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(54) **Durable sander comprising an oscillation buffer element**

(57) A durable sander comprises a body (20) with a drive motor (22), a sanding disk (30) driven by the drive motor (22) to perform sanding movement against the body (20) and at least one oscillation buffer element (40). The oscillation buffer element (40) includes an upper connection bar (41) fastened to the body (20), a lower connection bar (42) fastened to the sanding disk (30) and a plurality of buffer portions (43) bridging the upper connection bar (41) and lower connection bar (42) in an integrated manner. Each buffer portion (43) has a first connection end (431) connected to the upper connection bar (41), a second connection end (432) connected to the lower connection bar (42) and an elastic buffer section (433) interposed between the first connection end (431) and second connection end (432). The length of the elastic buffer section (433) is greater than the distance between the first connection end (431) and the second connection end (432).

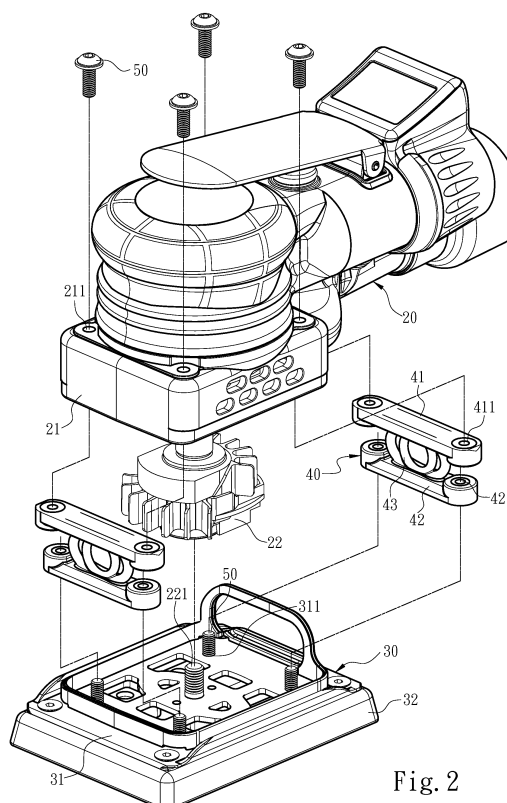


Fig. 2

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a sander and particularly to an oscillation buffer element used in a sander.

BACKGROUND OF THE INVENTION

[0002] Sanders are machine tools driven by high pressure gas or electric power to grind the surface of objects. A conventional sander comprises a drive motor to receive the high pressure gas or electric power as the driving source and a sanding disk driven by the drive motor. During sanding operation the sanding disk is bonded to a replaceable sandpaper and driven by the drive motor to make high speed oscillation about a moving track. The grinding granules of the sandpaper are contacted with an object to flatten and smooth the contact surface or remove other object attached to the surface.

[0003] During the sanding disk performing the high speed oscillation, an oscillation force is generated and transmitted to the sander body through a driving shaft of the drive motor. Hence operators have to apply extra effort to stabilize operation of the sander. The conventional sander generally has at least one cylindrical pillar to connect the sander body and sanding disk. For instance, U.S. patent Nos. 8231437, 7056199, 3862520, 3815292 and 3345784 disclose a sander with elastic pillars installed in four corners of the sander body to fasten the sanding disk. The elastic pillars can be a single strut at a greater diameter, or a cluster structure consisting of multiple elastic struts, as shown in U.S. patent No. 6705931. On the other hand, U.S. patent Nos. 7771253, 6979254, 6855040 and 5626510 disclose another type of sanders with two rows of clustered vertical pillars respectively installed in the front side and rear side of a sanding disk. Each row has a plurality of vertical elastic pillars. When the sanding disk oscillates, the elastic pillars share the oscillation force generated by the sanding disk and reduce the vibration transferred to the operator. Hence the operator can handle the sander easier.

[0004] Please refer to FIG. 1A for an example disclosed in U.S. patent Nos. 7771253, 6979254, 6855040 and 5626510 that has elastic vertical pillars 11 and 11a arranged in a row. When the sander 10 starts running, as shown in FIG. 1B, the sanding disk 12 is driven by a drive motor and oscillates, and the movement of the sanding disk 12 is towed by the elastic vertical pillars 11 and 11a. Since each elastic vertical pillars 11 and 11a has straight structure and the same structural strength, in practice, when the sanding disk 12 oscillates the elastic vertical pillar 11 towards the oscillation direction deforms at a smaller amount than other elastic vertical pillar 11a away from the oscillation direction. As a result, a lift elevation R takes place at some edge of the sanding disk 12 during operation. In other words, the moving track of

the sanding disk 12 does not locate on the same plane. In many circumstances the deformation takes place mainly at the center portion 111 of the elastic vertical pillars 11 and 11a. When the sander 10 is operated for a prolonged duration the center portion 111 of the elastic vertical pillars 11 and 11a could be fractured most easily. As the elastic vertical 11 and 11a are individual straight structure, the lifespan is determined by its own structural strength when the sander 10 is operated.

SUMMARY OF THE INVENTION

[0005] The primary object of the present invention is to solve the problems of the conventional sanders that the edge of the sanding disk is not in close contact with a working object during oscillation, and the center portion of the elastic vertical strut coupled the sander body and sanding disk is easier fractured that result in a short lifespan.

[0006] To achieve the foregoing object the present invention provides a durable sander that includes a body with a drive motor, a sanding disk driven by the drive motor to perform sanding movement against the body and at least one oscillation buffer element. The oscillation buffer element includes an upper connection bar fastened to the body, a lower connection bar fastened to the sanding disk and a plurality of buffer portions bridging the upper connection bar and lower connection bar in an integrated manner. Each buffer portion has a first connection end connected to the upper connection bar, a second connection end connected to the lower connection bar and an elastic buffer section interposed between the first connection end and second connection end. The elastic buffer section is formed at a length greater than a distance between the first and second connection ends.

[0007] In one embodiment the first connection ends of the buffer portions are connected to each other, and the second connection ends of the buffer portions also are connected to each other.

[0008] In another embodiment the first connection ends of the buffer portions are separated from each other, and the second connection ends of the buffer portion also are separated from each other.

[0009] In yet another embodiment the first connection end and second connection end of each buffer portion are located at a same vertical axis, and the elastic buffer section of each buffer portion includes at least one deviation section away from the vertical axis.

[0010] In yet another embodiment the elastic buffer section is formed in an arched shape.

[0011] In yet another embodiment the elastic buffer sections are mirrored about a symmetrical axis.

[0012] In yet another embodiment the oscillation buffer element includes a plurality of first elastic buffer sections and a plurality of second elastic buffer sections which are respectively mirrored about a symmetrical axes.

[0013] In yet another embodiment the buffer portions are located on a same plane.

[0014] In yet another embodiment the elastic buffer section is formed at a width increased from the first connection end towards the second connection end.

[0015] In yet another embodiment the first connection end is formed at a width smaller than that of the elastic buffer section, and the width of the elastic buffer section is smaller than that of the second connection end.

[0016] In yet another embodiment the buffer portion at the outer side of the oscillation buffer element is formed at a width greater than that of the buffer portion in the center of the oscillation buffer element.

[0017] In yet another embodiment the upper connection bar and lower connection bar of the oscillation buffer element respectively include a first hole and a second hole run through by a fastening element which is screwed on the body or sanding disk. The body has a housing to hold the drive motor. The housing has a first fastening hole corresponding to the first hole and run through by the fastening element. The sanding disk has a support frame and a sanding portion fastened to the support frame. The support frame includes a second fastening hole corresponding to the second hole and run through by the fastening element.

[0018] In yet another embodiment the drive motor includes a shaft connected to the sanding disk.

[0019] In addition, the invention further provides an oscillation buffer element installed on a sander. The sander includes a body with a drive motor and a sanding disk driven by the drive motor to perform sanding movement against the body. The oscillation buffer element includes an upper connection bar fastened to the body, a lower connection bar fastened to the sanding disk and a plurality of buffer portions bridging the upper connection bar and lower connection bar. Each buffer portion has a first connection end connected to the upper connection bar, a second connection end connected to the lower connection bar and an elastic buffer section interposed between the first connection end and second connection end. The elastic buffer section is formed at a length greater than the distance between the first and second connection ends.

[0020] The invention provides features of having an oscillation buffer element interposed between a body and a sanding disk of a sander. The oscillation buffer element has an elastic buffer section which is deformable during operation of the sander. The elastic buffer section is formed in a curved shape, hence can provide better extensibility during deformation to stabilize oscillation of the sanding disk so that the sanding disk can oscillate horizontally on the same plane. As the elastic buffer section has a longer deformation zone, it can reduce stress concentrated on various local structures in a prolonged operation period so as to extend the lifespan of the sander.

[0021] The foregoing, as well as additional objects, features and advantages of the invention will be more readily apparent from the following detailed description, which proceeds with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

- 5 FIG. 1A is a fragmentary view of a conventional sander at an initial condition.
 FIG. 1B is a fragmentary view of a conventional sander at an oscillating condition
 10 FIG. 2 is an exploded view of an embodiment of the durable sander of the invention.
 FIG. 3 is a schematic view of a first embodiment of the oscillation buffer element of the invention.
 FIG. 4 is a schematic view of the sander of the invention in an oscillating condition.
 15 FIG. 5 is a schematic view of a second embodiment of the oscillation buffer element of the invention.
 FIG. 6 is a perspective view of a third embodiment of the oscillation buffer element of the invention.
 20 FIG. 7 is a perspective view of a fourth embodiment of the oscillation buffer element of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

- 25 **[0023]** Please refer to FIGS. 2 and 3 for an embodiment of the durable sander and oscillation buffer element thereof according to the invention. The durable sander mainly comprises a body 20 and a sanding disk 30. The body 20 has a housing 21 and a drive motor 22 installed in the housing 21. The drive motor 22 is connected to the sanding disk 30 through a shaft 221. The sanding disk 30 can be driven by the drive motor 22 to perform sanding movement against the body 20. The drive motor 2 can be an electric motor driven by drive power converted from external power via a power modulation circuit, or a pneumatic motor driven by high pressure gas. The sanding disk 30 has a support frame 31 and a sanding portion 32 fastened to the support frame 31. The sanding portion 32 is bonded to a sandpaper. The sander further includes at least one oscillation buffer element 40 which has an upper connection bar 41 fastened to the body 20, a lower connection bar 42 fastened to the sanding disk 30 and a plurality of buffer portions 43 bridging the upper connection bar 41 and lower connection bar 42 in an integrated manner. The upper connection bar 41 and lower connection bar 42 of the oscillation buffer element 40 respectively include a first hole 411 and a second hole 421 run through by a fastening element 50. The housing 21 includes a first fastening hole 211 corresponding to the first hole 411 run through by the fastening element 50. The support frame 31 includes a second fastening hole 311 corresponding to the second hole 421 run through by the fastening element 50. Hence the oscillation buffer element 40 is fastened to the body 20 and sanding disk 30.
 40 **[0024]** In addition, referring to FIG. 3, each buffer portion 43 has a first connection end 431 connected to the upper connection bar 41, a second connection end 432 connected to the lower connection bar 42 and an elastic

buffer section 433 interposed between the first connection end 431 and second connection end 432. The elastic buffer section 433 is formed at a length greater than the distance *a* between the first connection end 431 and second connection end 432. The first and second connection ends 431 and 432 of each buffer portion 43 are located at a same vertical axis X1. The elastic buffer section 433 of each buffer portion 43 also includes at least one deviation section 434 away from the vertical axis X1. The elastic buffer section 433 can be formed in an arched shape with a continuous smooth curve. In this embodiment the buffer portions 43 of the oscillation buffer element 40 are located on a same plane. When the sander is operated the drive motor 22 drives the sanding disk 30 to oscillate through the shaft 221, and the oscillation buffer element 40 connected to the body 20 and sanding disk 30 also deforms. Referring to FIG. 4, take the sanding disk 30 moving rightward against the body 20 as an example for discussion, the lower connection bar 42 drawn by the sanding disk 30 also is moved rightward, and the elastic buffer section 433 connected to the second connection end 432 also is driven and deforms rightward. If the sanding disk 30 is moved leftward against the body 20, the elastic buffer section 433 also deforms leftward. Due to the length of the elastic buffer section 433 is greater than the distance *a* between the first connection end 431 and second connection end 432, the deformation zone of the elastic buffer section 433 is longer to reduce the stress generated by the deformation and the deformation amount of each unit length. Moreover, the elastic buffer section 433 has sufficient extensibility to make the sanding disk 30 to oscillate steadily and horizontally on the same plane during movement.

[0025] Referring to FIGS. 2 and 3, the first connection ends 431 of the buffer portions 43 are connected to each other, and the second connection ends 432 of the buffer portions 43 also are connected to each other. Since the first and second connection ends 431 and 432 of different buffer portions 43 are connected to each other, the connection of the buffer portion 43 with the upper connection bar 41 or lower connection bar 42 is enhanced, and total structural strength of the oscillation buffer element 40 also increases. In another embodiment the first connection ends 431 of the buffer portions 43 are separated from each other and the second connection ends 432 of the buffer portions 43 are separated from each other, as shown in FIG. 5. Hence the buffer portions 43 of the oscillation buffer element 40 also are separated from each other.

[0026] In terms of arrangement of the buffer portions 43 of the oscillation buffer element 40, FIG. 3 illustrates an embodiment in which the oscillation buffer element 40 includes a plurality of elastic buffer sections 433 mirrored about a symmetrical axis X2. FIG. 6 depicts another embodiment in which the oscillation buffer element 40 includes a plurality of first elastic buffer sections 433a and a plurality of second elastic buffer sections 433b which are respectively mirrored about a symmetrical axis

X2.

[0027] During operation of the sander, the lower half portion of the oscillation buffer element 40 usually deforms at a greater amount than the upper half portion. In order to enhance the structural strength of the oscillation buffer element 40, referring to FIG. 7, the first connection end 431 can be formed at a width W1 smaller than the width W2 of the elastic buffer section 433, and the width W2 of the elastic buffer section 433 is smaller than the width W3 of the second connection end 432. Or the width of the elastic buffer section 433 can be increased from the first connection end 431 towards the second connection end 432. On the other hand, the width of the buffer portion 43a at the outer side of the oscillation buffer element 40 is greater than the width of the buffer portion 43b in the center of the oscillation buffer element 40.

[0028] In short, the durable sander of the invention provides a feature with at least one oscillation buffer element interposed between the body and sanding disk. The oscillation buffer element has an elastic buffer section which can deform during operation of the sander. The elastic buffer section is formed in a curved structure to provide better extensibility during deformation to stabilize horizontal oscillation of the sanding disk on the same plane and maintain sanding quality. Comparing with the conventional vertical straight elastic strut structure, the elastic buffer section has longer deformation zone to reduce stress concentrated on local structures in prolonged operation period. As a result, overall lifespan of the sander is prolonged.

Claims

1. A durable sander, comprising:

a body (20) holding a drive motor (22) inside;
a sanding disk (30) driven by the drive motor (22) to perform sanding movement against the body (20); and
at least one oscillation buffer element (40) which includes an upper connection bar (41) fastened to the body (20), a lower connection bar (42) fastened to the sanding disk (30) and a plurality of buffer portions (43) bridging the upper connection bar (41) and the lower connection bar (42) in an integrated manner; each of the plurality of buffer portion (43) including a first connection end (431) connected to the upper connection bar (41), a second connection end (432) connected to the lower connection bar (42) and an elastic buffer section (433) interposed between the first connection end (431) and the second connection end (432), the elastic buffer section (433) being formed at a length greater than a distance (*a*) between the first connection end (431) and the second connection end (432).

2. The durable sander of claim 1, wherein the first connection ends (431) of the buffer portions (43) are connected to each other and the second connection ends (432) of the buffer portions (43) are connected to each other. 5
3. The durable sander of claim 1 or 2, wherein the first connection ends (431) of the buffer portions (43) are separated from each other and the second connection ends (432) of the buffer portions (43) are separated from each other. 10
4. The durable sander of any of the claims 1 to 3, wherein the first connection end (431) and the second connection end (432) of each buffer portion (43) are located at a same vertical axis (X1), the elastic buffer section (433) of each buffer portion (43) including at least one deviation section (434) away from the vertical axis (X1). 15
20
5. The durable sander of any of the claims 1 to 4, wherein the elastic buffer section (433) is formed in an arched shape.
6. The durable sander of any of the claims 1 to 5, wherein the elastic buffer sections (433) are mirrored about a symmetrical axis (X2). 25
7. The durable sander of any of the claims 1 to 6, wherein the oscillation buffer element (40) includes a plurality of first elastic buffer sections (433a) and a plurality of second elastic buffer sections (433b) which are respectively mirrored about a symmetrical axis (X2). 30
35
8. The durable sander of any of the claims 1 to 7, wherein the buffer portions (43) are located on a same plane.
9. The durable sander of any of the claims 1 to 8, wherein the elastic buffer section (433) is formed at a width increased from the first connection end (431) towards the second connection end (432). 40
10. The durable sander of any of the claims 1 to 9, wherein the first connection end (431) is formed at a width (W1) smaller than that of the elastic buffer section (433), and the width (W2) of the elastic buffer section (433) is smaller than that of the second connection end (432). 45
50
11. The durable sander of any of the claims 1 to 10, wherein the buffer portion at an outer side (43a) of the oscillation buffer element (40) is formed at a width greater than that of the buffer portion in the center (43b) of the oscillation buffer element (40). 55
12. The durable sander of any of the claims 1 to 11, wherein the upper connection bar (41) and the lower connection bar (42) of the oscillation buffer element (40) respectively include a first hole (411) and a second hole (421) run through by a fastening element (50) which is screwed on the body (20) or the sanding disk (30).
13. The durable sander of claim 12, wherein the body (20) includes a housing (21) to hold the drive motor (22), the housing (21) including a first fastening hole (211) corresponding to the first hole (411) and run through by the fastening element (50).
14. The durable sander of claim 12 or 13, wherein the sanding disk (30) includes a support frame (31) and a sanding portion (32) fastened to the support frame (31), the support frame (31) including a second fastening hole (311) corresponding to the second hole (421) and run through by the fastening element (50).
15. The durable sander of any of the claims 1 to 14, wherein the drive motor (22) includes a shaft (221) connected to the sanding disk (30).

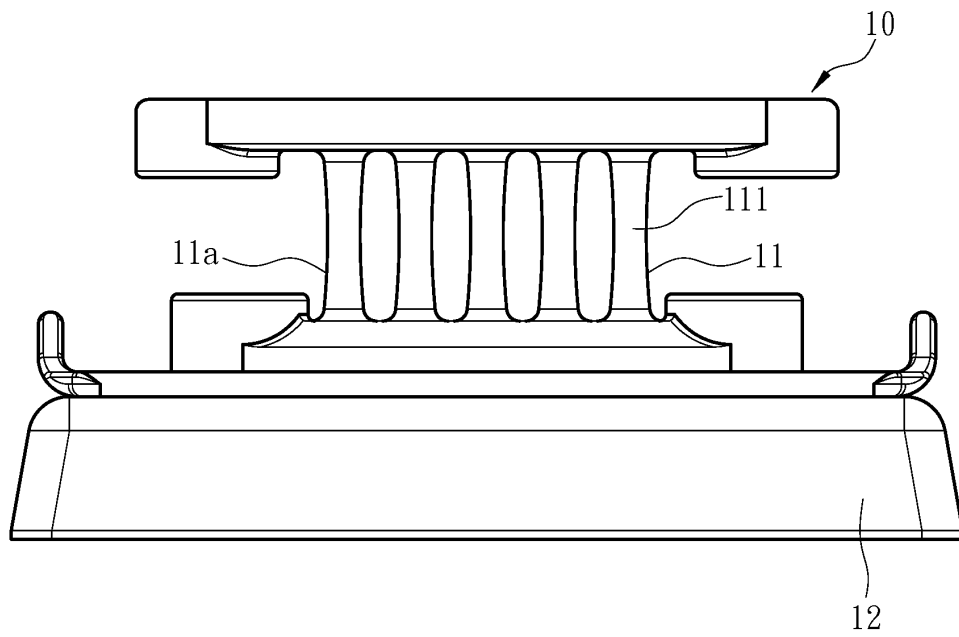


Fig. 1A PRIOR ART

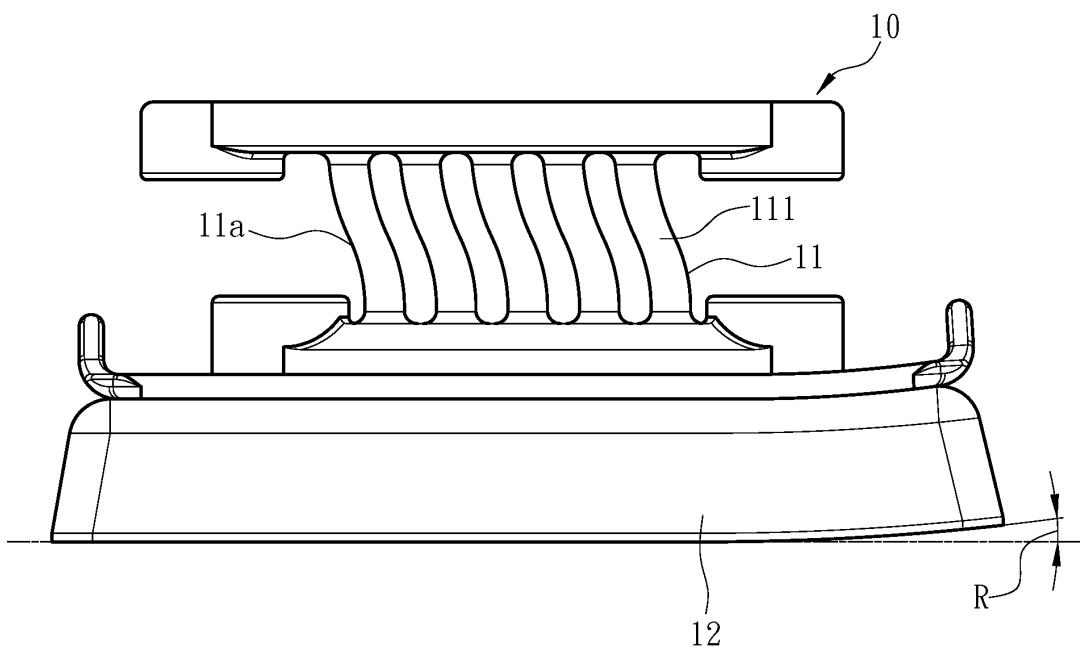


Fig. 1B PRIOR ART

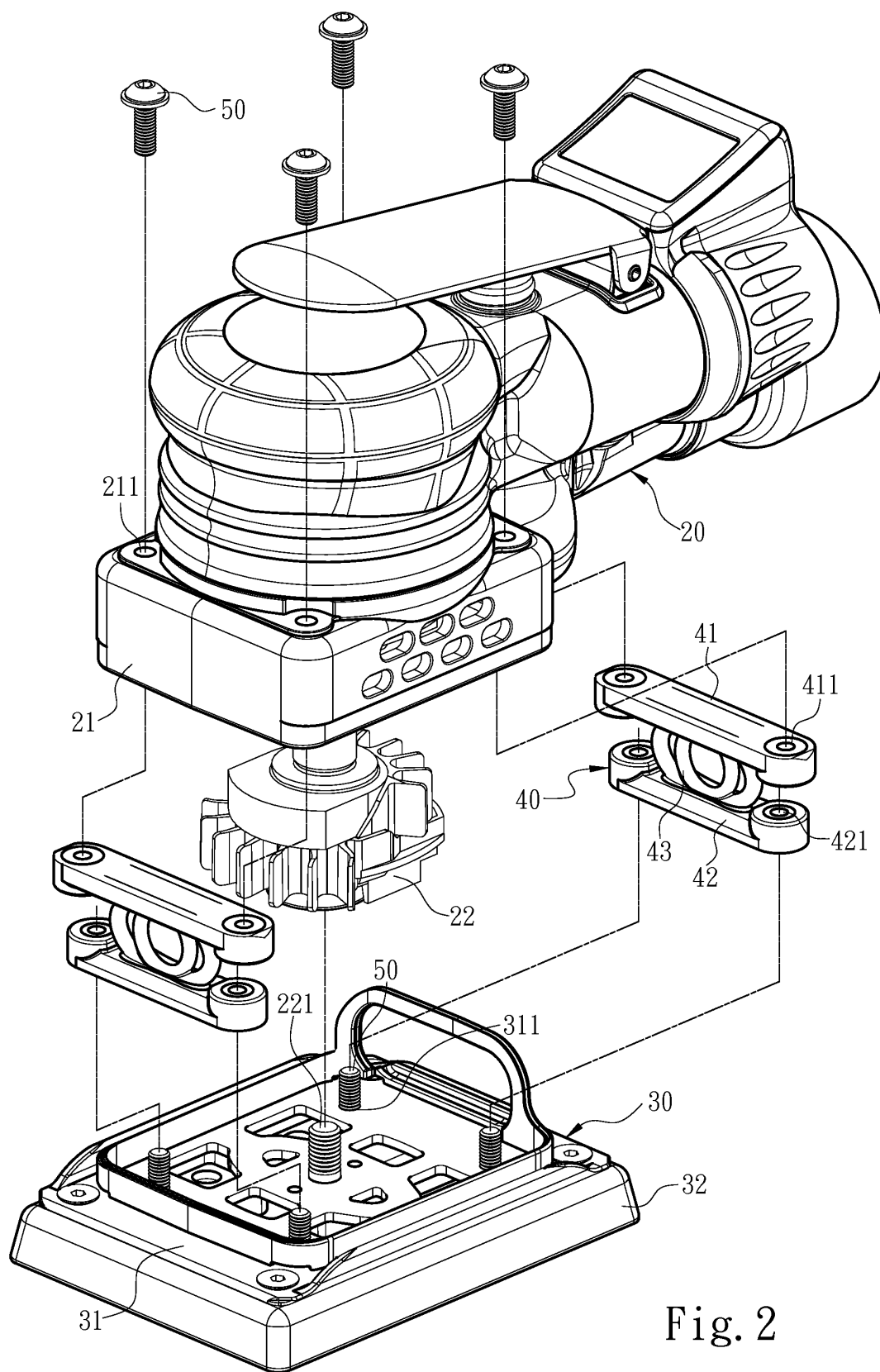


Fig. 2

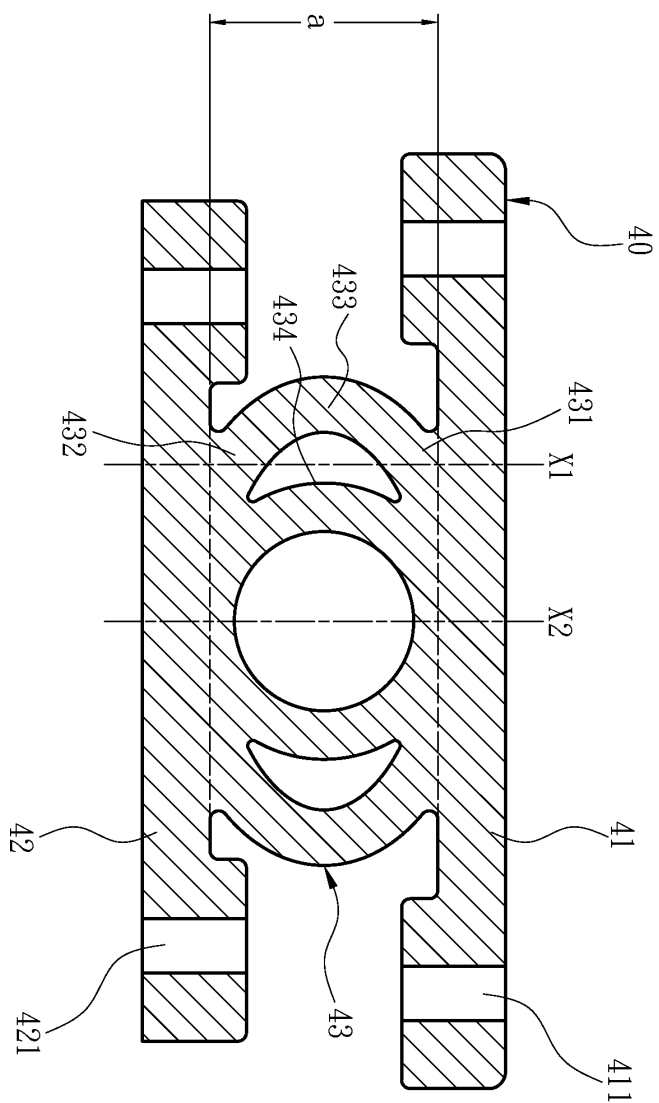


Fig. 3

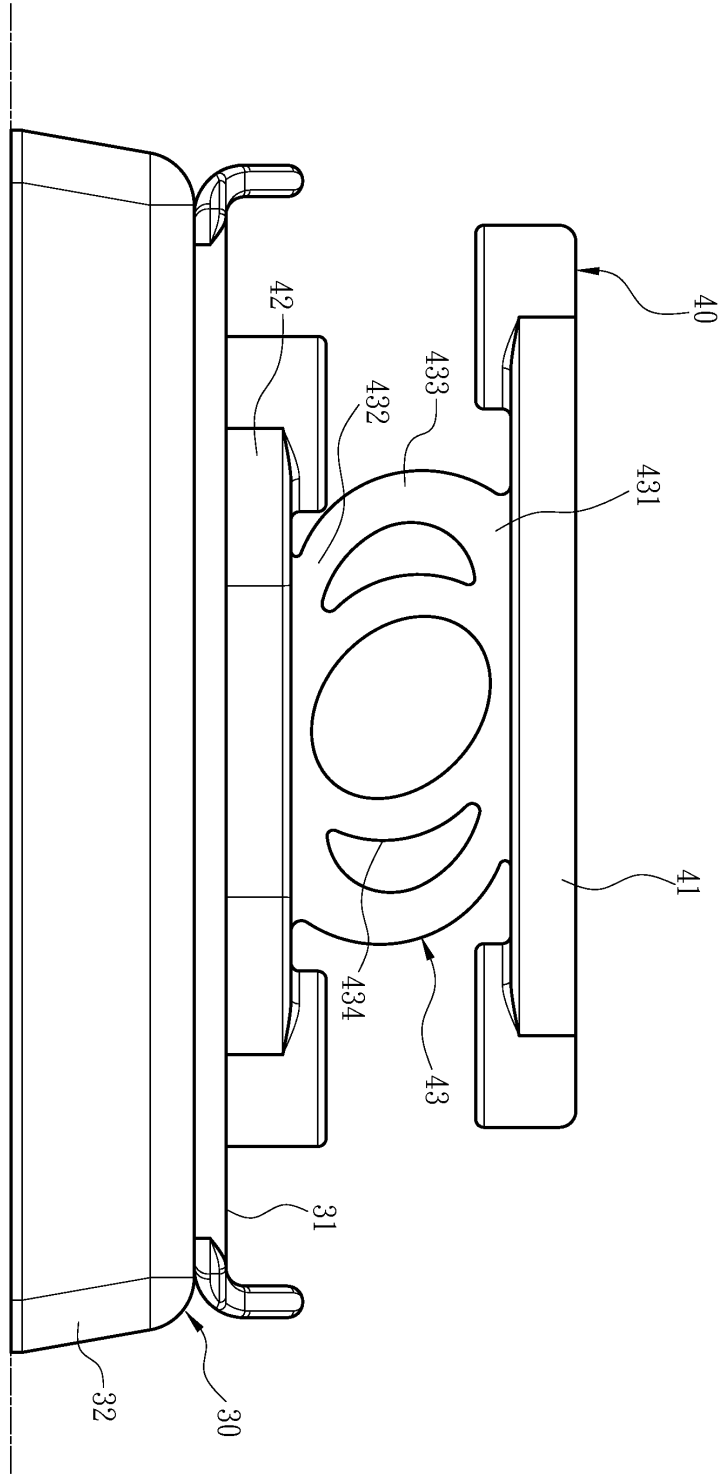


Fig. 4

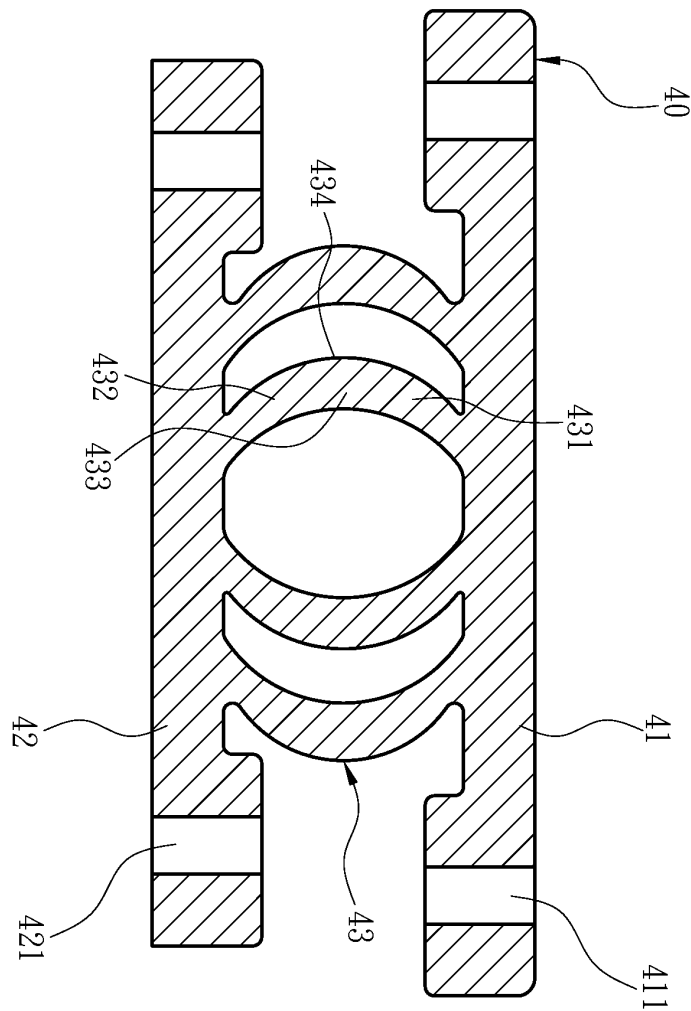


Fig. 5

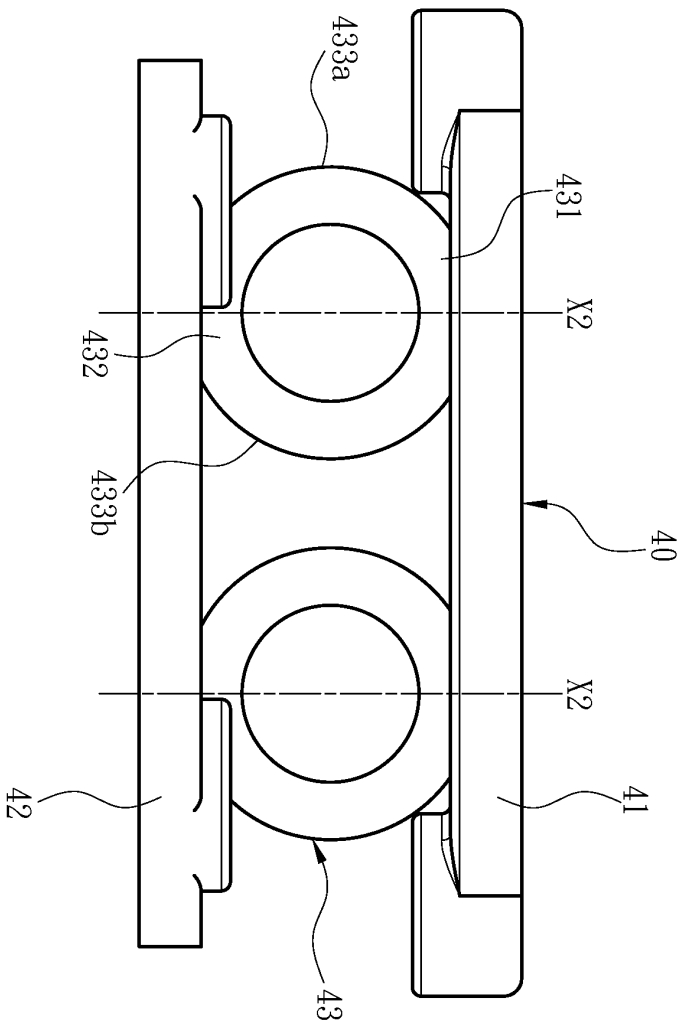


Fig. 6

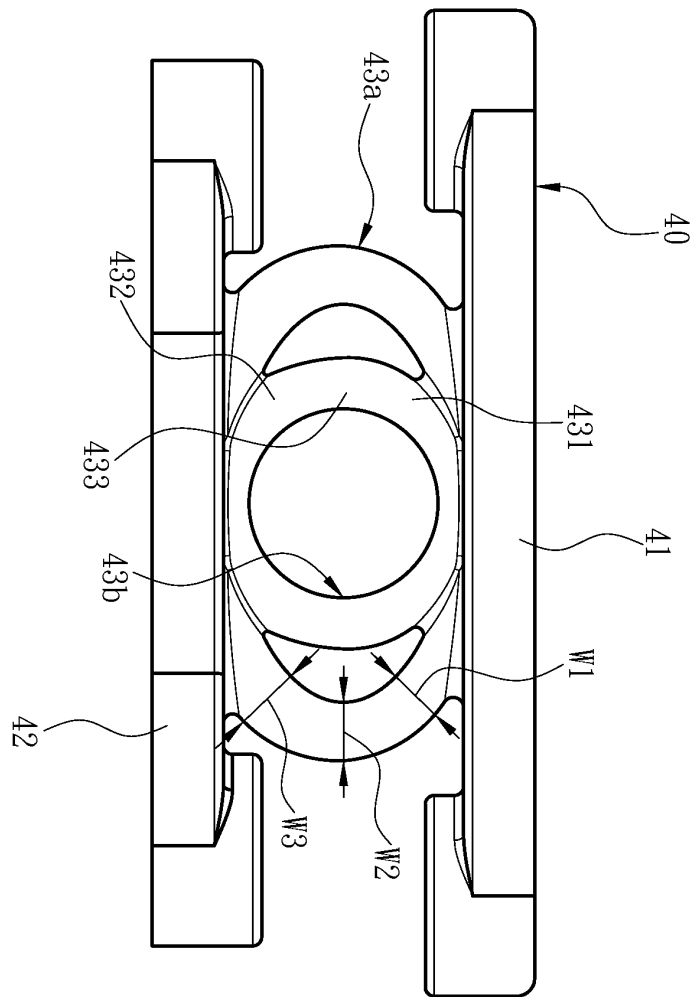


Fig. 7



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Application Number
EP 13 17 3240

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 23 October 2013	Examiner Zeckau, Jochen
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