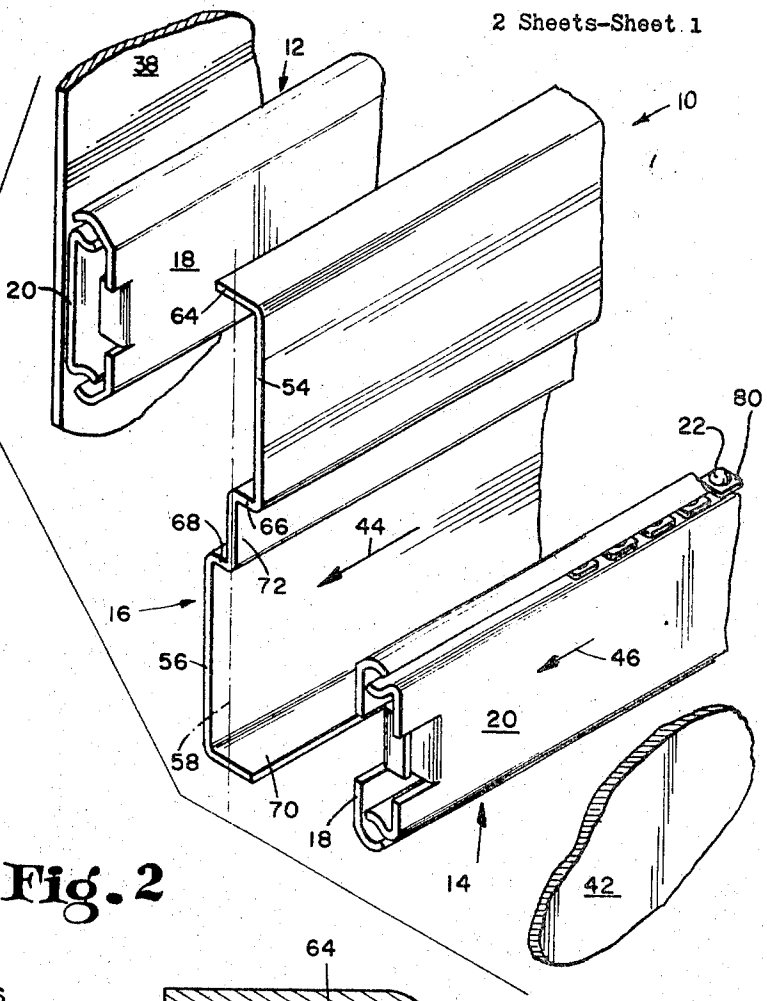
Jan. 6, 1970 H. S. FALL 3,488,097

HEAVY-DUTY DRAWER SLIDE

Filed July 26, 1968 2 Sheets-Sheet 1

Fig. 1



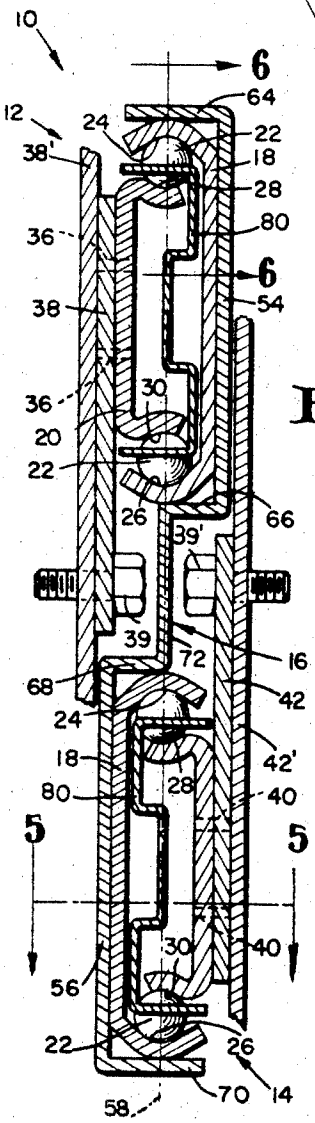


Fig. 2

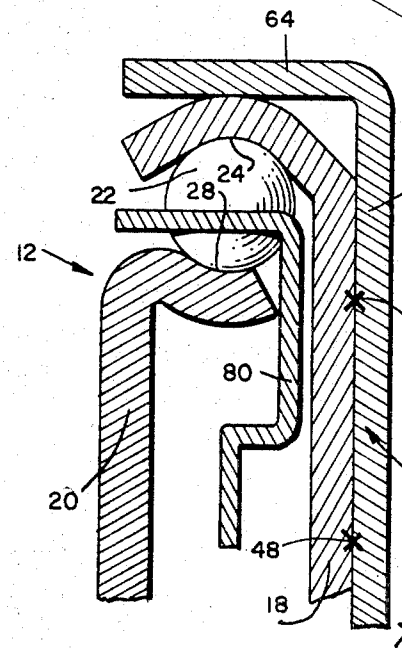


Fig. 3

INVENTOR
HERBERT S. FALL
BY
Hood, Gust, Irish & Lundy
ATTORNEYS

Jan. 6, 1970 H. S. FALL 3,488,097

HEAVY-DUTY DRAWER SLIDE

Filed July 26, 1968 2 Sheets-Sheet 2

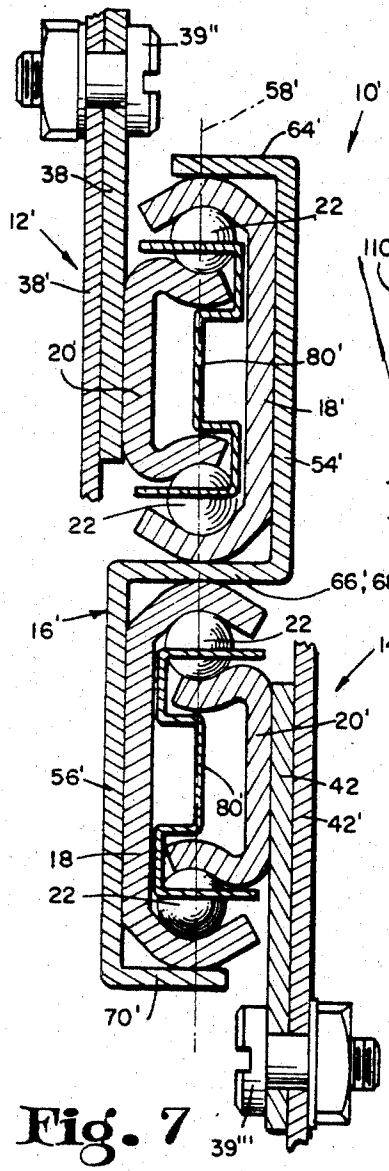


Fig. 7

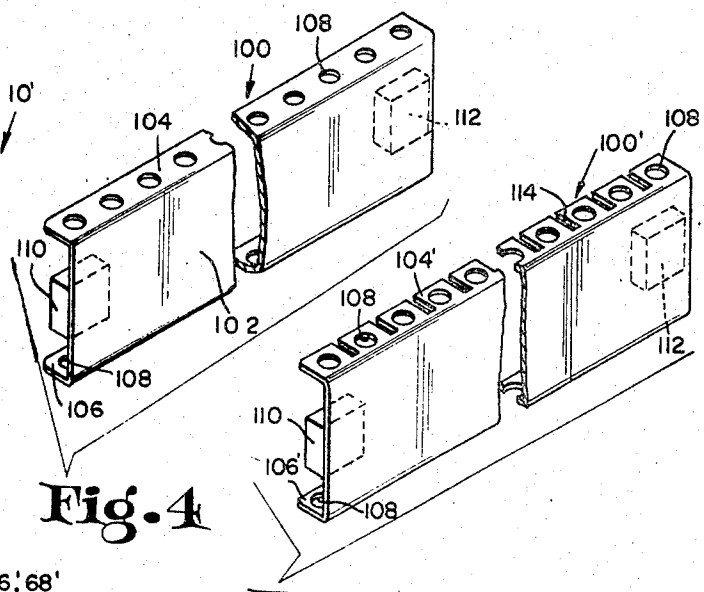


Fig. 4

Fig. 4a

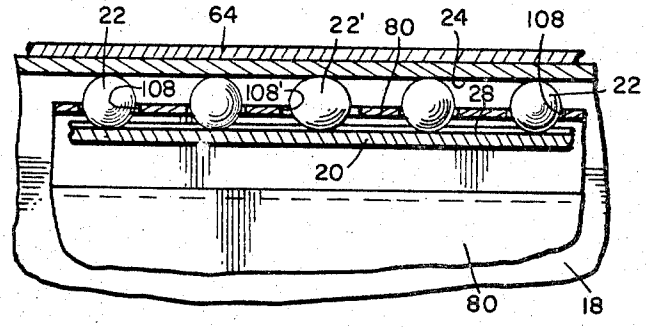


Fig. 6

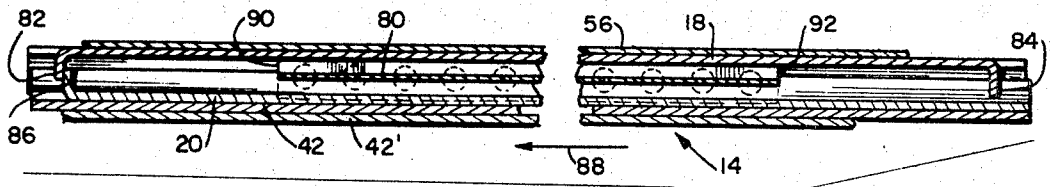


Fig. 5

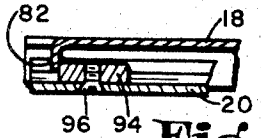


Fig. 5a

INVENTOR
HERBERT S. FALL

BY
Wood, Gust, Irish & Lundy
ATTORNEYS

United States Patent Office

3,488,097

Patented Jan. 6, 1970

3,488,097

HEAVY-DUTY DRAWER SLIDE

Herbert S. Fall, 6248 E. Iona, Indianapolis, Ind. 46203

Filed July 26, 1968, Ser. No. 747,930
Int. Cl. F16c 21/00, 29/00, 35/02
U.S. Cl. 308—3.8 9 Claims

ABSTRACT OF THE DISCLOSURE

A chassis track or drawer slide comprising a pair of extensible track means, each track means comprising a guide means, a slide means, and load-bearing anti-friction means movably supporting the slide means on the guide means, and an elongated connecting member. This connecting member is formed with a vertically and longitudinally extending upper wall portion and a vertically and longitudinally extending lower wall portion, the wall portions being spaced on opposite sides of a vertical plane extending longitudinally through the member. One of the guide means is rigidly fastened to each of the wall portions to extend longitudinally therealong, the guide means being fastened, respectively, to the sides of the wall portions which face the said vertical plane. Preferably, the wall portions are parallel to the plane and spaced apart so that the anti-friction means of both track means lie in a common vertical plane, this last-mentioned vertical plane, preferably, substantially coinciding with the first-mentioned vertical plane.

It is a primary object of my invention to provide a drawer slide which will movably support extremely heavy loads of up to several hundred pounds, which will support such loads for movement a distance equal to the depth of a conventional file cabinet drawer, which is relatively inexpensive to manufacture, which is relatively narrow in width, and which will operate smoothly. The problems involved in providing a drawer slide having these characteristics are well known, and because of these problems, such drawer slides have not heretofore been available.

My drawer slide comprises a pair of extensible track means, each track means comprising guide means, slide means, and load-bearing anti-friction means movably supporting the slide means on the guide means. I provide a connecting member to which the guide means of each track means is rigidly fastened, the connecting member being proportioned and designed so that the anti-friction means of both of the track means lie in a common vertical plane. Thus, my connecting member is arranged so that the force applied to one slide means is directed vertically in such a plane to be applied to the other slide means. Thus, there is no tendency for my connecting member to twist or bend laterally. Specifically, I have formed my connecting member to provide a vertically and longitudinally extending upper wall portion to which one of the guide means is rigidly fastened to extend longitudinally therealong and a vertically and longitudinally extending lower wall portion to which the other guide means is rigidly fastened to extend longitudinally therealong, the wall portions being spaced on opposite sides of a vertical plane extending longitudinally through the member and the guide means being fastened, respectievly, to the sides of the wall portions which face such a vertical plane. Preferably, the anti-friction means associated with each guide means will lie in such a vertical plane. Thus, I form the wall portions to be parallel to the plane and equally spaced therefrom.

Further, I have formed the connecting member so that each of the upper and lower wall portions is bounded at its upper and lower edges by horizontally and longitudinally extending side wall portions. Each of the guide means is snugly received between the side wall portions bounding the wall portion to which the guide means is fastened. Thus, each upper and lower wall portion with its side wall portions defines a channel section for snugly receiving one of the guide means. It will be seen, as this description progresses, that each such channel serves to strengthen the guide means disposed therein.

I have constructed such drawer slides having a total height of 3.5 inches and a total width of .423 inch, this height of 3.5 inches including a vertically and longitudinally extending intermediate portion which connects the upper and lower wall portions. Preferably, this intermediate portion substantially coincides with the vertical plane in which the anti-friction means lie. In my constructed embodiment of the drawer slide, the height of this intermediate portion is approximately one-half inch to define oppositely disposed longitudinally extending channels for receiving the heads of fastening elements used to connect the drawer slide to cabinets and drawers.

I have found that two of my drawer slides, each of which has a width of .423 inch, will satisfactorily movably support a drawer or the like which weighs as much as five hundred pounds. It will be appreciated that, since, with the exception of the anti-friction means, my drawer slide comprises only parts which are fabricated from sheet metal having a maximum thickness of .074 inch, such a performance is particularly outstanding.

Other objects and features of the present invention will become apparent as this description progresses.

To the accomplishment of the above and related objects, the present invention may be embodied in the forms illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that change may be made in the specific constructions illustrated and described, so long as the scope of the appended claims is not violated.

In the drawings:

FIG. 1 is an exploded, fragmentary, perspective view of one preferred embodiment of the drawer slide;

FIG. 2 is an enlarged transverse sectional view of the drawer slide showing one slide means rigidly fastened to a portion of a cabinet frame and the other slide means rigidly fastened to a portion of a drawer;

FIG. 3 is a further-enlarged, fragmentary sectional view showing the manner in which the anti-friction means are disposed between each slide means and guide means;

FIG. 4 is a perspective view of one type of bearing retainer and FIG. 4*a* is a similar view of another type of bearing retainer;

FIG. 5 is a reduced, longitudinal sectional view taken from FIG. 2 generally along the line **5—5** and FIG. 5*a* is a fragmentary sectional view showing a modification of the structure of FIG. 5;

FIG. 6 is a fragmentary sectional view taken from FIG. 2 generally along the line **6—6**; and

FIG. 7 is a transverse sectional view of a slightly different embodiment of my invention.

Referring now to FIGS. 1–5, it will be seen that I have illustrated a drawer slide **10** comprising a pair of extensible track means **12, 14** connected together by means of a connecting member **16**. Preferably, to save on the cost of fabrication, the track means **12, 14** are identical.

Each track means **12, 14** comprises a guide means **18**, a slide means **20** and load-bearing anti-friction means for movably supporting the slide means on the guide means. In the illustrative embodiment, such anti-friction means comprise a plurality of ball bearings **22** carried in raceways cooperatively defined by the guide means **18** and their respective slide means **20**. Specifically, in the illustrative embodiment, each guide means **18** is formed to provide a longitudinally and outwardly extending down-

wardly facing raceway **24** along its upper edge and a longitudinally and outwardly extending upwardly facing raceway **26** along its lower edge while each slide means **20** is formed to provide a longitudinally and inwardly extending upwardly facing raceway **28** along its upper edge and a longitudinally and inwardly extending downwardly facing raceway **30** along its lower edge. Thus, each track means **12, 14** comprises a plurality of ball bearings **22** carried on its raceway **28** and under and in rolling contact with its raceway **24** and additional ball bearings **22** carried on its raceway **26** and under and in rolling contact with its raceway **30**. This relationship is clearly seen in FIG. 2.

I have illustrated my preferred form of cooperating raceways, such as the raceways **24, 28,** in FIG. 3. Specifically, I prefer to form the guide means **18** from a strip of sheet metal having a thickness of approximately .062 inch in a roll die so that it has the rolled upper and lower edges defining, respectively, its raceways **24, 26**. Similarly, each slide means **20** is formed from a strip of sheet metal having a thickness of .074 inch in a roll die to have its upper and lower in-turned edges defining, respecively, its raceways **28, 30**. Each such raceway **24–30** is formed to receive ball bearings **22** having a diameter of .187 inch. Of course, each such raceway **24–30** must be formed with sufficient curvature to engage the ball bearings **22** to prevent lateral separation of the associated guide means **18** and slide means **20**. I refer to the F. A. Jordan United States Patent 3,205,025 issued Sept. 7, 1965 which discloses one manner in which my raceways **24–30** may be formed.

Referring to FIGS. 1 and 2, it will be seen that I have shown the slide means **20** of the track means **12** rigidly fastened by means of the elements **36** to an intermediate member **38** which is, in turn, connected by screws **39** (only one of which is shown) to a portion **38'** of a frame, which may be the frame of a cabinet, and the slide means **20** of the track means **14** rigidly fastened by means of the elements **40** to an intermediate member **42** which is, in turn, connected by screws **39'** (only one of which is shown) to a side portion **42'** of a drawer which is extensible relative to the frame. The fastening elements **36, 40** are merely illustrative and the members **38, 40** may be connected to their respective slide means by spot welding or any other such technique. Thus, since the guide means **18** of each track means **12, 14** is rigidly fastened to the connecting member **16**, the connecting member is extensible in the direction of the arrow **44** (FIG. 1) relative to the cabinet frame **38'** and the slide means **20** of the track means **14** is extensible in the direction of the arrow **46** relative to the connecting member. Spot welds between the guide means **18** and the connecting member **16** are indicated by the reference numeral **48** in FIG. 3.

Referring further to FIG. 2, it will be seen that the drawer slide **10** occupies a minimum amount of space between the cabinet frame **38'** and the drawer **42'**. Specifically, since my drawer slide can be fabricated with an overall width of .423 inch, as discussed previously, the space in which the slide is disposed need not be significantly wider than, for instance .500 inch. While drawer slides having widths of approximately .500 inch have been provided heretofore, none of such slides known to me has had the load carrying capacity of my drawer slide **10** described herein.

I am able to provide such a load carrying capacity in such a small space because of the manner in which I have formed the connecting member **16**. Specifically, I have formed the connecting member **16** to have a vertically and longitudinally extending upper wall portion **54** and a vertical and longitudinally extending lower wall portion **56**, these wall portions being spaced on opposite sides of a vertical plane which extends longitudinally through the member **16**. I have illustrated a center line **58** in FIGS 1 and 2 to represent such a vertically and

longitudinally extending plane. The wall portions **54, 56** are parallel to the plane and equally spaced therefrom. The distance between the wall portions **54, 56** is such that, preferably, the centers of all the ball bearings **22** lie substantially in the vertically and longitudinally extending plane represented by the center line **58**. Since the ball bearings **22** carry all of the load applied to the drawer slide **10**, the load is applied in the above-described vertically and longitudinally extending plane. It will be appreciated that, if the ball bearings **22** of the track means **12** were offset laterally relative to the ball bearings **22** of the track means **14**, there would be a bending moment applied to the connecting member **16**, which moment would require the member **16** to be significantly heavier and, depending on the amount of the offset, perhaps different in structure.

Further, I have formed the connecting member **16** so that the upper wall portion **54** is bounded at its upper and lower edges, respectively, by horizontally and longitudinally extending side wall portions **64, 66** and so that the lower wall portion **56** is bounded at its upper and lower edges, respectively, by horizontally and longitudinally extending side wall portions **68, 70**. The side wall portions **64, 66** are spaced apart snugly to receive therebetween the guide means **18** of the track means **12**, and similarly, the side wall portions **68, 70** are spaced apart snugly to receive therebetween the guide means **18** of the track means **14**. Thus, referring to FIG. 2, it will be seen that the upper wall portion **54** and the side wall portions **64, 66** form a channel section which significantly strengthens the structure of the guide means **18** fastened thereto while the lower wall portion **56** and the side wall portions **68, 70** define a channel section which significantly strengthens the guide means **18** fastened thereto. For instance, the side wall portions **64, 66** significantly strengthen the rolled edges of the guide means **18** of the track means **12** and the wall portion **54** significantly stiffens the main body portion, i.e., the vertically and longitudinally extending portion, of the guide means **18**.

In the illustrative embodiment of FIGS. 1–5, the connecting member **16** is further formed to provide an intermediate portion **72** which extends vertically and longitudinally between the inner edges of the side wall portions **66, 68**, this intermediate portion **72** also lying in the above-described vertically and longitudinally extending plane indicated by the center line **58**. This portion **72** defines a space between the track means **12, 14** for receiving the heads of the screws **39, 39'** which are used to connect the slide **10** between a drawer and cabinet. Of course, the member **16** moves relative to the screws **39** and the screws **39'** move relative to the member **16**.

I prefer to form the connecting member **16** from a strip of 18 gage sheet metal. It will be apreciated that, since the guide means **18**, slide means **20** and connecting member **16** are all formed from relatively thin sheet metal, it is important that no extended area of any portion of any of these elements be subjected to forces which are not directed along the plane indicated by the center line **58**.

In FIGS. 1, 2 and 3, I have shown a bearing retainer **80** which corresponds to the bearing retainer disclosed in the aforementioned Jordan patent. This bearing retainer **80** also functions as a stop member as will be discussed in conjunction with FIG. 5. Specifically, in the illustrative embodiment of FIG. 5, each guide means **18** is formed with an in-turned flange **82, 84** at each of its ends. Each slide means **20** is formed with an in-turned flange **86** at one of its ends, which flange **86** is arranged to engage the flange **82** to limit the movement of the slide means **20** in the direction of the arrow **88** (FIG. 5). When the slide means **20** moves in the direction opposite to the arrow **88**, the flange **86** will engage the end **90** of the bearing retainer **80** to move the retainer toward the flange **84**. The flange **84** is arranged to engage the end **92** of the retainer **80** to stop movement of the retainer in the direction opposite to the arrow **88**. FIG. 5, therefore, illustrates

a rather conventional stop arrangement for drawer slides After the slide means **20** is inserted into the guide means **18** and the flange **84** is bent inwardly, the guide means and slide means cannot be separated without bending one of the flanges **82, 84, 86**. It is for this reason that I have illustrated a removable stop member **94** in FIG. 5*a*. This stop member **94**, which is held to the slide means **20** by a fastening element **96**, replaces the flange **86**. When the stop member **94** is removed, the slide means **20** can be withdrawn from either end of the guide means **18**. It will be apparent that any one or all of the flanges **82, 84, 86** can be replaced by removable stop members, such as the stop member **94**.

In some cases, since the bearing retainer **80** must act as a stop member, i.e., cooperate with the stop flanges **82, 84, 86**, it is desirable to have a more rugged bearing retainer. Thus, referring to FIGS. 4 and 4*a*, the structure of bearing retainers **100, 100'** which are more rugged than the bearing retainers **80** will be discussed.

The bearing retainer **100** (FIG. 4) is a channel member comprising a main body portion **102** bounded by flange portions **104, 106**. A plurality of longitudinally spaced apart holes **108** are provided in each flange **104, 106**, the diameter of these holes **108** being less than the diameter of the ball bearings which are retained in the holes. The reason for this is disclosed in the aforementioned Jordan patent. However, the distance between the flanges **104** and **106** is such that there is no tendency for the bearing retainer **100** to urge resiliently the ball bearings **22** against the upper raceway **24** and the lower raceway **26**. In fact, I prefer that the distance between the flanges **104, 106** be such that, when the retainer **100** and ball bearings **22** are disposed in a guide means **18** before its associated slide means **20** is inserted therein, the ball bearings **22** carried by the upper flange **104** will be out of contact with the raceway **24**.

I prefer to weld a stop member **110, 112** on each end of the retainer **100**. These stop members **110, 112** engage, respectively, the flanges **84, 86** discussed previously. Thus, the stop members **110, 112** provide the function of the hat-section which extends longitudinally along the bearing retainers **80**.

The bearing retainer **100'** (FIG. 4*a*) is similar to the bearing retainer **100** except that slits **114** are provided between adjacent holes **108** in the flanges **104', 106'**. These slits **114** make the bearing retainer **100'** more flexible than the bearing retainer **100**. This flexibility will permit slight independent vertical movement of the flanges **104', 106'** to compensate for slight irregularities in the forming of the raceways **24–30**.

Referring to FIG. 6, it will be seen that I have illustrated one of the holes **108'** in the bearing retainer **80** somewhat larger in diameter than the rest of the holes **108**. I place a hardened rubber ball, indicated by the reference numeral **22'**, in each of such larger holes **108'**, the balls **22'** being slightly smaller in diameter than the holes **108'**. Preferably, these rubber balls **22'** have a diameter which is slightly larger than the ball bearings **22** so that the rubber balls will be deformed as illustrated in FIG. 6, the illustration of course, being slightly exaggerated. I can place several of such rubber balls in each of the upper and lower raceways **24, 26**. Each rubber ball **22'** will frictionally and rollably engage the raceway on which it is carried and under which it is carried in such a manner that it will always roll when one raceway moves relatively to the other. When the rubber balls **22'** roll, they move the bearing retainers **80** to keep them in synchronization with the movement of the slide means **20** relative to the guide means **18**. Thus, the rubber balls **22'** are means for insuring that the bearing retainer moves by an amount corresponding to the relative movement between a guide means **18** and slide means **20**. The steel balls **22**, of course, carry the extremely heavy loads which can be applied to the slide **10**. The rubber balls **22'** are not provided for load-carrying purposes.

The drawer slide **10**, therefore, comprises a retainer **80** associated with each track means **12, 14** and arranged to hold the ball bearings **22** thereof in a group movable therealong, and rubber roller means **22'** drivingly connected to said retainer. The roller means **22'** is arranged frictionally and rollably to engage the guide means **18** and slide means **20** to move the retainer **80** an amount corresponding to the relative movement between the guide means and slide means.

Referring now to FIG. 7, another embodiment of my drawer slide, indicated generally by the reference numeral **10'**, will be discussed. The main difference between the drawer slide **10'** and the previously described drawer slide **10** is that the connecting member **16'** of the drawer slide **10'** is formed without the vertically and longitudinally extending intermediate portion **72**. Thus, the fastening elements **39''** and **39'''** are located above and below, respectively, the connecting member **16'**. Further the drawer slide **10'** is approximately 50% wider than the drawer slide **10**. Additionally, the connecting member **16'**, the guide means **18'** and the slide means **20'** are formed from somewhat thicker sheet metal. For instance, I prefer to form the connecting member **16'** from 14 gage sheet metal and the guide means **18'** and slide means **20'** from 12 gage sheet metal.

In this description and in the appended claims, I have referred to "guide means" and "slide means" without distinguishing which means actually moves. For instance, the "guide means" **18** of the track means **12** actually moves relative to the stationary "slide means" **20** of that track means. I have done this only for convenience and because the track means **12** and **14** are preferably identical. In this specification, therefore, I intend for "guide means" and "slide means" to refer to two relatively movable and operatively connected track elements.

What is claimed is:

1. A chassis track comprising a pair of extensible track means, each track means comprising a guide means, a slide means, and load-bearing anti-friction means movably supporting said slide means on said guide means, an elongated connecting member, said member being formed with a vertically and longitudinally extending upper wall portion and a vertically and longitudinally extending lower wall portion, said wall portions being spaced on opposite sides of a vertical plane extending longitudinally through said member, one of said guide means being rigidly fastened to each of said wall portions to extend longitudinally therealong, said guide means being fastened, respectively, to the sides of said wall portions which face said vertical plane.

2. The chassis track as in claim **1** in which said wall portions are parallel to said plane, said wall portions being spaced apart so that the anti-friction means of both track means lie in a common vertical plane.

3. The chassis track of claim **2** in which said last-mentioned vertical plane substantially coincides with said first-mentioned vertical plane.

4. The chassis track of claim **3** in which said member is formed with a vertically and longitudinally extending intermediate portion connecting said upper and lower wall portions, said intermediate portion substantially coinciding with said first-mentioned vertical plane.

5. The chassis track of claim **4** in which each of said wall portions is bounded at its upper and lower edges by horizontally and longitudinally extending side wall portions, each of said guide means being snugly received between the side wall portions bounding the wall portion to which the guide means is fastened.

6. A chassis track comprising a pair of track means, each track means comprising a guide means and a slide means, each guide means being formed to provide a longitudinally and outwardly extending first downwardly facing raceway along its upper edge and a longitudinally and outwardly extending first upwardly facing raceway along its lower edge, each slide means being formed to provide a longi-

tudinally and inwardly extending second upwardly facing raceway along its upper edge and a longitudinally and inwardly extending second downwardly facing raceway along its lower edge, and load-bearing anti-friction means carried on said first upwardly facing raceway and under and in rolling contact with said second downwardly facing raceway and additional load-bearing anti-friction means carried on said second upwardly facing raceway and under and in rolling contact with said first downwardly facing raceway, and an elongated rigid connecting member formed to provide a pair of longitudinally extending channels, one of the channels opening to one side of said member and the other channel opening to the opposite side of said member, one of said guide means rigidly fastened in each of said channels to have its first raceways extend laterally outwardly therefrom and longitudinally therealong, and said member being formed so that said one channel is above said other channel and so that said anti-friction means comprising both of said track means lie in a common vertical plane.

7. The chassis track of claim **6** in which each track means includes a retainer arranged to hold the anti-friction means thereof in a group movable therealong, and rubber roller means drivingly connected to said retainer, said roller means being arranged frictionally and rollably to engage said guide means and said slide means, thereby to move said retainer an amount corresponding to the relative movement between said guide means and slide means.

8. The chassis track of claim **1** in which each track means includes a retainer arranged to hold the anti-friction means thereof in a group movable therealong, and rubber roller means drivingly connected to said retainer, said roller means being arranged frictionally

and rollably to engage said guide means and said slide means, thereby to move said retainer an amount corresponding to the relative movement between said guide means and slide means.

9. The chassis track of claim **6** in which each of said load-bearing anti-friction means and said additional load-bearing anti-friction means comprises a group of steel ball bearings, and including a retainer having longitudinally-spaced apart apertures therein for receiving, respectively, said bearings of each group, and a rubber ball carried on one of said upwardly facing raceways and under its cooperating downwardly facing raceway, said rubber ball being drivingly connected to said retainer, and said rubber ball being proportioned and arranged frictionally and rollably to engage said cooperating raceways to move said retainer an amount corresponding to the relative movement between said guide means and slide means.

References Cited

UNITED STATES PATENTS

1,237,956	8/1917	Pue	308—3.8
1,938,908	12/1933	Hunter	312—339
1,963,220	6/1934	Anderson	312—339
2,032,054	2/1936	Gussack	312—339

FOREIGN PATENTS

548,474	1/1923	France.

EDGAR W. GEOGHEGAN, Primary Examiner
LUCIOUS L. JOHNSON, Assistant Examiner

U.S. Cl. X.R.
312—339, 340, 342