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Chen et al.

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(54) **SLIDE RAIL MECHANISM**

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A47B 88/43	(2017.01)
A47B 88/493	(2017.01)
F16C 29/04	(2006.01)

(52) **U.S. Cl.**

CPC ***A47B 88/493*** (2017.01); ***A47B 88/43*** (2017.01); ***F16C 29/04*** (2013.01); *A47B 2210/0045* (2013.01)

(58) **Field of Classification Search**

CPC A47B 88/43; A47B 88/437; A47B 88/443; A47B 88/493; A47B 2210/0043; A47B 2210/0045; F16C 29/04; F16C 2314/72

See application file for complete search history.

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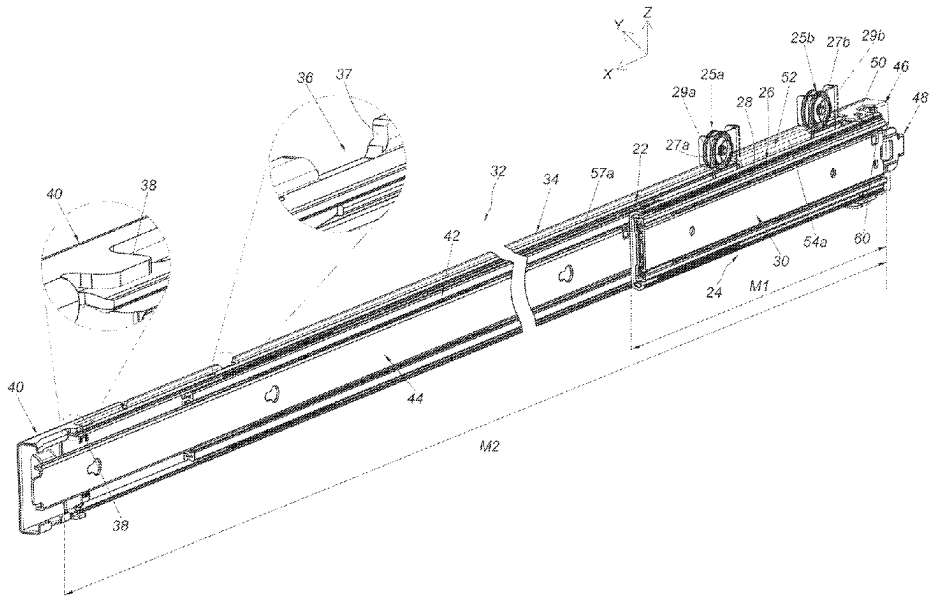
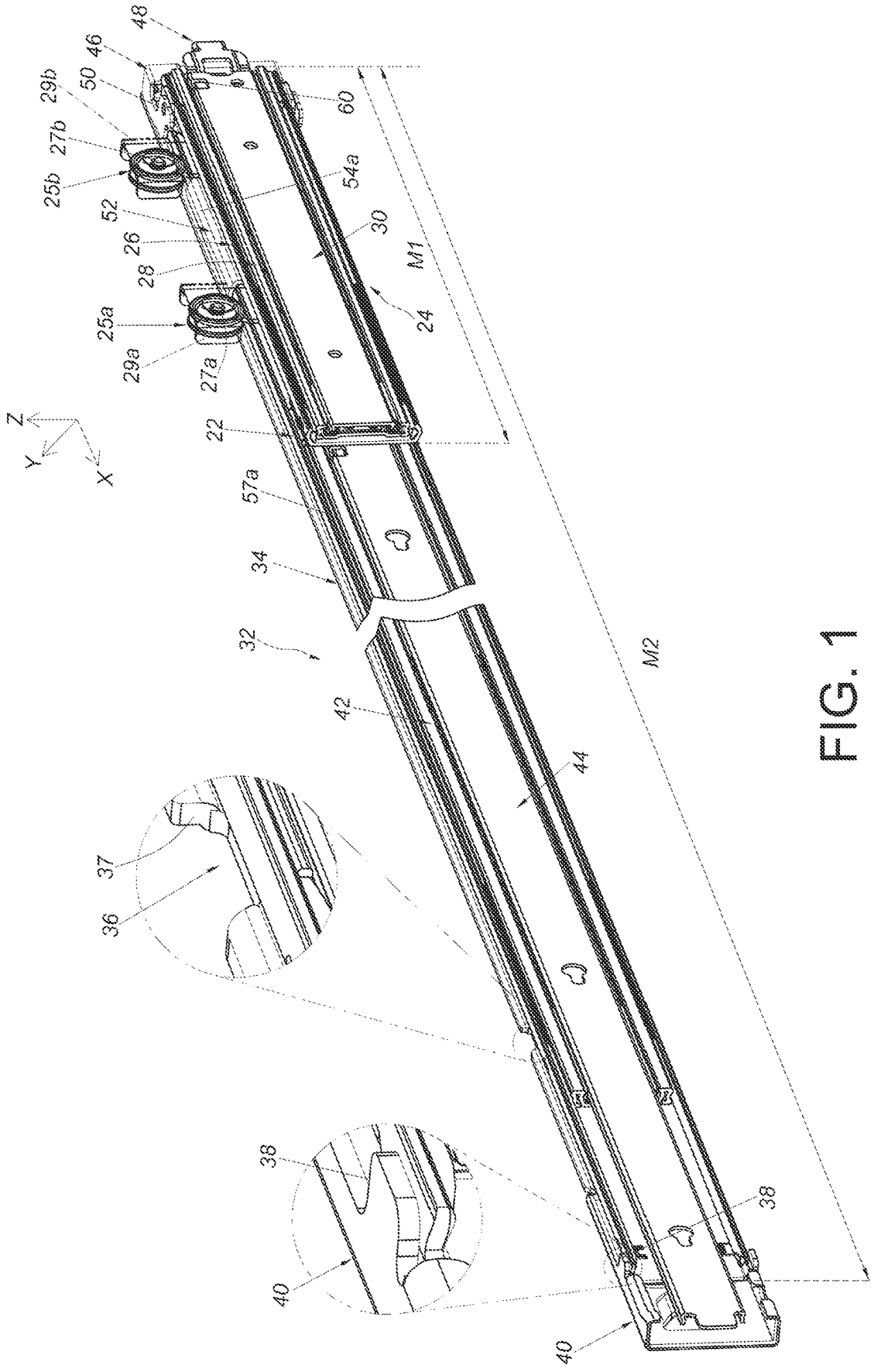
(74) *Attorney, Agent, or Firm* — Winston Hsu

(57) **ABSTRACT**

A slide rail mechanism is provided and includes a supporting member, a slide rail assembly and a rolling member. The slide rail assembly and the supporting member are displaceable relative to each other. The rolling member is arranged on one of the slide rail assembly and the supporting member. The slide rail assembly is configured to engage with the supporting member via the rolling member.

18 Claims, 16 Drawing Sheets

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M1
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42
44
M2
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38
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38
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Z
Y
X

FIG. 1

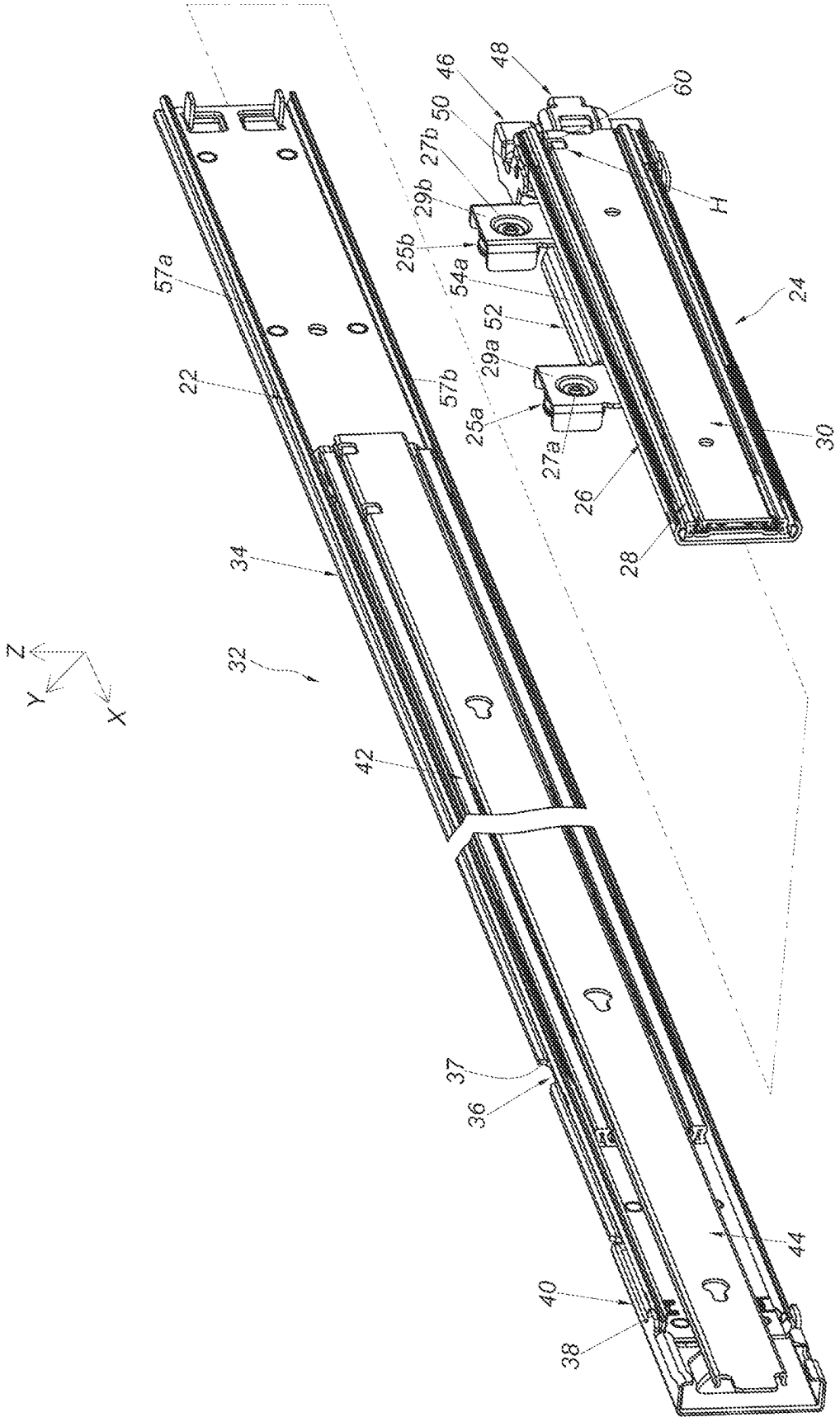
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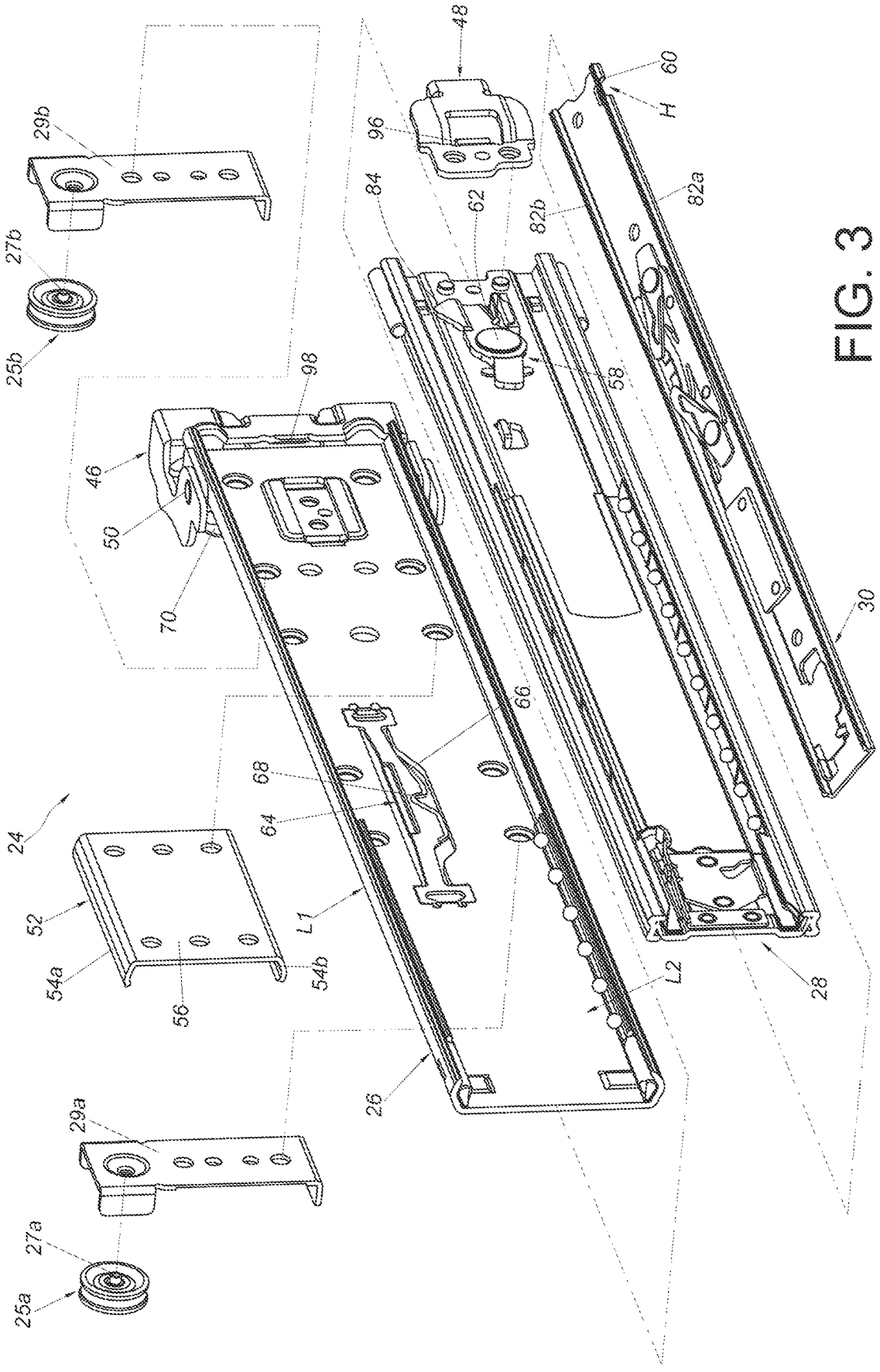
FIG. 2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25b
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70
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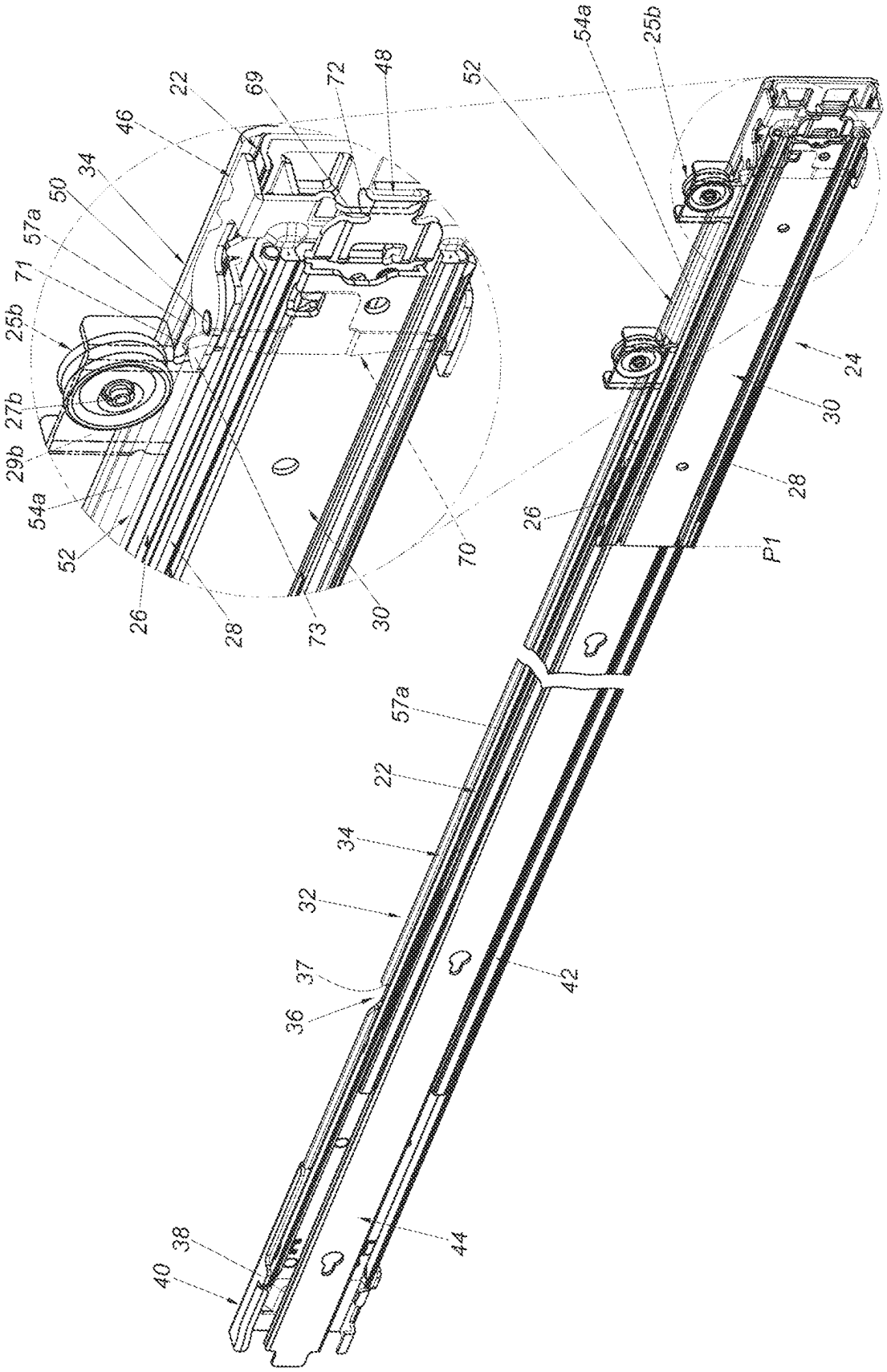
24
52
54a
56
54b
L1
L2
28
26
29a
27a
25a

FIG. 3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57a
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44
38
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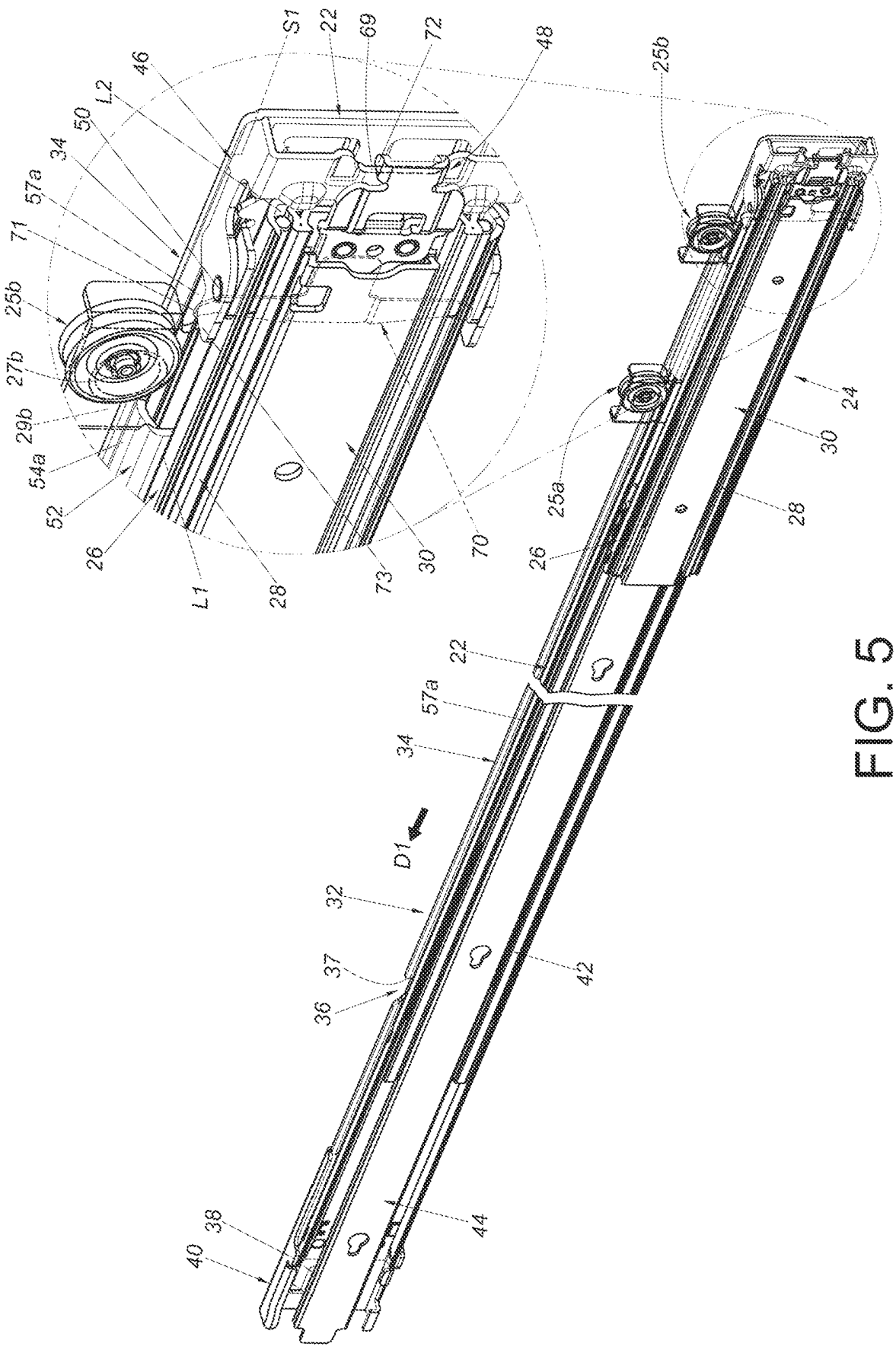
FIG. 4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L2
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28
73
30
70
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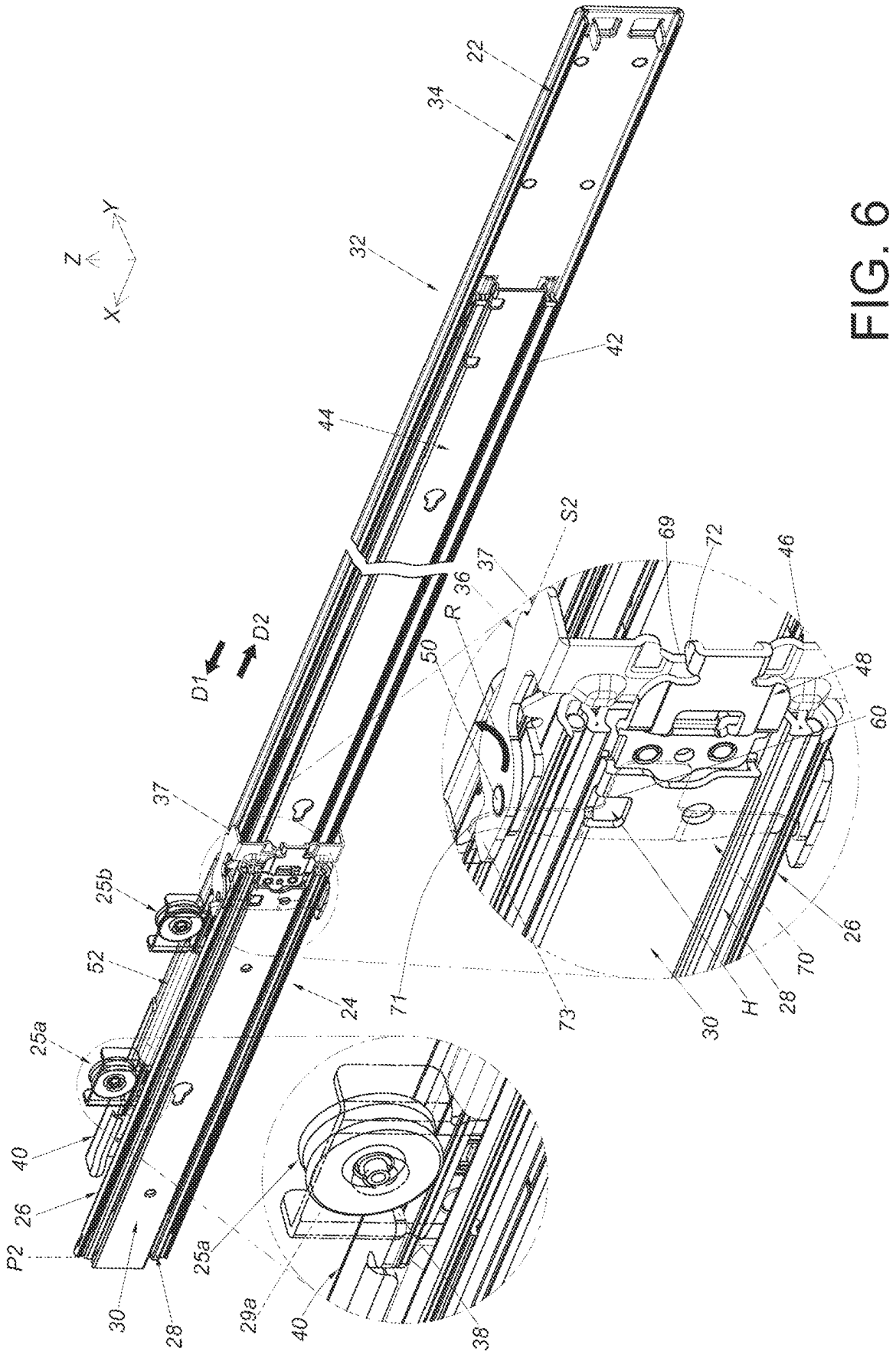
22
57a
34
D1
32
37
36
42
38
40
44

FIG. 5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25a
29a
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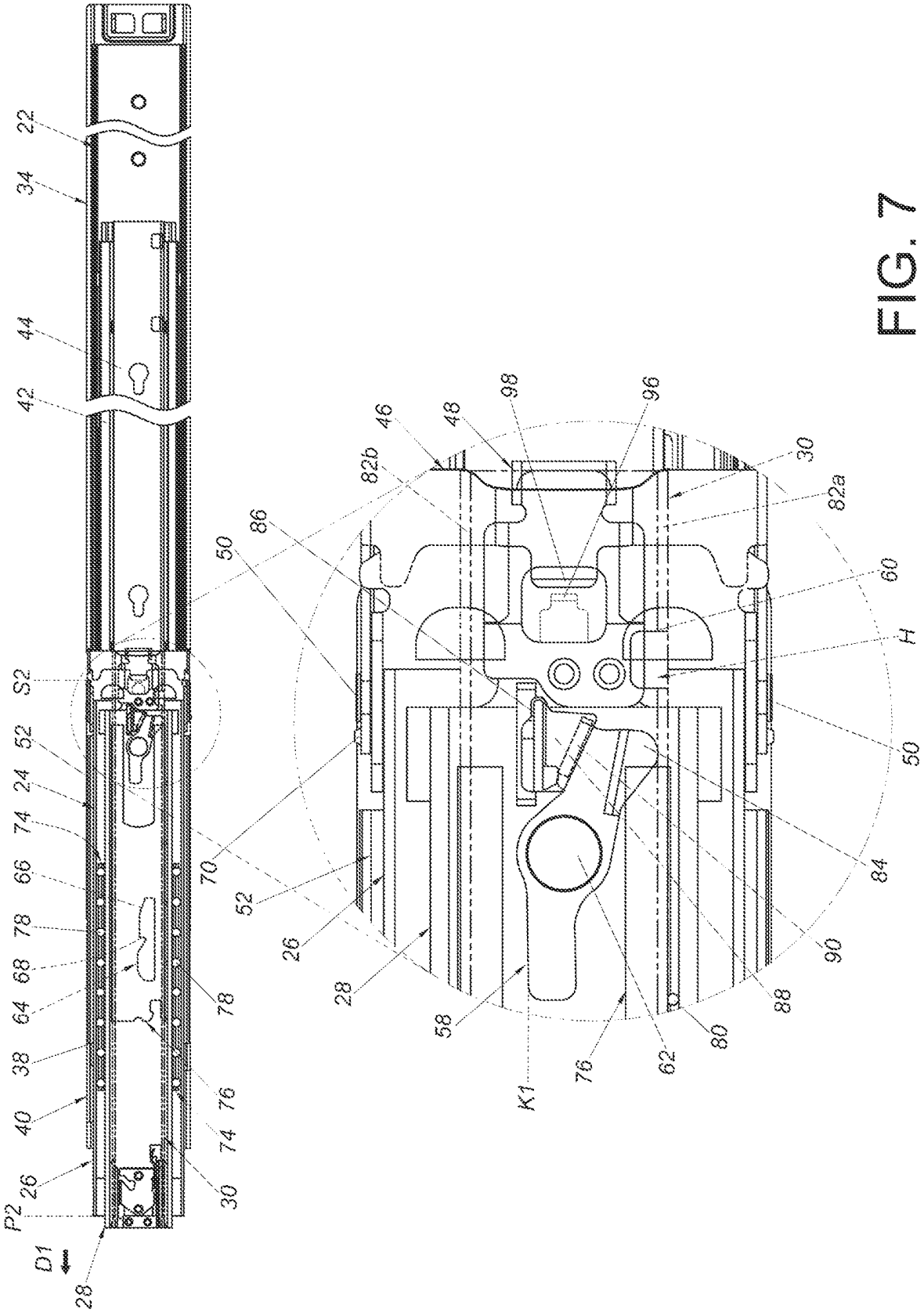
FIG. 6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86
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52
26
28
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K1
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82b
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96

FIG. 7

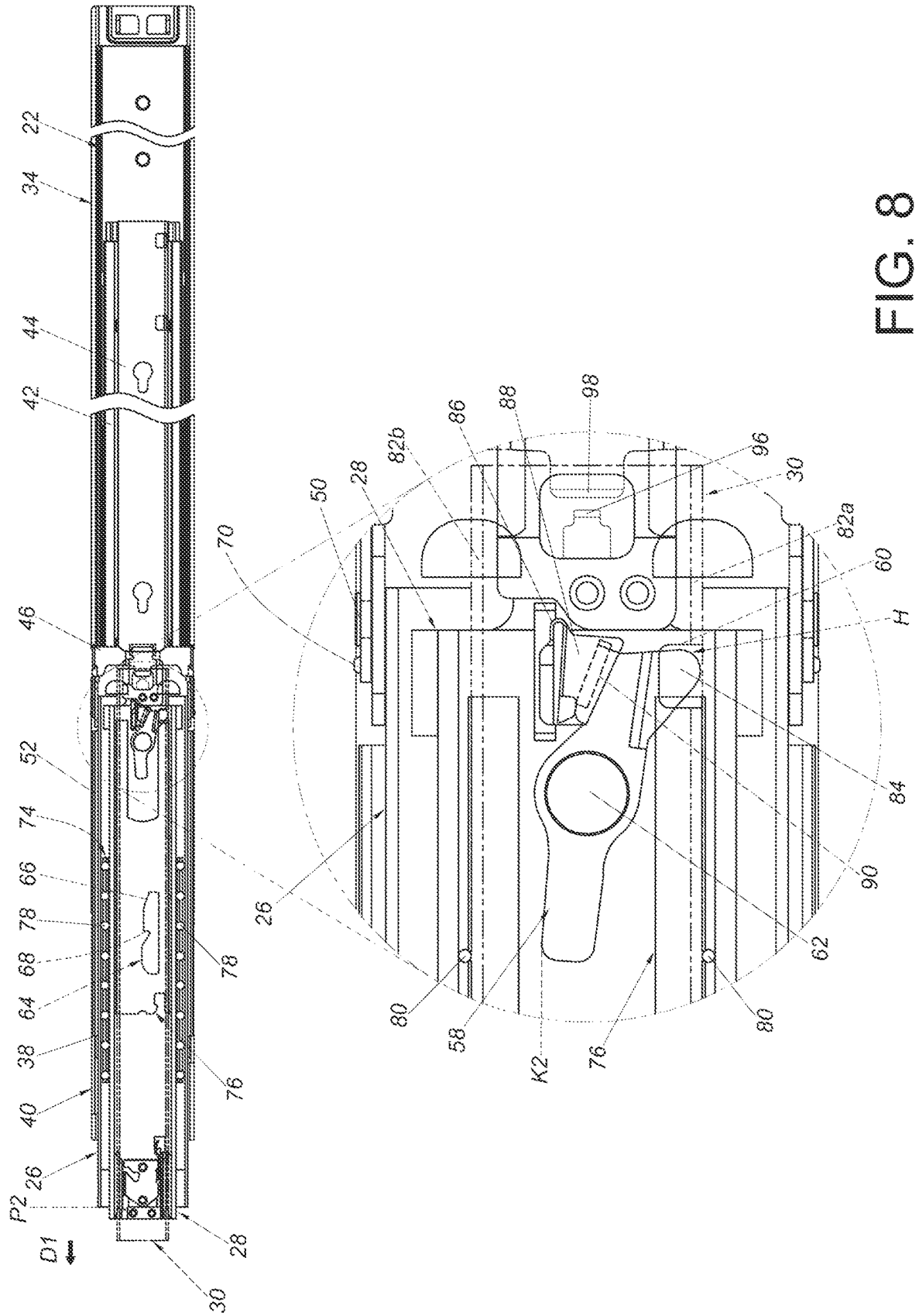
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FIG. 8

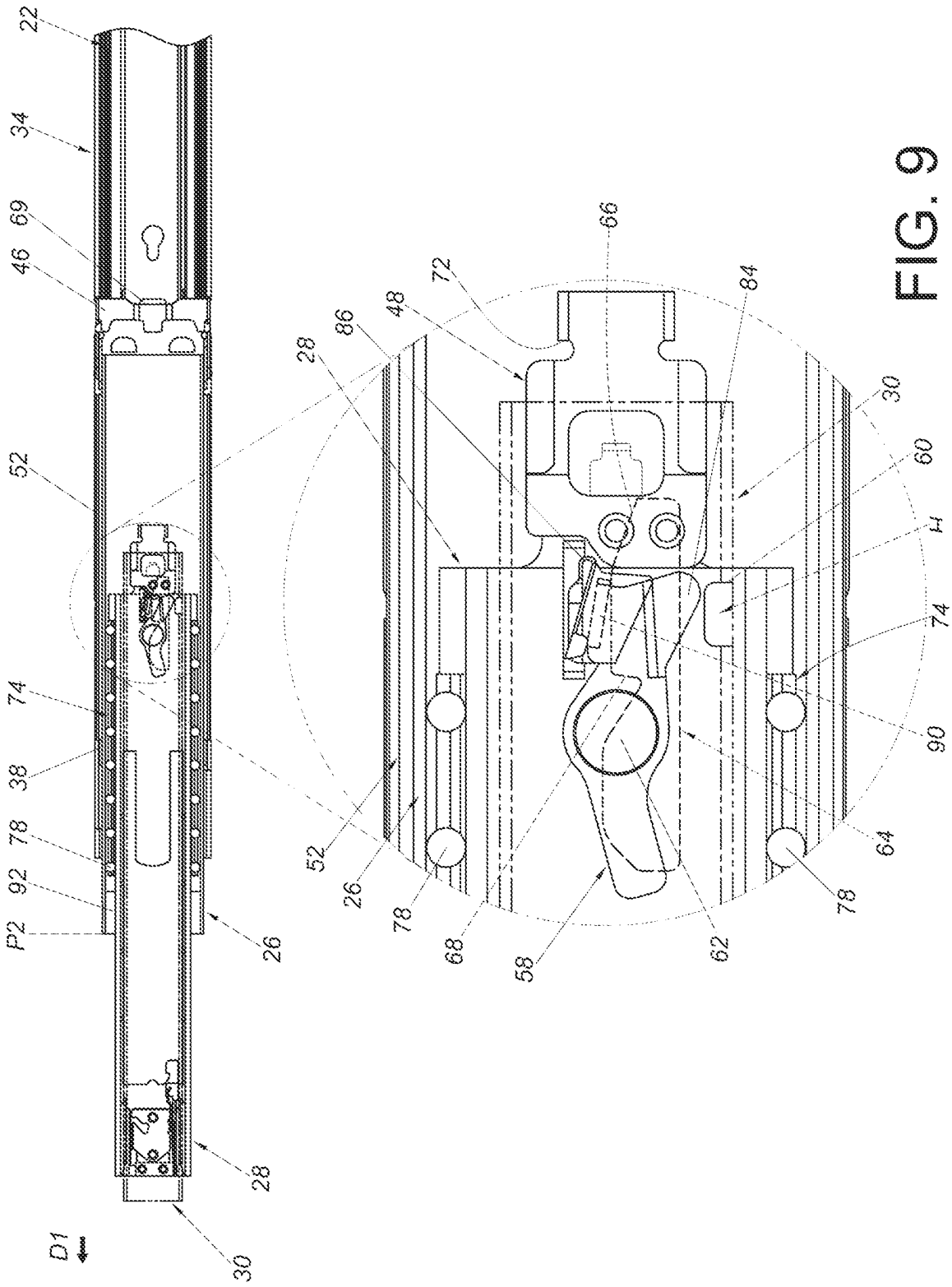
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FIG. 9

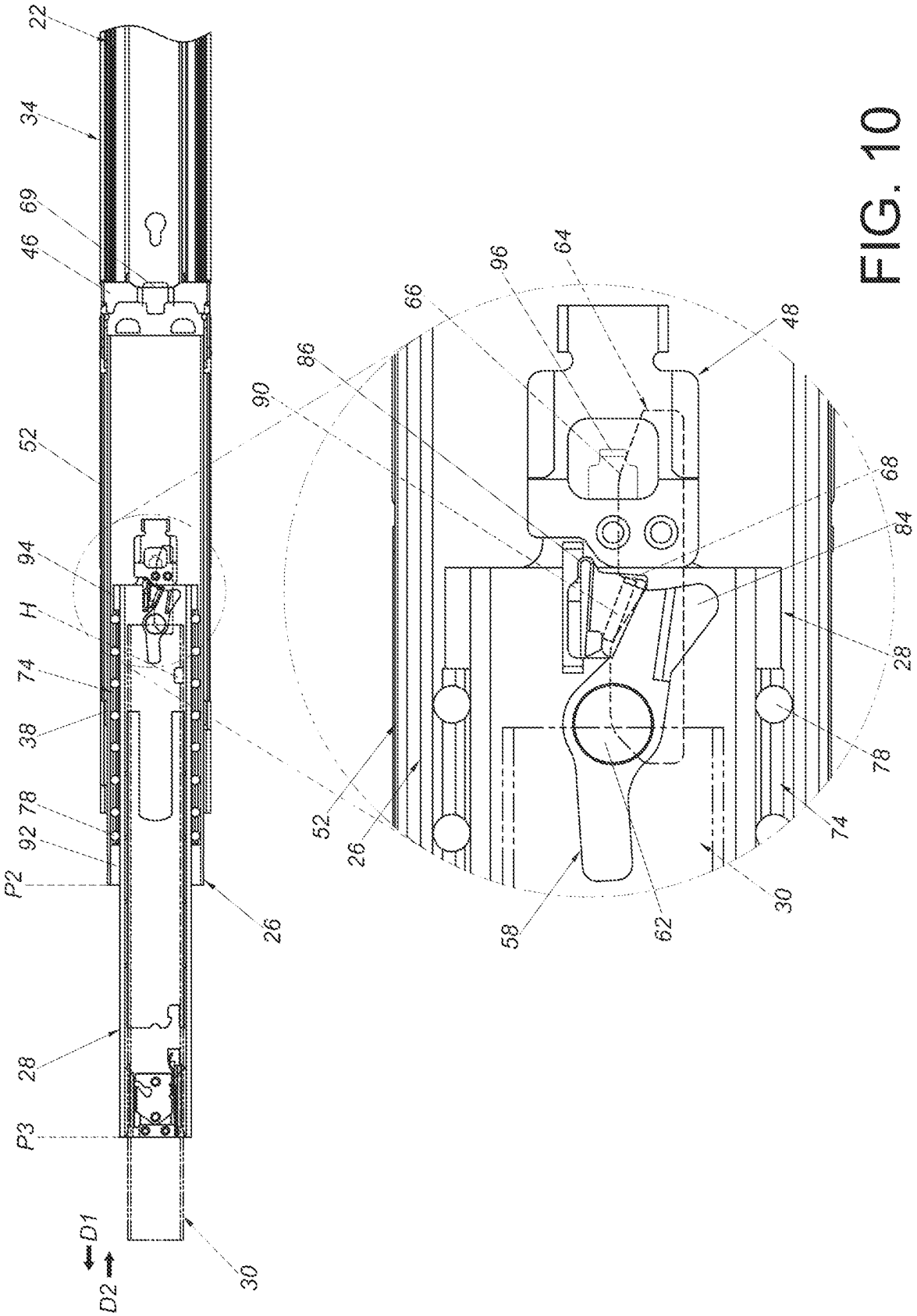
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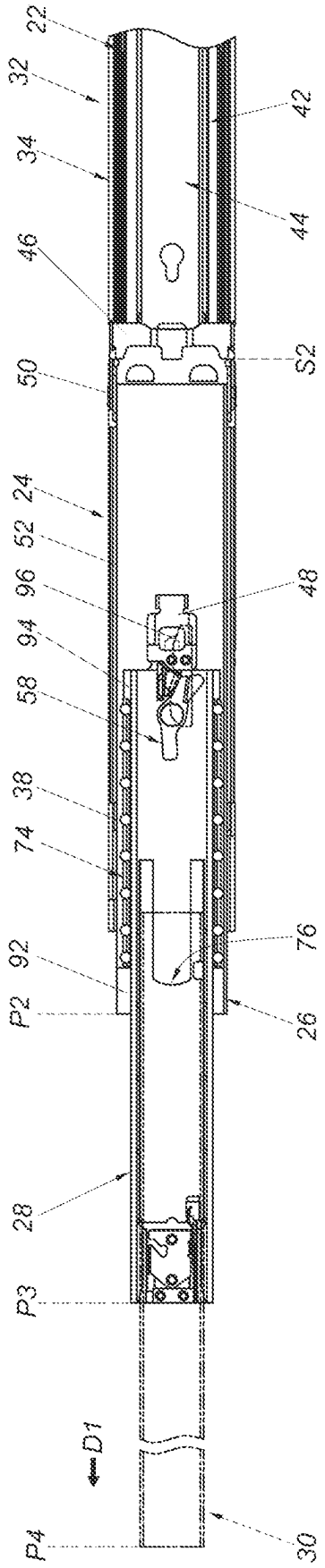
FIG. 10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S2
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76
26
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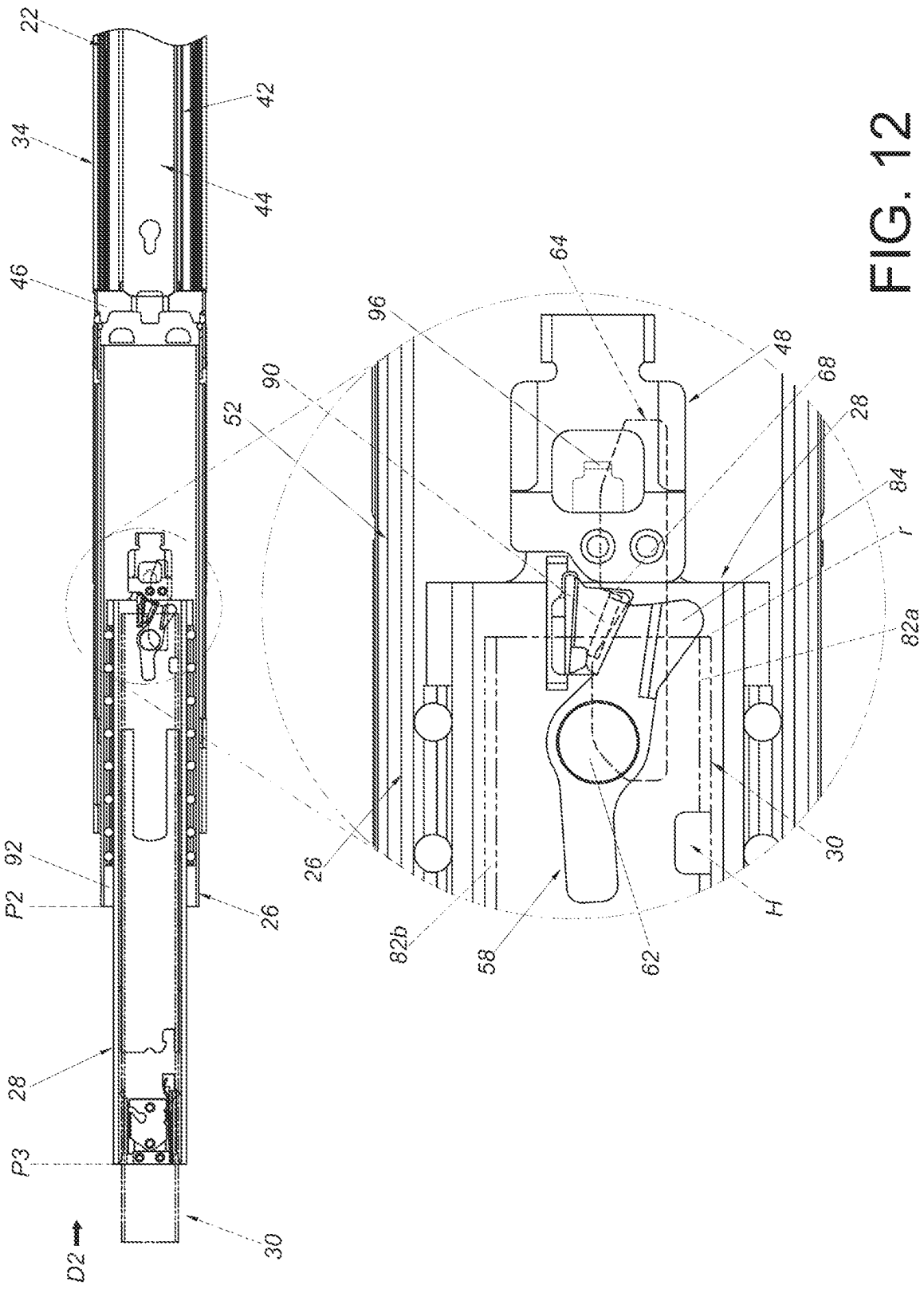
FIG. 11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D2
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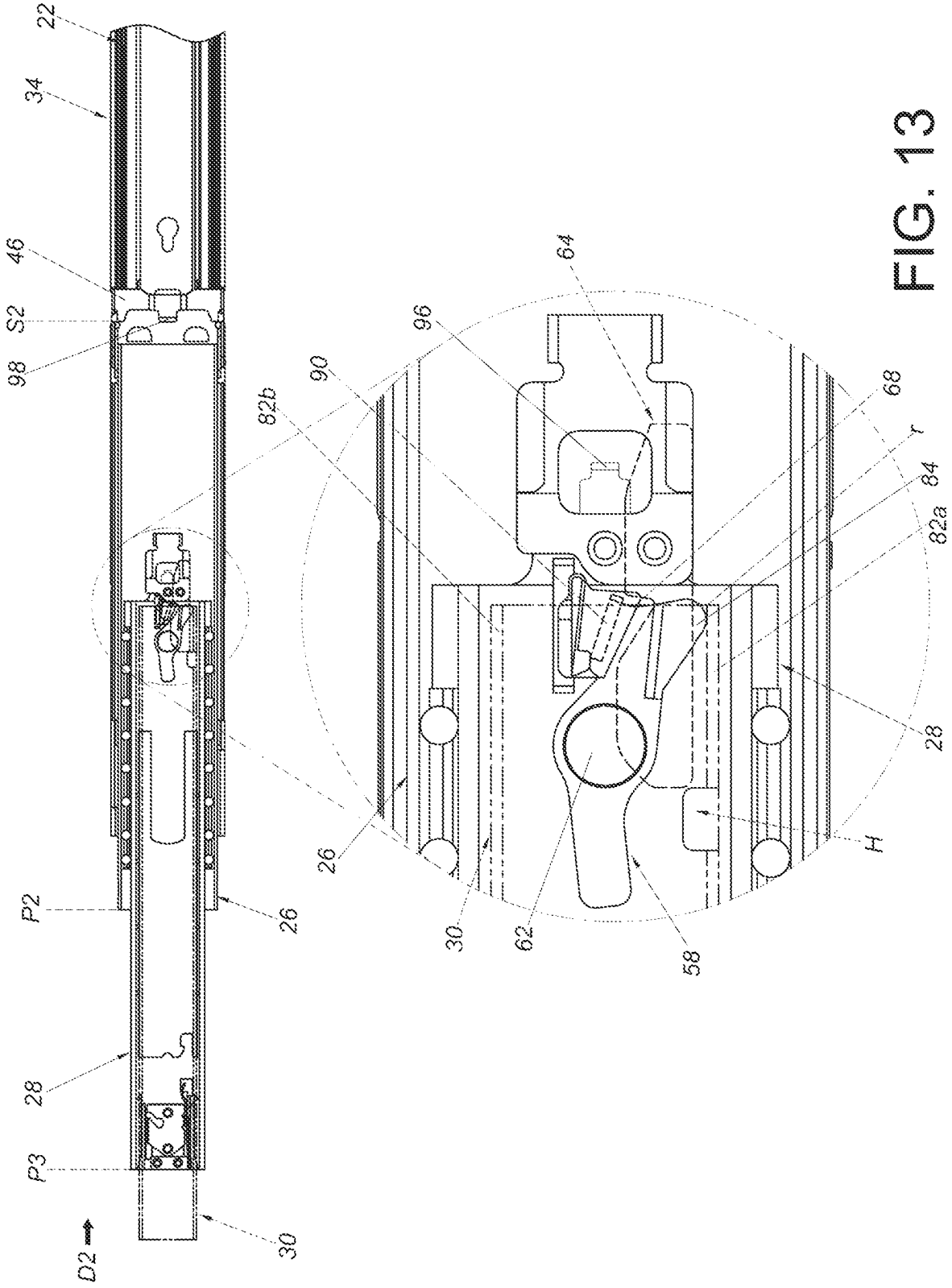
FIG. 12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P3
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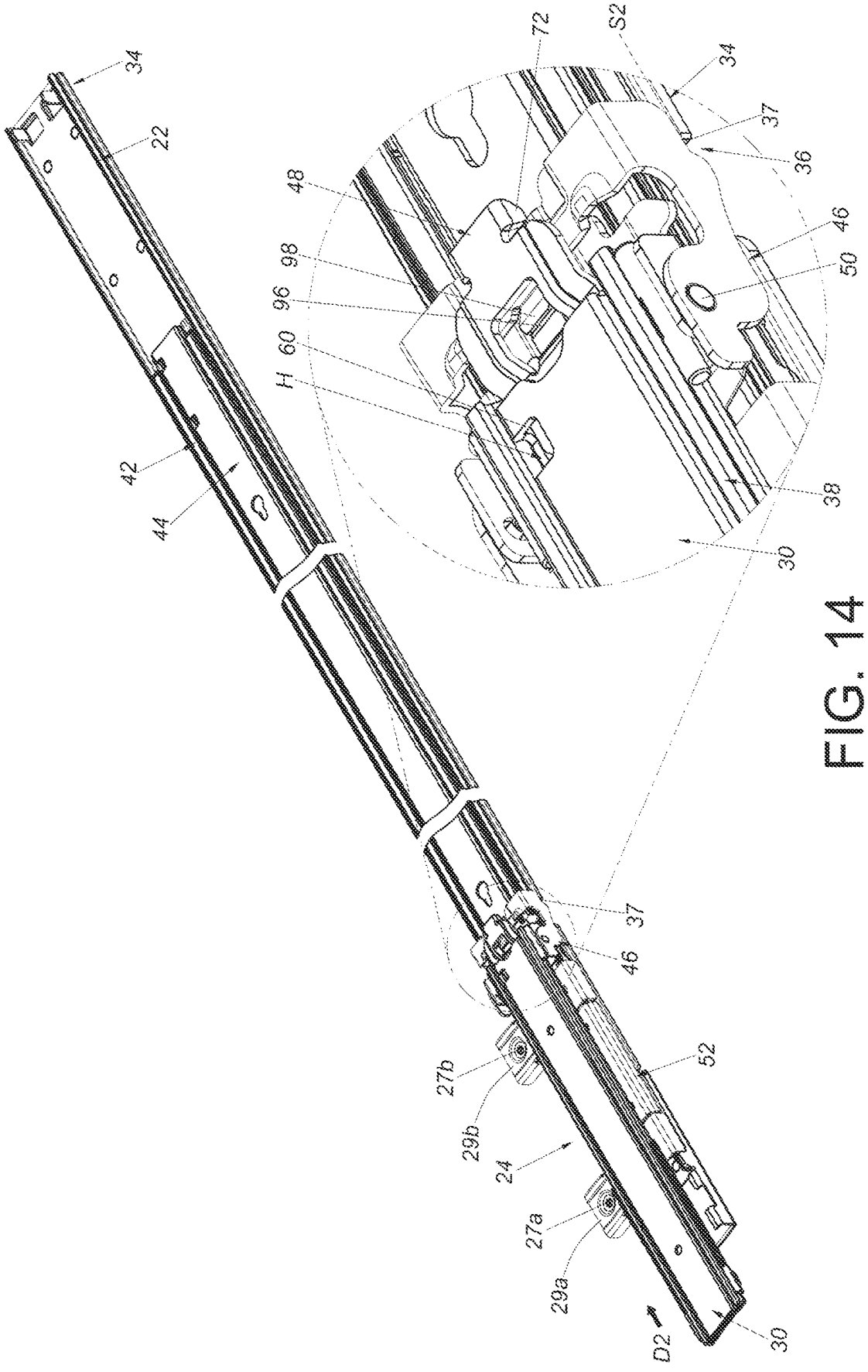
D2

FIG. 13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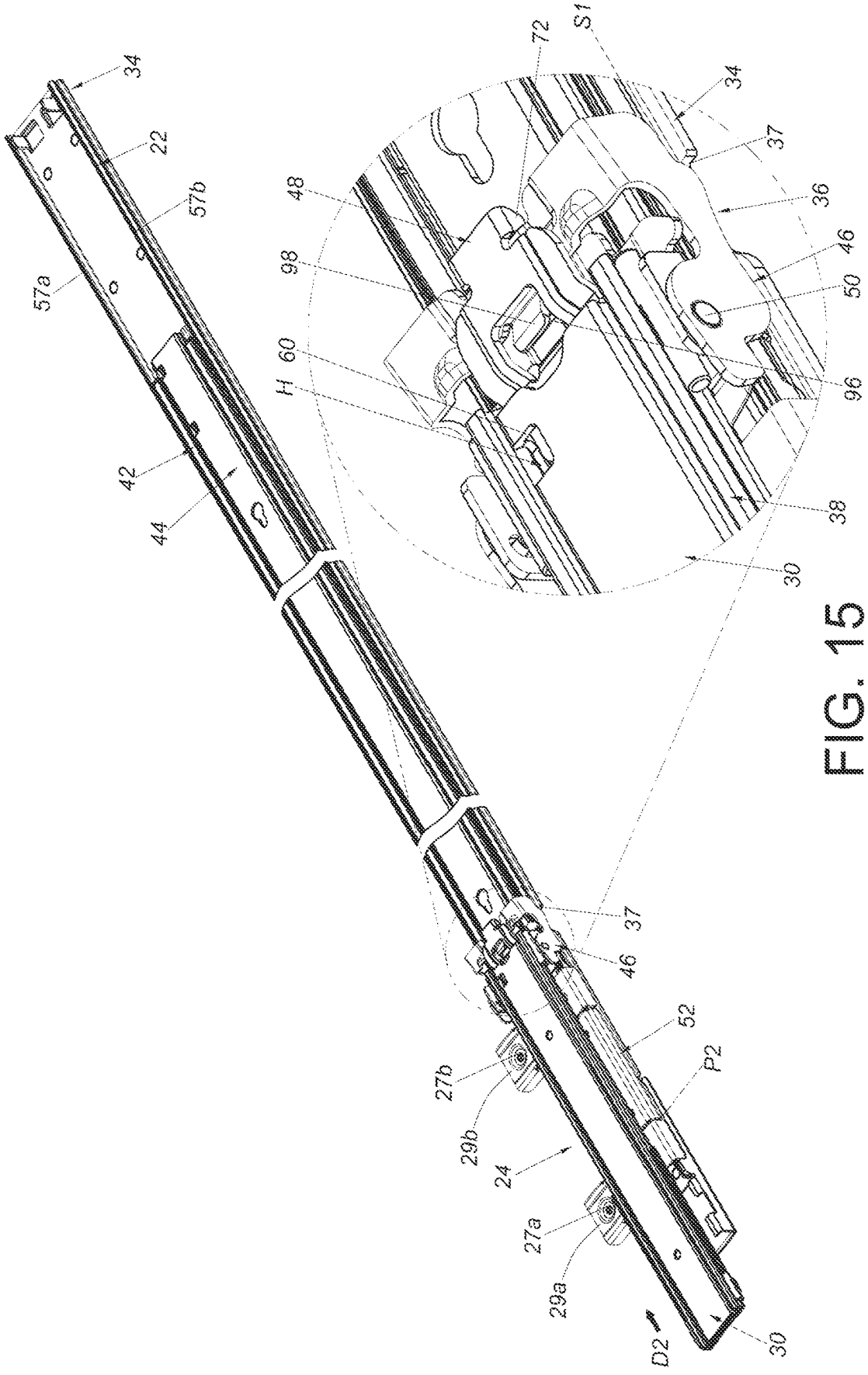
27a
29a
D2
30
22
34

FIG. 14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29a
D2
30

FIG. 15

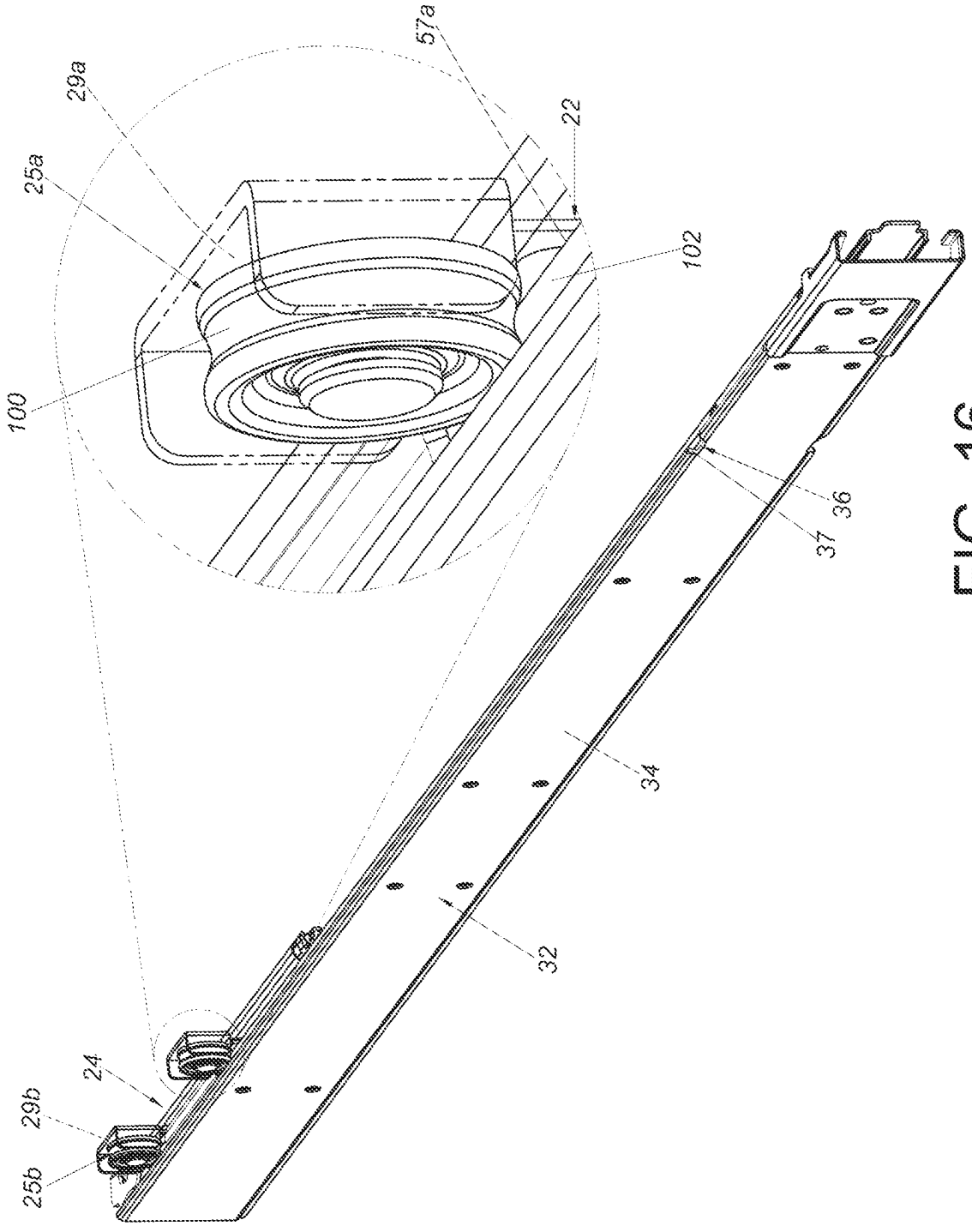

FIG. 16

SLIDE RAIL MECHANISM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a slide rail product, and more specifically, to a slide rail mechanism with a low frictional force.

2. Description of the Prior Art

For example, in U.S. Pat. No. 8,147,011 B2, it discloses a slide rail assembly including a first rail, a second rail and a third rail. The second rail is movably mounted between the first rail and the third rail. The second rail includes a first segment and a second segment. The first segment and the second segment are connected to each other back to back. A plurality of first rollers and a plurality of second rollers are arranged on the second segment. When the third rail is pulled out relative to the second rail, the plurality of first rollers and the plurality of second rollers can support the third rail for facilitating a movement of the third rail. When the third rail is pulled out relative to the second rail at a predetermined distance, a support roller connected to a front support of the first rail also can support the third rail. The support roller is further configured to support the third rail for facilitating an inserting movement of the third rail during reinsertion of the third rail into the second rail after the third rail is completely pulled out of the second rail.

However, in order to meet various requirements, it becomes an important topic to provide an improved slide rail product.

SUMMARY OF THE INVENTION

It is an objective of the present invention to provide a slide rail mechanism with a low frictional force.

According to an aspect of the present invention, a slide rail mechanism includes a first supporting member, a slide rail assembly and at least one rolling member. A length of the slide rail assembly is different from a length of the first supporting member, and the slide rail assembly includes a first rail. The first rail and the first supporting member are displaceable relative to each other by the at least one rolling member.

According to another aspect of the present invention, a slide rail mechanism includes a first supporting member, a slide rail assembly and a rolling member. The first supporting member includes a first wall and a second wall. The slide rail assembly includes a first rail. The first rail and the first supporting member are displaceable relative to each other along a longitudinal direction. The rolling member is arranged on one of the first rail and the first supporting member and rotatably contacting with another one of the first rail and the first supporting member, so as to engage the first rail with the first wall of the first supporting member via the rolling member.

These and other objectives of the present invention will no doubt become obvious to those of ordinary skill in the art after reading the following detailed description of the preferred embodiment that is illustrated in the various figures and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic diagram of a slide rail mechanism according to an embodiment of the present invention.

FIG. **2** is an exploded diagram of the slide rail mechanism according to the embodiment of the present invention.

FIG. **3** is an exploded diagram of a slide rail assembly of the slide rail mechanism according to the embodiment of the present invention.

FIG. **4** is a diagram of the slide rail mechanism as the slide rail assembly is in a retracted state according to the embodiment of the present invention.

FIG. **5** is a diagram of the slide rail mechanism as a second rail and a first rail of the slide rail assembly are synchronously displaceable along a first predetermined direction according to the embodiment of the present invention.

FIG. **6** is a diagram of the slide rail mechanism as displacement synchronization between the second rail and the first rail of the slide rail assembly is terminated according to the embodiment of the present invention.

FIG. **7** is a diagram of the slide rail mechanism as a third rail and the second rail of the slide rail assembly are not synchronously displaceable along the first predetermined direction according to the embodiment of the present invention.

FIG. **8** is a diagram of the slide rail mechanism as the third rail and the second rail of the slide rail assembly are synchronously displaceable along the first predetermined direction according to the embodiment of the present invention

FIG. **9** is a diagram of the slide rail mechanism as displacement synchronization between the third rail and the second rail of the slide rail assembly is terminated according to the embodiment of the present invention.

FIG. **10** is a diagram of the slide rail mechanism as the second rail of the slide rail assembly is located at a third predetermined position according to the embodiment of the present invention.

FIG. **11** is a diagram of the slide rail mechanism as the slide rail assembly is in an extended state according to the embodiment of the present invention.

FIG. **12** is a diagram of the slide rail mechanism as the third rail of the slide rail assembly displaces away from a fourth predetermined position along a second predetermined direction according to the embodiment of the present invention.

FIG. **13** is a diagram of the slide rail mechanism as the second rail of the slide rail assembly is displaceable away from the third predetermined position along the second predetermined direction by the third rail displacing along the second predetermined direction according to the embodiment of the present invention.

FIG. **14** is a diagram of the slide rail mechanism as the second rail of the slide rail assembly displaces away from the third predetermined position as shown in FIG. **13** along the second predetermined direction according to the embodiment of the present invention

FIG. **15** is a diagram of the slide rail mechanism as the first rail of the slide rail assembly is displaceable away from the second predetermined position along the second predetermined direction by the second rail displacing along the second predetermined direction according to the embodiment of the present invention.

FIG. **16** is a diagram illustrating that at least one rolling member and a first supporting member of the slide rail mechanism respectively have cooperating features configured to cooperate with each other according to the embodiment of the present invention.

DETAILED DESCRIPTION

In the following detailed description of the preferred embodiments, reference is made to the accompanying draw-

ings which form a part hereof, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. In this regard, directional terminology, such as "top", "bottom", "left", "right", "front", "back", etc., is used with reference to the orientation of the Figure(s) being described. The members of the present invention can be positioned in a number of different orientations. As such, the directional terminology is used for purposes of illustration and is in no way limiting. Accordingly, the drawings and descriptions will be regarded as illustrative in nature and not as restrictive. Also, if not specified, the term "connect" is intended to mean either an indirect or direct mechanical connection. Thus, if a first device is connected to a second device, that connection may be through a direct mechanical connection, or through an indirect mechanical connection via other devices and connections.

As shown in FIG. **1** to FIG. **3**, a slide rail mechanism includes a first supporting member **22**, a slide rail assembly **24** and at least one rolling member. A length M1 of the slide rail assembly **24** along a longitudinal direction is different from a length M2 of the first supporting member **22** along the longitudinal direction. For example, as shown in FIG. **1**, the length M1 of the slide rail assembly **24** along the longitudinal direction can be less than the length M2 of the first supporting member **22**. Furthermore, the slide rail assembly **24** includes a first rail **26**. A length of the first rail **26** along the longitudinal direction is less than the length M2 of the first supporting member **22** along the longitudinal direction. Besides, the slide rail mechanism further includes a second supporting member **34** connected to the first supporting member **22**, and the length of the first rail **26** along the longitudinal direction is less than a length of the second supporting member **34** along the longitudinal direction. The first rail **26** and the first supporting member **22** are displaceable relative to each other. In this embodiment, by way of example, the longitudinal direction can be defined by a length direction or a displacing direction of a slide rail, e.g., the first rail **26**, and parallel to an X axis. A transverse direction can be defined by a lateral direction or a width direction of the slide rail, e.g., the first rail **26**, and parallel to a Y axis. A vertical direction can be defined by a height direction of the slide rail, e.g., the first rail **26**, and parallel to a Z axis. The second supporting member **34** can be a supporting frame configured to enable the first supporting member **22** and the slide rail assembly **24** to be mounted on a rack.

In this embodiment, by way of example, the at least one rolling member can include a first rolling member **25***a*, e.g., a front rolling member, and a second rolling member **25***b*, e.g., a rear rolling member. The first rolling member **25***a* and the second rolling member **25***b* are configured to facilitate the first rail **26** and the first supporting member **22** to be displaceable relative to each other. However, the present invention is not limited to this embodiment. For example, in another embodiment, the slide rail mechanism can include only one rolling member.

Preferably, the first rolling member **25***a* and the second rolling member **25***b* are arranged on one of the first rail **26** and the first supporting member **22** and rotatably contacting with the other one of the first rail **26** and the first supporting member **22**. In this embodiment, by way of example, the first rolling member **25***a* and the second rolling member **25***b* can be arranged on the first rail **26** and spaced from each other at a distance along the longitudinal direction. Furthermore, the first rolling member **25***a* is pivotally connected to a first mounting member **29***a* by a first shaft **27***a*, and the second rolling member **25***b* is pivotally connected to a second mounting member **29***b* by a second shaft **27***b*. In this embodiment, by way of example, each of the first mounting member **29***a* and the second mounting member **29***b* can be fixedly connected to the first rail **26** and therefore regarded as a part of the first rail **26**. Understandably, in another embodiment, the first mounting member and the second mounting member can be detachably connected to the first rail.

Preferably, the slide rail mechanism further includes a slide rail device **32**. The slide rail device **32** includes the first supporting member **22** and the second supporting member **34**. In this embodiment, by way of example, the first supporting member **22** and the second supporting member **34** can be fixedly connected to each other and therefore regarded as an integral structure. However, the present invention is not limited to this embodiment. The first rolling member **25***a* and the second rolling member **25***b* are displaceable together with the first rail **26**. Furthermore, the first rail **26** is displaceable relative to the first supporting member **22** along the longitudinal direction by the first rolling member **25***a* and the second rolling member **25***b*. The configuration of the first rolling member **25***a* and the second rolling member **25***b* can reduce a friction force resisting a displacement of the first rail **26** relative to the first supporting member **22** for ensuring the first rail **26** to displace relative to the first supporting member **22** smoothly.

Preferably, the first rolling member **25***a* and the second rolling member **25***b* can be members with arc-shaped contours, e.g., rollers or balls. However, the present invention is not limited thereto.

The slide rail assembly **24** further includes a second rail **28** and a third rail **30**. In this embodiment, by way of example, the first rail **26**, the second rail **28** and the third rail **30** can be an outer rail, a middle rail and an inner rail, and the second rail **28** can be movably mounted between the first rail **26** and the third rail **30**.

Preferably, the second supporting member **34** includes a disengaging feature **36** and a blocking feature **37** located adjacent to the disengaging feature **36**. In this embodiment, by way of example, the disengaging feature **36** can be formed by excavating, and the blocking feature **37** can be a wall. However, the present invention is not limited to this embodiment.

Preferably, a blocking portion **38** is arranged on the first supporting member **22**. In this embodiment, by way of example, the first supporting member **22** can include a bracket **40** located adjacent to an end portion, e.g., a front end portion, of the first supporting member **22**, and the blocking portion **38** can be arranged on the bracket **40**.

Preferably, the first supporting member **22** further includes a supporting channel configured to at least partially receive a plurality of movable rails, e.g., a first movable rail **42** and a second movable rail **44**. The first movable rail **42** is located between the first supporting member **22** and the second movable rail **44**. A length of the third rail **30** of the slide rail assembly **24** along the longitudinal direction is less than a length of the second movable rail **44** of the slide rail device **32** along the longitudinal direction. It should be noticed that the third rail **30** of the slide rail assembly **24** is configured to support a first object, which is not shown in the figures, and the second movable rail **44** of the slide rail device **32** is configured to support a second object, which is not shown in the figures. After the second object is detached from the second movable rail **44**, or after the second movable rail **44** and the second object are together detached from the first movable rail **42**, the first rail **26** of the slide rail assembly **24** can displace relative to the first supporting

member **22** and/or the second supporting member **34** of the slide rail device **32** along the longitudinal direction by the first rolling member **25***a* and the second rolling member **25***b*. During a displacement of the first rail **26** or the slide rail assembly **24** relative to the first supporting member **22** or the slide rail device **32** along the longitudinal direction, the configuration of the first rolling member **25***a* and the second rolling member **25***b* can reduce a friction force resisting the displacement of the first rail **26** or the slide rail assembly **24** relative to the first supporting member **22** or the slide rail device **32** along the longitudinal direction. Therefore, the present invention can achieve an effect of saving effort.

Preferably, the slide rail assembly **24** further includes a first auxiliary member **46** and a second auxiliary member **48**. The first auxiliary member **46** is arranged on the first rail **26**. The second auxiliary member **48** is arranged on the second rail **28**.

Preferably, one of the first auxiliary member **46** and the second auxiliary member **48** is movable. The other one of the first auxiliary member **46** and the second auxiliary member **48** is immovable. In this embodiment, by way of example, the first auxiliary member **46** can be pivotally connected to the first rail **26** by a shaft **50**, so as to be pivotable relative to the first rail **26**. The second auxiliary member **48** can be fixedly connected to the second rail **28**.

Preferably, the slide rail assembly **24** further includes an auxiliary rail **52** arranged on the first rail **26**. The first rail **26** is movably mounted on one of the first supporting member **22** and the second supporting member **34** by the auxiliary rail **52**. Furthermore, the auxiliary rail **52** includes a first auxiliary wall **54***a*, a second auxiliary wall **54***b* and a middle wall **56** connected between the first auxiliary wall **54***a* and the second auxiliary wall **54***b*. The middle wall **56** is connected to a first side L**1** of the first rail **26**. As shown in FIG. **3**, in this embodiment, by way of example, the middle wall **56** can be fixedly connected to the first side L**1** of the first rail **26**, and the first side L**1** of the first rail **26** can be a back side of the first rail **26** located adjacent to the first supporting member **22** or the second supporting member **34**. The first auxiliary wall **54***a* and the second auxiliary wall **54***b* are configured to hold the first supporting member **22** or the second supporting member **34**. In this embodiment, by way of example, the first auxiliary wall **54***a* and the second auxiliary wall **54***b* can hold a first wall **57***a* and a second wall **57***b* of the first supporting member **22** respectively, and the first wall **57***a* and the second wall **57***b* of the first supporting member **22** can be an upper wall and a lower wall of the first supporting member **22** respectively. However, the present invention is not limited to this embodiment. In addition, as shown in FIG. **3**, the second rail **28** is at least partially movably mounted inside a first channel of the first rail **26** formed on a second side L**2** of the first rail **26** opposite to the first side L**1** of the first rail **26**. Besides, the third rail **30** is at least partially movably mounted inside a second channel of the second rail **28**.

Preferably, as shown in FIG. **3**, the slide rail assembly **24** further includes a working member **58** movably mounted on the second rail **28**. A corresponding feature **60** is arranged on the third rail **30** and configured to cooperate with the working member **58**. The third rail **30** can drive the second rail **28** to synchronously displace together with the third rail **30** by an abutment of the corresponding feature **60** and the working member **58**.

Preferably, the working member **58** is pivotally connected to the second rail **28** by a connecting member **62**.

Preferably, a retaining member **64** is arranged on the first rail **26**. In this embodiment, by way of example, the retaining member **64** can be a resilient element, such as a resilient plate. However, the present invention is not limited to this embodiment. The retaining member **64** includes a disengaging structure **66** and a blocking structure **68** located adjacent to the disengaging structure **66**. In this embodiment, by way of example, the disengaging structure **66** can be an inclined surface or an arc surface, and the blocking structure **68** can be a wall, such as a vertical wall. However, the present invention is not limited to this embodiment. Understandably, in another embodiment, the disengaging structure and/or the blocking structure can be integrally connected to the first rail.

As shown in FIG. **4** and FIG. **5**, the slide rail assembly **24** is in a retracted state relative to the first supporting member **22** or the slide rail device **32**. As shown in FIG. **5**, the second auxiliary member **48** can abut against the first auxiliary member **46** for driving the first rail **26** to displace together with the second rail **28** during a displacement of the second rail **28** away from a first predetermined position P**1** along a first predetermined direction D**1**. Besides, the second rail **28** can be driven by the third rail **30** to synchronously displace together with the third rail **30** by an abutment of the corresponding feature **60** and the working member **58** during a displacement of the third rail **30** along the first predetermined direction D**1**. Therefore, when the third rail **30** is operated to displace along the first predetermined direction D**1**, the second rail **28** can synchronously displace together with the third rail **30** and the first rail **26** can synchronously displace together with the second rail **28**, i.e., the third rail **30**, the second rail **28** and the first rail **26** can synchronously displace together along the first predetermined direction D**1**. During a displacement of the first rail **26** along the first predetermined direction D**1**, the first rail **26** engages with the first wall **57***a* of the first supporting member **22** via the first rolling member **25***a* and the second rolling member **25***b*, and the configuration of the first rolling member **25***a* and the second rolling member **25***b* can reduce the friction force resisting the displacement of the first rail **26** relative to the first supporting member **22** along the first predetermined direction D**1** by rotating movements of the first rolling member **25***a* and the second rolling member **25***b* relative to the first wall **57***a*, e.g., the upper wall, of the first supporting member **22**. Besides, the first wall **57***a*, e.g., the upper wall, of the first supporting member **22** can support the first rolling member **25***a* and the second rolling member **25***b* for enhancing a supporting strength of the first rail **26** or the slide rail assembly **24**. Preferably, since the first auxiliary wall **54***a* and the second auxiliary wall **54***b* of the auxiliary rail **52** hold the first wall **57***a* and the second wall **57***b* respectively, it facilitates stability and reliability of the displacement of the first rail **26** relative to the first t supporting member **22** along the first predetermined direction D**1**.

Preferably, as shown in FIG. **5**, the slide rail assembly **24** further includes a resilient member **70**. The first auxiliary member **46** is retained in a first state S**1** for abutting against the second auxiliary member **48** in response to a resilient force provided by the resilient member **70** and/or a support of the second supporting member **34**. As shown in FIG. **4** and FIG. **5**, in this embodiment, by way of example, the second auxiliary member **48** can include at least one abutting portion **72**, such as a hook portion or a hook-shaped structure, configured to abut against a corresponding portion **69** of the first auxiliary member **46** for driving the first rail **26** to synchronously displace together with the second rail **28** during the displacement of the second rail **28** away from the first predetermined position P**1** along the first predetermined direction D**1**.

Preferably, the resilient member **70** is arranged on the first side L**1** of the first rail **26** and hidden between the first rail **26** and the first supporting member **22** or between the first rail **26** and the slide rail device **32**. In this embodiment, by way of example, the resilient member **70** can be a resilient plate. However, the present invention is not limited to this embodiment. As shown in FIG. **5**, the resilient member **70** includes at least one resilient portion **71** for providing the resilient force to at least one extending portion **73** of the first auxiliary member **46**, and the second supporting member **34** supports the first auxiliary member **46**, such that the first auxiliary member **46** is retained in the first state S**1**.

As shown in FIG. **6**, the disengaging feature **36** of the second supporting member **34** is configured to terminate displacement synchronization between the second rail **28** and the first rail **26** when the second rail **28** and the first rail **26** are synchronously displaced to a second predetermined position P**2** along the first predetermined direction D**1**.

Preferably, when the first rail **26** is located at the second predetermined position P**2**, the disengaging feature **36** of the second supporting member **34** is configured to provide a moving space for the first auxiliary member **46**, so as to release the resilient member **70** to drive the first auxiliary member **46** to move, e.g., pivot along a predetermined pivoting direction R, from the first state S**1** to a second state S**2** for disengaging the first auxiliary member **46** from the second auxiliary member **48**, such that the corresponding portion **69** of the first auxiliary member **46** can be moved to be misaligned with the at least one abutting portion **72** of the second auxiliary member **48** along the longitudinal direction, e.g., the X axis, so as to terminate the displacement synchronization between the second rail **28** and the first rail **26**.

Preferably, when the first auxiliary member **46** is in the second state S**2**, the blocking feature **37** of the second supporting member **34** can block the first auxiliary member **46** for preventing the first rail **26** from displacing away from the second predetermined position P**2** along a second predetermined direction D**2**, e.g., a retracting direction, opposite to the first predetermined direction D**1**. Moreover, the blocking portion **38** on the first supporting member **22** can block one of the first rail **26** and the auxiliary rail **52** for preventing the first rail **26** from displacing away from the second predetermined position P**2** along the first predetermined direction D**1**. In this embodiment, by way of example, the blocking portion **38** arranged on the bracket **40** of the first supporting member **22** can block the first mounting member **29***a* of the first rail **26**. However, the present invention is not limited to this embodiment.

FIG. **7** to FIG. **13** does not illustrate the first rolling member **25***a*, the second rolling member **25***b*, the first mounting member **29***a* and the second mounting member **29***b* for simplicity. As shown in FIG. **7** and FIG. **8**, the slide rail assembly **24** further includes at least one first slide-aiding device **74** and a second slide-aiding device **76**. The at least one first slide-aiding device **74** is movably mounted between the second rail **28** and the first rail **26** for facilitating a smooth displacement of the second rail **28** relative to the first rail **26**. The second slide-aiding device **76** is movably mounted between the second rail **28** and the third rail **30** for facilitating a smooth displacement of the third rail **30** relative to the second rail **28**. In this embodiment, by way of example, the first slide-aiding device **74** can include a plurality of first slide-aiding members **78**, and the second slide-aiding device **76** can include a plurality of second slide-aiding members **80**, wherein the first slide-aiding member **78** or the second slide-aiding member **80** can be a ball, a roller, or the like.

In detail, during a displacement of the second rail **28** from the first predetermined position P**1** to the second predetermined position P**2**, if the third rail **30** does not displace relative to the second rail **28** along the first predetermined direction D**1**, the corresponding feature **60** on the third rail and the working member **58** on the second rail **28** are spaced from each other at a predetermined distance along the longitudinal direction. Preferably, during the displacement of the third rail **30** along the first predetermined direction D**1**, the third rail **30** drives the second rail **28** to displace along the first predetermined direction D**1** by a frictional force therebetween as shown in FIG. **7** before the abutment of the corresponding feature **60** and the working member **58**, and then the third rail **30** drives the second rail **28** to synchronously displace together with the third rail **30** by the abutment of the corresponding feature **60** and the working member **58** as shown in FIG. **8** after the abutment of the corresponding feature **60** and the working member **58**.

Preferably, the third rail **30** includes a first wall **82***a* and a second wall **82***b*, and the corresponding feature **60** is arranged on the first wall **82***a* of the third rail **30**. For example, the corresponding feature **60** can be a hole wall of a hole H. The first wall **82***a* of the third rail **30** can support the working member **58** for retaining the working member **58** in an initial state K**1** as shown in FIG. **7**. During the displacement of the third rail **30** along the first predetermined direction D**1**, the hole H formed on the third rail **30** moves to a position corresponding to a synchronization feature **84** of the working member **58** for allowing the working member **58** to move, e.g., pivot, from the initial state K**1** to a predetermined position K**2** as shown in FIG. **8** in response to a resilient force provided by a resilient object **86**, such that the corresponding feature **60** on the third rail **30** abuts against the synchronization feature **84** of the working member **58** to enable the third rail **30** to drive the second rail **28** to synchronously displace together with the third rail **30** as shown in FIG. **8**.

Preferably, as shown in FIG. **8**, the second rail **28** includes a through hole **88**, and a working portion **90** of the working member **58** extends toward the first rail **26** through the through hole **88**. The working portion **90** of the working member **58** can cooperate with the retaining member **64**, e.g., the disengaging structure **66** and the blocking structure **68** of the retaining member **64**, on the first rail **26**.

When the third rail **30** drives the second rail **28** to synchronously displace together with the third rail **30** from a position as shown in FIG. **8** to a disengaging position as shown in FIG. **9**, the disengaging structure **66** on the first rail **26** is configured to terminate displacement synchronization between the third rail **30** and the second rail **28**. In this embodiment, by way of example, the working portion **90** of the working member **58** on the second rail **28** can be guided by the disengaging structure **66** on the first rail **26** to drive the working member **58** to move away from the predetermined state K**2**, e.g., by pivoting at a predetermined angle, such that the corresponding feature **60** on the third rail **30** does not abut against the synchronization feature **84** of the working member **58** for terminating the synchronization displacement between the third rail **30** and the second rail **28**. After the synchronization displacement between the third rail **30** and the second rail **28** is terminated, the third rail **30** and the second rail **28** can be individually displaced relative to the first rail **26** along the first predetermined

direction D1. Besides, when the working member **58** is in a state as shown in FIG. **9**, the resilient object **86** is resiliently deformed.

As shown in FIG. **10**, when the second rail **28** is further displaced to a third predetermined position P3 along the first predetermined direction D1, the blocking structure **68** on the first rail **26** is configured to block the second rail **28** for preventing the second rail **28** from displacing away from the third predetermined position P3 along the second predetermined direction D2. In this embodiment, by way of example, when the second rail **28** is located at the third predetermined position P3, the resilient object **86** can be released to drive the working member **58** to move to a position as shown in FIG. **10**, such that the working portion **90** of the working member **58** can be blocked by the blocking structure **68** on the first rail **26** for preventing the second rail **28** from displacing away from the third predetermined position P3 along the second predetermined direction D2.

Preferably, a first restraining feature **92** is further arranged on the first rail **26**, and a second restraining feature **94** is further arranged on the second rail **28**. When the second rail **28** is located at the third predetermined position P3, a front end and a rear end of the first slide-aiding device **74** abut against the first restraining feature **92** and the second restraining feature **94** respectively for preventing the second rail **28** from displacing away from the third predetermined position P3 along the first predetermined direction D1.

As shown in FIG. **11**, when the second rail **28** is located at the third predetermined position P3, the third rail **30** can be further displaced to a fourth predetermined position P4 along the first predetermined direction D1, so as to locate the slide rail assembly **24** in an extended state, e.g., a fully extended state, relative to the first supporting member **22** or the slide rail device **32**. Preferably, when the third rail **30** is located at the fourth predetermined position P4, the second slide-aiding device **76** is located adjacent to an end portion, e.g., a front end portion, of the second rail **28**.

As shown in FIG. **12** and FIG. **13**, during a displacement of the third rail **30** away from the fourth predetermined position P4 along the second predetermined direction D2, the third rail **30** is configured to terminate a blocking relation between the blocking structure **68** and the second rail **28**. Furthermore, as shown in FIG. **12** and FIG. **13**, a portion, e.g., a rear end portion r, of the third rail **30**, is configured to abut against the synchronization feature **84** of the working member **58** for driving the working member **58** to prevent the working portion **90** of the working member **58** from being blocked by the blocking structure **68** on the first rail **26**. When the working portion **90** of the working member **58** is not blocked by the blocking structure **68** on the first rail **26**, the second rail **28** is allowed to displace away from the third predetermined position P3 along the second predetermined direction D2.

As shown in FIG. **14** and FIG. **15**, one of the second rail **28** and the first auxiliary member **46** includes a first guiding feature **96**. Preferably, the other one of the second rail **28** and the first auxiliary member **46** includes a second guiding feature **98** for cooperating with the first guiding feature **96**. As shown in FIG. **3**, in this embodiment, by way of example, the second rail **28** can include the first guiding feature **96** arranged on the second auxiliary member **48**, and the first auxiliary member **46** can include the second guiding feature **98**, wherein the first guiding feature **96** and the second guiding feature **98** can be inclined surfaces or arc surfaces. However, the present invention is not limited to this embodiment.

During a displacement of the second rail **28** away from the third predetermined position P3 along the second predetermined direction D2, the second rail **28** is configured to terminate a blocking relation between the blocking feature **37** and the first rail **26**. In this embodiment, by way of example, the first guiding structure **96** of the second rail **28** can abut against the second guiding structure **98** of the first auxiliary member **46** for driving the first auxiliary member **46** from the second state S2 as shown in FIG. **14** to the first state S1 as shown in FIG. **15**, such that the blocking feature **37** of the second supporting member **34** does not block the first auxiliary member **46** on the first rail **26** for allowing the first rail **26** and the auxiliary rail **52** to displace away from the second predetermined position P2 along the second predetermined direction D2. Accordingly, the third rail **30**, the second rail **28** and the first rail **26** can be displaced along the second predetermined direction D2 until the slide rail assembly **24** is moved back to the retracted state as shown in FIG. **4**. During a displacement of the first rail **26** or the slide rail assembly **24** relative to the first supporting member **22** or the slide rail device **32** along the second predetermined direction D2, the configuration of the first rolling member **25***a* and the second rolling member **25***b* can reduce a friction force resisting the displacement of the first rail **26** or the slide rail assembly **24** relative to the first supporting member **22** or the slide rail device **32** along the second predetermined direction D2 by the rotating movements of the first rolling member **25***a* and the second rolling member **25***b* relative to the first wall **57***a*, e.g., the upper wall, of the first supporting member **22**. Besides, the first wall **57***a*, e.g., the upper wall, of the first supporting member **22** can support the first rolling member **25***a* and the second rolling member **25***b* for enhancing the supporting strength of the first rail **26** or the slide rail assembly **24**.

It should be noticed that the slide rail assembly **24** can be adapted for the rack, and the third rail **30** can be configured to support the first object, such as an electronic apparatus or a drawer. The slide rail assembly **24** can ensure the second rail **28** and the first rail **26** to displace synchronously and prevent the third rail **30** and the second rail **28** from being pulled out along the first predetermined direction D1 without any displacement of the first rail **26**. Therefore, the slide rail assembly **24** can solve a technical problem that it takes a lot of effort to overcome an excessive friction between a first rail and a supporting frame and/or between the first rail and a supporting rail caused by, e.g., a weight of a carried object, to pull out the first rail if a third rail and a second rail have been pulled out without any displacement of the first rail. Besides, the configuration of the first rolling member **25***a* and the second rolling member **25***b* can reduce the friction forces resisting the displacements of the first rail **26** or the slide rail assembly **24** relative to the first supporting member **22** or the slide rail device **32** along the first predetermined direction D1 and the second predetermined direction D2 by the rotating movements of the first rolling member **25***a* and the second rolling member **25***b* relative to the first wall **57***a*, e.g., the upper wall, of the first supporting member **22**.

As shown in FIG. **16**, the first supporting member **22** and each of the first rolling member **25***a* and the second rolling member **25***b* have two cooperating features configured to cooperate with each other. Furthermore, one of the first supporting member **22** and each of the first rolling member **25***a* and the second rolling member **25***b* includes a first cooperating feature **100**, and the other one of the first supporting member **22** and each of the first rolling member **25***a* and the second rolling member **25***b* includes a second cooperating feature **102** configured to cooperate with the

first cooperating feature **100**. In this embodiment, by way of example, each of the first rolling member **25***a* and the second rolling member **25***b* can include the first cooperating feature **100**, and the first supporting member **22** can include the second cooperating feature **102**.

Specifically, the first cooperating feature **100** can be a groove structure, and the second cooperating feature **102** can be a protruding edge extending along g the longitudinal direction configured to abut against the groove structure for enhancing stability and reliability of the rotating movements of the first rolling member **25***a* and the second rolling member **25***b* relative to the first wall **57***a* of the first supporting member along the longitudinal direction.

From the above, the slide rail assembly **24** includes the following characteristics.

1. The configuration of at least one rolling member, e.g., the first rolling member **25***a* and/or the second rolling member **25***b*, arranged on the first rail **26** of the slide rail assembly **24** can reduce the friction forces resisting the displacements of the first rail **26** or the slide rail assembly **24** relative to the first supporting member **22** along the first predetermined direction D**1** and the second predetermined direction D**2**.

2. The second rail **28** can synchronously displace together with the first rail **26** along the first predetermined direction D**1**, and/or the third rail **30** can synchronously displace together with the second rail **28** along the first predetermined direction D**1**.

3. The at least one rolling member, e.g., the first rolling member **25***a* and/or the second rolling member **25***b*, and the first supporting member **22** respectively include the first cooperating feature **100** and the second cooperating feature **102** configured to cooperate with the first cooperating feature **100** for enhancing stability and reliability of the rotating movements of the first rolling member **25***a* and the second rolling member **25***b* relative to the first supporting member **22** along the longitudinal direction.

Those skilled in the art will readily observe that numerous modifications and alterations of the device and method may be made while retaining the teachings of the invention. Accordingly, the above disclosure should be construed as limited only by the metes and bounds of the appended claims.

What is claimed is:

1. A slide rail mechanism comprising:

a first supporting member;

a slide rail assembly, a length of the slide rail assembly being different from a length of the first supporting member, the slide rail assembly comprising a first rail, a second rail and a third rail, the first rail being an outer rail, the second rail being a middle rail, and the third rail being an inner rail;

at least one rolling member, the first rail and the first supporting member being displaceable relative to each other by the at least one rolling member; and

a second supporting member connected to the first supporting member, and the second supporting member comprising a disengaging feature.

2. The slide rail mechanism of claim **1**, wherein the at least one rolling member is arranged on one of the first rail and the first supporting member.

3. The slide rail mechanism of claim **1**, wherein the length of the slide rail assembly is less than the length of the first supporting member.

4. The slide rail mechanism of claim **1**, wherein the second rail and the first rail displace synchronously during a displacement of the second rail away from a first predetermined position along a first predetermined direction, and the disengaging feature of the second supporting member is configured to terminate a displacement synchronization between the second rail and the first rail when the second rail and the first rail are synchronously displaced to a second predetermined position along the first predetermined direction.

5. The slide rail mechanism of claim **4**, wherein the slide rail assembly further comprises a first auxiliary member and a second auxiliary member, the first auxiliary member is arranged on the first rail, the second auxiliary member is arranged on the second rail, and the second rail and the first rail displace synchronously by an abutment of the first auxiliary member and the second auxiliary member during the displacement of the second rail away from the first predetermined position along the first predetermined direction.

6. The slide rail mechanism of claim **5**, wherein the first rail comprises a first side and a second side opposite to the first side, the slide rail assembly further comprises a resilient member arranged on the first side of the first rail and located between the first supporting member and the first rail, one of the first auxiliary member and the second auxiliary member is movable, and the one of the first auxiliary member and the second auxiliary member is configured to move to a first state for abutting against another one of the first auxiliary member and the second auxiliary member in response to a resilient force provided by the resilient member.

7. The slide rail mechanism of claim **6**, wherein the disengaging feature of the second supporting member is configured to release the resilient member to drive the one of the first auxiliary member and the second auxiliary member from the first state to a second state so as to disengage the one of the first auxiliary member and the second auxiliary member from the another one of the first auxiliary member and the second auxiliary member for terminating the displacement synchronization between the second rail and the first rail when the second rail is displaced to the second predetermined position, the disengaging feature of the second supporting member is formed by excavating and configured to provide a moving space for the one of the first auxiliary member and the second auxiliary member, and the second supporting member further comprises a blocking feature located adjacent to the disengaging feature and configured to block the first rail for preventing the first rail from displacing away from the second predetermined position along a second predetermined direction opposite to the first predetermined direction.

8. The slide rail mechanism of claim **7**, wherein the slide rail assembly further comprises a working member movably mounted on the second rail, a corresponding feature is arranged on the third rail, and the third rail drives the second rail to synchronously displace together with the third rail by an abutment of the corresponding feature and the working member during a displacement of the third rail along the first predetermined direction, the working member is pivotally connected to the second rail by a connecting member, and the working member is driven to a predetermined state for abutting against the corresponding feature in response to a resilient force provided by a resilient object.

9. The slide rail mechanism of claim **8**, wherein a disengaging structure is arranged on the first rail, the disengaging structure is configured to terminate a displacement synchronization between the third rail and the second rail when the third rail and the second rail are synchronously displaced to a disengaging position along the first predetermined direction, a blocking structure is further arranged on the first rail

and located adjacent to the disengaging structure, the blocking structure blocks the second rail for preventing the second rail from displacing away from a third predetermined position along the second predetermined direction when the second rail is displaced to the third predetermined position along the first predetermined direction.

10. A slide rail mechanism comprising:

a first supporting member comprising a first wall and a second wall;

a slide rail assembly comprising a first rail, a second rail and a third rail, the first rail and the first supporting member being displaceable relative to each other along a longitudinal direction, a disengaging structure being arranged on the first rail, the second rail and the first rail displacing synchronously during a displacement of the second rail away from a first predetermined position along a first predetermined direction, the third rail and the second rail synchronously displacing during a displacement of the third rail along the first predetermined direction, and the disengaging structure being configured to terminate a displacement synchronization between the third rail and the second rail;

a rolling member arranged on one of the first rail and the first supporting member and rotatably contacting with another one of the first rail and the first supporting member, so as to engage the first rail with the first wall of the first supporting member via the rolling member; and

a second supporting member connected to the first supporting member, the second supporting member comprising a disengaging feature, the disengaging feature of the second supporting member being configured to terminate a displacement synchronization between the second rail and the first rail when the second rail and the first rail are synchronously displaced to a second predetermined position along the first predetermined direction.

11. The slide rail mechanism of claim **10**, wherein the first wall and the second wall of the first supporting member are an upper wall and a lower wall respectively, the rolling member comprises a first cooperating feature, and the first supporting member comprises a second cooperating feature configured to cooperate with the first cooperating feature.

12. The slide rail mechanism of claim **11**, wherein a length of the first rail along the longitudinal direction is less than a length of the first supporting member along the longitudinal direction.

13. The slide rail mechanism of claim **10**, wherein a blocking structure is further arranged on the first rail and located adjacent to the disengaging structure, the blocking structure blocks the second rail for preventing the second rail from displacing away from a third predetermined position along a second predetermined direction opposite to the first predetermined direction and the third rail is displaceable to a fourth predetermined position along the first predetermined direction when the second rail is displaced to the third predetermined position along the first predetermined direction, and the third rail is configured to terminate a blocking relation between the blocking structure and the second rail during a displacement of the third rail away from the fourth predetermined position along the second predetermined direction.

14. The slide rail mechanism of claim **13**, wherein the second supporting member further comprises a blocking feature located adjacent to the disengaging feature and configured to block the first rail for preventing the first rail from displacing away from the second predetermined position along the second predetermined direction, and the second rail is configured to terminate a blocking relation between the blocking feature and the first rail during a displacement of the second rail away from the third predetermined position along the second predetermined direction.

15. The slide rail mechanism of claim **10**, wherein the slide rail assembly further comprises a first auxiliary member and a second auxiliary member, the first auxiliary member is arranged on the first rail, the second auxiliary member is arranged on the second rail, and the second rail and the first rail displace synchronously by an abutment of the first auxiliary member and the second auxiliary member during the displacement of the second rail away from the first predetermined position along the first predetermined direction.

16. The slide rail mechanism of claim **15**, wherein the slide rail assembly further comprises a resilient member, one of the first auxiliary member and the second auxiliary member is movable, and the one of the first auxiliary member and the second auxiliary member is configured to move to a first state for abutting against another one of the first auxiliary member and the second auxiliary member in response to a resilient force provided by the resilient member.

17. The slide rail mechanism of claim **16**, wherein the disengaging feature of the second supporting member is configured to release the resilient member to drive the one of the first auxiliary member and the second auxiliary member from the first state to a second state so as to disengage the one of the first auxiliary member and the second auxiliary member from the another one of the first auxiliary member and the second auxiliary member for terminating the displacement synchronization between the second rail and the first rail when the second rail is displaced to the second predetermined position.

18. The slide rail mechanism of claim **10**, wherein the slide rail assembly further comprises a working member movably mounted on the second rail, a corresponding feature is arranged on the third rail, and the third rail drives the second rail to synchronously displace together with the third rail by an abutment of the corresponding feature and the working member during the displacement of the third rail along the first predetermined direction, the working member is pivotally connected to the second rail by a connecting member, and the working member is driven to a predetermined state for abutting against the corresponding feature in response to a resilient force provided by a resilient object.

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