Sept. 7, 1965 F. A. JORDAN 3,205,025

DRAWER SLIDE

Filed Feb. 8, 1963

Fig. 1.

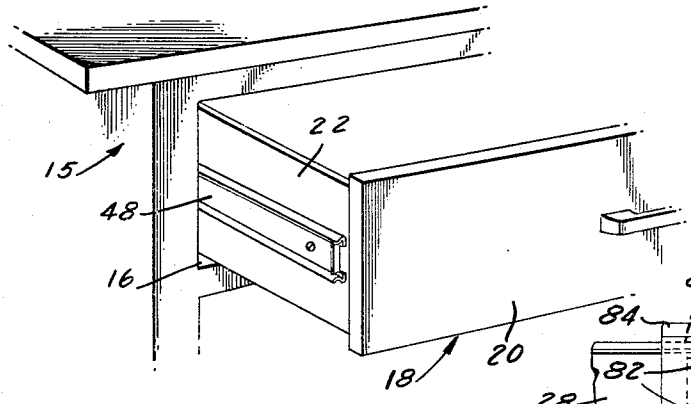


Fig. 9.

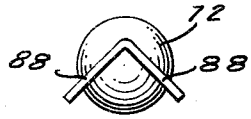


Fig. 10.

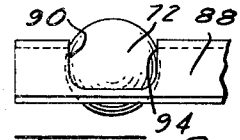


Fig. 8.

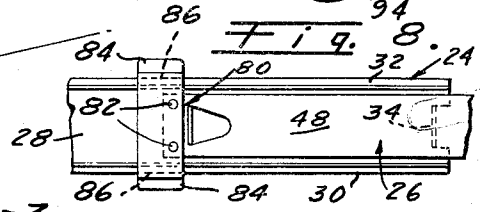


Fig. 2.

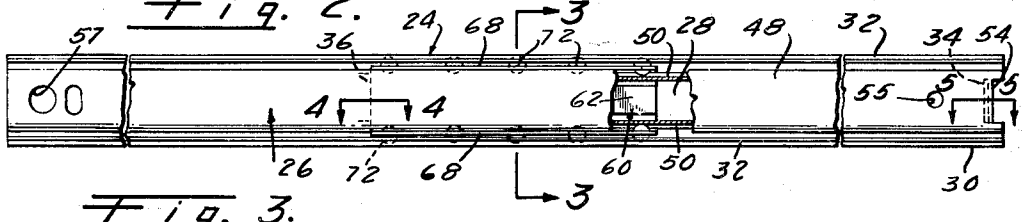


Fig. 3.

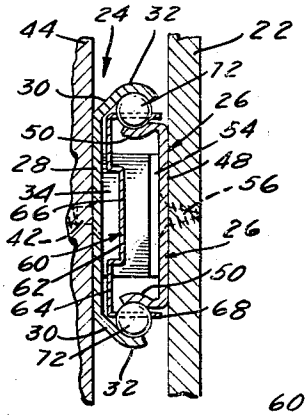


Fig. 4.

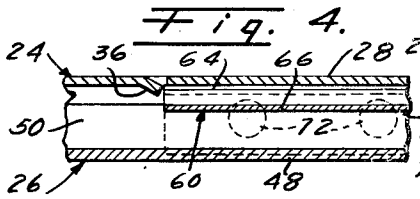


Fig. 5.

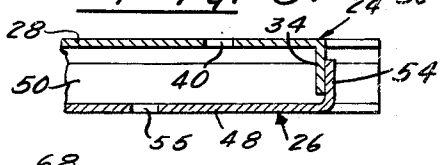


Fig. 6.

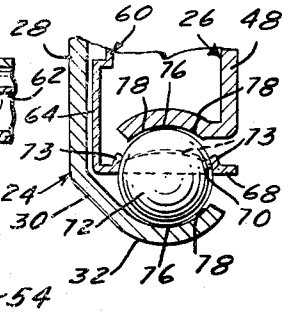
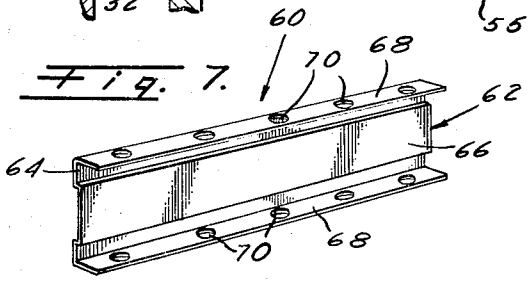


Fig. 7.



Fred Jordan
INVENTOR.

BY J. C. Barrick

Attorney

United States Patent Office 3,205,025 Patented Sept. 7, 1965

3,205,025

DRAWER SLIDE

Fred Alex Jordan, Brea, Calif., assignor to Standard Precision, Div. A—A Engineering Corp., South Gate, Calif., a corporation of California

Filed Feb. 8, 1963, Ser. No. 257,292
2 Claims. (Cl. 308—3.8)

This invention relates generally to slides for drawers of various types, and relates more particularly to telescoping ball slides.

While the invention has particular utility in connection with slides for drawers and the like, and is shown and described in such connection, it is to be understood that its utility is not confined thereto.

Heretofore certain telescoping precision ball slides have been made of extruded high strength alloys and the races are precision broached in order to achieve the close tolerances necessary for the precision steel balls giving precision telescoping slide movement. Such materials and processes are expensive and their use is prohibitive in the wide commercial application areas of common drawer movement, being used presently only on expensive electronic and military installations due to prices incompatible with commercial merchandise.

It is therefore an object of the present invention to provide telescoping precision ball slides that will solve the above problem and difficulties.

It is another object of the invention to provide telescoping precision ball slides that are relatively inexpensive to manufacture.

It is still another object of the invention to provide devices or mechanisms of this character that have no appreciable horizontal or vertical play.

It is a further object of the invention to provide mechanisms of this character that are slim-lined in design and of narrow width.

It is a still further object of the invention to provide devices or mechanisms of this character that will fit into extremely narrow spaces and afford space saving in packaging drawer type or chassis type construction.

It is another object of the invention to provide devices of this character that are compact and have smooth lines.

Still another object of the invention is to provide a mechanism of this character using a retaining member which securely encloses the balls.

It is a further object of the invention to provide mechanism of this character wherein the balls have point contact only on both slide races providing a minimum amount of friction and wherein there is means of accommodating possible misalignment of the parts.

It is a still further object of the invention to provide mechanism of this character wherein, if the slide is too far misaligned so that there is some tension or pressure between the slide members the balls still have an equal amount of bearing surface on each slide member and an even speed regarding the slide members.

It is another object of the invention to provide devices of this character that can be mounted in vertical as well as horiozntal positions.

It is still another object of the invention to provide devices of this character that have extremely long life and a minimum of wear.

It is a further object of the invention to provide devices of this character having unique automatic means for disconnecting and connecting the parts.

It is a still further object of the invention to provide stop means that will hold the drawer in closed position and resist light gravity drawer pull.

It is another object of the invention to provide a device of this character having ball retainers of precise tolerances and unique means for holding the balls in place.

It is still another object of the invention to provide a device of this character wherein retainer vibration and noise is minimized or eliminated.

Yet another object of the invention is to provide a device of this character wherein the retainer holds the balls in place in the outer slide member and allows the inner slide member to be released from the assembly without spilling of the balls and also accommodates reinsertion of the inner member without jamming.

It is a further object of the invention to provide devices of this character having means for automatically preventing withdrawing of the drawer or chassis at the end of the normal travel sufficiently so that it will not be fully withdrawn but permitting the drawer to be fully withdrawn by increased pulling force on the drawer when completely withdrawing the drawer or chassis.

A still further object of the invention is to provide mechanism of this character having guide means for properly locating and aligning the slide members when installing a drawer.

It is another object of the invention to provide devices of this character completely fabricated by stamping presses only, holding tolerances commensurate to precision centerless ground balls under precision movement between the slide members.

It is still another object of the invention to provide a device of this character which is adapted to electrically isolate the chassis from the rack structure in certain types of installation, as for electronic equipment.

The characteristics and advantages of the invention are further sufficiently referred to in connection with the following detailed description of the accompanying drawings which represent one embodiment. After considering this example skilled persons will understand that many variations may be made without departing from the principles disclosed and I contemplate the employment of any structures, arrangements or modes of operation that are properly within the scope of the appended claims.

Referring to the drawings, which are for illustrative purposes only:

FIG. 1 is a perspective view of a portion of a desk with a partly open drawer thereof having slides embodying the present invention, one such slide being shown;

FIG. 2 is an enlarged back plan view of the slide with portions broken away to show interior construction;

FIG. 3 is an enlarged sectional view taken on line 3—3 of FIG. 2;

FIG. 4 is an enlarged sectional view taken on line 4—4 of FIG. 2;

FIG. 5 is an enlarged sectional view taken on line 5—5 of FIG. 2;

FIG. 6 is an enlarged sectional view showing the relationship of the balls to the track or races;

FIG. 7 is an enlarged perspective view of the ball retainer;

FIG. 8 is a fragmentary view of the slide device showing the locator bracket in operative position;

FIG. 9 is a sectional view of an alternative type of ball retainer; and

FIG. 10 is a side view of the ball retainer shown in FIG. 9.

Referring more particularly to FIG. 1 of the drawings, there is shown a desk, indicated generally at **15**, of well known type, having a drawer opening **16** in which is slidably disposed a drawer, indicated generally at **18**, and having a front wall **20**, side walls **22**, a bottom not shown, and a back wall, also not shown.

The drawer is operably mounted in the drawer opening on slides at the sides, only one such slide being shown in FIG. 1. These slides comprise a pair of slide members, an outer member indicated generally at **24**, and an

inner slide member indicated generally at **26**. One of the slide members is attached to the side of the drawer and the other is attached or secured to the adjacent side of the desk, there being sufficient clearance for the slide between the sides of the drawer and the adjacent sides or parts of the desk defining the sides of the drawer opening. Normally the smaller or inner slide member is secured to the side of the drawer while the larger or outer slide member is secured to the adjacent part or wall of the desk defining the sides of the drawer opening.

Slide members **24** and **26** are generally channel shaped and formed of sheet metal by stamping, these parts being made with great accuracy.

Outer member **24** has a longitudinally extending center wall **28** which may be termed the bottom of the channel. Along each side edge of the bottom **28** there is an outwardly and laterally extending ball race **30** which terminates in a longitudinally extending portion **32** that is concavo-convex in cross section with the concave surfaces facing inwardly so that said surfaces are oppositely arranged relative to each other and are spaced apart laterally relative to the length of the wall **28**.

At one end the outer member **24** has a flange **34** that is turned laterally at an angle substantially normal to the plane of the bottom wall **28** and in the same direction as the ball races **30**. However, the flange **34** extends but part way across the channel so as to leave clearance space at each end for the ball races of the inner slide member when the device is assembled as described hereinafter.

At its other end, the member **24** is open and at a location intermediate the ends of member **24** there is a tongue **36** cut from the bottom wall, said tongue being about a third of the distance from the open end of the member **24** relative to the length of said member **28**. The sides of the tongue **36** are cut parallel to each other in laterally spaced relationship and the inner end of said tongue is free and formed by a cut connecting the adjacent ends of the side cuts. At its outer end the tongue is integral with the metal of the bottom wall **28** while the other end is free and said tongue is bent inwardly into the channel so that said free end is positioned inwardly of the inner surface of wall **28** and provides stop means of a ball retainer which will be described hereinafter. Wall **28** is also provided with various openings **40** for reception of screws **42** whereby said member **24** is secured to a support **44**, in FIG. 3, such as the part of the desk defining the side walls of the drawer opening **16** or the like.

Inner slide member **26** also has a bottom wall, indicated at **48**, along the longitudinally extending sides or side edges are laterally turned ball races **50** which are oppositely arranged and arcuate in cross-section with the concave surfaces arranged oppositely respective adjacent ball races **32** of the outer slide member, said races **50** being spaced from said adjacent races **32**.

One end of the inner slide member **26** has a flange **54** turned inwardly at an angle normal to the wall **48**, the opposite end of the member **26** being open. Flange **54** need not extend entirely across the channel of the inner member, the purpose of said flanges **34** and **54** being to engage each other when the slide members **24** and **26** are fully telescoped together to thereby limit telescoping movement thereof. However, the inner member **26** may be moved longitudinally to the right from the fully telescoped position, as shown in FIGS. 2, 4 and 5. Thus the members **24** and **26** have longitudinal movement relative to each other. Wall **48** of the inner member **26** also has openings **55** therein for screws **56**, FIG. 3, whereby said member **26** is attached to the side wall **22** of the desk drawer. There are also access hole means **57** in the wall **48**.

Slide members **24** and **26** are arranged so that their open sides face each other and disposed between said members, in the space between the parallel walls **28** and **48** is a ball retainer, indicated generally at **60**.

Ball retainer **60** is also channel shaped and has a bottom wall comprising a shallow, reverse channel portion **62** which extends longitudinally of the retainer and from the outer edges of which there are longitudinally extending wall portions **64** in a plane parallel to the bottom **66** of said channel portion **62**. From the outer edges of the wall portions **64** extend the sides **68** of the ball retainer, which are parallel to each other and spaced apart laterally and at right angles to the bottom portions **64**. The sides **68** are provided with a plurality of longitudinally spaced, aligned openings **70** for reception of ball bearings **72**, said openings **70** being of smaller diameter than the balls **72**. Alternatively, the holes are irregularly contoured to provide a plurality of ears **73** which are bent out of the plane of sides **68** to form ball seats to give ample ball support areas for maximum support of the balls while still leaving spaces for grease circulation. Also the ball seats leave no sharp edges or corners for possible abrasion as well as for wiping off lubricant.

Ball retainer **60** is inserted into the outer member **24** before the tongue **36** is bent inwardly, which prevents said retainer **60** from coming out of the outer member at the left hand end of said member **24**, the flange **34** preventing said retainer from coming out the opposite end of said member. Thus the ball retainer has longitudinal movement between said tongue **36** and the flange **34**.

When the ball retainer is operably disposed in the outer member the balls **72** are operably positioned in the races **32**, as best shown in FIG. 3. The sides **68** of the ball retainer may exert a slight pressure or tension on the balls against the races **32** to minimize or eliminate retainer vibration and possible noise.

To telescopically assemble the outer and inner members the ball retainer is moved toward the tongue until the adjacent end engages said tongue. The inner member is then inserted into the outer member to a position whereat the races **50** of said inner member contact the first balls of the race at the end opposite the tongue. At this point there is frictional resistance but the inner race is forced telescopically inwardly until the flange **54** engages the flange **34** of the outer member and telescopic movement is stopped. When the outer and inner members **24** and **25** are thus telescopically positioned they may be moved longitudinally apart relative to each other, supported by the balls **72** with a minimum of friction. As said members are moved apart the ball retainer travels toward the flange **34** of the outer member and when the adjacent end of the retainer strikes flange **34** said movement of the retainer is stopped and this in turn stops said movement of the outer and inner members due to the frictional resistance of the ball on the races **50** of the inner member. However, by exertion of a sufficient pull to overcome said frictional resistance said members may be separated. Replacement of the inner member in the outer member is effected as described above.

This is a very advantageous feature when the slides are installed since it permits drawers to be fully and easily removed from the desk should it be desired to do so and as easily replaced. Further, the outward movement of the drawer is effectively stopped when the members **24** and **26** reach a predetermined extended position, whereat further extension is stopped by the frictional resistance above described.

In FIG. 6 it will be noted that there is point contact at **76** between the balls and the inner and outer races but there is sufficient clearance at the opposite sides of these contact points, as at **78**, to permit a certain amount of alignment variations between the outer and inner members **24** and **26** respectively.

Means is provided for aligning the open end of the inner slide member with the balls **72** when the members **24** and **26** are initially located for telescoping together. This means comprises a locator bracket **80**, FIG. 8, which is secured to the outer side of the wall **48** of the inner bracket by any suitable means such as, for example,

rivets **82**. The bracket **80** is transversely arranged relative to the wall **48**, said bracket being in the shape of a shallow U with outwardly extending flanges **84** at the free ends of the arms **86** of the U. The bracket extends outwardly of the inner member into overlapping relation to the edge portions of the outer member. The arms of the U extend to a position alongside the adjacent edges of the outer member and maintain the members in alignment with each other until the races of the inner member enter the adjacent end of the ball retainer and engage the adjacent balls preparatory to pushing the members together against the friction of the balls with the races of the inner member.

Some types of installation require insulating the slide members from each other and with such installations the balls are of a suitable plastic material having insulating qualities. Various known types of such plastics are known.

The plastic balls provide a very soft sliding action with shock absorbing ability and electrically isolate the chassis from rack structure in which the chassis of drawer is installed. With such installation the slide stops are also of insulating material such as, for example, felt or plastic.

In FIGS. 9 and 10 the ball retainer is shown as being in the shape of a right angle, having sides **88**. There are a series of aligned elongated openings **90** at the point of junction of said sides, the width of said openings being less than the diameter of the balls. When the retainers are formed, a flat blank of sheet metal is used and the holes or openings **90** formed along the longitudinal center of the blank. The balls **72** are placed in the openings and the blank formed to provide the right angle shape best shown in FIG. 9. The balls are snugly held in the openings with the side edges of the material about the openings slightly overlapping adjacent portions of the balls and the points **94** of the retainer at the junction of the sides thereof hold the balls in said openings but permit free rotation of said balls. There are two retainers of this type when used and each is disposed with a side extending between adjacent inner and outer races with the balls in said races similarly as in the arrangement first described. The other side extends laterally as do the parts **64** of the retainer **60**.

While the slide is shown as installed at the sides of a desk drawer, it is to be understood that one or more slides may be installed beneath the drawer and operatively attached to the bottom thereof and to a wall defining the bottom of the drawer opening. In other words, the slides may be installed either vertically or horizontally.

The invention and its attendant advantages will be readily understood from the foregoing description and it will be apparent that various changes may be made in the form, construction and arrangement of the parts of the invention without departing from the spirit and scope thereof or sacrificing its material advantages, the arrangement hereinbefore described being merely for purposes of illustration, and I do not wish to be restricted to the specific form shown or uses mentioned except as defined in the accompanying claims, wherein various portions have been separated for clarity of reading and not for emphasis.

I claim:

1. In a drawer slide mechanism:

(A) an outer slide member of generally channel shape and formed of sheet metal, said member having
  (a) ball races along the side edges thereof, said races being concave at their inner, facing sides,
  (b) an inwardly extending outer stop at one end of said slide member
  (c) and an inwardly extending intermediate stop adjacent the opposite end of said slide member, said opposite end of said slide member being open;

(B) an inner slide member operably disposed within said outer slide member, said inner slide member being of generally channel shape and formed of sheet metal and having ball races along the side edges thereof, said ball races being concave at their outer sides in aligned spaced relation to the respective ball races of the outer member, said inner member having a stop at one end for engagement with the end stop of the outer member, the opposite end of the inner member being open and the open side of said inner slide member facing the open side of said outer slide member;

(C) a ball retainer of generally channel shape with the side walls of the channel having a plurality of longitudinally spaced aligned ball receiving openings;

(D) and balls in said openings of greater diameter than said openings and at the outer sides of said retainer side walls, said retainer being disposed in the outer slide member for operable movement longitudinally thereof between the end stop of said outer member and the intermediate stop, the side walls of said retainer urging the balls against the inner concave sides of the outer races with slight resilient pressure, the inner slide member being telescopically disposed within the outer member and the races of said inner member being positioned for reception of the balls, said members sliding longitudinally relative to each other when the ball retainer moves between the stops of the outer member, said balls having point contact with the races of the outer and inner members, the radius of the races being sufficiently greater than the radius of the balls to thereby accommodate alignment variations of the slide members, and the spacing of the inner and outer races relative to each other being such that there is frictional resistance of the balls against the races when the slide members are being extended and the ball retainer engages the outer stop of the outer member for resisting further extension of the slide members, and when the slide members are being telescopically assembled and the ball retainer is stopped by the intermediate stop of the outer slide member.

2. A drawer slide, comprising:

(A) an outer channel shaped slide member stamped from sheet metal and having a central longitudinally extending body,
  (a) outwardly and laterally inclined edge portions each terminating in longitudinally extending ball races concavo-convex in cross section with the concave sides facing each other in opposed relationship,
  (b) a laterally extending flange at one end of said body turned inwardly but being of less length than the width of the channel shaped outer member and of less width than the depth of the outer member,
  (c) and an inturned tongue adjacent the end opposite said flange;

(B) an inner channel shaped slide member formed of sheet material having a central portion and laterally turned edge portions forming ball races extending in the same direction and of concavo-convex cross section with the concave sides facing away from each other and toward the ball races of the outer member and aligned therewith,
  (a) and an inturned flange adapted to engage the flange of the outer member when said members are fully telescoped;

(C) a ball retainer of channel shape, there being a central longitudinally extending portion from the side edges of which side walls extend in parallel laterally spaced relationship,
  (a) said side walls having a plurality of longitudinally spaced, aligned ball openings therein,

said openings being of smaller diameter than the diameter of the balls;

(D) and a ball for said openings positioned at the outer sides of said side walls of the ball retainer, said ball retainer being operably disposed in said outer member for longitudinal movement between the flange of said outer member and the tongue, the balls being operably disposed in the ball races of the outer member and held therein with slight pressure by the side walls of said retainer, the inner slide member being telescopically disposed in the outer slide member with balls also operably disposed within the races of said inner member, the ends of said slide members opposite the end flanges thereof being open and said members being slidable apart against frictional resistance of the balls against the races of the inner member when the ball retainer is stopped by the flange of the outer slide member, said members being telescopically movable to the fully telescoped position against such friction when the retainer is held against longitudinal movement by the tongue of the outer member;

(E) and locator means secured to the inner slide member adjacent the open end thereof for guiding said

member in the outer member when telescoping said members together.

References Cited by the Examiner

UNITED STATES PATENTS

822,723	6/06	Conrad	308—201 X
921,464	5/09	Rockwell	308—201
1,045,523	11/12	Cossey.	
1,356,444	10/20	Golden	308—193
2,195,349	3/39	Woina	248—430
2,564,658	8/51	Jakeway.	
2,614,022	10/52	Kurtzon	308—3.8
2,649,346	8/53	Wcina	308—3.8
2,794,690	6/57	Bullock	308—3.3
2,805,106	9/57	Penkala	308—3.8
2,995,405	8/61	Ferdig	308—190
3,013,763	12/61	Weberman	308—6 X
3,022,129	2/62	Manson	312—343
3,039,838	6/62	Koch	312—348 X
3,143,758	8/64	Dunham	308—4 X
3,181,925	5/65	Fisher	312—339

DON A. WAITE, *Primary Examiner.*

ROBERT C. RIORDON, *Examiner.*