the drawer to be withdrawn its entire length from its cabinet while holding the drawer level. At the same time it permits the drawer to be opened and closed with a minimum of effort. To this end, the drawer rail supports the drawer throughout substantially the drawer's entire length and transmits the weight of the drawer to the suspension member **2**. The suspension member **2** provides a beam by which the drawer rail **3** is held horizontal and the load of the drawer transmitted to the case rail **1**. The case rail **1** supports the suspension member **2** and transmits the load to the frame of the cabinet.

When the drawer is in its closed position (Fig. 2) the weight of the drawer is transmitted from the drawer rail **3** to the case rail **1** through the main ball **20**. Minor loads may be transmitted through the auxiliary ball **31**, if the drawer happens to be heavily loaded at the forward end and thus unbalanced. As the drawer is extended, the main ball **20** along with the auxiliary balls **24**, **25**, **30**, **31** and **34** move forwardly together with the members of the suspension assembly but with a maximum forward travel of only one-half that of the members of the suspension assembly. The ball **20** at all times remains at the pivot point whereby the major weight of the drawer is transmitted by the ball **20** directly from the drawer rail **3** to the case rail **1**.

In extended position, the auxiliary ball **31** transmits the downward thrust of the drawer rail **3** to the suspension member **2**, acting as the forward support for the drawer load. The main ball **20**, thus, always has a tractive engagement with the suspension member **2**, due to the fact that its upper surface is at all times in contact with the drawer rail **3** while the lower surface is at all times in contact with case rail **1**. Thus, any movement of the drawer rail **3** moves the main ball **20** in the same direction at half the speed of the drawer rail. The main ball **20**, through its tractive engagement with the upturned lips **22** of the suspension member **2** causes the suspension member to travel with the ball, making it, in effect, a propeller ball, insuring proper travel of the suspension member. The auxiliary ball **25** transmits the upward thrust of the drawer rail **3** to the suspension member **2**. This upward thrust results from the tendency of the drawer to pivot forwardly about the main ball **20**. The auxiliary ball **34** keeps the suspension member **2** and drawer rail **3** properly spaced and facilitates their relative movement. The auxiliary ball **24** transmits upward thrust from the suspension member **2** to the case rail **1** resulting from the tendency of the suspension assembly to pivot about the main ball **20** under the downward load of the extended drawer.

When the drawer is unbalanced by heavy loading at its rearward end, the drawer may have some tendency to pivot rearwardly. To limit this rearward pivoting, the suspension member **2** is provided with a glide **70** (Fig. 4) on its lower rearward end permitting the weight of the rearward end of the suepension member to be transmitted to the case rail **1**. Upon slight forward movement of the drawer, the center of balance will be shifted and the slide **70** caused to rise from the case rail **1**.

The auxiliary balls **24** and **30** are each of the same diameter and fill the raceway or track formed between the shoulders **8** and **9** and the upper wall of the suspension member **2** and the wall of the flange **5** of the case rail **1**. Thus, the raceway or track within which the auxiliary balls **30** and **24** move is substantially square whereby the balls may transmit both vertical and horizontal thrust loads. The relative size of the balls **24** and **30** and the design of the case rail **1** and of the suspension member **2** is such that the auxiliary balls **24** and **30** will form a contact between these members before surface contact can occur between them. The auxiliary balls **25** and **34** are of the same diameter and contact not only the shoulders **9** and **13** but also the vertical walls of the suspension member **2** and of the drawer rail **3** forming the track for these auxiliary balls. Thus, the auxiliary balls **25** and **34** are also capable of transmitting both vertical and horizontal loads and of maintaining proper spacing between the drawer rail **3** and suspension member **2**. To accomplish this, it is obvious that the raceways or tracks for the auxiliary balls **24**, **25**, **30** and **35** are substantially square. The roller **40** contacts the vertical wall **23** of the drawer rail **3** and the vertical wall of the case rail **1**. Thus, the roller **40** maintains proper horizontal spacing between the drawer rail **3** and the case rail **1** in the lower portion of the suspension assembly. The auxiliary balls **24**, **25**, **30** and **35** maintain proper horizontal spacing of the members in the upper portion of the suspension assembly. The function of the auxiliary balls **30** and **34** is primarily to transmit side thrust and secondarily to transmit vertical loads. The function of the auxiliary balls **24** and **25** is primarily to transmit vertical loads and secondarily to transmit side thrust. The slight downward V-shaping of the track **12** in the case rail **1** automatically centers the main ball **20**, keeping the entire suspension properly aligned vertically and centering the drawer within the opening in the cabinet.

By means of the auxiliary balls **24**, **25**, **30** and **34** and the roller **40**, each of the separate members forming the suspension assembly is properly spaced and frictional surface to surface contact between these members is positively eliminated. The entire assembly runs very easily even though the whole assembly is subjected to severe side thrust. Not only does this prevent the wear attendant surface to surface frictional contact but it materially reduces sidesway of the drawer. Heretofore, this sidesway or racking has never been successfully prevented in a suspension assembly of practical design nor has the wear and malfunction attendant metal to metal contact between the various members of the suspension assemblies been successful eliminated.

The suspension assemblies embodying my invention are utilized in pairs, one assembly on each side of a drawer. The assemblies of each drawer cooperate, each one providing the major support against side movement in its particular direction.

Minor modifications of my invention may be made without departing from the principle of my invention. Such modifications are to be considered as included in the hereinafter appended claims unless these claims expressly state otherwise.

I claim:

1. In a telescoping drawer suspension having a case rail, a suspension member and a drawer rail, the improvement in said suspension comprising: said case rail, suspension member and drawer rail each being laterally spaced; said case rail having a vertical portion and a first horizontal offset; said suspension member having a vertical portion and a second horizontal offset; said first and second offsets together with said vertical portions of said case rail and said suspension member providing a first ball raceway of square cross-section; a pair of spaced balls mounted in said first raceway; said drawer rail having a vertical portion and a third horizontal offset; said second and third offsets together with the vertical portions of said suspension member and said drawer rail providing a second ball raceway of square cross-section; a pair of spaced balls mounted in said second raceway; each of said balls having a diameter equal to the width of said raceway; said suspension member having a horizontal bottom leg; a vertical axle mounted to said leg of said suspension member; a roller adapted to rotate about said axle; an aperture in the vertical portion of said suspension member and said roller extending through said aperture; said roller contacting the vertical portions of both said drawer rail and said case rail.

2. In a telescoping drawer suspension having a case rail, a suspension member and a drawer rail, a main ball for

supporting said drawer rail on said case rail, the improvement in said suspension comprising: said case rail, suspension member and drawer rail being laterally spaced; said case rail having a vertical portion and a first horizontal offset; said suspension member having a vertical portion and a second horizontal offset; said first and second offsets together with said vertical portions of said case rail and said suspension member providing a first ball raceway of square cross-section; a pair of spaced balls mounted in said first raceway; each of said balls having a diameter equal to the width of said first raceway; said drawer rail having a vertical portion and a third horizontal offset; said second and third offsets together with the vertical portions of said suspension member and said drawer rail providing a second ball raceway of square cross-section; a pair of spaced balls mounted in said second raceway; each of said balls having a diameter equal to the width of said second raceway; said suspension member having a horizontal bottom leg; a vertical axle secured to said leg of said suspension member adjacent said main ball; a roller adapted to rotate about said axle; an aperture in the vertical portion of said suspension member and said roller extending through said aperture; said roller contacting the vertical portions of both said drawer rail and said case rail.

3. In a telescoping drawer suspension having a case rail, a suspension member, and a drawer rail each being laterally spaced one from the other and each having vertical portions, said case rail and said suspension member each having off-set shoulders in their upper portions, said drawer rail having an off-set shoulder approximately mid-

way between its upper and lower ends, the improvement in said combination comprising: said off-set shoulders and vertical portions forming a pair of trackways each of square cross section; balls mounted in each of said trackways; said balls having a diameter equal to the height and width of said trackways, for separating the upper portions of said case rail, suspension member and drawer rail both laterally and vertically; said suspension member having a flange at the lower end normal to its vertical portion; a stationary, vertical pin fixed to said flange of said suspension member; a roller seated on said pin for free horizontal rotation; an aperture in the vertical portion of said suspension member and said roller projecting through said aperture to contact said case rail; the opposite side of said roller being in contact with said drawer rail, whereby said roller may positively space said rails and suspension member from each other.

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