Sept. 26, 1961 C. F. KRAMER 3,001,835

SEAT ADJUSTER TRACK MECHANISM

Filed July 20, 1959

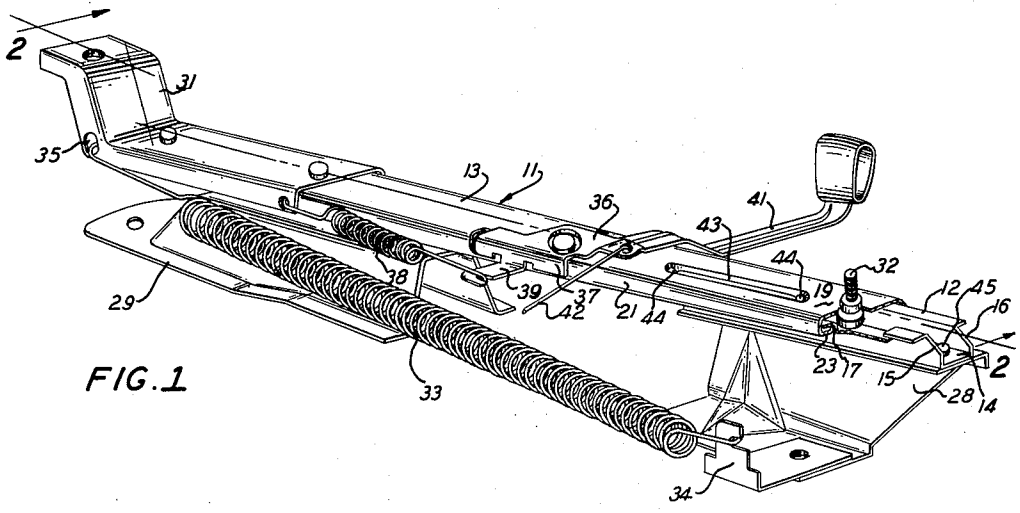


FIG. 1

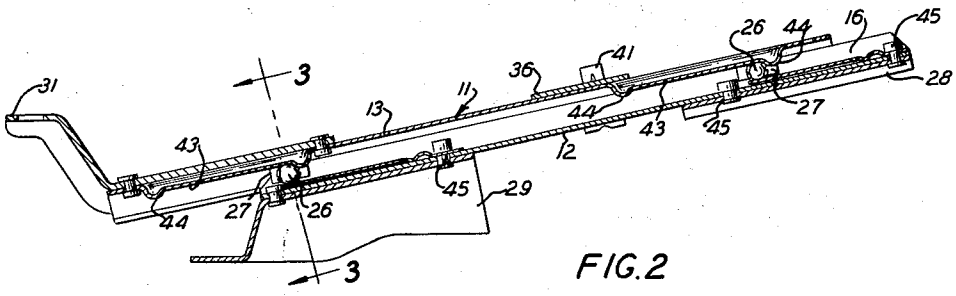


FIG. 2

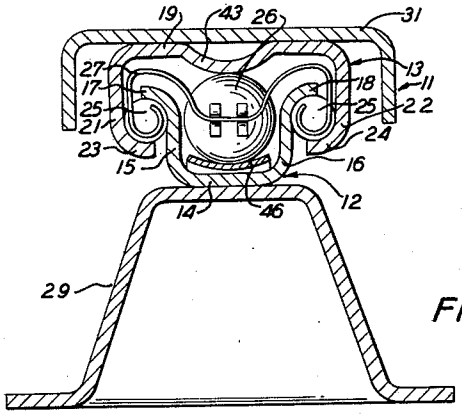


FIG. 3

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United States Patent Office 3,001,835 Patented Sept. 26, 1961

3,001,835

SEAT ADJUSTER TRACK MECHANISM

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Filed July 20, 1959, Ser. No. 828,387
3 Claims. (Cl. 308—6)

This invention relates generally to adjustable seats for motor vehicles, and has particular reference to a seat adjuster mechanism having a slidable track unit supporting the vehicle seat for fore and aft movements.

Seat adjuster mechanisms embodying a slidable track unit providing the fore and aft adjustment and positioning of the seat are well known to the prior art. In general, the slidable track unit comprises a pair of substantially U-shaped channel track members, one invertedly encompassing the other. The track members are provided with laterally extending, race forming flanges thereon in complementary relationship to each other. A bearing element, usually a small diameter ball, is interposed between each pair of flanges to provide lateral bearing means between the track members. A center bearing element, a ball somewhat larger in size than the lateral bearing elements, is interposed between the opposed base portions of the track members. Usually, the side bearing elements and the center enlarged bearing element are maintained in a predetermined relationship to one another by a suitable cage device. One of these bearing element assemblies is positioned at each end of the track unit.

In a conventional structure the center bearing element or ball while rolling on the lower track member supports the vertical load of the vehicle seat and its occupants, while the lateral bearing elements or balls merely provide lateral stability.

It is an object of the present invention to provide an improved construction and arrangement of the track unit in which a part of the vertical load carried by the center bearing element or ball is distributed to at least one of the bearing elements or balls between the lateral flanges of the track member. In a conventional track unit, the opposed base portions of the track members are both either flat or one of them is provided with a curved surface complementary to the ball surface. In the structure embodying the present invention, one ball engaging base portion, preferably that of the upper track, is curved oppositely to the curvature of the ball, thereby providing an unstable condition. Because of this deliberately created unstable condition, the tendency of the track to shift laterally to the extent of the tolerances beween the lateral bearing elements and the associated race forming flanges results in a vertical component of force being exerted on at least one of the balls forming the lateral bearing elements. This results in a reduction of the load on the center ball element.

Other objects and advantages of this invention will be made more apparent as this description proceeds, particularly when considered in connection with the accompanying drawings, wherein:

FIG. 1 is a perspective view, in part sectional, of one track unit of an adjustable seat mechanism incorporating the present invention;

FIG. 2 is a sectional view taken substantially through line 2—2 of FIG. 1 looking in the direction of the arrows; and

FIG. 3 is an enlarged cross sectional view taken substantially on the line 3—3 of FIG. 2 looking in the direction of the arrows.

Referring now to the drawings, and particularly to FIG. 1, there is illustrated one of the two seat track units located at each side of the vehicle seat (not shown) and

supporting the latter for fore and aft adjustment. The illustrated unit, generally designated 11, is the one usually found beneath the left or driver's side of the vehicle seat, as will be more fully explained. The right-hand unit (not shown) is substantially the same as the illustrated unit. The minor differences between the two do not affect the present invention and only the one unit will be described in detail.

Much of the structure illustrated follows conventional practice. A brief description of the details should suffice for an understanding of the present invention.

In general, the seat track unit 11 comprises a lower track member 12 and an upper track member 13. Each of the track members is a substantially U-shaped channel member. The lower track member 12 is provided with a base portion 14 and upwardly extending leg portions 15 and 16 at each side of the base portion. Each of the leg portions 15 and 16 terminates in a laterally extending, outwardly curved flange 17 and 18, respectively.

The upper track member 13 is provided with a base portion 19 and downwardly depending leg portions 21 and 22 at each side thereof. Each of the leg portions 21 and 22 terminates in a laterally extending but inwardly curved flange 23 and 24, respectively.

As seen in FIG. 3, the upper track member 13 invertedly encompasses the lower track member 12. Each pair of flanges 17—23 and 18—24 are complementally curved to form races receiving bearing elements in the form of small balls 25. In a conventional seat track structure the function of the small balls 25 is to provide lateral bearing means between the channel members or track members 12 and 13, and, thus, to control the lateral stability of the seat adjuster mechanism.

The vertical load on the upper seat track 13 is transmitted to the lower track 12 through bearing elements in the form of balls 26 somewhat larger in diameter than the balls 25. Each pair of side balls 25 and associated centrally positioned balls 26 are retained in predetermined lateral position or alignment by means of a bearing cage 27 of any convenient form. It will be understood that there are generally two of these ball and track assemblies, one located at each end of the track unit.

The lower track 12 is supported on suitable front and rear brackets 28 and 29, respectively, on the floor of the vehicle body. The upper track 13 is provided with the necessary support bracket 31 at the rear thereof and the necessary retaining devices, such as the device 32 shown at the front of the bracket, for supporting and securing the frame of the vehicle seat. An elongated tension or assist spring 33 is provided to exist in forward and slightly upward movement of the seat. The spring extends between a flange 34 on the fixed front support bracket 28 and the edge wall of an aperture 35 in the seat support bracket 31 carried on the movable upper track 13.

Any convenient type of latching device may be provided to hold the upper track 13 in adjusted position relative to the lower track 12. As illustrated, the latching device comprises a latch plate 36 pivotally mounted on the upper surface of the upper track member 13. The latch plate 36 is provided at the side 37 thereof with pawl elements (not shown) engageable with rack elements (not shown) on the side of the lower track member. A tension spring 38 is provided which extends between a latch plate extension 39 and a suitable aperture in the side wall of the bracket 31. The spring 38 continually urges and holds the latch plate in latching position. A suitable hand lever 41 is provided when it is desired to retract the pawl elements from the rack elements permitting the upper track member 13 to be adjusted relative to the lower track member 12. The hand lever 41 is usually provided only on the latch plate mounted on the track unit 11 beneath the driver's side of the vehicle

seat. The track unit mounted at the opposite side of the vehicle seat is provided with a similar latch plate except that the latter is adapted to be actuated by remote control through the medium of a cable **42** extending between it and the latch plate operated by the handle **41**.

The feature which distinguishes the seat track unit **11** embodying the present invention over the conventional seat track units as above described relates to the vertical load carrying balls **26** and their associate sections of the upper track member **13**. In a conventional seat track the base portion **19** is either flat or, as it would appear from the inside, laterally curved to provide a groove or recessed track in which the ball would roll, in a relative sense. The groove might have a cross sectional radius substantially equal to or somewhat larger than the radius of the ball **26**. Whether flat or so grooved, the entire vertical load carried by the track is concentrated on the balls **26**. The smaller side balls **25** merely function to provide lateral stability.

In carrying out the present invention, the conventional groove is turned inside out. As best seen in cross section in FIG. 3, the ball **26** is in engagement with a convexly curved, as it appears from the inside, centrally located elongated raised section **43** of the base portion **19**. The relative length of the raised section **43** to the length of the upper track member **13** is illustrated in FIGS. 1 and 2. It will be noted that the base portion **19** of the upper track member **13** is provided with the longitudinally extending raised sections **43** at each end thereof. Each raised section **43** is at each of its ends provided with semispherical knolls **44**. The knolls **44**, which project deeper into the channel member **13** than the raised sections **43** proper, act as stops which in part control the range of movement of the upper track member **13** over the balls **26**. In this regard, it will be noted that the studs or rivets **45** securing the lower track **12** to the support brackets **28** and **29**, respectively, are provided with enlarged head portions effective to limit the distance each ball **26** may roll relative to the lower track.

To complete the description of the physical details of the seat track unit **11**, it should be noted that wear strips **46** are provided on which the balls **26** are adapted to roll. One of these wear strips **46** extends between each pair of stops **45** on the lower track member **12**. Each of the wear strips **46** is an elongated member, made of a resilient material such as spring steel. Each wear strip is preferably anchored at only one end by the same rivet or stud **45** securing the track member to the support bracket.

The wear strips **46** have a function other than merely providing a wear resistant surface for the balls **26**. This second function forms an important feature of the present invention. As best seen in FIG. 3, each wear strip **46** is provided with a concave lateral curvature opposing the convex lateral curvature of the track section **43**. In addition, each strip member **46** is slightly longitudinally bowed, its free end when not under pressure from a ball **26** being flexed upwardly from the surface of the track member **12**.

The manner in which the seat track units embodying the present invention operate may best be explained with reference to FIG. 3. It will be readily understood that as the seat is shifted fore or aft, each ball **26** rolls beneath the track member **13** and over the lower track member **12**. In a conventional seat track unit, the only function of the side bearing elements or balls **25** is to provide lateral stability of the upper movable track member **13** relative to the fixedly supported track member **12**. However, as is readily apparent from FIG. 3, in the present construction and arrangement, the seat track **13** has a precarious perch on the balls **26**. Assuming no lateral clearances between the balls **25** and their associated flanges, the line of contact of each ball **26** and base portion **19**, that is, the curved section **43** of the latter, would lie on the vertical center line of the ball. Stated in another way, the crest of the convexly curved section **47** would be in tangential contact with the ball **26** at a surface or peripheral point lying on the vertical center line of the ball. In practice, there are always sufficient deviations of clearances resulting from manufacturing tolerances which permit sufficient lateral play between the two tracks **12** and **13** to result in the upper track slipping to one side of the vertical center line of the ball **26**. There is, of course, a reaction force acting on the ball **26**. Because of the concave curvature of the wear strip **46** and the resistance to downward deflection resulting from the longitudinally bowed form of the strip member, the ball **26** tends to remain centered or stabilized relative to the lower track member.

The slight lateral shift of the upper track member **13** resulting from its unstable relationship to the balls **26** results in some of the vertical load being shifted to the balls **25** on the side of the vertical center line of the ball **26** opposite to that to which the upper track curved section **43** has shifted. For example, if the direction of the lateral shift of the upper track **13** is to the left of the vertical center line of the ball **26**, as viewed in FIG. 3, the force causing such shift results in a force couple tending to raise the flange **24** of the leg portion **22** of the track member **13**. The ball **25** between the flange **24** and its associated flange **18** is then subject not only to the usual laterally or horizontally acting components of force, as found in conventional seat track units, but is also subject to vertical force components. These vertical force components, in effect, are a partial distribution of the load or vertical forces acting directly on the associated ball **26**.

The result of the foregoing is a distribution of the load over a greater number of balls with a resultant greater ease of operation. A secondary result is the take-up of all lateral clearances. Instead of the upper track being able to shift from side to side laterally as it moves longitudinally of the lower track, it exerts a lateral thrust primarily against the balls carrying the vertical load and does not shift from one side of the vertical center line of the ball **26** to the other. The result is a much smoother operating seat track unit.

It will be understood that the invention is not to be limited to the exact construction shown and described, but that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. In a seat track unit comprising an upper and a lower channel member, said upper channel member invertedly encompassing the lower channel member with their base portions in opposed spaced relationship, said members being provided with complementary laterally extending race forming flanges thereon, ball means interposed between said flanges providing lateral bearing means between said channel members, said upper channel member being shiftable laterally relative to said lower channel member to the extent of the clearances between said ball means and said race forming flanges, and a ball element interposed between said base portions maintaining said channel members in vertical spaced relationship, said upper channel member being provided with a convexly laterally curved ball element engageable means, the relationship between said upper channel member base portion means and said ball element creating an unstable condition whereby said upper channel member shifts laterally to take up said clearances and a part of any vertical load carried by said ball element is distributed to the lateral bearing means on at least one side of said channel members.

2. In a seat track unit comprising a pair of substantially U-shaped channel members, one invertedly encompassing the other, said members being provided with complementary laterally extending race forming flanges thereon, ball means interposed between said flanges providing

lateral bearing means between said channel members, said upper channel member being shiftable laterally relative to said lower channel member to the extent of the clearances between said ball means and said race forming flanges, and a ball element interposed between said base portions maintaining said channel members in vertical spaced relationship, said upper channel member having a convexly laterally curved ball element engageable means integral therewith and the lower channel member base portion a concavely laterally curved ball element engageable means supported thereon, the relationship between said upper channel member base portion means and said ball element creating an unstable condition whereby said upper channel member shifts laterally to take up said

clearances and a part of any vertical load carried by said ball element is distributed to the lateral bearing means on at least one side of said channel members.

3. A seat track unit according to claim 2 in which a cage means extends between said ball means and ball element to maintain the same in predetermined longitudinal and lateral relationship relative to one another.

References Cited in the file of this patent

UNITED STATES PATENTS

2,307,305 Saunders ---------- Jan. 5, 1943

FOREIGN PATENTS

725,218 Great Britain ---------- Mar. 2, 1955