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(54) **SLIDER SWITCH AND THERMOSTAT CONTROLLER USING THE SAME**

SCHIEBESCHALTER UND THERMOSTATREGLER DAMIT

COMMUTATEUR À GLISSIÈRE ET DISPOSITIF DE COMMANDE DE THERMOSTAT L'UTILISANT

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(73) Proprietor: **Siemens Schweiz AG**
8047 Zürich (CH)

(72) Inventors:
• **YANG, Lin**
Beijing 102208 (CN)
• **WANG, Jianfang**
Beijing 100089 (CN)

• **YAN, Yafei**
Beijing 100192 (CN)

(74) Representative: **Maier, Daniel Oliver et al**
Siemens AG
Postfach 22 16 34
80506 München (DE)

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Description**BACKGROUND OF THE INVENTION****Field of Invention**

[0001] The present invention relates to a slider switch, in particular, to a slider switch for turning on and off the fan and adjusting the fan speed in a thermostat.

[0002] The present invention further relates to a thermostat controller using said slider switch.

Related Art

[0003] In various kinds of speed adjusting controllers, a slider switch could be used for switching among circuit phases of different functions. However, a few switching devices might be employed together to accomplish the control function since there are too many subjects to be controlled at same time. For example, in the existing thermostat controllers, the fan speed is controlled by two slider switches, in which one slider switch is used for turning the fan on and off, and the other slider switch is used for controlling the speed of the fan. Said slider switches are both set in the thermostat controller, thereby bringing the thermostat controller with a large volume and a high cost.

[0004] In addition, only adjacent contact points could be connected on the glide direction of the slider switch in the existing slider switches. In this case, if two rows of contact points, each of which has m contact points, are arranged in the glide direction on the circuit board, a pair of neighboring contact points in each row could be connected at the same time by operating the slider switch, so that two circuits are linked to accomplish switching among m-1 control phases. In some situations, the slider switch is required to connect three pairs of contact points at the same time for linking three circuits, in which case the circuits of the slider switch have to be re-configured to meet such demands.

[0005] Moreover, the slider is connected to the contact points on the circuit board via a point contact and thus there tends to be a deficient contact therebetween in the existing slider switch. Furthermore, the smaller the contact surface between the slider and the contact points is, the higher the contact resistance will be. Therefore, the slider switch would generate too much heat when used for controlling a large current, disadvantageously affecting the reliability of the thermostat controller.

[0006] The German utility model DE8527547U1 discloses a switch with a slidable actuation mechanism. The switch of DE8527547U1 provides a rest position. The switch of DE8527547U1 also provides at least two switch positions further to its rest position.

SUMMARY OF THE INVENTION

[0007] It is therefore an object of the present invention to provide a slider switch, which could achieve both the function of turning the circuit on and off and the function of adjusting different operation conditions when the circuit is on.

[0008] Another object of the present invention is to provide a slider switch in which two rows of several contact points are arranged on the glide direction thereof. Such a switch could accomplish switching among different phases and connecting three circuits.

[0009] A further object of the present invention is to provide a slider switch to increase the contact surface at each contact position therein, and reduce the contact resistance.

[0010] One more object of the present invention is to provide a thermostat controller which could employ only one slider switch to turn the fan on and off and adjust the fan speed.

[0011] To achieve the objects thus mentioned, certain exemplary embodiments can provide a slider switch, comprising a base, a slider set in the base and several pins arranged in two rows, in which the slider could glide in the glide direction defined by said two rows of pins. A contact element could be provided on each of two sides of the slider opposite to the pins, and each of said contact elements could electrically connect a pair of neighboring pins in the same row. A first elastic element and a contact sheet could be provided along the glide direction in the base. One end of the first elastic element could be connected with the base, and the other end of the first elastic element could be connected with the contact sheet. One end surface of the slider adjacent to the contact sheet could be pressed against the contact sheet from a direction opposite to the first elastic element. When each of said contact elements is in contact with a pair of said pins closest to the contact sheet, the contact sheet could be separate from said two pins closest to the contact sheet with the pressure from the slider. When each of said contact elements is in contact with other pairs of pins other than those closest to the contact sheet, the contact sheet could be pressed against said two pins closest to the contact sheet by the first elastic element.

[0012] According to certain exemplary embodiments of the slider switch, the contact elements can have a planar end surface opposite to the pins in the direction vertical to the glide direction.

[0013] According to certain exemplary embodiments of the slider switch, a second elastic element can be further provided between the contact elements and the slider and could press the contact elements against the pins.

[0014] According to certain exemplary embodiments of the slider switch, the second elastic element can be a pair of coil springs.

[0015] According to certain exemplary embodiments of the slider switch, each of said two pins closest to the contact sheet can be further provided with an additional contact part respectively. Each of said additional contact parts could be connected with one end of the adjacent pin and extend in a direction parallel to the contact sheet. The contact sheet could be pressed against the additional contact parts to form an electric connection between the contact sheet and said two pins closest to the contact sheet.

[0016] According to certain exemplary embodiments of the slider switch, the first elastic element can be a pair of coil springs.

[0017] Certain exemplary embodiments can provide a thermostat controller using the afore-mentioned slider switch.

[0018] In the slider switch of the certain exemplary embodiments, the contact sheet can be subject to the elastic force of the first elastic element and the pressure from the slider. When the contact elements on the slider are connected to a pair of pins closest to the contact sheet, the slider is pressed against the contact sheet, and the contact sheet is separate from two pins closest to the contact sheet, so that the fan is turned off. When the circuit is to be switched to other positions, the slider could be pushed by the operator, and the contact sheet could be connected to two pins closest to the contact sheet by the contact sheet with the action of the first elastic element. This way, the slider could be switched among different circuits in the glide direction when required, and the contact sheet would be kept in contact with two pins closest to the contact sheet. In this case, three circuits could be electrically connected without re-configuring the circuit.

[0019] In addition, the surface contact between the pins and the contact elements and/or the contact sheet could guarantee a stable and reliable contact in the slider switch as well as reduce the contact resistance among the contacts.

[0020] By virtue of the slider switch of the certain exemplary embodiments, a push rod is further provided on the end face of the slider opposite to the contact sheet. The contact between the slider and the contact sheet could be achieved by said push rod, in which case the volume and weight of the slider would be reduced, the cost would be decreased, and the switch could be conveniently operated.

[0021] In another aspect of the certain exemplary embodiments, the slider switch of the invention is employed in the thermostat controller, and two conventional slider switches used in the existing thermostat controller could be substituted with one slider switch of the invention. Therefore, the production cost is efficiently reduced and the volume of the thermostat controller is decreased.

[0022] Further scope of applicability of the certain exemplary embodiments will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within scope of the invention will become apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] The present invention will become more fully understood from the detailed description given herein below for illustration only, and thus are not limitative of the present invention, and wherein:

FIG.1 is a structural diagram of a slider switch according to one embodiment of the invention;

FIG.2 is a diagram from the II direction of fig.1, in which the slider switch is in a work position;

FIG.3 is a diagram of the slider switch in a glide position;

FIG.4 is a diagram of the slider switch in another work position; and

FIG.5 is a diagram of the slider switch according to another embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0024] Certain exemplary embodiments will be described in detail below with reference to the drawings, where like reference numerals indicate identical or functionally similar elements. Hereinafter, "a/an" not only indicates the case of "only one" but also indicates the case of "more than one". Herein, "contact" not only indicates the case of "direct contact" but also indicates the case of "indirect contact".

[0025] Fig.1 is a structural diagram of a slider switch according to one exemplary embodiment. As shown in fig.1, the

slider switch includes a base 30, a slider 10 set in the base 30, and several pins 20 (only 5 pins are illustratively depicted in fig.1) arranged in two rows (as shown in fig.2). The slider 10 could glide in the glide direction G defined by said two rows of pins 20.

[0026] Fig.2 is a diagram from the II direction of fig.1, which illustratively describes the structure of the slider switch. As shown in fig.2, the slider 10 has a contact element 12 on each of the sides opposite to the pins 20. Each said contact element 12 could electrically connect a pair of neighboring pins 20 in the same row. A first elastic element 34 and a contact sheet 32 are further provided in the base 30, which are positioned along the glide direction G as shown. One end of the first elastic element 34 is connected with the base 30, and the other end thereof is connected with the contact sheet 32. One end of the slider 10 adjacent to the contact sheet 32 could be pressed against the contact sheet from a direction opposite to the first elastic element 34. When the contact element 12 is in contact with a pair of neighboring pins 20 closest to the contact sheet 32, the contact sheet 32 is separate from two pins 20 closest to the contact sheet 32 via the pressure from the slider 10. In this case, for example, the fan is turned off.

[0027] When the circuit is to be switched, the operator could push the slider 10 along the glide direction G in fig.2. While the slider 10 is in the glide position as shown in fig.3, one end of the slider 10 facing the contact sheet 32 is kept in contact with the contact sheet 32, the contact elements 12 of the slider 10 are merely contacted with the pins 20c and 20d, and the contact sheet 32 is in contact with the pins 20a and 20b driven by the first elastic element 34.

[0028] Where the operator further pushes the slider 10 to another work position shown in fig.4 along the glide direction G, two contact elements 12 are in contact with the pins 20c and 20e as well as the pins 20d and 20f respectively, the contact sheet 32 is separate from the slider 10, and the contact sheet 32 is pressed against the pins 20a and 20b by the first elastic element 34. In this situation, the contact sheet 32 would be kept pressing against the pins 20a and 20b even if the slider 10 is further pushed to contact with different pins.

[0029] Fig.4 illustrates one work position of the slider switch. Those skilled in the art would understand the operation process of the slider gliding along another direction, which is thus not described herein for brevity.

[0030] Fig.5 is a diagram of a slider switch according to another embodiment of the invention, in which the internal structure of slider 10 is illustratively described. In this figure, the contact elements 12 have a planar end surface opposite to the pins in the direction vertical to the glide direction G. A second elastic element 13 is further provided between the contact elements 12 and the slider 10. The contact elements 12 are pressed against the pins by the second elastic element 13. The second elastic element 13 could be a spring, a plate spring or a leaf spring. In particular, the second elastic element 13 is implemented to be a pair of coil springs in fig.5.

[0031] The pins 20a and 20c could be further provided with an additional contact part 22 respectively. Each said additional contact part 22 is connected with one end of each of the pins 20a and 20c, and extends in a direction parallel to the contact sheet 32. The contact sheet 32 could be pressed against the additional contact parts 22 to form an electric connection between the contact sheet 32 and the pins 20a and 20b.

[0032] Furthermore, the first elastic element 34 interacting with the contact sheet 32 could be a spring, a plate spring or a leaf spring. In particular, the first elastic element 34 is implemented to be a pair of coil springs in fig.5.

[0033] The slider 10 is provided with a push rod 14, via which the slider is contacted with the contact sheet.

[0034] It is apparent those skilled in the art could understand the contact element and the contact sheet are conductors in the afore-mentioned embodiments. Two rows of pins with 5 pins in each row are illustrated in the figures. However, the slider switch of the invention could also be used where there are more than two rows of pins with more than three pins in each row. In the situation where the pins are arranged in more than two rows along the glide direction, the number of the sliders would be increased. The additional contact parts are provided for improving the contact between the pins 20 and the contact sheet 32 to increase the contact surface, which could be substituted with other means having functions similar to those of the additional contact parts.

[0035] According to the slider switch of the certain exemplary embodiments, the contact sheet and the first elastic element connecting the base and the contact sheet are introduced, so that the contact sheet could be separate from and in contact with two pins closest to the contact sheet by bringing the slider away from and in contact with the contact sheet, and the contact sheet could be thus electrically connected to or detached from said two pins closest to the contact sheet. Therefore, the fan could be turned on and off. Three circuits could be connected by contacting the contact elements of the slider with other two pairs of pins other than two pins closest to the contact sheet. The speed of the fan, for example, could be adjusted by moving the slider to switch different connecting circuits.

[0036] Where the slider switch of the certain exemplary embodiment is used for the existing thermostat controllers, the conventional two slide devices for turning the fan on and off and adjusting the fan speed respectively could be combined together, in which case the production cost is reduced and the volume of the thermostat controller is decreased.

[0037] By using the slider switch of the certain exemplary embodiment when two rows of pins with m ($m \geq 3$) pins in each row are arranged on the glide direction of the slider switch, $m-1$ control phases could be switched and three circuits could be connected. In other words, where n ($n \geq 2$) rows of pins with m ($m \geq 3$) pins in each row are arranged in the glide direction of the slider switch, at least $m-1$ control phases could be switched and at least $n+1$ circuits could be connected.

[0038] According to the slider switch of the certain exemplary embodiment, the contact element is connected to the

pins via a surface contact instead of the point contact between the slider and the contact points in the prior art. Therefore, the contact resistance is efficiently reduced. In addition, a second elastic element is provided between the slider and the contact element to efficiently enhance the contact strength of the contact element and the pins, and the contact resistance is thereby reduced.

[0039] According to the slider switch of the certain exemplary embodiment, the slider is in contact with the contact sheet through a push rod, in which case the volume of the slider is reduced and the cost is decreased. The contact strength of the contact sheet and two pins closest to the contact sheet is improved by providing additional contact parts on two pins closest to the contact sheet and providing a first elastic element between the contact sheet and the base, and the contact resistance is thereby reduced.

[0040] Those skilled in the art should understand the slider switch could be used for occasions requiring switch and connection among multiple circuits, for example, lighting control, heating control and display control.

[0041] It should be understood though the invention is described referring to different embodiments, each embodiment does not merely contain one independent technical solution. In other words, the specification is described in such a way that those skilled in the art should read and comprehend the specification as a whole. The technical solutions mentioned in these embodiments could be appropriately combined to form other embodiments understandable by those skilled in the art.

[0042] The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from scope of the invention, and all such modifications as would be obvious to those skilled in the art are intended to be included within the scope of the attached claims.

LIST OF REFERENCE NUMERALS

[0043]

10	slider
12	contact element
13	second elastic element
14	push rod
20, 20a, 20b, 20c, 20d, 20e, 20f	pin
22	additional contact part
30	base
32	contact sheet
34	first elastic element

Claims

1. A slider switch, comprising a base, a slider set in the base and several pins arranged in two rows, in which the slider is configured to glide in the glide direction defined by said two rows of pins;
the slider switch further comprises
a contact element (12) respectively provided on each of two sides of the slider (10) opposite to the pins, in which each of said contact elements (12) are configured to electrically connect a pair of neighboring pins in the same row; and
a first elastic element (34) and a contact sheet (32) provided along the glide direction in the base, in which one end of the first elastic element (34) is configured to connect to the base, the other end of the first elastic element (34) is configured to connect to the contact sheet (32), and one end surface of the slider (10) adjacent to the contact sheet (32) is configured to press against the contact sheet (32) from a direction opposite to the first elastic element (34), wherein, when each of said contact elements (12) is in contact with a pair of said pins closest to the contact sheet (32), the contact sheet (32) is separate from said two pins closest to the contact sheet (32) with the pressure from the slider (10), and when each of said contact elements (12) is in contact with pairs of pins other than those closest (20a, 20b) to the contact sheet (32), the contact sheet (32) is pressed against said two pins (20a, 20b) closest to the contact sheet (32) by the first elastic element (34),
characterized in that,
when each of said contact elements (12) is in contact with pairs of pins other than those closest (20a, 20b) to the contact sheet (32), the contact sheet (32) is separate from the slider (10).
2. The slider switch as claimed in claim 1, wherein the contact elements (12) have a planar end surface opposite to the pins in the direction vertical to the glide direction.

3. The slider switch as claimed in claim 2, wherein a second elastic element (13) is further provided between the contact elements (12) and the slider (10) and is configured to press the contact elements (12) against the pins.
4. The slider switch as claimed in claim 3, wherein the second elastic element (13) is a pair of coil springs.
5. The slider switch as claimed in claim 1, wherein each of said two pins closest to the contact sheet (32) is further provided with an additional contact part respectively, each of said additional contact parts is configured to connect to one end of the adjacent pin and extend in a direction parallel to the contact sheet (32), and the contact sheet (32) is configured to press against the additional contact parts to form an electric connection between the contact sheet (32) and said two pins closest to the contact sheet (32).
6. The slider switch as claimed in claim 1, wherein the first elastic element (34) is a pair of coil springs.
7. The slider switch as claimed in claim 1, wherein the slider (10) is provided with a push rod, and the slider (10) is contacted with the contact sheet (32) via the push rod.
8. A thermostat controller, using a slider switch as claimed in any one of the claims 1-7.

Patentansprüche

1. Schiebeschalter, welcher einen Sockel, einen im Sockel eingesetzten Schieber und mehrere Bolzen, die in zwei Reihen angeordnet sind, umfasst, wobei der Schieber dafür ausgelegt ist, in der durch die zwei Reihen von Bolzen definierten Gleitrichtung zu gleiten;
wobei der Schieber ferner umfasst:

jeweils ein Kontaktelement (12) auf jeder von zwei Seiten des Schiebers (10) gegenüber den Bolzen, wobei jedes dieser Kontaktelemente (12) dafür ausgebildet ist, ein Paar von benachbarten Bolzen in derselben Reihe elektrisch zu verbinden; und

ein erstes elastisches Element (34) und ein Kontaktblech (32), die entlang der Gleitrichtung in dem Sockel vorgesehen sind, wobei ein Ende des ersten elastischen Elements (34) dafür ausgebildet ist, mit dem Sockel verbunden zu werden, das andere Ende des ersten elastischen Elements (34) dafür ausgebildet ist, mit dem Kontaktblech (32) verbunden zu werden, und eine Endfläche des Schiebers (10), die dem Kontaktblech (32) benachbart ist, dafür ausgebildet ist, aus einer zu dem ersten elastischen Element (34) entgegengesetzten Richtung gegen das Kontaktblech (32) zu drücken,

wobei, wenn jedes der Kontaktelemente (12) sich in Kontakt mit einem Paar der Bolzen befindet, das dem Kontaktblech (32) am nächsten ist, das Kontaktblech (32) durch den vom Schieber (10) ausgeübten Druck von den zwei Bolzen, die dem Kontaktblech (32) am nächsten sind, getrennt ist, und wenn jedes der Kontaktelemente (12) sich in Kontakt mit anderen Paaren von Bolzen als denjenigen, die dem Kontaktblech (32) am nächsten sind (20a, 20b), befindet, das Kontaktblech (32) durch das erste elastische Element (34) gegen die zwei Bolzen (20a, 20b) gedrückt wird, die dem Kontaktblech (32) am nächsten sind,

dadurch gekennzeichnet, dass,

wenn jedes der Kontaktelemente (12) sich in Kontakt mit anderen Paaren von Bolzen als denjenigen, die dem Kontaktblech (32) am nächsten sind (20a, 20b), befindet, das Kontaktblech (32) von dem Schieber (10) getrennt ist.

2. Schiebeschalter nach Anspruch 1, wobei die Kontaktelemente (12) eine ebene Stirnfläche gegenüber den Bolzen in der zur Gleitrichtung senkrechten Richtung aufweisen.
3. Schiebeschalter nach Anspruch 2, wobei ferner ein zweites elastisches Element (13) zwischen den Kontaktelementen (12) und dem Schieber (10) vorgesehen ist und dafür ausgebildet ist, die Kontaktelemente (12) gegen die Bolzen zu drücken.
4. Schiebeschalter nach Anspruch 3, wobei das zweite elastische Element (13) ein Paar von Schraubenfedern ist.
5. Schiebeschalter nach Anspruch 1, wobei jeder der zwei Bolzen, die dem Kontaktblech (32) am nächsten sind, ferner mit jeweils einem zusätzlichen Kontaktteil versehen ist, wobei jedes der zusätzlichen Kontaktteile dafür ausgebildet ist, mit einem Ende des benachbarten Bolzen verbunden zu werden und sich in einer Richtung parallel zu dem

Kontaktblech (32) zu erstrecken, und das Kontaktblech (32) dafür ausgebildet ist, gegen die zusätzlichen Kontaktteile zu drücken, um eine elektrische Verbindung zwischen dem Kontaktblech (32) und den zwei Bolzen, die dem Kontaktblech (32) am nächsten sind, zu bilden.

- 5 6. Schiebeschalter nach Anspruch 1, wobei das erste elastische Element (34) ein Paar von Schraubenfedern ist.
7. Schiebeschalter nach Anspruch 1, wobei der Schieber (10) mit einer Schubstange versehen ist und der Schieber (10) über die Schubstange mit dem Kontaktblech (32) in Kontakt gebracht wird.
- 10 8. Thermostatregler, der einen Schiebeschalter nach einem der Ansprüche 1-7 verwendet.

Revendications

- 15 1. Commutateur à glissière, comprenant une base, une glissière placée dans la base et plusieurs broches agencées sur deux rangées, dans lequel la glissière est configurée pour glisser dans la direction de glissement définie par lesdites deux rangées de broches ;
le commutateur à glissière comprend en outre
un élément de contact (12) respectivement disposé sur chacun des deux côtés de la glissière (10) à l'opposé des
20 broches, dans lequel chacun desdits éléments de contact (12) est configuré pour connecter électriquement une paire de broches voisines de la même rangée ; et
un premier élément élastique (34) et une feuille de contact (32) disposés le long de la direction de glissement dans la base, une première extrémité du premier élément élastique (34) étant configurée pour être connectée à la base, l'autre extrémité du premier élément élastique (34) étant configurée pour être connectée à la feuille de contact (32),
25 et une première extrémité de la glissière (10) adjacente à la feuille de contact (32) étant configurée pour être pressée contre la feuille de contact (32) depuis une direction opposée au premier élément élastique (34), dans lequel, quand chacun desdits éléments de contact (12) est en contact avec une paire desdites broches les plus proches de la feuille de contact (32), la feuille de contact (32) est séparée desdites deux broches les plus proches de la feuille de contact (32) grâce à la pression provenant de ladite glissière (10), et quand chacun desdits
30 éléments de contact (12) est en contact avec des paires de broches autres que celles les plus proches (20a, 20b) de la feuille de contact (32), la feuille de contact (32) est pressée contre lesdites deux broches (20a, 20b) les plus proches de la feuille de contact (32) par le premier élément élastique (34),
caractérisé en ce que,
quand chacun desdits éléments de contact (2) est en contact avec des paires de broches autres que celles les plus
35 proches (20a, 20b) de la feuille de contact (32), la feuille de contact (32) est séparée de la glissière (10).
2. Commutateur à glissière selon la revendication 1, dans lequel les éléments de contact (12) comportent une surface d'extrémité plane opposée aux broches dans la direction verticale à la direction de glissement.
- 40 3. Commutateur à glissière selon la revendication 2, dans lequel un second élément élastique (13) est en outre disposé entre les éléments de contact (12) et la glissière (10) et est configuré pour presser les éléments de contact (12) contre les broches.
4. Commutateur à glissière selon la revendication 3, dans lequel le second élément élastique (13) est une paire de
45 ressorts hélicoïdaux.
5. Commutateur à glissière selon la revendication 1, dans lequel chacune desdites deux broches les plus proches de la feuille de contact (32) est en outre respectivement pourvue d'une partie de contact supplémentaire, chacune desdites parties de contact supplémentaires est configurée pour être connectée à une extrémité de la broche adjacente et s'étendre dans une direction parallèle à la feuille de contact (32), et la feuille de contact (32) est configurée pour être pressée contre les parties de contact supplémentaires afin de former une connexion électrique entre la feuille de contact (32) et lesdites deux broches les plus proches de la feuille de contact (32).
- 50 6. Commutateur à glissière selon la revendication 1, dans lequel le premier élément élastique (34) est une paire de ressorts hélicoïdaux.
7. Commutateur à glissière selon la revendication 1, dans lequel la glissière (10) est pourvue d'une tige de poussée, et la glissière (10) entre en contact avec la feuille de contact (32) par le biais de la tige de poussée.

8. Dispositif de commande de thermostat, utilisant le commutateur à glissière selon 1"une quelconque des revendications 1-7.

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Figures of the invention

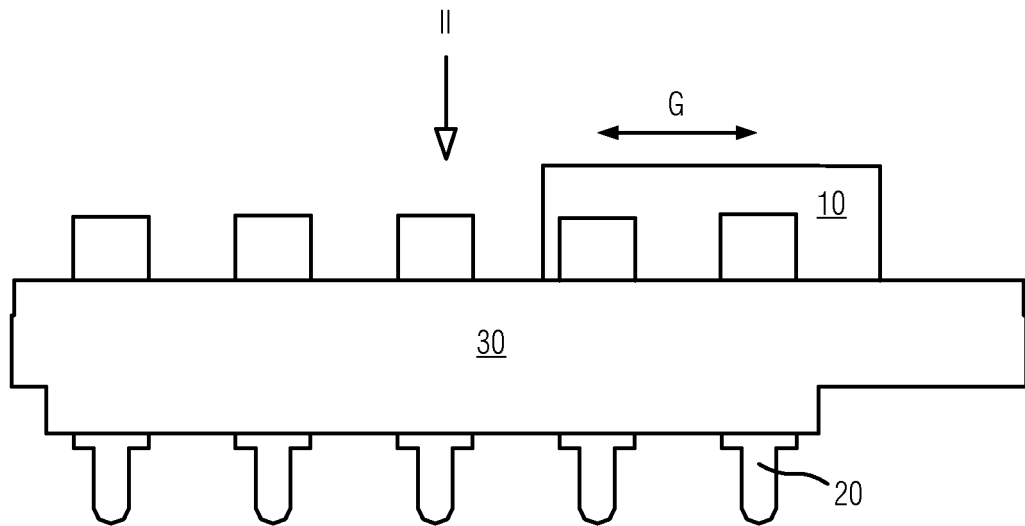


Fig 1

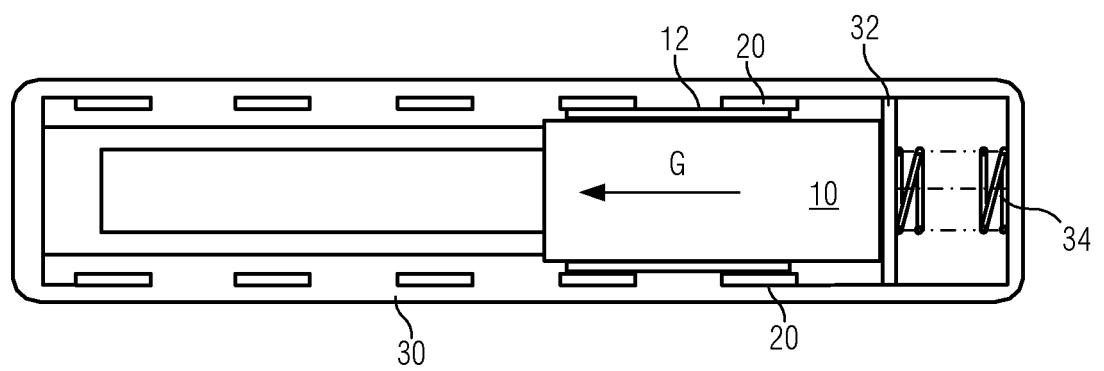


Fig 2

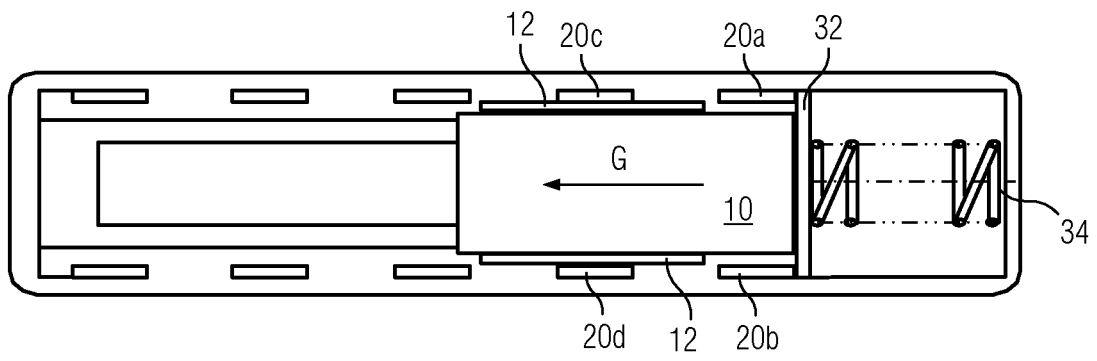


Fig 3

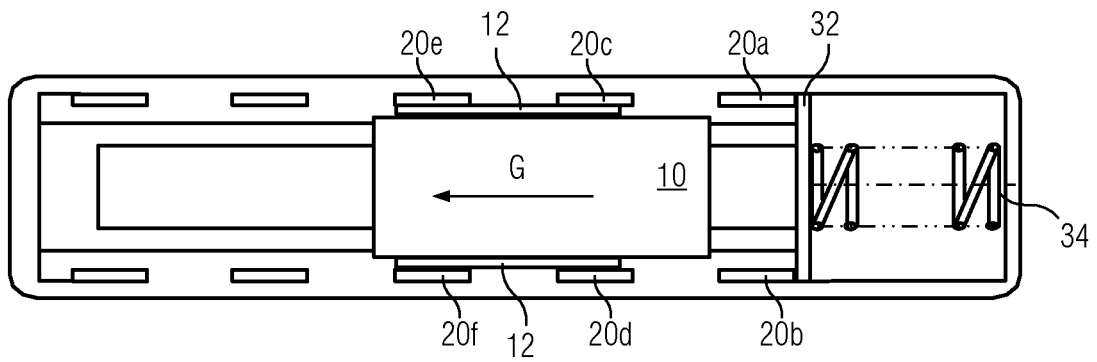


Fig 4

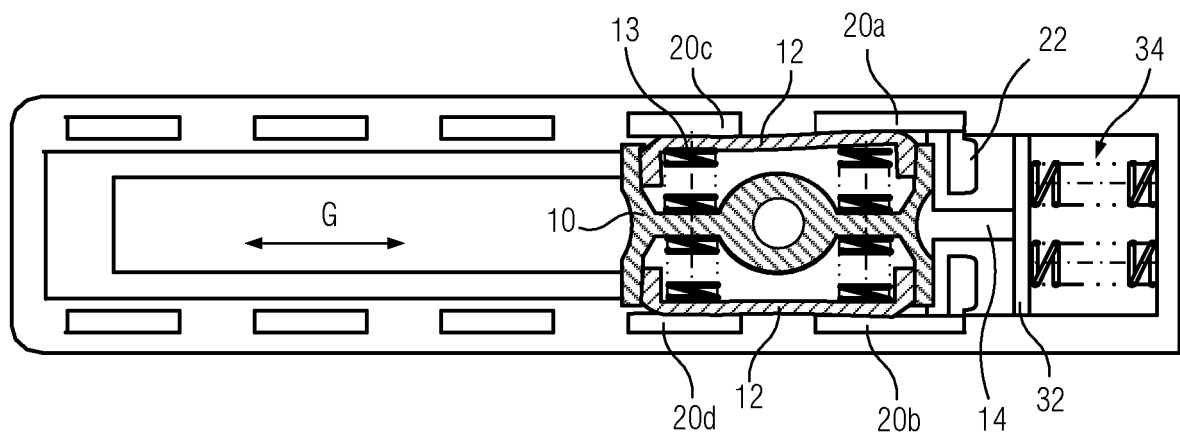


Fig 5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 8527547 U1 [0006]