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[45] **Nov. 12, 1974**

[54] **SLIDE MECHANISM WITH RESTRAINTS AGAINST TRANSVERSE MOVEMENT**

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[21] Appl. No.: **337,440**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 247,681, April 26, 1972.

[52] **U.S. Cl.** ..... **308/6 R,** 312/341 NR

[51] **Int. Cl.** **F16c 17/00,** F16c 21/00

[58] **Field of Search** ..... 308/3.6, 3.8; 312/341 NR, 312/344, 345, 346

[56] **References Cited**

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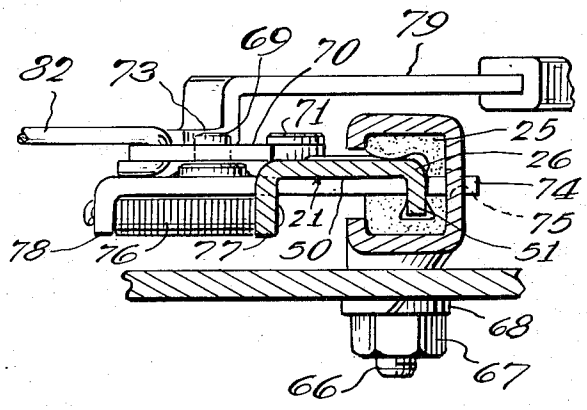
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Primary Examiner—Charles J. Myhre
Assistant Examiner—R. H. Lazarus
Attorney, Agent, or Firm—Merriam, Marshall, Shapiro & Klose

[57] **ABSTRACT**

A slide mechanism in which a movable slide member slides in a stationary bearing element which restrains the slidable member against movement other than in the direction of sliding movement. Contact between the sliding member and the bearing element is linear at all locations of contact. Compacted foreign matter accumulating in the slide mechanism is broken up, loosened and ejected from the bearing element in response to sliding movement.

14 Claims, 10 Drawing Figures



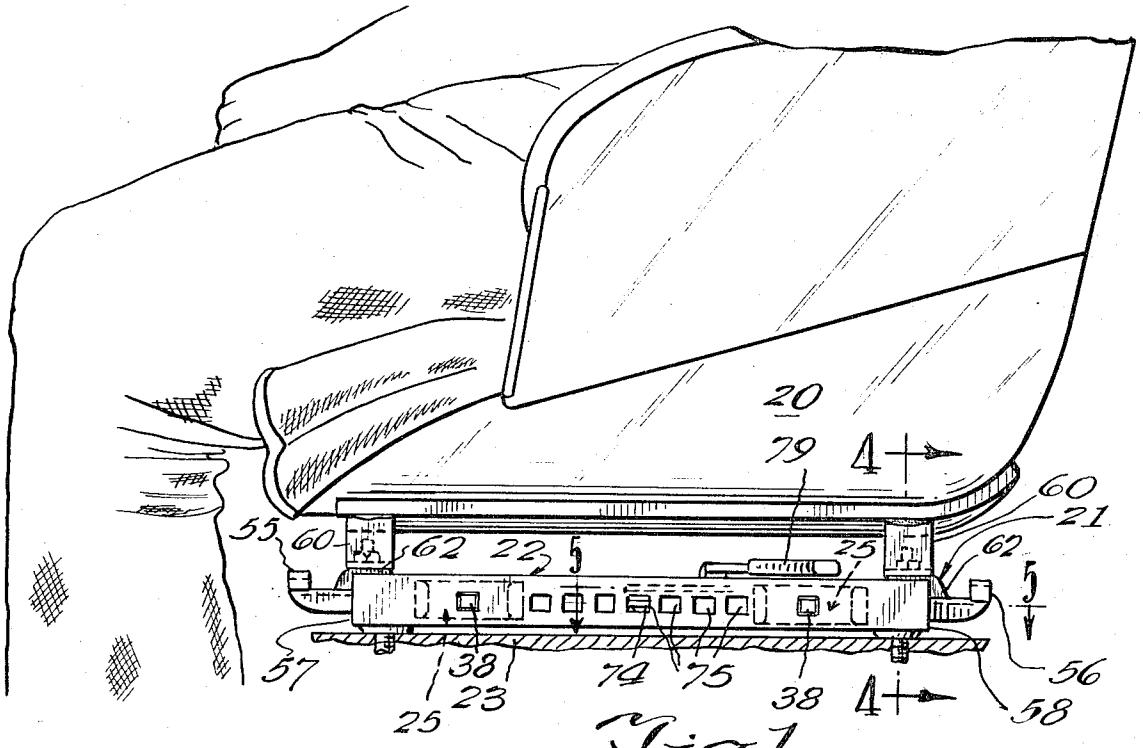


Fig. 1

Fig. 2

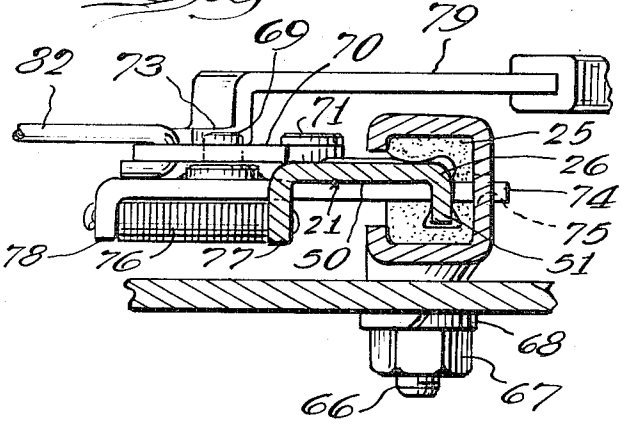
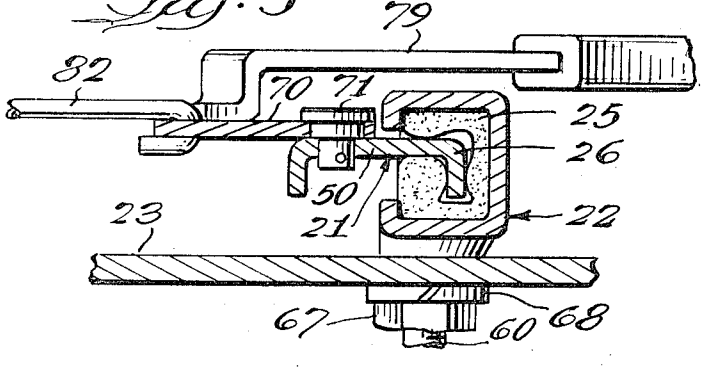


Fig. 3



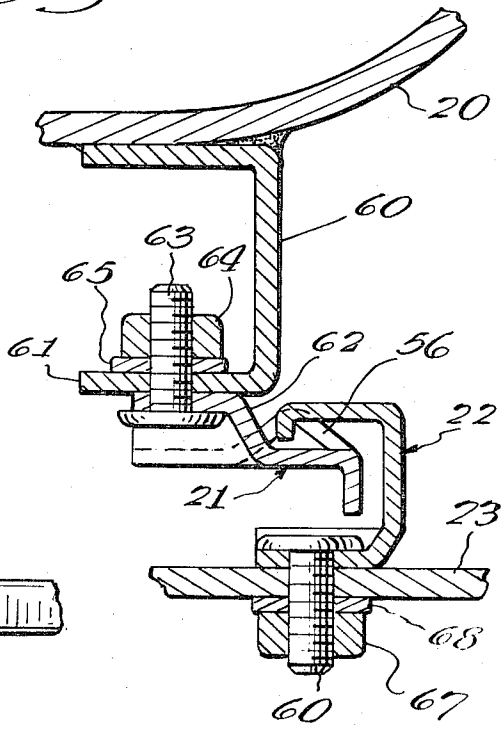


Fig. 4

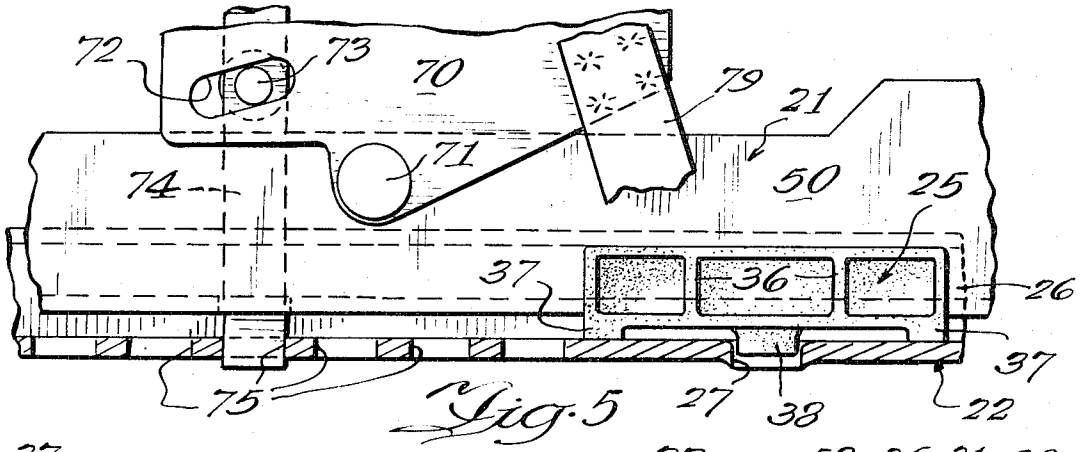


Fig. 5

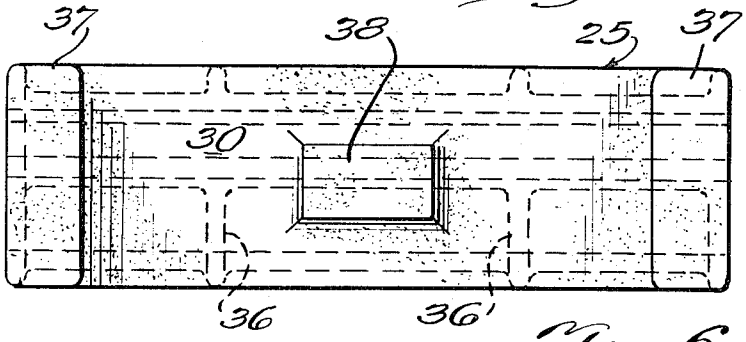


Fig. 6

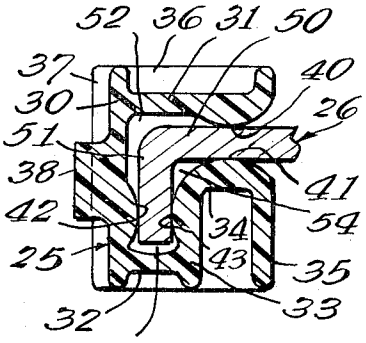


Fig. 8

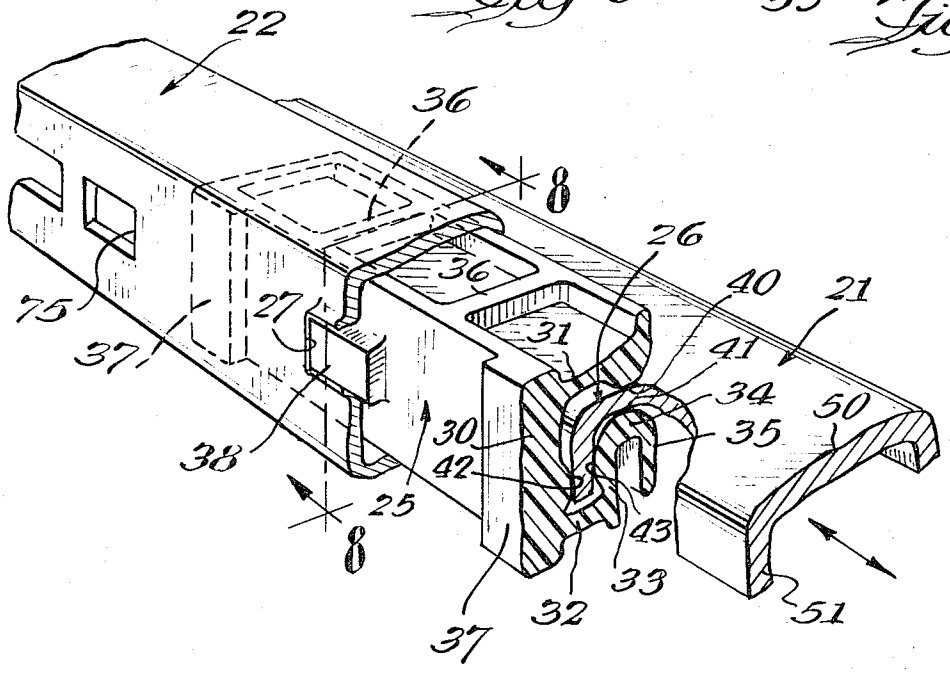
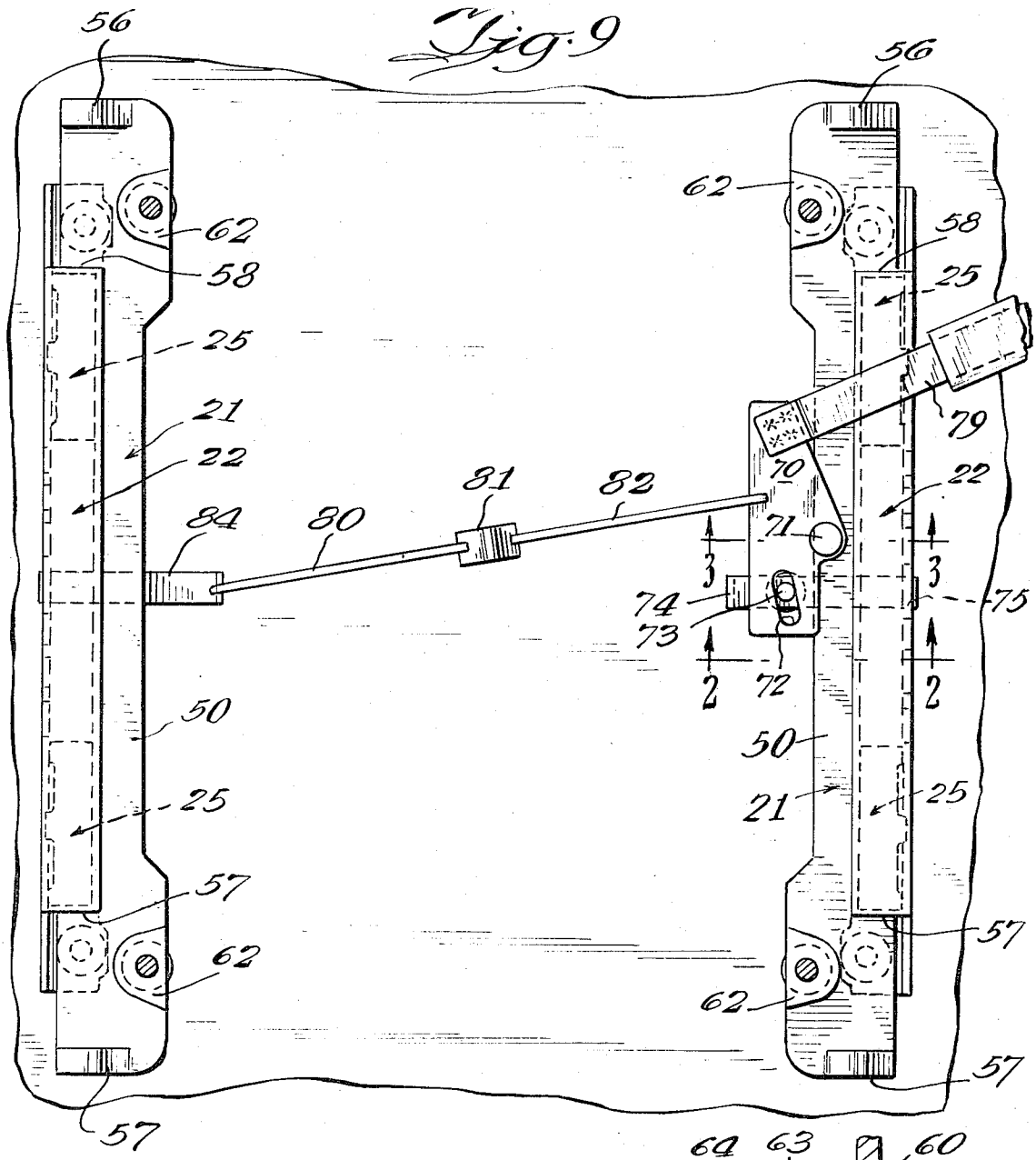


Fig. 7

Fig. 9


56
62
58
25
21
22
84
80
81
82
70
71
74
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72
79
75
3
2
50
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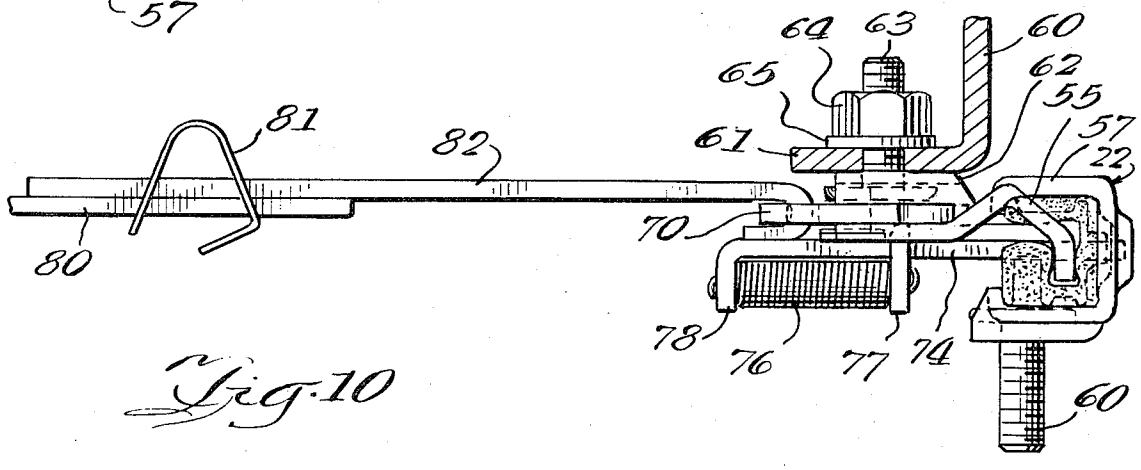

81
82
80
64
63
60
65
62
55
61
57
22
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77
74

Fig. 10

SLIDE MECHANISM WITH RESTRAINTS AGAINST TRANSVERSE MOVEMENT

CROSS REFERENCE TO RELATED APPLICATION

This is a continuation-in-part of the present inventor's application Ser. No. 247,681 filed Apr. 26, 1972 and entitled "Slide Mechanism".

BACKGROUND OF THE INVENTION

The present invention relates generally to a slide mechanism having a member slidable relative to a stationary member mounting a bearing element, and more particularly to a slide mechanism in which the bearing element prevents movement of the slidable member in a direction transverse to the direction of sliding movement.

Slide mechanisms of the type described above are used, for example, to mount vehicle seats for frontward and rearward sliding movement relative to a base on which the seat is mounted, to adjust the distance between the seat and the steering wheel of the vehicle. Such adjustable vehicle seats are often employed in off-the-road vehicles, such as tractors and construction equipment, where the slide mechanism is subjected to dirt and moisture, causing jamming problems in the slide mechanism. Jamming can be due to dirt or dust being windblown into the slide mechanism or to corrosion of the parts of the slide mechanism.

It is desirable to prevent movement of the sliding vehicle seat from side to side in a direction transverse to the direction of sliding movement. Conventionally, this has required relatively large areas of surface contact for the engaging parts of the slide mechanism, and this has a tendency to increase the likelihood of jamming.

The related application, noted above, utilizes a resilient bearing element composed of non-corrosive, self-lubricating, anti-friction plastic material such as nylon, polytetrafluorethylene, high density polyethylene or the like. Pairs of these bearing elements are mounted on spaced-apart stationary frame members, with each bearing element of a pair being spaced apart from the other bearing element in a direction transverse to the direction of desired sliding movement and in opposed relation to the other bearing element and at a fixed distance from each other. The two opposed, resilient bearing elements grip therebetween the slidable member (or a frame having two such members), thereby preventing movement in a direction transverse to the direction of sliding movement, while still permitting sliding movement. To do this, two opposed bearing elements are required, and they must be tied together in some manner to maintain the fixed distance between them and to obtain the gripping action.

SUMMARY OF THE INVENTION

The present invention relates to a slide mechanism which is corrosion resistant, anti-jamming, and eliminates the problem of side to side movement of a slidable frame member relative to a stationary frame member, but without requiring two opposed bearing elements which grip the slidable frame member therebetween, as in the related application.

The present invention utilizes a single bearing element, composed of non-corrosive, self-lubricating, anti-friction plastic material such as Delrin, nylon, and the like. A slide member is mounted for sliding movement relative to the bearing element, and the single bearing element includes structure which, in itself, retains the slide member against movement other than in the direction of sliding movement. The bearing element and slide member are so constructed as to restrict contact between these two to substantially linear contact at all locations of contact, thereby minimizing friction between the two.

In addition, the two are so constructed that any compacted foreign matter accumulating between them is broken up, loosened and ejected from the slide mechanism in response to sliding movement of one relative to the other.

Other features and advantages are inherent in the structure claimed and disclosed or will become apparent to those skilled in the art from the following detailed description in conjunction with the accompanying diagrammatic drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view of a vehicle seat utilizing an embodiment of slide mechanism in accordance with the present invention;

FIG. **2** is a sectional view along line **2—2** in FIG. **9**;

FIG. **3** is a sectional view along line **3—3** in FIG. **9**;

FIG. **4** is a sectional view along line **4—4** in FIG. **1**;

FIG. **5** is a sectional view along line **5—5** in FIG. **1**;

FIG. **6** is a side elevational view of a bearing element constructed in accordance with an embodiment of the present invention;

FIG. **7** is a perspective illustrating an embodiment of the slide mechanism;

FIG. **8** is a sectional view taken along line **8—8** in FIG. **7**;

FIG. **9** is a plan view of a slide mechanism utilized in conjunction with the vehicle seat of FIG. **1**; and

FIG. **10** is a fragmentary front view of the slide mechanism illustrated in FIG. **9**.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring initially to FIGS. **1** and **9**, a vehicle seat **20** is mounted atop a pair of slidable frame members each indicated generally at **21** and each being mounted for sliding movement in a fore and aft direction relative to a respective base member indicated generally at **22** and mounted on a base **23**.

Each base member **22** mounts a pair of spaced apart self-lubricating, non-corrosive, anti-friction, plastic bearing elements **25, 25** each of which receives and slidably mounts an L-shaped portion **26** of slidable frame member **21** (FIGS. **2–3** and **7–9**). L-shaped portion **26** is mounted for sliding movement relative to bearing element **25** in response to movement of slidable frame member **21** in a fore and aft direction relative to base member **22**.

As shown in FIG. **8**, bearing element **25** has an essentially L-shaped interior recess for receiving L-shaped slidable portion **26**.

Referring now to FIGS. **5–8**, bearing element **25** includes a back portion **30** from which a top portion **31** extends forwardly. Also extending forwardly from back

portion 30 is a bottom portion 32 from which an inner vertical portion 33 extends upwardly. Extending forwardly from inner vertical portion 33 is a horizontal portion 34 from which depends an outer vertical portion 35. Bearing element 25 is provided with intermediate ribs 36, 36 and end ribs 37, 37 for strengthing purposes. Extending rearwardly from back portion 30 is a key 38 received and held in an opening 27 in base member 22 to mount bearing element 25 on base member 22.

Bearing element 25 includes four convex interior contacting surfaces; an upper convex contacting surface 40 on top portion 31, a lower convex contacting surface 41 on horizontal portion 34, a back convex contacting surface 42 on back portion 30 and a front convex contacting surface 43 on inner vertical portion 33.

Referring to FIG. 8, L-shaped portion 26 of slidable frame member 21 comprises a web 50 having top and bottom contacting surfaces and a flange 51 having front and back contacting surfaces.

Upper and lower convex contacting surfaces 40, 41 on bearing element 25 are in mutually opposed vertical alignment; and back and front convex contacting surfaces 42, 43 are in mutually opposed horizontal alignment. Upper and lower convex contacting surfaces 40, 41 on bearing element 25 engage the top and bottom contacting surfaces on web 50 of slidable L-shaped portion 26. Back and front convex contacting surfaces 42, 43 on bearing element 25 engage the back and front contacting surfaces on flange 51 of slidable L-shaped portion 26.

Because all the contacting surfaces on slidable L-shaped portion 26 are planar, and all the contacting surfaces on stationary slide element 25 are convex, contact between the two slide elements is restricted to substantially linear contact.

The engagement of web 50 (on slidable L-shaped portion 26) between upper and lower convex contacting surfaces 40, 41 on bearing element 25, restrains L-shaped portion 26 and slidable frame member 21 against movement in a vertical direction (a direction transverse to the direction of sliding movement); and the engagement of flange 51 (on L-shaped portion 26) between back and front convex contacting surfaces 42, 43 on bearing element 25, restrains L-shaped portion 26 and slidable frame member 21 against movement in a horizontal direction transverse to the direction of sliding movement.

In summary, the contacting engagement between the various surfaces on elements 25 and 26 is such that a single bearing element 25 will restrain the slidable frame member 21 from undergoing side to side or up and down movement. A pair of opposed bearing elements is not required for this purpose.

When bearing element 25 and L-shaped portion 26 are in contacting engagement with each other, as shown in FIG. 8, there are a plurality of cavities 52, 53, 54 defined by the adjacent surfaces of the element 25 and portion 26 between adjacent linear contact locations. Cavities 52, 53, 54 are sufficiently large and so shaped as to permit compacted foreign matter which accumulates therein to break up and loosen or flake off during normal operating vibrations of the slide mechanism and in response to sliding movement of L-shaped portion 26 relative to bearing element 25; and the loosened foreign matter is ejected to the outside of bearing element 25 in response to the sliding movement.

Bearing element 25 may be composed of an antifriction, self-lubricating, corrosion-resistant plastic material such as nylon, Teflon or a high molecular weight linear polyethylene. A preferable material is a thermoplastic polymer manufactured by the polymerization of formaldehyde and sold under the tradename Delrin by DuPont.

Delrin has improved dimensional stability compared to other plastic bearing material such as Teflon. Delrin has excellent anti-friction properties both from the standpoint of overcoming friction to start from a dead stop and from the standpoint of maintaining movement once movement has been started.

Slidable frame member 21 is mounted below seat 20 utilizing structure illustrated in FIGS. 1, 4 and 9. Welded to the bottom of seat 20 are a plurality of channelshaped brackets 60 each having a lower horizontally extending flange 61. Formed at each end of each slidable member 21 is a dimple shaped portion 62 attached to lower bracket flange 61 by a fastening arrangement comprising a bolt 63, a nut 64 and a washer 65 (FIG. 4). Stationary base member 22 is connected to base 23 by a fastening arrangement comprising a bolt 66, a nut 67 and a washer 68.

Fore and aft movement of slidable frame member 21 (and of seat 20) is limited by the engagement of a front stop 55, on slidable member 21, with the front end 57 of base member 22 and by engagement of a rear stop 56, on slidable member 21, with the rear end 58 of base member 22.

Slidable frame member 21 and seat 20 may be stopped and fixed at intermediate positions between their limits of movement, utilizing a latching arrangement described below.

Referring to FIGS. 2–3, 5, 9 and 10, a pivotal planar member 70 is pivotally mounted by pivot pin 71 to web 50 of slidable frame member 21. Pivotal member 70 has a slot 72 which receives a pin 73 in a lost-motion linkage. Pin 73 is attached to a latch finger 74 which extends through and locks in one of a series of latching holes 75 in base member 22. Latch finger 74 is urged in the direction of latching holes 75 by a spring 76 having one end connected to an inner depending flange 77 on slidable frame member 21 and another end connected to a flange 78 on latch finger 74.

Finger 74 is retractable from a hole 75 by manipulating a handle 79 attached to one end of pivotal member 70. Turning handle 79 in a clockwise sense, as viewed in FIG. 9, pivots member 70 about the axis of pin 71, in turn causing latch finger 74 to be retracted from a latching hole 75, against the urging of spring 76. Finger 74 moves with slidable frame member 21. When the latter has been moved to a desired position, handle 79 is released, and finger 74 is urged into locking engagement with a latching hole 75 by the urging of spring 76.

Lost motion pin 73 is encased in a bearing member 69, composed of the same anti-friction material as that used for bearing element 25, to enhance the operation of the latching mechanism and to minimize friction.

Finger 74 extends through slots (not shown) in the two depending flanges 77, 51 of slidable frame member 21 (FIG. 2). Web 50 of slidable frame member 21 is indented, at that location where locking finger 74 traverses it, to facilitate movement of finger 74 back and

forth by minimizing the surface contact between the upper surface of finger **74** and the lower surface of web portion **50.**

Handle **79** also manipulates a second latching finger **84** on the opposite side of the slidable seat arrangement of FIGS. **1** and **9,** using the following linkage. Finger **84** is connected to one end of a link rod **80** having its other end connected by a connector **81** to one end of a second link rod **82** having its other end connected to pivotal member **70.**

Both the left hand and the right hand latching fingers **74, 84** in FIG. **9** are of identical construction and are interchangeable, each being urged toward its respective locking hole **75** by a spring **76.**

All of the left hand and right hand parts of the sliding and latching mechanism shown in FIG. **9** are identical and interchangeable, except for the unlocking portion of the latching mechanism.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, as modifications will be obvious to those skilled in the art.

What is claimed is:

1. A slide mechanism comprising:
a first member;
a second member;
a bearing element on said first member;
means on said bearing element and on said second member cooperating to mount said second member for sliding movement relative to said bearing element;
said bearing element comprising means for restraining said second member against movement other than in the direction of said sliding movement;
said bearing element and said second member comprising a planar contacting surface on one of the two and a convex contacting surface on the other of the two;
and means on said bearing element and on said second member cooperating to restrict contact between the two to contact between a convex surface on one of the two and a planar surface on the other of the two at all locations of contact, thereby minimizing friction between the two.

2. A slide mechanism as recited in claim **1** wherein:
said second member has a plurality of contacting surfaces;
and said bearing element has a plurality of contacting surfaces each engaging a respective contacting surface of said second member.

3. A slide mechanism as recited in claim **2** wherein:
said bearing element has two pairs of convex contacting surfaces;
one of said two pairs of convex contacting surfaces comprising means for restraining said second member against movement in a first direction transverse to said direction of sliding movement;
and the other of said two pairs of convex contacting surfaces comprising means for restraining said second member against movement in a second direction transverse to the direction of sliding movement and transverse to said first direction.

4. A slide mechanism as recited in claim **3** wherein:
the convex contacting surfaces in said one pair are in mutually opposed vertical alignment;
and the convex contacting surfaces in said other pair are in mutually opposed horizontal alignment.

5. A slide mechanism as recited in claim **1** and comprising:
means on said bearing element and on said second member cooperating to eject loose foreign matter accumulating between the two, in response to said sliding movement.

6. A slide mechanism as recited in claim **5** wherein said last recited means further comprises:
means for breaking up and loosening compacted foreign matter accumulating between the two in response to said sliding movement.

7. A slide mechanism as recited in claim **6** wherein said last recited means comprises:
a cavity defined by adjacent surfaces of the bearing element and the second member between adjacent contact locations.

8. A stationary bearing element for use with a movable slide member, said bearing element and said slide member comprising a planar contacting surface on one of the two and a convex contacting surface on the other of the two, said stationary bearing element comprising:
means for restraining the movable slide member against movement other than in the direction of sliding movement;
and means for restricting contact between said bearing element and said slide member to contact of a convex surface with a planar surface at all locations of contact.

9. A stationary bearing element recited in claim **8** wherein said restraining means and said contact-restricting means are embodied in a plurality of contacting surfaces each comprising means for engaging a respective contacting surface on the movable slide member.

10. A stationary bearing element as recited in claim **9** and comprising:
two pairs of said convex contacting surfaces;
one of said two pairs of convex contacting surfaces comprising means for restraining said movable slide member against movement in a first direction transverse to said direction of sliding movement;
and the other of said two pairs of convex contacting surfaces comprising means for restraining said movable slide member against movement in a second direction transverse to the direction of sliding movement and transverse to said first direction.

11. A stationary bearing element as recited in claim **10** wherein:
the convex contacting surfaces in said one pair are in mutually opposed vertical alignment;
and the convex contact surfaces in said other pair are in mutually opposed horizontal alignment.

12. A stationary bearing element as recited in claim **8** and comprising:
means for permitting the ejection of loose foreign matter accumulating between the bearing element and the slide member, in response to said sliding movement.

13. A stationary slide element as recited in claim **12** and comprising:
means for permitting the breaking up and loosening of compacted foreign matter accumulating be-

tween the bearing element and the movable slide member, in response to said sliding movement.

14. A stationary slide element as recited in claim **13** wherein said last recited means comprises;

an enlarged recess located between adjacent linear contact locations on the stationary bearing element.

* * * * *