Dec. 23, 1969 H. S. FALL ETAL 3,485,539

ROLLER BEARING MULTIPLE SECTION DRAWER TRACK

Filed May 19, 1966 2 Sheets-Sheet 1

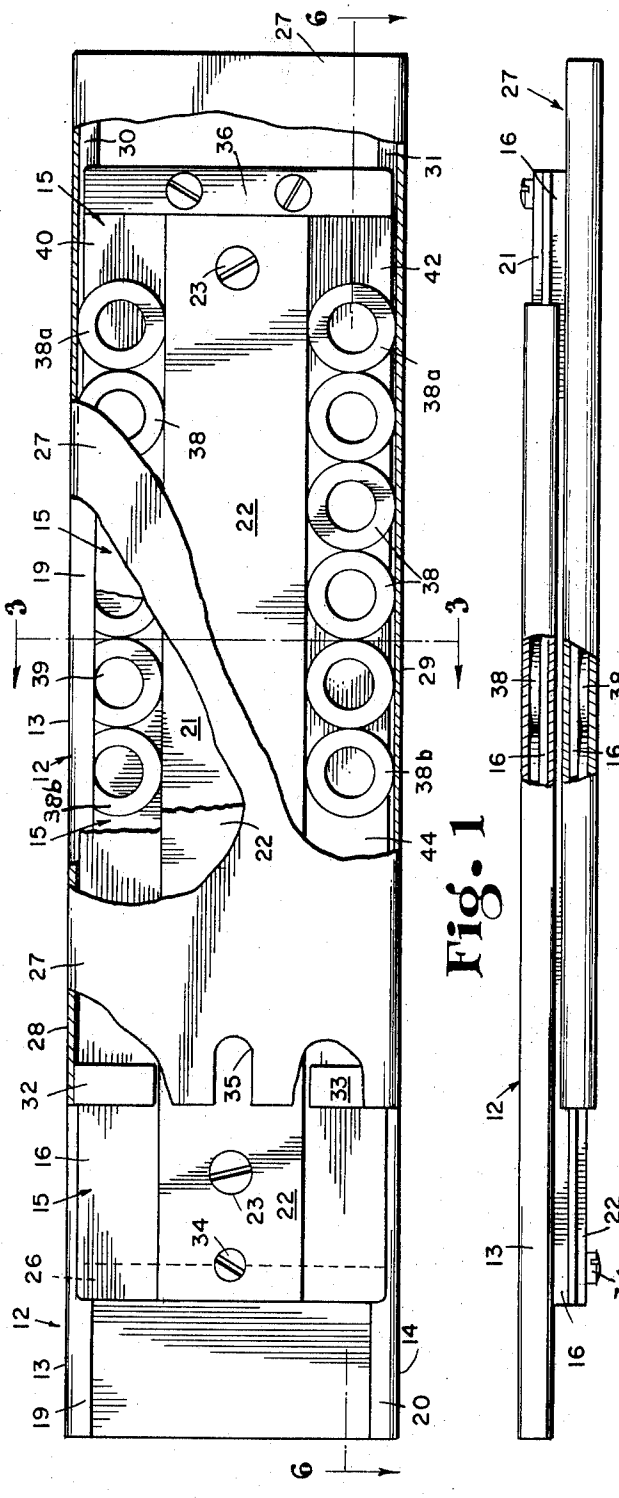


Fig. 1

Fig. 2

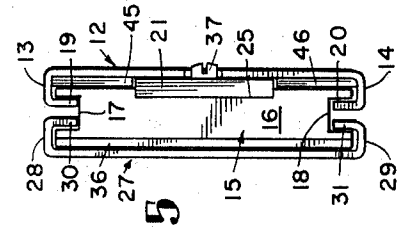


Fig. 5

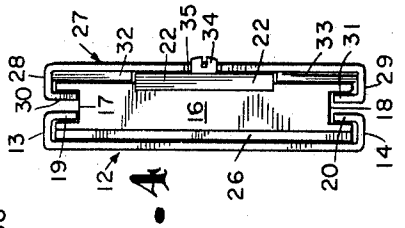


Fig. 4

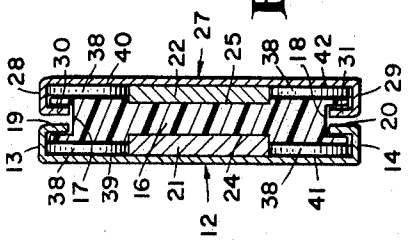


Fig. 3

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ROLLER BEARING MULTIPLE SECTION DRAWER TRACK

Filed May 19, 1966 2 Sheets-Sheet 2

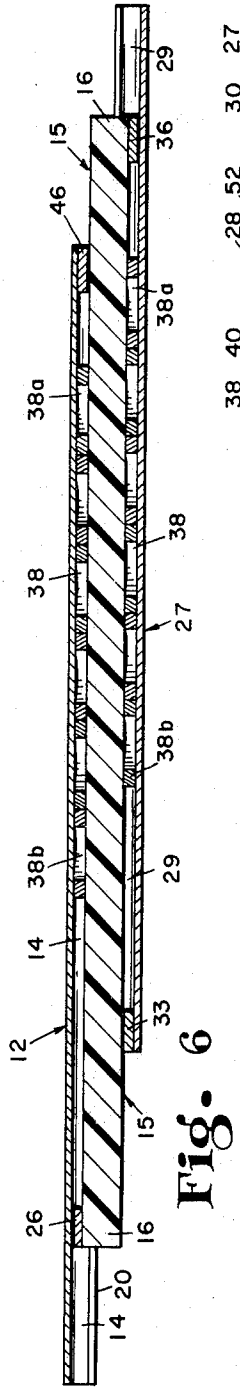


Fig. 6

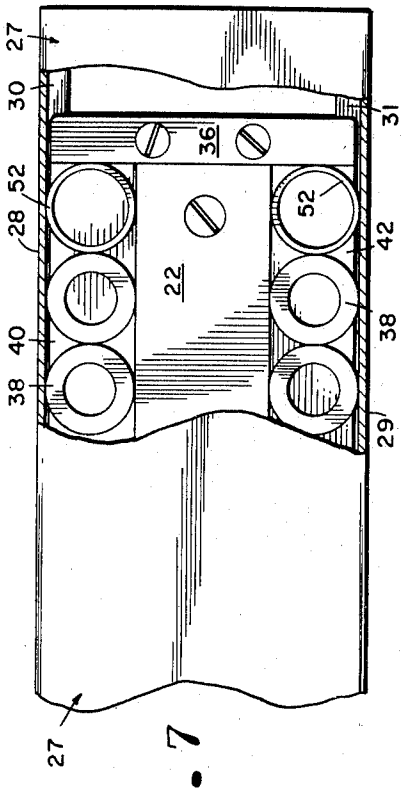


Fig. 7

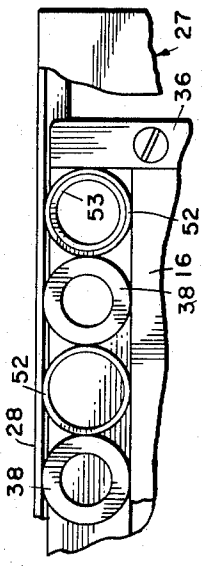


Fig. 8

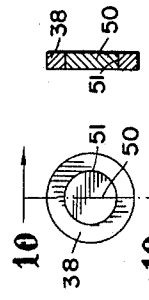


Fig. 9

Fig. 10

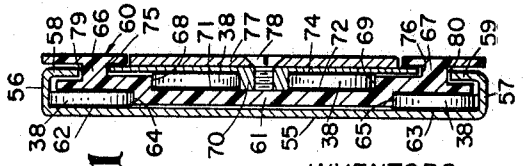


Fig. 11

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ROLLER BEARING MULTIPLE SECTION DRAWER TRACK

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Int. Cl. F16c 35/02, 29/00, 21/00

U.S. Cl. 308—3.8 9 Claims

ABSTRACT OF THE DISCLOSURE

An extensible and retractible track comprising a first unit, a second unit, means for shiftably retaining the second unit along the first unit, and means forming a pair of vertically spaced raceways having horizontal surfaces extending between vertical walls of the units, and a group of horizontally free cylindrical rollers in approximate tangency one with the other and carried in each of the raceways, the length of each of the groups being less than the length of the raceway in which the group is carried. Preferably, the rollers are annuli, each roller having a radial thickness sufficient to support a predetermined load. In one embodiment, at least one of the rollers in each group has less radial thickness than that of the other rollers in the group so that the said one roller will be spring-like in nature to act as a shock absorber when the roller groups strike the roller stops. In other embodiments, plugs are fitted in the center opening of certain of the rollers in a group to increase the load carrying capability of the track. Further, the rollers may be magnetized so that they will remain in contact one with the other without the requirement for cages. In still another embodiment, a third track unit is extensibly mounted on the second track unit and means are provided to form a second pair of vertically spaced raceways having horizontal surfaces extending between vertical walls of the second and third units. In this last-mentioned embodiment, the second unit may be formed or provided with offset ledges defining the first and second pairs of raceways, the ledges extending laterally outwardly approximately respectively to the first and third unit walls.

This invention relates to an extensible drawer track or slide having, in most instances at least three units, the first of which is a fixed unit; a second one is an intermediate unit extensible within limits from the fixed unit; and a third unit extensible within limits from the second unit, the third unit being the one to which a drawer or electronic chassis is attached.

There are sets of rollers between each of the three units. The invention is concerned with the particular shapes of the rollers such as would be had by cutting short lengths of tubing to provide an annulus, and further with the manner of carrying the rollers in raceways. The rollers are in a group in any one raceway. The group occupies a space along the raceway such that the total diameters of all the rollers in the group is less than the length of the raceway to provide for a movement of the group in the raceway equal approximately to a limit of extension of a unit one from another. The rollers, while moving in a group in a raceway, are free one from another without any cage or spacing means.

Some rollers, even though slightly varying one from another in external diameter over other rollers, such for example, as by a thousandth or so of an inch, may deform under load to distribute that load to all of the rollers in a group within a raceway.

The invention readily provides adoption of rollers to carry various predetermined loads by selection of rollers in respect to the radial thickness of the rollers, that is, from a solid to a thin, spring-like radial thickness of the annulus.

The invention also provides a laterally, extremely thin over-all assembly of the three slide units to permit using a drawer in a cabinet of a maximum possible width.

Another advantage of the invention is found in the reduction of cost of manufacturing in those parts of the assembly which may be made of metallic extrusions and plastic moldings or extrusions, whereby machine work is reduced to a minimum. Also, as above indicated, the rollers may be cut or sliced diametrically across lengths of tubing, requiring no grinding or machining.

Other objects and advantages will become apparent to those versed in the art in the following description of the invention in reference to the accompanying drawings, in which

FIG. 1 is a view in side elevation of a structure embodying the invention and in slightly extended condition, one unit from another, and with fragments of walls broken away to disclose inner structure;

FIG. 2 is a view in top plan of the structure shown in FIG. 1;

FIG. 3 is a view in vertical section on the line **3—3** in FIG. 1, and in exaggerated width to avoid confusion of lines in the drawing;

FIG. 4 is a left hand view in end elevation, likewise exaggerated in width;

FIG. 5 is a right hand view in vertical elevation, also exaggerated in width;

FIG. 6 is a view in horizontal section on the line **6—6** in FIG. 1;

FIG. 7 is a view in partial section and in side elevation of a fragmentary portion of the right end of the structure as shown in FIG. 1, with modified end rollers;

FIG. 8 is a view of a detail in side elevation and section showing a further modification as to roller shapes;

FIG. 9 is a view in side elevation of a roller carrying a filler plug;

FIG. 10 is a view in section on the line **10—10** in FIG. 9; and

FIG. 11 is a view in vertical section illustrating a modified structure for an ultra-thin track.

Referring first to the structure of the invention as illustrated in FIGS. 1–6, a fixed unit **12** is formed in the nature of a plate to have upper and lower overturned flanges **13** and **14** forming roller runways within the flanges substantially perpendicular to both the plate **12** and flange legs **19** and **20**, each runway being in the nature of a groove, one opening toward the other.

An intermediate unit **15** has a central body **16** which may be made of a plastic material. Along the top and bottom edges of the body **16** are longitudinal grooves **17** and **18** respectively and into which grooves the flange legs **19** and **20** extend in a freely sliding manner, FIGS. 3, 4 and 5.

Bars of metal **21** and **22** are fixed respectively to opposite sides of the body **16**, such as by screws **23**, preferably fitting into recesses **24** and **25** in and along the body **16**. A roller stop bar **26** extends vertically across the body **16** on its side directed toward the plate **12**, approximately from bottom to top edges of the body **16** and across the left hand end (as viewed in the drawings) to extend from the body a distance approaching the thickness of rollers to be employed as will later be described. Also, there are roller stops **45** and **46** extending vertically across the right hand end of the plate **12** above and below the bar **21** to be in the paths of said rollers.

A plate **27** is formed to be the third unit of the structure, and in the present showing, has the same size, shape, and approximate length as of the plate **12**. The plate **27** has overturned top and bottom flanges **28** and **29** at substantially right angles to the plate and has opposing legs **30** and **31** entering respectively into the body grooves **17** and **18**. At the left hand end of the plate **27**, there are two roller stops **32** and **33** each fixed to the plate **27**, extending respectively from inside the flanges **28** and **29** toward top and bottom edges of the bar **22**, FIG. 1.

The member **16** carries a stop member **34**, such as a screw, extending into the path of the plate **27** at the left hand end of the bar **22**. The plate **27** has a cut-out **35** which will straddle and abut the stop **34** when the plate **27** is sufficiently moved to the left. The intermediate member **15** has a vertical, roller stop bar **36** fixed across its right hand end to extend laterally beyond the bar **22** toward the plate **27** but not into contact therewith, to serve as a stop limiting travel of rollers between the member **15** and the plate **27** as will be later described.

The intermediate member **15** carries a stop member **37** protruding therefrom at the right hand end of the bar **21** to strike and stop against the right end of the plate **12**, serving as a limit of travel of the member **15** to the left.

A plurality of groups of rollers, each generally designated by the numeral **38** is introduced into each of four raceways formed between each side of the intermediate unit **15**, two above, and two below the bars **21** and **22** and between the plates **12** and **27**. These raceways are designated by the numerals **39**, **40** and **41**, **42**. The rollers **38** in any one group do not fill the longitudinal length of its raceway in any instance, the number of rollers **38**, for example in raceway **44** total to six. This number may vary depending upon the length of a raceway between the end stops **33** and **36** as shown in FIG. 1, in turn varying with the full longitudinal travel desired in each of the units **15** and **27** in relation to the length of the fixed unit **12**. The limiting factor as to the number of rollers in each raceway is the use of only that number of rollers which may be free to roll as a group between those stops at the ends of the raceways.

As one example, assuming that the third unit **27** which carries the load is moving to the right in relation to the intermediate or second unit **15**, the rollers **38** will roll in the direction of the travel of the plate **27** at approximately half the speed of the travel of the plate **27**. The plate **27** may continue in its outward travel until the stops **32** and **33** come into abutment with the rearmost rollers **38***b* in the respective raceways **40** and **42**. At the same time, or shortly thereafter, each of the forward rollers **38***a* will come against the bar **36**, depending upon the lengths of the raceways and the number of rollers in the raceways. The lengths of the raceways are preferably made to be such that the travel of each group of a common number of rollers therein will, at respective ends of plate **27** travel either be against the plate stops **32**, **33** or the body **16** stop **36** so as to avoid non-rolling, sliding of the rollers in approaching the respective stops.

At the outward end of plate **27** travel, the rollers abutting the body **16** bar **36** will then push the body **16** outwardly. In so doing, the body **16** will be moved between the rollers in raceways **39** and **41**. These rollers will be stopped in their outward travel by coming against the upper and lower stops **45** and **46**, particularly so, when the body **16** carried stop bar **26**, FIG. 6 comes up against the rear rollers **38***b*.

In reverse, inward travel of the plate **27**, the rollers **38** in the top and bottom raceways **40** and **42** will move away from the stop bar **36** until the plate **27** strikes the stop **34** on the body **16**. Then the unit **15** is pushed inwardly with the rollers **38** moving away from the stops **45** and **46**, continuing to do so until the body **16** carried stop abuts the end of the plate **27**.

In each raceway, considering raceways **40** and **42** for example, the rollers **38** in the upper raceway **40** will have a load impressed upon their upper sides by the flange **28**, the load being that which is carried by the plate **27**. In turn, these upper rollers will ride on the bar **22**. Side motion of these rollers is limited by reason of the confining plate **27** on the one side and the body **16** on the other side. The spacing apart of these members **27** and **16** is controlled by reason of the plate flange legs **30** and **31** fitting into the body grooves **17** and **18**. This spacing is held against decreasing by the thickness of the rollers therein.

The under edge of the bar **22** transmits the load impressed upon the upper edge of the bar to the rollers **38** thereunder, and in turn, to the flange **29** of the plate **27**. The rollers in the top and bottom raceways **40** and **42**, each being an elastic annulus, readily deformable under the superimposed load to cause each roller in each group to carry its share of the over-all load. In some instances, particularly where vertical dimensions of the three units are required to be limited, so that the rollers in turn are limited in diameters, and where a particularly high load must be carried, the smaller diameter rollers may still be employed by press fitting a plug **50** within the hole **51** of the roller **38**, thus in effect, for that particular situation, the rollers become solid members.

In the great majority of instances the annular rollers are used. A further advantage in using such rollers, is that there may interspersed in each roller group a spring roller of relatively thin wall such as is suggested in FIGS. 7 and 8; in FIG. 7, a spring roller **52** is placed at the end of a group of rollers **38** to absorb the shock arising by a quick pull of the plate **27** when a roller **38** would otherwise strike the stop **36** with considerable force. The spring roller **52** has a much thinner ring section than do the rollers **38**. The distortion of the roller **52** may be lessened as indicated in FIG. 8 where a smaller diameter spring roller **53** is inserted within the roller **52** to serve as a shock absorber under heavier load conditions. Spring rollers **52** may also be inserted within the group of rollers **38**, as indicated in FIG. 8 for additional resilience in linear directions of roller travel.

The invention also lends itself to ultra-thin construction as indicated in FIG. 11. Here there is a back or fixed plate **55** having top and bottom overturned flanges **56** and **57** terminating in down and upturned legs **58** and **59** respectively. A body **60**, which is illustrated as plastic, but which may be extruded aluminum, is formed to have a central portion **61** extending with a clearance along the central part of the plate **55** and to be offset from the plate **55** and thence upwardly and downwardly to form roller raceways **62** and **63** respectively receiving rollers **38** therein with the flange **56** riding on the rollers **38** which in turn ride on a shoulder **64**, and by an under shoulder **65** riding on rollers **38** in turn riding on the lower plate flange **57**.

The central portion **61** has approximately the thickness of a roller **38**. The offset top and bottom body portions **66** and **67** have shoulders **68** and **69**, centrally between which extends a floating bar **70**, either of plastic or metallic material, to define upper and lower raceways **71** and **72** between it and the shoulders **68** and **69**.

Rollers **38** are placed in the upper raceway **71** to have the shoulder **68** bear on the rollers and the rollers **38** in turn bear upon the bar **70**. Rollers **38** are placed in the raceway **72** to have the bar **70** bear on them and in turn to bear on the shoulder **69**.

The rollers **38** in both the top and bottom raceways **71** and **72** are retained therein by a spring steel plate **74** which carries the bar **70** and their top and bottom edges fitted to slide up and down within opposing grooves **75** and **76** opposing one another in the body portions **66** and **67**. A plate **77** bears against the plate **74** and is fixed thereto in any suitable manner, such as by a screw **78**, and is shaftable up and down with the plate **74**. The plate **74**

maintains substantially constant widths of the raceways **71** and **72** to permit free rolling of the rollers therein.

The legs **58** and **59** are slidingly carried within top and bottom grooves or channels **79** and **80** as means for maintaining the raceways **62** and **63** of substantially constant widths, sufficiently wide to permit free rolling of the rollers therein.

In this thin structure the plate **55** is fixed to the wall of a cabinet or the like, and the loaded member (not shown) is attached to the plate **77** which constitutes the third unit body, and which travels longitudinally of the plastic intermediate or second unit, in turn carried by the first or fixed plate **55**.

The rollers **38** in the upper raceways **39, 40** of the form shown in FIGS. 1–8, do not normally carry a direct downwardly directed load thrust, but do bear upwardly against the flanges **13** and **28** to prevent tendency of the plate **27** to tilt downwardly under load when in its extended position. The same is true of the rollers **38** in the raceways **62** and **71** of the FIG. 11 form. However, these devices are made to be interchangeably used in either left or right hand positions, in which case the plate **12** or the plate **55** carrying the second and third units is simply turned over one assembled device in respect to the other without change in internal construction or assembly. That is, the top flange **13** would be the bottom flange and likewise the flange **56** would be the bottom flange.

The rollers **38** may be magnetized as a means for resisting the free travel of individual rollers from their groups. Obviously, if each roller **38** is magnetized to have an N pole and an S pole on its axis, and the N and S poles, respectively, of adjacent rollers in a group are oppositely disposed, adjacent rollers will always be magnetically attracted to each other to maintain the integrity of the group. The methods by which the rollers **38** can be so magnetized are well known and need not be discussed, in detail, herein.

Another feature of the invention resides in the fact that the flanges **13, 14** and **28, 29** are at right angles to the respective plates **12** and **27** which means that the rollers **38** being short cylinders ride on the flanges in side, sliding contact with those plates and thereby permit a thinner over-all construction than when there is an arc of curvature in a radius between those flanges and their plates. Not only is that true, but more importantly, there is less flange bending leverage by spacing the rolling members against the plates than if they were spaced outwardly therefrom. Furthermore this assures of full line contact of the rollers against the flange laterally across the periphery of the rollers.

While we have herein shown and described our invention in more or less minute detail, it is obvious that materials may be selected to differ from those recited, and also, that structural changes may be made without departing from the spirit of the invention and the limitations which may be imposed by the following claims.

We claim:

1. An extensible and retractible track comprising

a first unit;

a second unit;

means shiftably retaining the second unit along the first unit;

means forming a pair of vertically spaced, rectilinear raceways having horizontal surfaces extending between vertical walls of said units;

a horizontally free group of cylindrical rollers in tangency one with the other and carried in each of said raceways for movement as a group longitudinally back and forth therein, each roller of each group including means by the roller alone resisting separation of the roller from its group; and

the length of each of said groups being less than the length of each of said raceways.

2. The structure of claim **1** in which

said rollers are annuli, each having a radial thickness to support a predetermined load; and further comprising

roller stops carried at one end of said second unit to extend respectively into said raceways;

roller stops carried at the opposite end of said first unit to extend respectively into said raceways; and

at least one of said rollers in each group having a lesser radial thickness than that of the others whereby said one roller is rendered spring-like in nature to act as a shock absorber when the roller groups strike said roller stops.

3. The structure of claim **1**, in which

said rollers are cylindrical with axially extending holes therethrough defining resilient annuli, the radial thickness of the annuli being selected to carry predetermined loads; and

a plug tightly fitted in the hole of some, but not all of said rollers in each of said groups to increase the load carrying capacity of each group.

4. The structure of claim **1**, in which said second unit retaining means comprises upper and lower vertically disposed flange members, each flange member forming a side of a channel extending longitudinally along each of the upper and lower edges of said second unit;

said first unit comprises vertically extending upper and lower flanges extending downwardly and upwardly respectively into said channels; and

a third unit forming, in combination with said second unit, a second pair of vertically spaced raceways having horizontal surfaces extending between vertical walls of said units on the side of the second unit opposite to that of the first pair of raceways;

a second group of horizontally free cylindrical rollers in approximate tangency one with the other and carried in each of said second pair of raceways, the lengths of each of said second groups of rollers being less than each of the lengths of said second pairs of raceways; and

said third unit also comprising vertically extending flanges engaging said second unit to prevent lateral separation of said second and third units,

5. The structure of claim **4**, in which said second unit carries offset ledges defining said first and second pairs of raceways, said ledges extending approximately respectively to said first unit wall and said third unit wall.

6. The structure of claim **4**, in which

said second unit has a vertically extending control portion thickness approximately equal to that of one of said rollers, and a horizontally offset portion vertically extending around each of said groups of rollers in the first pair;

said raceways being located respectively on the top and bottom portions of said central portion between the respective offset portions and said first unit;

said first group of rollers riding on said central body raceways;

a shoulder under the upper offset portion extending laterally from said central portion forming said second pair of raceways;

a shoulder over the lower offset portion extending laterally from said central portion;

said second pair of rollers riding on said second raceways;

said second raceways being spaced vertically a distance exceeding two diameters of said rollers;

a spacer element inserted between the second pair of rollers to maintain the two groups of rollers in approximate contact with the respective second raceways;

a plate-like member carrying said spacer element shiftable vertically of the second unit; and

means carried by said second unit shiftably carrying

said element and retaining said rollers of said second pair against lateral shifting;

7. The structure of claim 1, in which said rollers are magnetized and remain in contact one with the other, free of spacing cages.

8. The structure of claim 1 wherein said rollers in each group are magnetized to resist separation of individual rollers of a group.

9. The structure of claim 1 wherein said units each comprise roller stops extending into each raceway, and wherein at least one roller in each group is a resilient annulus arranged to act as a shock absorber when said group strikes said roller stops, there being at least one substantially solid roller in each group.

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U.S. Cl. X.R.

308—6; 312—339, 341