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(54) **SLIDE RAIL**

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(57) **ABSTRACT**

In the present slide rail a space receives a roller. Upper and lower rollers have their respective axes for rotation having inclinations of θ and $-\theta^\circ$, respectively, relative to an axis perpendicular to a body of the external rail. Thus the slide rail can have a simple structure.

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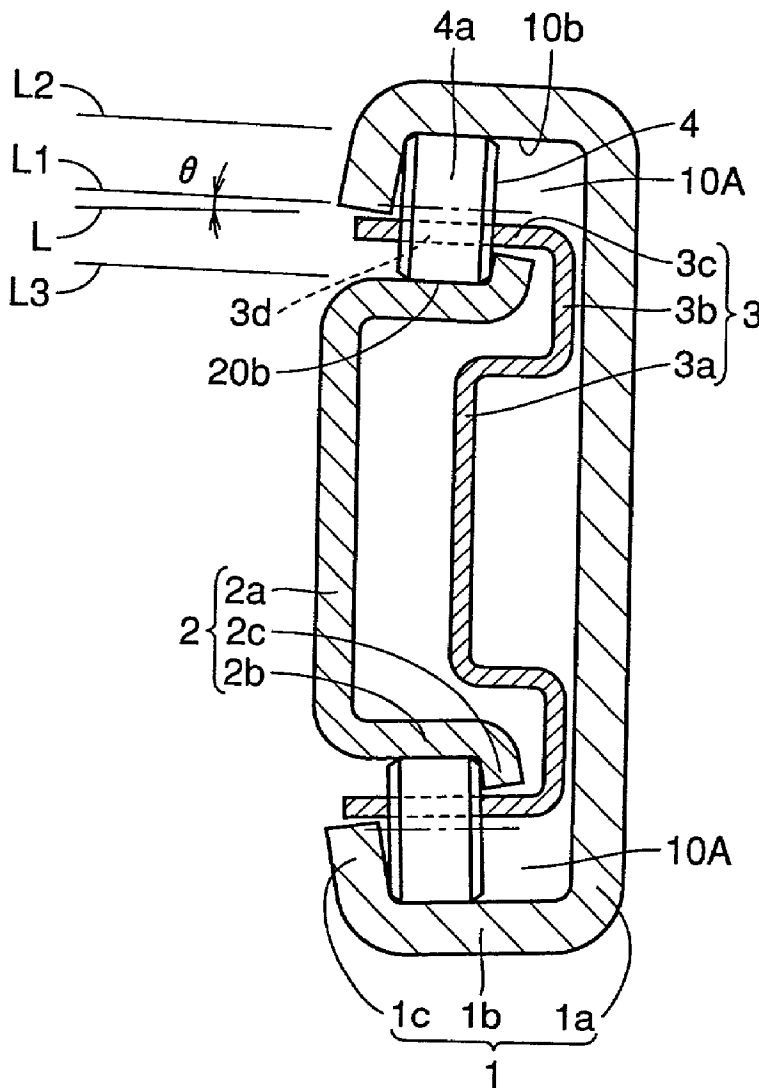


FIG. 1A

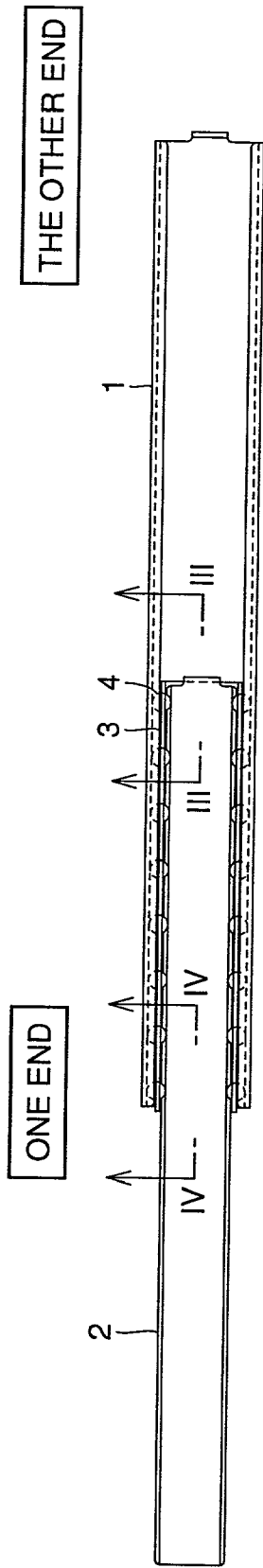


FIG. 1B

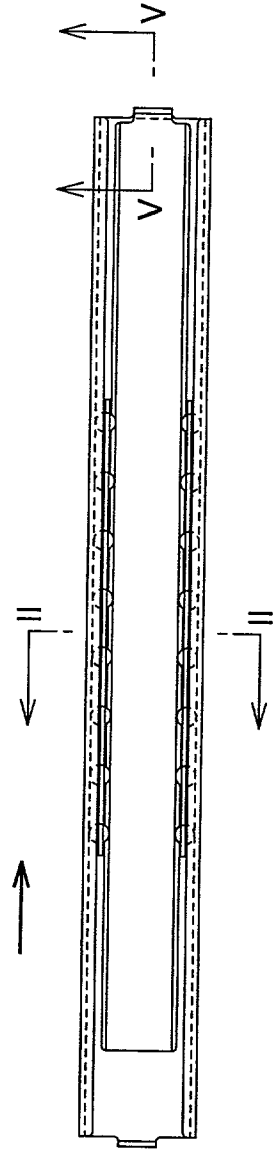


FIG. 2

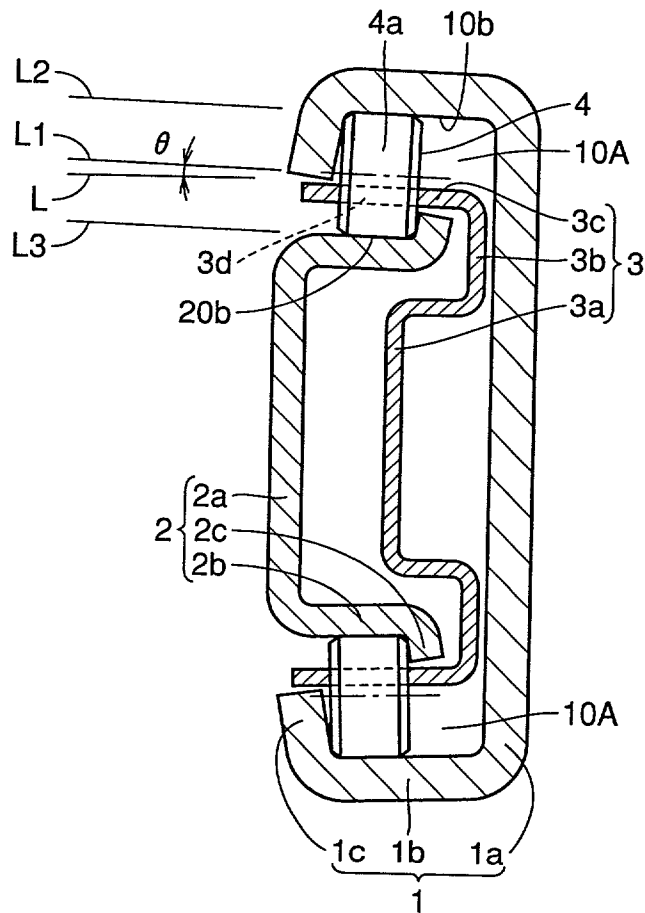


FIG. 3

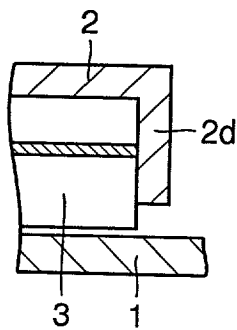


FIG. 4

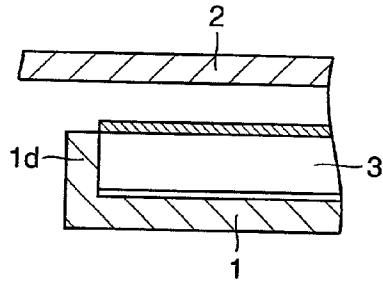


FIG. 5

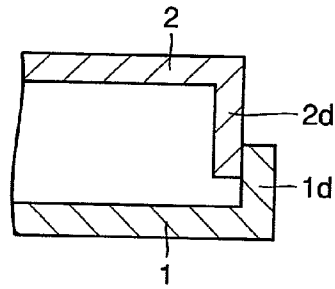
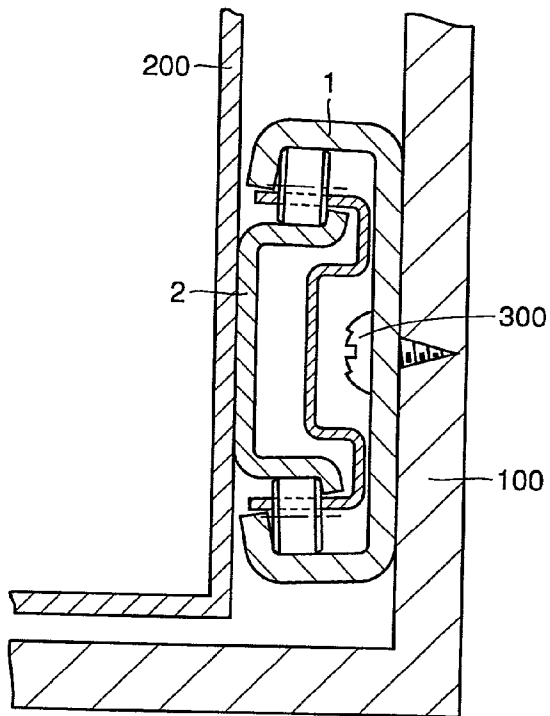


FIG. 6



SLIDE RAIL

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates generally to slide rails for drawers of OA equipment, furniture and the like and more specifically to those simplified in structure.

[0003] 2. Description of the Background Art

[0004] Conventionally, various forms of slide rails have been developed for drawers of furniture, OA equipment and the like. For example, Japanese Patent Laying-Open No. 59-67913 discloses a slide rail structured including a supporting rail attached to a body receiving a drawer and a drawer rail attached to a drawer, with rollers provided therebetween to ensure reliable movement in longitudinal and lateral directions, respectively.

[0005] This conventional slide rail requires that between the supporting and drawer rails there exist rollers providing two functions. This increases the number of the parts of the slide rail and consequently complicates its structure and also increases its cost.

SUMMARY OF THE INVENTION

[0006] The present invention has been made to solve the above disadvantage and it contemplates a slide rail simplified in structure.

[0007] To achieve the above object the present invention provides a slide rail including an external rail, an internal rail and a roller arranged between the external rail and the internal rail, the external rail and the internal rail being slideable relative to each other, wherein the external rail accommodates the internal rail, between a side of the internal rail facing outward and that of the external rail facing inward there being provided opposite spaces each receiving the roller having an axis for rotation traversing a plane in which the slide rail slides, the axis for rotation being spaced from each other by a distance reduced as the axis for rotation comes closer to the external rail.

[0008] In the present invention preferably the external rail includes a body extending in a direction in which the slide rail slides, a flange raised at each of opposite sides of the body of the external rail, and a raised portion provided at each of opposite ends of the flange of the external rail to extend inward facing the body of the external rail.

[0009] Furthermore the internal rail includes a body extending in the direction in which the slide rail slides, a flange raised at each of opposite sides of the body of the internal rail, and a raised portion provided at each of opposite ends of the flange of the internal rail to extend outward facing the body. The external rail accommodates the internal rail to have their respective internal sides facing each other, an outer side of the flange and raised portion of the internal rail and an inner side of the flange and raised portion of the external rail together define opposite spaces each accommodating the roller with a rolling surface in contact with the flange of the internal rail and the flange of the external rail.

[0010] The roller each has an axis for rotation traversing the plane in which the slide rail slides and spaced from each other by a distance reduced as the axis for rotation comes closer to the external rail.

[0011] With the space accommodating the roller, if an external force is exerted to move the external and internal rails away from each other the rails can have their respective raised portions together pinching the roller to prevent the rails from moving away from each other.

[0012] If an external force is exerted to move the external and internal rails closer to each other, with the rollers' axes for rotation spaced from each other by a distance reduced as they come closer to the external rail, the external force is thus exerted to move the opposite rollers closer to each other. However, the rollers, having their positions fixed by the flange of the internal rail, cannot be moved close to each other. Thus the external and internal rails would not move close to each other. Thus if the external and internal rails receive such external forces in the two directions as described above the rails would not move close to or away from each other.

[0013] Furthermore, if an external force is exerted in a direction traversing the roller's rolling surface, with the space having the roller arranged therein, the internal rail does not move relative to the external rail in the direction traversing the rolling surface. Generally, a large load is imposed in this direction, although the rolling surface can receive the load and the roller can thus have its function maximally served to ensure that the slide rail reliably operates.

[0014] Furthermore in the present invention preferably the flange of the external rail and the flange of the internal rail each have a surface contacting a rolling surface of the roller, parallel thereto.

[0015] Furthermore in the present invention preferably a portion of the raised portion of the external rail closer to the roller and that of the raised portion of the internal rail closer to the roller are each substantially parallel to a side surface of the roller.

[0016] With the rails having a surface contacting the roller, parallel thereto, the roller can smoothly rotate to reduce the resistance between the external and internal rails as they slide. Thus the slide rail's function can further be enhanced.

[0017] Furthermore in the present invention preferably the space receives more than one roller integrally supported by a supporting rail provided between the external and internal rails.

[0018] The supporting rail supporting the rollers integrally, can facilitate assembling the slide rail and also allows the rollers to integrally function to further enhance the slide rail's function.

[0019] The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] In the drawings:

[0021] **FIGS. 1A and 1B** are front views of a structure of a slide rail in an embodiment of the present invention, the former showing a position with an internal rail pull out of an

external rail, the latter showing a position with the internal rail pushed into the external rail;

[0022] FIG. 2 is a cross section taken along line II-II of FIG. 1B;

[0023] FIG. 3 is a cross section taken along line III-III of FIG. 1A;

[0024] FIG. 4 is a cross section taken along line IV-IV of FIG. 1A;

[0025] FIG. 5 is a cross section taken along line V-V of FIG. 1B; and

[0026] FIG. 6 is a cross section of a drawer with a slide rail of an embodiment of the present invention applied thereto.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0027] An embodiment of a slide rail of the present invention will now be described with reference to the drawings.

Structure of Slide Rail

[0028] In the present embodiment the slide rail is structured as described with reference to FIGS. 1A and 1B and 2.

[0029] With reference the figures the present embodiment provides a slide rail including an external rail 1 and an internal rail 2. Between external and internal rails 1 and 2 a roller accommodating space is provided to arrange therein a plurality of rollers 4 to allow external and internal rails 1 and 2 to be slideable relative to each other.

Structure of External Rail 1

[0030] External rail 1 includes a body 1a, a flange 1b provided at opposite sides of body 1a, and a raised portion 1c provided at flange 1b. Body 1a extends in a direction in which the rail slides. Flange 1b is raised at the opposite sides of body 1a. Raised portion 1c is each provided at an end of flange 1b to extend inward facing body 1a.

Structure of Internal Rail 2

[0031] Internal rail 2 includes a body 2a, a flange 2b provided at opposite sides of body 2a and a raised portion 2c provided at flange 2b. Body 2a extends in a direction in which the rail slides. Flange 2b is raised at the opposite sides of body 2a. Raised portion 2c is each provided at an end of flange 2b to extend outward facing body 2a.

[0032] As shown in the figure, external rail 1 accommodates internal rail 2 such that the rails have their respective internal sides facing each other. An outer side of flange 2a and raised portion 2c and an inner side of flange 1b and raised portion 1c define a space 10A for accommodating a roller 4.

[0033] Roller 4 has a rolling surface 4a contacting a contact surface 20b of flange 2b and a contact surface 10b of flange 1b. Furthermore, roller 4 has an axis for rotation L1 traversing the plane in which the rail slides and, at the opposite sides, spaced from each other by a distance reduced as it comes closer to external rail 1. In the present embodiment, as shown in FIG. 2, upper and lower rollers 4 have

their respective axes for rotation L1 having inclinations of 0° and -0° , respectively, relative to an axis L perpendicular to body 1a of the external rail.

[0034] Furthermore, contact surfaces 10b and 20b are provided parallel to rolling surface 4a of roller 4, as indicated by lines L1 and L3.

[0035] Furthermore a supporting rail 3 is provided between external and internal rails 1 and 2 to support and thus integrate roller 4. Supporting rail 3 includes a body 3a, a bent portion 3b provided at opposite sides of body 3a and a raised portion 3c raised at an end of bent portion 3b.

[0036] Raised portion 3c has a plurality of guide holes 3d provided lengthwise to accommodate roller 4.

Function and Effect

[0037] If the slide rail thus configured, with roller 4 accommodated in space 10A, receives an external force to move external and internal rails 1 and 2 away from each other, raised portions 1c and 2c together can pinch roller 4 to prevent external and internal rails 1 and 2 from moving away from each other.

[0038] If an external force is exerted to move external and internal rails 1 and 2 closer to each other, with the roller 4 axis for rotation L1 spaced from each other by a distance reduced as it comes closer to external rail 1, the external force is thus exerted to move opposite rollers 4 closer to each other. However, rollers 4, having their positions fixed by flange 2b of the internal rail, cannot be moved close to each other. Thus external and internal rails 1 and 2 would not move close to each other.

[0039] Thus if external and internal rails 1 and 2 receive such external forces in the two directions as described above the rails do not move close to or away from each other.

[0040] Furthermore, if an external force is exerted in a direction traversing the roller 4 rolling surface 4a, with space 10A having the roller arranged therein, internal rail 2 does not move relative to external rail 1 in the direction traversing rolling surface 4a. Generally, a large load is imposed in this direction, although rolling surface 4a can receive the load and roller 4 can thus have its function maximally served to ensure that the slide rail reliably operates.

[0041] Furthermore, supporting rail 3 supporting roller 4 integrally, can facilitate assembling the slide rail and also allows roller 4 to integrally function to provide the slide rail with a further enhanced function.

[0042] Preferably, a portion of raised portion 1c closer to roller 4 and that of raised portion 2c closer to roller 4 are each substantially parallel to a side surface of roller 4. With the rails having a surface contacting roller 4, parallel thereto, roller 4 can smoothly rotate to reduce the resistance between external and internal rails 1 and 2 as they slide. Thus the slide rail's function can further be enhanced.

Stopper Mechanism

[0043] A description will now be provided of a stopper mechanism of the slide rail of the present embodiment. FIG. 1A shows a position with internal rail 2 maximally drawn out of external rail 1. In this position a mechanism is adapted

to prevent internal rail 2 from coming off external rail 1. This mechanism will now be described with reference to FIGS. 3 and 4.

[0044] With reference to FIG. 3, internal rail 2 has the other end provided with a bent portion 2d extending toward external rail 1 and abutting against the other end of supporting rail 3. Furthermore, with reference to FIG. 4, external rail 1 has one end provided with a bent portion 1d extending toward internal rail 2 and abutting against one end of supporting rail 3. Thus supporting rail 3 has the opposite ends sandwiched between external and internal rails 1 and 2 to limit the movement of internal rail 2 toward one end.

[0045] With reference to FIG. 5, at the other end of the slide rail, the internal rail's bent portion 2d abuts against the external rail's bent portion 1d to limit the movement of internal rail 2 toward the other end.

[0046] FIG. 6 shows an example of a slide rail as configured above with a drawer attached thereto. The drawer has a body 100 with external rail 1 fixed thereto by a screw 300 or the like. Internal rail 2 and supporting rail 3 each have a geometry avoiding the head of screw 300. Fixed to a drawer 200 is internal rail 2.

[0047] While the present slide rail is typically applied to such a drawer as shown in FIG. 6 it can also be applied to external rail 1 fixed to a ceiling and internal rail 2 having a lightning appliance attached thereto to readily change the position of the lightning appliance.

[0048] The present invention essentially provides a slide rail including an external rail, an internal rail and a roller arranged between the external and internal rails, the external and internal rail being provided slideably relative to each other, wherein the external rail accommodates the internal rail, between a side of the internal rail facing outward and that of the external rail facing inward there are provided opposite spaces each receiving the roller having an axis for rotation traversing a plane in which the slide rail slides, and also spaced from each other by a distance reduced as it comes closer to the external rail.

[0049] Conventionally, external forces in two directions are each addressed by a roller. By contrast the present slide rail can have a single roller having the above-described two functions and it can thus be simplified in structure. Furthermore the external, internal and supporting rails can each have a simple geometry and they can thus be produced through press work to reduce the cost for producing the slide rail.

[0050] Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way of illustration and example only and is not to be taken by way of limitation, the spirit and scope of the present invention being limited only by the terms of the appended claims.

What is claimed is:

1. A slide rail comprising an external rail, an internal rail and a roller arranged between said external rail and said internal rail, said external rail and said internal rail being slideable relative to each other, wherein said external rail accommodates said internal rail, between a side of said internal rail facing outward and that of said external rail facing inward there being provided opposite spaces each receiving said roller having an axis for rotation traversing a plane in which the slide rail slides, said axis for rotation being spaced from each other by a distance reduced as said axis of rotation comes closer to said external rail.

2. The slide rail of claim 1, wherein:

said external rail includes a body extending in a direction in which the slide rail slides, a flange raised at each of opposite sides of said body of said external rail, and a raised portion provided at each of opposite ends of said flange of said external rail to extend inward facing said body of said external rail;

said internal rail includes a body extending in the direction in which the slide rail slides, a flange raised at each of opposite sides of said body of said internal rail, and a raised portion provided at each of opposite ends of said flange of said internal rail to extend outward facing said body; and

Said external rail accommodates said internal rail to have their respective internal sides facing each other, an outer side of said flange and raised portion of said internal rail and an inner side of said flange and raised portion of said external rail together define opposite spaces each accommodating said roller with a rolling surface in contact with said flange of said internal rail and said flange of said external rail, said roller each having an axis for rotation traversing the plane in which the slide rail slides and spaced from each other by a distance reduced as said axis for rotation comes closer to said external rail.

3. The slide rail of claim 2, wherein said flange of said external rail and said flange of said internal rail each have a surface contacting a rolling surface of said roller, parallel thereto.

4. The slide rail of claim 2, wherein a portion of said raised portion of said external rail closer to said roller and that of said raised portion of said internal rail closer to said roller are each substantially parallel to a side surface of said roller.

5. The slide rail of claim 2, wherein said space receives more than one said roller integrally supported by a supporting rail provided between said external rail and said internal rail.

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