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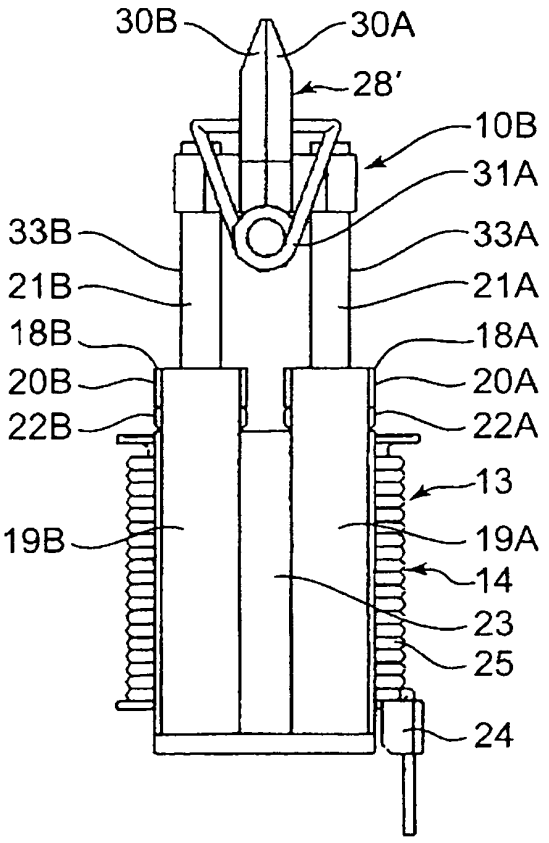
(54) Hair clipper

(57) In a hair clipper 10A including a comb-shaped fixed blade 29, a comb-shaped movable blade 30 facing the fixed blade 29 and a vibratory linear actuator 13 for vibrating the movable blade 30 in reciprocating movement directions with respect to the fixed blade 29, a spring member 31 for resonating the movable blade 30 in the reciprocating movement directions is fixedly connected to the movable blade 30 and the fixed blade 29, which eliminates the need to transversely arrange the spring members 31 between a movable member 18 of the linear actuator 13 and a main body housing 11. Thus, the main body housing 11 can be made to have a generally cylindrical cross section so that a user may grip the main body housing 11 in any orientation. Further, it is possible to reduce the size of the main body housing 11, thereby making the manipulation of the hair clipper easy.

FIG. 5B



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Description

[0001] The present invention relates to a hair clipper provided with a vibratory linear actuator.

[0002] Japanese Laid-open Patent Publication No. 2005-185067 discloses a conventional hair clipper provided with a vibratory linear actuator, e.g., a linear motor.

[0003] Such a hair clipper is designed to vibrate a movable blade with respect to a fixed blade by means of the vibratory linear actuator.

[0004] In the meantime, as shown in Figs. 6A, 6B and 7, it would be conceivable that a hair clipper employs a vibratory linear actuator 2 to vibrate a comb-shaped movable blade 3 in the directions indicated by the arrow "F" in a state that the comb-shaped movable blade 3 is pressed against a comb-shaped fixed blade 4 by means of spring members 5. The configurations of the vibratory linear actuator 2 and the other parts will be described in detail in the section of Detailed Description of the Embodiments.

[0005] With the conventional hair clipper noted above, however, resonance spring members 7 for resonating or moving the movable blade 3 in the reciprocating movement directions "F" are transversely arranged between the movable member 8 of the vibratory linear actuator 2 and a main body housing 9. Thus, a handgrip portion of the main body housing 9 is formed into a generally rectangular cross section with a reduced thickness T and an increased width W, as shown in Fig. 7. This restricts a user's grip of the main body housing, thereby making the manipulation of the hair clipper inconvenient.

[0006] It is, therefore, an object of the present invention to provide a hair clipper whose manipulation is easy by reducing the size thereof.

[0007] In accordance with a first aspect of the present invention, there is provided a hair clipper including a comb-shaped fixed blade, a comb-shaped movable blade facing the fixed blade, and a vibratory linear actuator for vibrating the movable blade with respect to the fixed blade in reciprocating movement directions, characterized by: a spring member for vibrating the movable blade in the reciprocating movement directions, the spring member being fixedly connected to the movable blade and the fixed blade.

[0008] The spring member may also serve to press the movable blade against the fixed blade, so that the cutting performance of the hair clipper can be improved and the number of parts thereof can be reduced.

[0009] In accordance with a second aspect of the present invention, there is provided a hair clipper including: a plurality of comb-shaped movable blades arranged to face one another; a vibratory linear actuator for vibrating the adjacent movable blades in reciprocating movement directions in opposite phases; and a spring member for pressing the movable blades against one another, the spring member being adapted to fixedly connect the movable blades with one another and also serving to resonate the movable blades in the reciprocating movement directions.

[0010] In accordance with the first aspect of the present invention, the spring member for resonating the movable blade in the reciprocating movement directions is fixedly connected to both the movable blade and the fixed blade. This eliminates the need to transversely arrange the spring member between a movable member of the vibratory linear actuator and a main body housing, as in the case of the conventional hair clipper noted above. Thus, the main body housing can be made to have, e.g., a generally cylindrical cross section so that a user may grip the main body housing in any orientation. It is also possible to reduce the size of the main body housing, thereby making the manipulation of the hair clipper easy.

[0011] Furthermore, since the spring member also serves to press the movable blade against the fixed blade, the movable blade makes close contact with the fixed blade, which improves the cutting performance of the hair clipper. It is also possible to reduce the number of parts or components required in fabricating the hair clipper.

[0012] In accordance with the second aspect of the present invention, the spring member for pressing the movable blades against one another is adapted to fixedly connect the movable blades with one another, and the spring member also serves to resonate the movable blades in the reciprocating movement directions. This eliminates the need to transversely arrange the spring member between the movable member of the vibratory linear actuator and the main body housing, as in the case of the conventional hair clipper noted above. Thus, the main body housing can be made to have, e.g., a generally cylindrical cross section so that a user may grip the main body housing in any orientation. It is also possible to reduce the size of the main body housing, thereby making the manipulation of the hair clipper easy. Moreover, the movable blades make close contact with one another to improve the cutting performance of the hair clipper.

[0013] In addition, since the spring member also serves to resonate the movable blades in the reciprocating movement directions, it becomes possible to reduce the number of parts or components required in fabricating the hair clipper.

[0014] Besides, it is possible to reduce vibration because the adjacent movable blades are vibrated in the reciprocating movement directions in opposite phases.

[0015] The above and other objects and features of the present invention will become apparent from the following description of preferred embodiments, given in conjunction with the accompanying drawings, in which:

Fig. 1 is an exploded perspective view of a hair clipper in accordance with a first embodiment of the present invention.

Fig. 2A is a front elevational view showing an assembly of a vibratory linear actuator and a blade block employed in the hair clipper in accordance with

the first embodiment of the present invention and Fig. 2B is a perspective view thereof.

Fig. 3 is a horizontal section view illustrating the hair clipper in accordance with the first embodiment of the present invention.

Fig. 4A is a front elevational view showing an assembly of a vibratory linear actuator and a blade block employed in a hair clipper in accordance with a second embodiment of the present invention and Fig. 4B is a perspective view thereof.

Fig. 5A is a horizontal section view illustrating the hair clipper in accordance with the second embodiment of the present invention and Fig. 5B is a side elevational view depicting the assembly of the vibratory linear actuator and the blade block thereof.

Fig. 6A is a front elevational view showing an assembly of a vibratory linear actuator and a blade block employed in a conventional hair clipper and Fig. 6B is a perspective view thereof.

Fig. 7 is a horizontal section view illustrating the conventional hair clipper.

[0016] Hereinafter, embodiments of the invention will be described in detail with reference to the accompanying drawings.

[0017] Referring to Figs. 1 to 3, a hair clipper 10 in accordance with a first embodiment of the preset invention includes a generally cylindrical main body housing 11 having a front housing 11A and a rear housing 11B combined together.

[0018] A vibratory linear actuator 13 is received within an upper portion of the main body housing 11, while a battery 15 for power supply and a control circuit 16 for controlling movement of the vibratory linear actuator 13 are accommodated within a lower portion of the main body housing 11.

[0019] The vibratory linear actuator 13 is provided with a movable member 18, a stator core block 14 (stationary member) and retainer members 19.

[0020] The movable member 18 includes a yoke 20 made of a magnetic material, a drive shaft 21 provided upright on the top surface of the yoke 20, and a permanent magnet 22 attached to the bottom surface of the yoke 20.

[0021] The stator core block 14 is formed of an electromagnet including a stator 23 made of a sintered magnetic material or stacked iron plates, and a winding (electric wire) 25 provided in the stator 23 through an insulating material 24 in an insulated state. The stator core block 14 is fixedly secured in place between the front housing 11A and the rear housing 11B.

[0022] The retainer members 19 are arranged in a pair on the right and left sides and serve to keep the movable member 18 spaced apart from the stator core block 14 so that the permanent magnet 22 of the movable member 18 can be in a face-to-face relationship with the stator core block 14 in a non-contact condition with a gap 26 (see Fig. 2A) left therebetween. The retainer members 19 are flexible to allow the movable member 18 to reciprocatingly move in the directions indicated by the arrow "F" in the drawings.

[0023] By alternating the direction of the electric current in the electromagnet, i.e., the stator core block 14, the movable member 18 is reciprocatingly moved together with the permanent magnet 22 in the directions "F".

[0024] A blade block 28 includes a comb-shaped fixed blade 29, a comb-shaped movable blade 30 and spring members 31. The fixed blade 29 is slantingly fixed to a top portion of the rear housing 11B.

[0025] The spring members 31 are coil springs arranged in a pair at left and right sides. Each of the spring members 31 is fixedly connected to the movable blade 30 and the fixed blade 29 by compressively fitting it between an outer wall surface of a coupling portion 30a of the movable blade 30 and an inner wall surface of a corresponding protrusion 29a of the fixed blade 29 such that it is inclined from an upper position of the coupling portion 30a to a lower position of the protrusion 29a.

[0026] The spring members 31 are adapted to press the movable blade 30 against the fixed blade 29, while holding the movable blade 30 movable in the reciprocating movement directions "F". In other words, the spring members 31 are adapted to serve as both a thrust spring for pressing the movable blade 30 against the fixed blade 29 and a resonance spring for resonating or moving the movable blade 30 (exactly, a movable block 33 including the movable blade 30 and the movable member 18) in the reciprocating movement directions "F".

[0027] The movable blade 30 has the coupling portion 30a with a recess for connection with the drive shaft 21 of the movable member 18, and the drive shaft 21 is fitted into the recess of the coupling portion 30a. Thus, as the movable member 18 is vibrated in the directions "F", the movable blade 30 is also vibrated in the directions "F" together with the movable member 18, thereby cutting hairs in cooperation with the fixed blade 29.

[0028] In the hair clipper 10A of the first embodiment, the spring members 31 for resonating the movable blade 30 in the reciprocating movement directions "F" are fixedly connected to both the movable blade 30 and the fixed blade 29. This eliminates the need to transversely arrange the spring members 31 between the movable member 18 of the vibratory linear actuator 13 and the main body housing 11, as in the case of the conventional hair clipper noted above. Thus, the main body housing 11 can be made to have, e.g., a generally cylindrical cross section as illustrated in Fig. 3 so that a user may grip the main body housing 11 in any orientation. It is also possible to reduce the size of the main body housing 11, thereby making the manipulation of the hair clipper easy.

[0029] Furthermore, the spring members 31 also serve to press the movable blade 30 against the fixed blade 31, so that the movable blade 30 makes close contact with the fixed blade 29, thereby improving the cutting performance of the hair clipper 10A. It is also possible to reduce the number of parts or components required in

fabricating the hair clipper 10A.

[0030] Figs. 4A, 4B, 5A and 5B illustrate a hair clipper 10B in accordance with a second embodiment of the present invention. The hair clipper 10B of the second embodiment differs from the hair clipper 10A of the first embodiment in that a plurality of movable blades 30A and 30B (two movable blades 30A and 30B in the present embodiment) are arranged to face each other, and adjacent movable blades are vibrated by respective vibratory linear actuator 13 in the reciprocating movement directions "F" but in opposite phases.

[0031] Movable members 18A and 18B including yokes 20A and 20B, drive shafts 21A and 21B and permanent magnets 22A and 22B are provided at the side of the front housing 11A and at the side of the rear housing 11B in a spaced-apart relationship with the stator core block 14, respectively. Furthermore, retainer members 19A and 19B are provided to keep the movable members 18A and 18B spaced apart from the stator core block 14 so that the permanent magnets 22A and 22B can be in a face-to-face relationship with respect to the stator core block 14 in a non-contact state with gaps 26A and 26B therebetween, respectively.

[0032] A blade block 28' includes movable blades 30A and 30B and spring members 31A and 31B.

[0033] The spring members 31A and 31B are wire springs arranged in pair at left and right sides. Each of the spring members 31A and 31B is fixedly connected to an external surface of the movable blade 30A at one end portion thereof and to an external surface of the movable blade 30B at the other end portion thereof.

[0034] The spring members 31A and 31B are adapted to press the movable blades 30A and 30B against one another and to keep the movable blades 30A and 30B movable in the reciprocating movement directions "F". In other words, the spring members 31A and 31B are designed to serve as both a thrust spring for pressing the movable blades 30A and 30B against one another and a resonance spring for resonating or moving the movable blades 30A and 30B (movable blocks 33A and 33B) in the reciprocating movement directions "F".

[0035] The movable blades 30A and 30B have coupling portions 30a with recesses into which drive shafts 21A and 21B of the movable members 18A and 18B are fitted, respectively. Thus, if the movable members 18A and 18B are vibrated in the reciprocating movement directions "F", the movable blades 30A and 30B are also vibrated therewith. In this regard, permanent magnets 22A and 22B of the movable members 18A and 18B are designed to have opposite polarities, so that the movable members 18A and 18B, namely, the movable blades 30A and 30B are vibrated in the reciprocating movement directions "F" in opposite phases of 180 degrees, i.e., in antiphase, which makes it possible to cut hairs by cooperation of the movable blades 30A and 30B.

[0036] In the hair clipper 10B of the second embodiment, the spring members 31A and 31B for pressing the movable blades 30A and 30B against one another are adapted to fixedly connect the movable blades 30A and 30B with one another, and the spring members 31A and 31B also serve as the resonance springs for resonating the movable blades 30A and 30B in the reciprocating movement directions "F". This eliminates the need to transversely arrange the spring member 31A and 31B between the movable members 18A and 18B of the vibratory linear actuator 13 and the main body housing 11, as in the case of the conventional hair clipper noted above. Thus, the main body housing 11 can be made to have, e.g., a generally cylindrical cross section as illustrated in Fig. 5A so that a user may grip the main body housing 11 in any orientation. It is also possible to reduce the size of the main body housing 11, thereby making the manipulation of the hair clipper easy. Moreover, the movable blades 30A and 30B are brought into close contact with one another by the spring members 31A and 31B, which improves the cutting performance of the hair clipper 10B.

[0037] In addition, thanks to the fact that the spring members 31A and 31B also serve as the resonance springs for resonating the movable blades 30A and 30B in the reciprocating movement directions "F", it becomes possible to reduce the number of parts or components required in fabricating the hair clipper 10B.

[0038] Besides, it is possible to reduce vibration because the movable blades 30A and 30B adjoining to each other are reciprocatingly moved in the opposite phases.

Claims

1. A hair clipper including a comb-shaped fixed blade, a comb-shaped movable blade facing the fixed blade, and a vibratory linear actuator for vibrating the movable blade with respect to the fixed blade in reciprocating movement directions, **characterized by**:

   a spring member for vibrating the movable blade in the reciprocating movement directions, the spring member being fixedly connected to the movable blade and the fixed blade.

2. The hair clipper of claim 1, wherein the spring member also serves to press the movable blade against the fixed blade.

3. A hair clipper comprising:

   a plurality of comb-shaped movable blades arranged to face one another;
   a vibratory linear actuator for vibrating the adjacent movable blades in reciprocating movement directions in opposite phases; and
   a spring member for pressing the movable blades against one another, the spring member being adapted to fixedly connect the movable

blades with one another and also serving to resonate the movable blades in the reciprocating movement directions.

FIG. 1

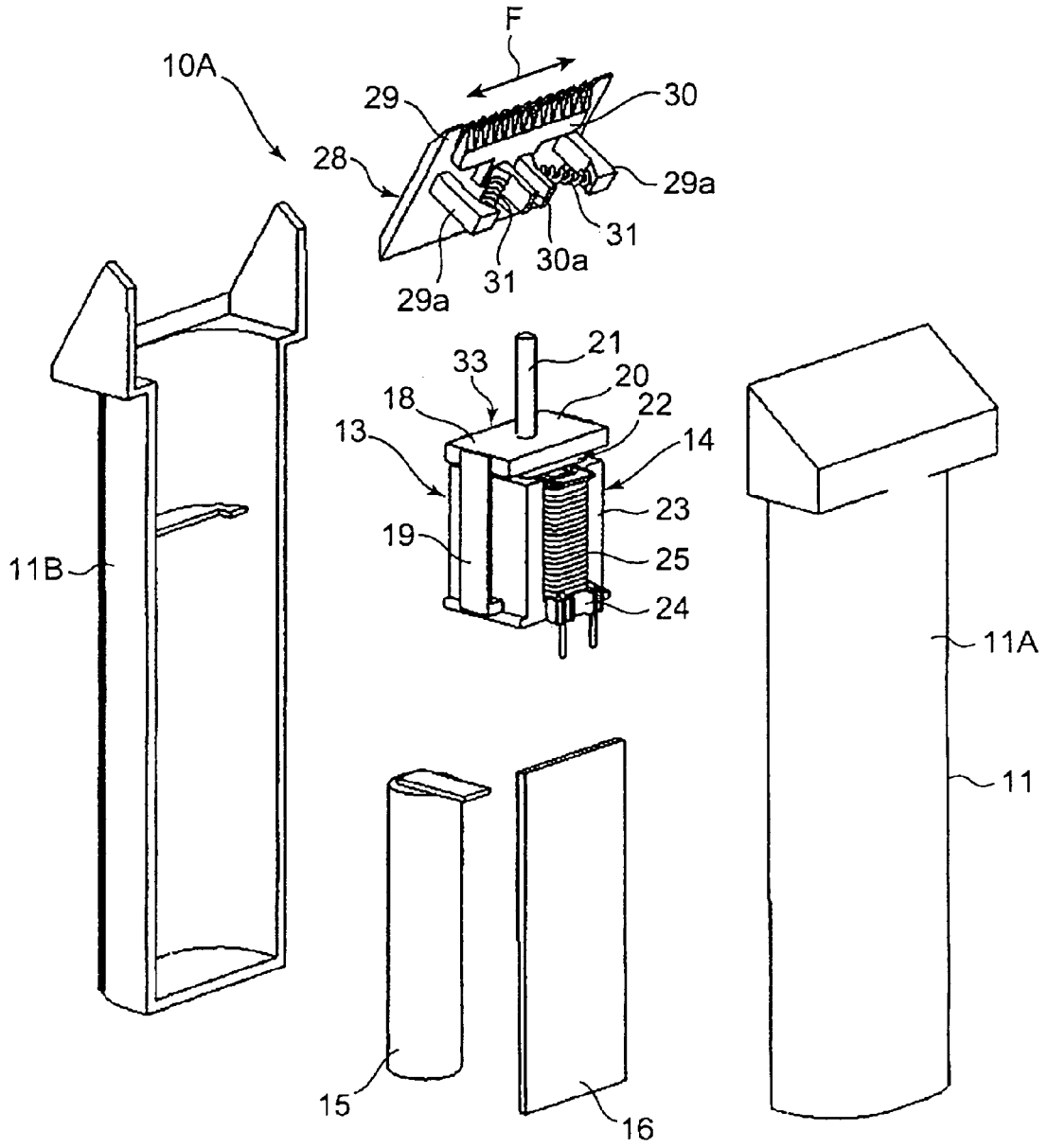

F
10A
29
30
28
29a
31
30a
29a
31
21
33
20
18
22
13
14
23
19
25
24
11B
11A
11
15
16

FIG. 2A

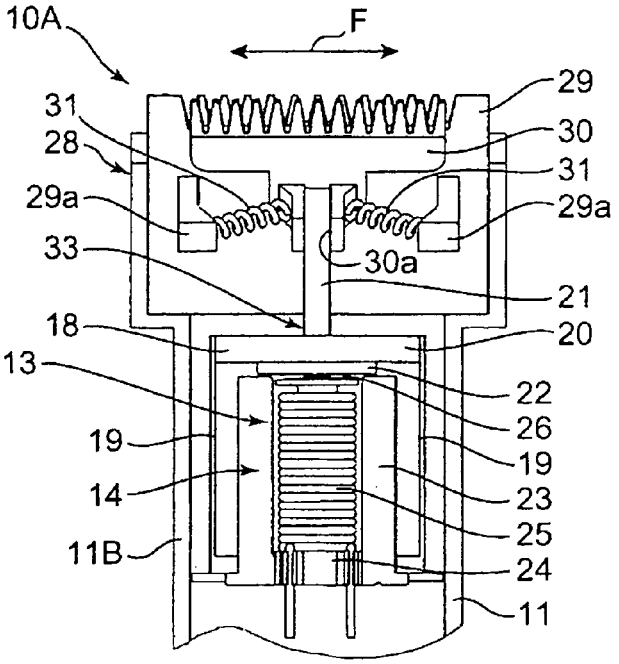

10A
F
29
31
30
28
31
29a
29a
33
30a
21
18
20
13
22
26
19
19
14
23
25
11B
24
11

FIG. 2B

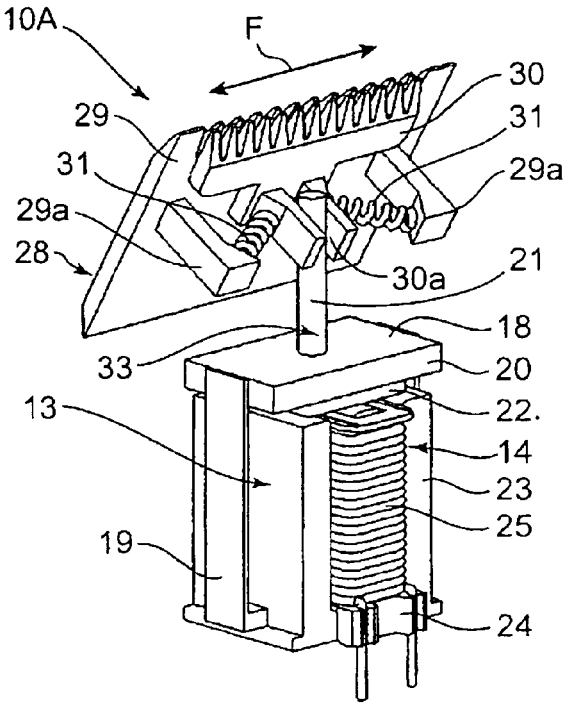

10A
F
30
29
31
31
29a
29a
28
30a
21
18
33
20
13
22.
14
23
25
19
24

FIG.3

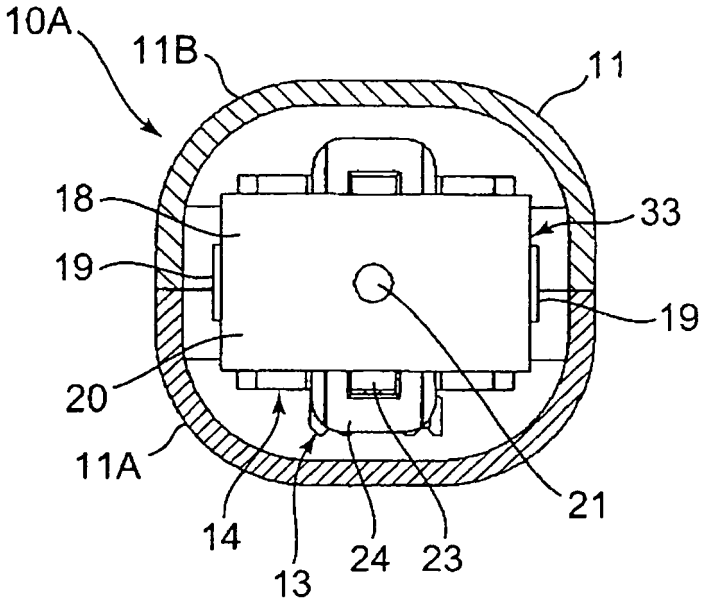


FIG. 4A

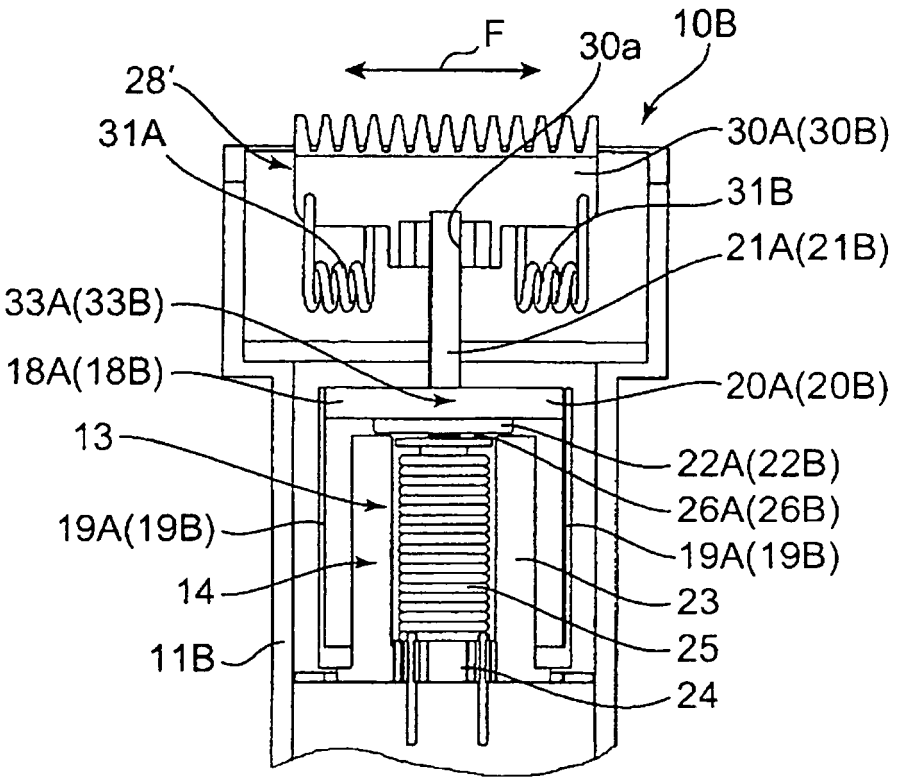

F
30a
10B
28'
31A
30A(30B)
31B
21A(21B)
33A(33B)
18A(18B)
20A(20B)
13
22A(22B)
26A(26B)
19A(19B)
19A(19B)
14
23
25
11B
24

FIG. 4B

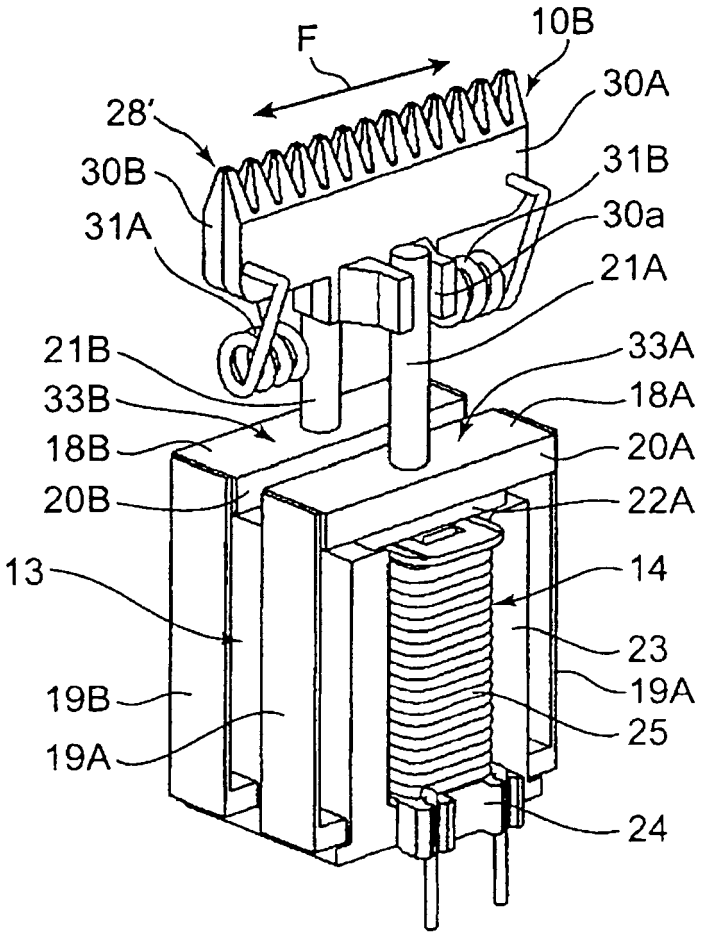

F
10B
30A
28'
30B
31B
31A
30a
21A
21B
33A
33B
18A
18B
20A
20B
22A
13
14
23
19B
19A
25
24

FIG.5A

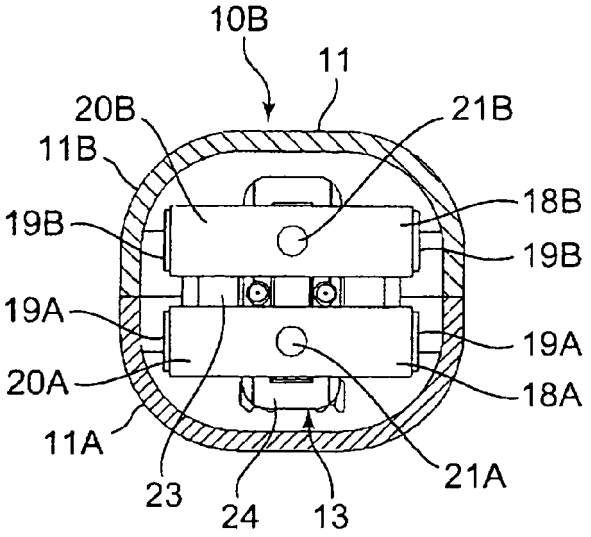

10B
11
20B
21B
11B
18B
19B
19B
19A
19A
20A
18A
11A
21A
23
24
13

FIG.5B

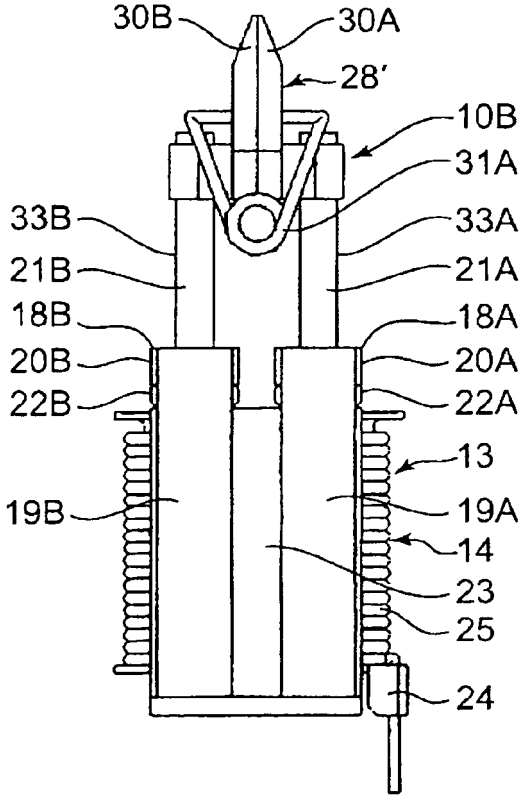

30B
30A
28'
10B
31A
33B
33A
21B
21A
18B
18A
20B
20A
22B
22A
13
19B
19A
14
23
25
24

FIG. 6A

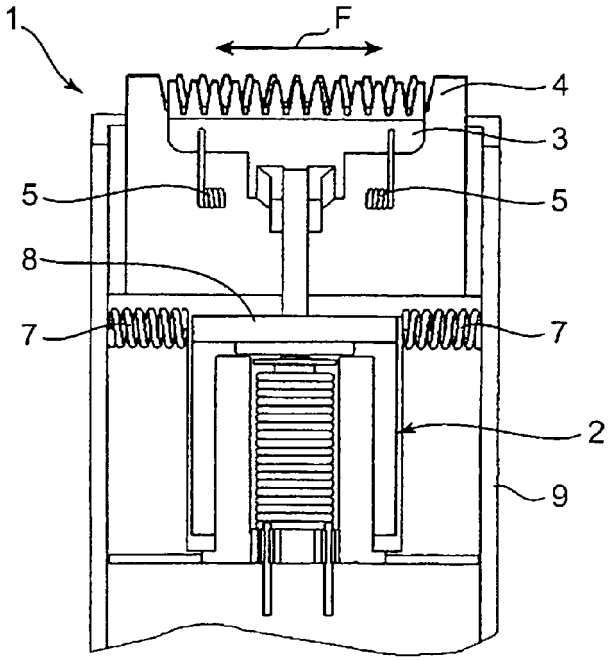


FIG. 6B

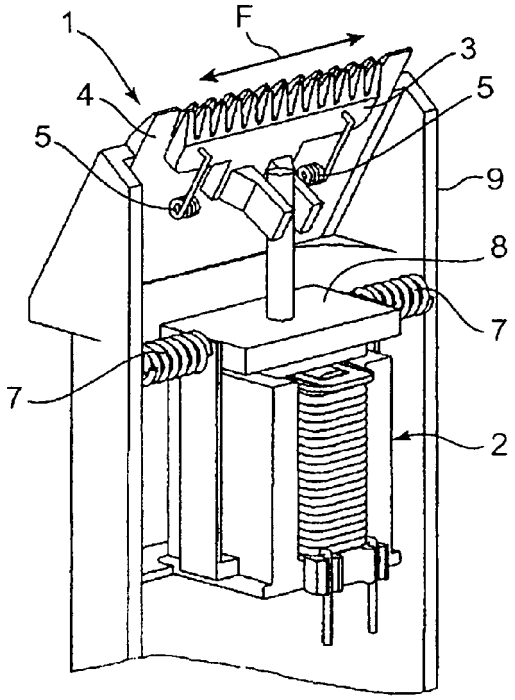
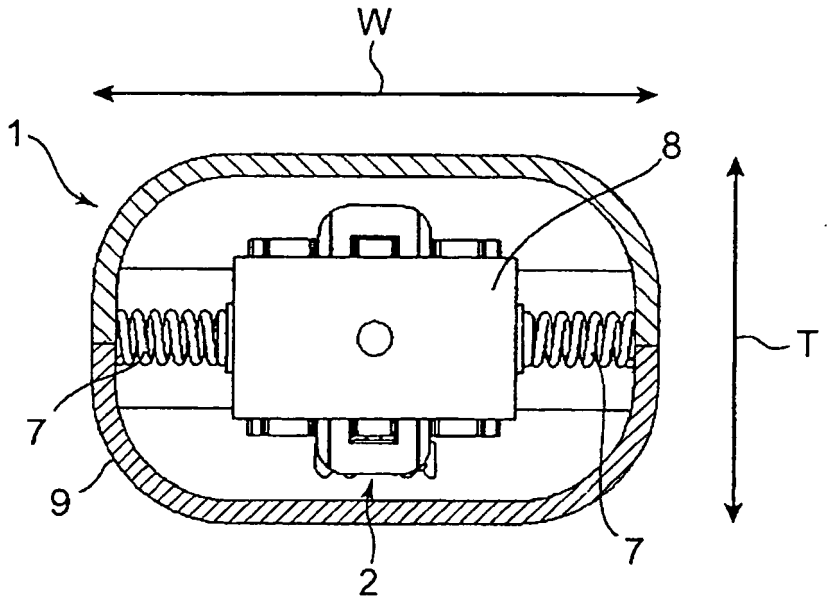


FIG. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 07 00 0350

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A	* column 5, lines 34-40; figures 1,2 *	3	
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A	* paragraphs [0007], [0020]; figures 1,3 *	3	
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TECHNICAL FIELDS SEARCHED (IPC)

B26B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	25 April 2007	RATTENBERGER, B

CATEGORY OF CITED DOCUMENTS

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