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(54) Polishing apparatus.

(57) A polishing apparatus including a driving source (3), a polishing member (4) driven by the driving source (3), and a pair of guide members (23) and (30). The polishing member 4 is composed of a pair of rigid support plates (51) and (52) and an elastic body (50) sandwitched between the pair of rigid support plates (51) and (52). The lower-positioned support plate (52) is formed with a polishing face (5).

Fig. 3

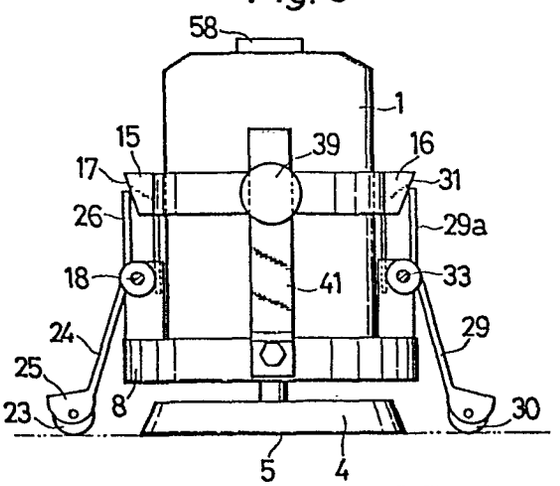
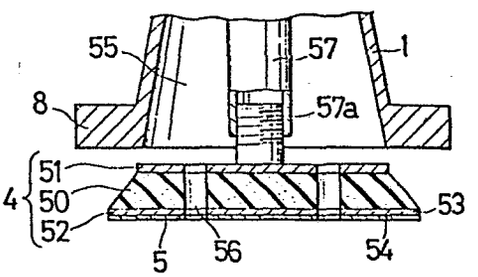


Fig. 9



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DESCRIPTION

POLISHING APPARATUS

The present invention relates to an apparatus for polishing the painted surfaces of automobiles or the like.

It has been a common practice to use a sand paper manually with water for the area to be polished when automobiles are repainted. However, although it is laborious to perform such an operation, uniform polish can not be expected with irregular finishing.

Therefore, the principal object of the invention is to provide a polishing apparatus which can accomplish the uniformly polished finishing.

To achieve the above object, the polishing apparatus in accordance with the invention comprises a driving source having a vertical axis of rotation, a polishing member comprising a polishing face perpendicular to the axis of rotation and being driven to rotate by the driving source, and a pair of guide members extending in a direction perpendicular to the axis of rotation and being disposed on both sides of the polishing member.

In a preferred embodiment of the invention, the polishing member comprises a pair of rigid support plates, one of the support plates being disposed on the lower position with respect to the axis of rotation and being formed with

the polishing face, and an elastic body sandwitched between the pair of rigid support plates.

Hence, according to the invention, uniform polished finishing can be accomplished by means of the guide members. In addition, because of the elastic body on the polishing member, surface having a small curvature radius can be smoothly polished for the entire area thereof. Furthermore, since the polishing face is supported by a rigid plate, slight unevenness on a surface to be polished can be removed and polished.

The features and advantages of the invention will be apparent from the following description of the preferred embodiment taken in conjunction with the appended claims and the accompanying drawing figures wherein :

Fig. 1 is a side elevation of an embodiment of the invention;

Fig. 2 is a top plain view of an embodiment of the invention;

Fig. 3 is a front elevation of an embodiment of the invention;

Fig. 4 is a perspective view showing in detail a roller employed as a guide member and the vicinities thereof of the invention;

Fig. 5 is a plain view showing an arrangement of a pair of guide rollers and the construction relative thereto of the invention;

Fig. 6 is a sectional view showing in detail the vicinities of a movable element of the invention;

Fig. 7 is an elevational view showing a movement of the movable member of the invention;

Fig. 8 is a sectional view showing the vicinities of a rotational shaft of the invention;

Fig. 9 is a sectional view showing a polishing member and the vicinities thereof of the invention;

Fig. 10 is a plain view showing a bottom face of the polishing member of the invention;

Fig. 11 through Fig. 13 are simplified views illustrating modes of operations of the polishing apparatus of the invention;

Fig. 14 is a simplified view illustrating a movement of a polishing face of the invention.

As shown in Fig. 1, a main body 1 forms substantially "L" and a connecting end 2 on the main body 1 receives pressurized air which drives an air pressure motor 3 integrated in the main body 1. By this air pressure motor 3 a polishing member 4 is rotated about the vertical axis of rotation, and a polishing face 5 is formed in a plane perpendicular to the axis. Dust produced by the polishing operation using the polishing member 4 thus formed is absorbed toward a vacuum source through a bottom portion 6 on the main body 1 and a connecting end 7. The connecting end 2 and 7 are respective-

ly connected with flexible tubes.

The polishing apparatus according to the invention is formed symmetric with respect to a plane which contains the vertical axis of rotation of the polishing member 4. A base member 8 formed at the bottom of the main body 1 protrudes radially outwardly of the main body 1. As also shown in Figs. 4 and 5 the base member 8 has a pair of circumferentially spaced brackets 9 and 10 and another pair of circumferentially spaced brackets 11 nad 12 opposite to the pair of brackets 9 and 10. The brackets 9 and 11 substantially have the shape of the letter L as viewed from the horizontal plane. To these brackets 9 and 11 a U-shaped adjusting member 14 is attached at both the ends thereof by pins 13 and 18. These ends are fixed on the brackets 9 and 11 in such a way that the adjusting member 14 can be angularly displaced about the axis that is perpendicular to the axis of rotation. On legs 14a and 14b of the adjusting member 14 abutting projections 15 and 16 are formed respectively. The abutting projection 15 has an abutting surface 17 which is inclined toward the axis of rotation as it lowers. The other abutting projection 16 is identical in shape with the abutting projection 15.

The bracket 9 is provided with a screw bar 18 whose axis extends perpendicular to the axis of rotation and the axis of the pin 13, and which passes through a through hole 19. One end of the screw bar 18 passes through a through

hole 20 formed on the bracket 10 and E rings 21 and 22 provided thereon prevent the bar 18 from axial displacements. A roller 23 playing the role of a guide member is rotatably held on a support leg 25 of an operating member 24 about an axis parallel to the screw bar 18. An adjusting portion 26 formed in an upper portion of the operating member 24 and bent toward it can make contact with the tilted surface 17 of the abutting projection 15. At a meeting point of the leg 25 with the adjusting portion 26 there is formed a pair of tapped holes 27 in a spaced relation. These tapped holes 27 receive the screw bar 18. By rotating a knob 28 of the screw bar 18 the operating member 24 and the guide roller 23 can be moved along the axis of the screw bar 18. Between said tapped holes 27 for the screw bar 18 a coil spring 100 is disposed around the bar 18, and one end of the coil spring 100 is supported by the base member 8 and the other end of the same is supported on the surface of the operating member 24 which is facing to the base member 8. By this coil spring 100 the operating member 24 is given force away from the base member 8 and consequently, the adjusting member 26 is always given force repulsive to the tilted surface 17. Furthermore a spring 119 is provided around the screw bar 18 between the knob 28 and the bracket 9 to thereby cause the smooth rotation of the screw bar 18. The same construction is provided with respect to the leg 14b in which an operating member 29, a guide roller

30, and an abutting projection 16 having an abutting surface 31 are similarly provided. Likewise, by rotating a knob 32 of the screw bar 33 which is provided with a spring 120 thereabout between the knob 32 and the bracket 11, the operating member 29 can be moved along said operating member 24 in parallel.

As clearly shown in Fig. 6, approximately at the center of the adjusting member 14 there is formed a ring unit 34. At a fixed wall 36 located opposite to a holder 35 on the body side a nut 37 is disposed. A fixing screw bar 38 screwed in this nut 37 protrudes toward the holder 35. The screw bar 38 is rotated through a knob 39. One end 40 of the screw bar 38 can make contact with a movable element 41 which is fixed to the base member 8. By the end 40 of the screw bar 38 the movable element 41 can be firmly sandwiched between the end 40 and the holder 35 whereby the angular displacement positions of the adjusting member 14 about the axis of 13 (81) can be set. Through this setting the angular displacement positions of the operating members 24 and 29 about the axes of the screw bar 18 and 33 are determined. Accordingly the positional relationship between the lower surfaces of the rollers 23, 30 and the polishing face 5 of the polishing member 4 can be adjusted so that the polishing face 5 will protrude slightly lower than the lower surfaces of the rollers 23, 30 or it is flush with the surfaces.

At the lower end 41a of the movable member 41 there is formed a slot 102 extending vertically with respect to Fig. 6. A screw 103 for fixing the movable element 41 to the base member 8 is screwed in a tapped hole 104 of the base member 8 through this slot 102. The relation between the diameter ℓ1 of the slot 102 and the ℓ2 of the screw 103 is expressed by ℓ1 > ℓ2 and, therefore the movable element 41 is allowed to move by way of the screw 103 by the distance ℓ1-ℓ2. By this movement the adjusting member 14 can be slightly displaced angularby about the axes of the pins 13 and 81 with the movable element 41 being sandwiched between the end 40 of the screw bar 38 and the holder 35. In other words, the adjusting member 14 is fixed to the base member 8 with a certain play therebetween. When vibrations caused by a surface 70 to be polished are transferred from the rollers 23, 30 to the projections 15, 16 of the adjusting member 14 through the operating members 24, 29 and the adjusting members 26, 29a shown in Fig. 7 during polishing work, the play of the movable element 41 serves to make the vibrations absorbed by the adjusting member 14, thereby achieving a stable rotating operation of the polishing member 4. In addition, since the rollers 23 and 30 are individually installed from each other, vibrations on one roller 23 or 30 will not be transferred to the other roller 30 or 23 but will be fully absorbed by the adjusting member 14, a remarkable

improvement in work is accomplished.

Fig. 8 shows a sectional view showing the vicinities of a rotating shaft 89. The radial force of the rotating shaft 89 is supported by bearings 90 and 91. The rotating shaft 89 is rotatably driven by a rotor 92, and a rotating cylinder 93 is fixed to the lower end of the rotating shaft 89 by means of a jig 94. Inside the rotating cylinder 93 a rotating shaft 57 is rotatably disposed through a bearing 95 so as to be eccentric by distance d with respect to the axis of the rotating shaft 89. On the rotating shaft 57 a screw 57a which is fixed to the polishing member 4 integrally is screwed coaxially. By disposing the shaft 57 and 89 eccentrically to each other, the polishing face 5 of the polishing member 4 can be driven to move as shown in Fig. 14. The driving mechanism of the polishing member 4 is not limited to the one shown in Fig. 8 but other driving mechanisms such as gives a single circular movement may be employed.

Fig. 9 is an enlarged view of the polishing member 4 and the vicinities thereof. An elastic 50 made of rubber, sponge and the like is sandwiched between a rigid support plate 51 of metal or the like and a rigid support plate 52 having the polishing face 5. The support plate 5 comprises a rigid plate 53 made of bakelite or the like and sand paper 54, which has the polishing face 5, bonded to the rigid plate 53 with an adhesive agent. A cavity 55 formed within the main

body 1 is communicated with the connecting end 7 for absorbing fine dust of the painted surfaces of automobile bodies produced during polishing work by the polishing face 5 whereby working environment is properly maintained. To improve the absorbing efficiency of dust produced, the polishing member 4 is specifically provided with a plurality of suction holes 56 which are bored through the polishing member 4 in the thicknesswise direction thereof and are circumferentially spaced at intervals. A screw stud 57a mounted on the center of the support plate 51 is screwed in the rotating shaft 57 to connect the polishing member 4 to the shaft 57. The motor 3 is supplied with pressurized air for driving the polishing member 4 to rotate by depressing an operating lever 58, which is mounted on the top of the main body 1, around an axis of a pin 59 so as to press a knob 60. The lever 58 is reset to its original position by a spring not shown. Another lever 61 is adapted to be angularby displaced. By operating the lever 61, air flow rate to be supplied to the motor 3 can be varied, thereby changing the rotating speed of the motor 3.

With the guide rollers 23 and 30 being in contact with the body of an automobile to be polished, the polishing face 5 of the polishing member 4 rotating polishes the surface of the body. In the case where the surface 70 to be polished has an outwardly protruding cylindrical portion,

by placing the rollers 23 and 30 parallel to the circumferential direction of the cylindrical portion as shown in Fig. 11, that is, parallel to a direction shown by a curved arrow 71 in Fig. 11, the entire peripheral area of the outwardly protruding cylindrical portion in the surface 70 can be positively uniformly polished. In addition, by adjusting the screw bars 18 and 33 with respect to the axial positions thereof through the rotation of the knobs 28 and 32, a surface 70 to be polished having a stepped portion 70a as shown in Fig. 12 can be fully polished.

Since the support plate 52 having the polishing face 5 is fixed to the rigid support plate 51 through the elastic body 50, a somewhat uneven surface 70 can be polished to be even because of this rigidity. The elastic body 50 contributes, on the other hand, to smoothly polish a surface 70 having a small curvature radius as shown in Fig. 13 for the entire area thereof. Furthermore, polishing wherein the outer edge of the polishing face 5 is employed can be effected because of the elasticity of the elastic body 50, and whereby the operator can always check the condition of the surface being polished, so that excellent finish can be attained.

As other embodiments of the present invention, other type of driving source for operating the polishing member may be used in place of the air pressure motor 3.

Likewise the rollers 23 and 30 may be replaced with bars or rods fixed to the operating members 24 and 29 respectively.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

CLAIMS

1. A polishing apparatus characterized by a driving source 3 having a vertical axis of rotation; a polishing member 4 comprising a polishing face 5 perpendicular to the axis of rotation and being driven to rotate by the driving source 3; and a pair of guide members 23 and 30 extending in a direction perpendicular to the axis of rotation and being disposed on both sides of the polishing member 4.

2. A polishing apparatus as recited in claim 1 characterized in that the polishing member 4 comprises a pair of rigid support plates 51 and 52, one 52 of the support plates being disposed on the lower position with respect to the axis of rotation and being formed with the polishing face 5; and an elastic body 50 sandwitched between the pair of rigid support plates 51 and 52.

Fig. 1

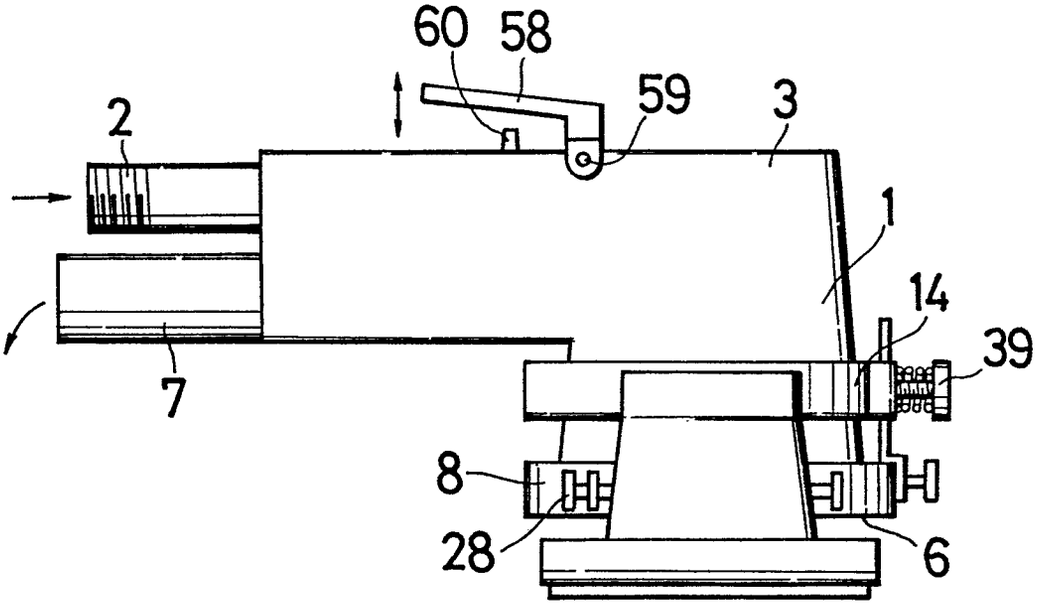
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Fig. 3

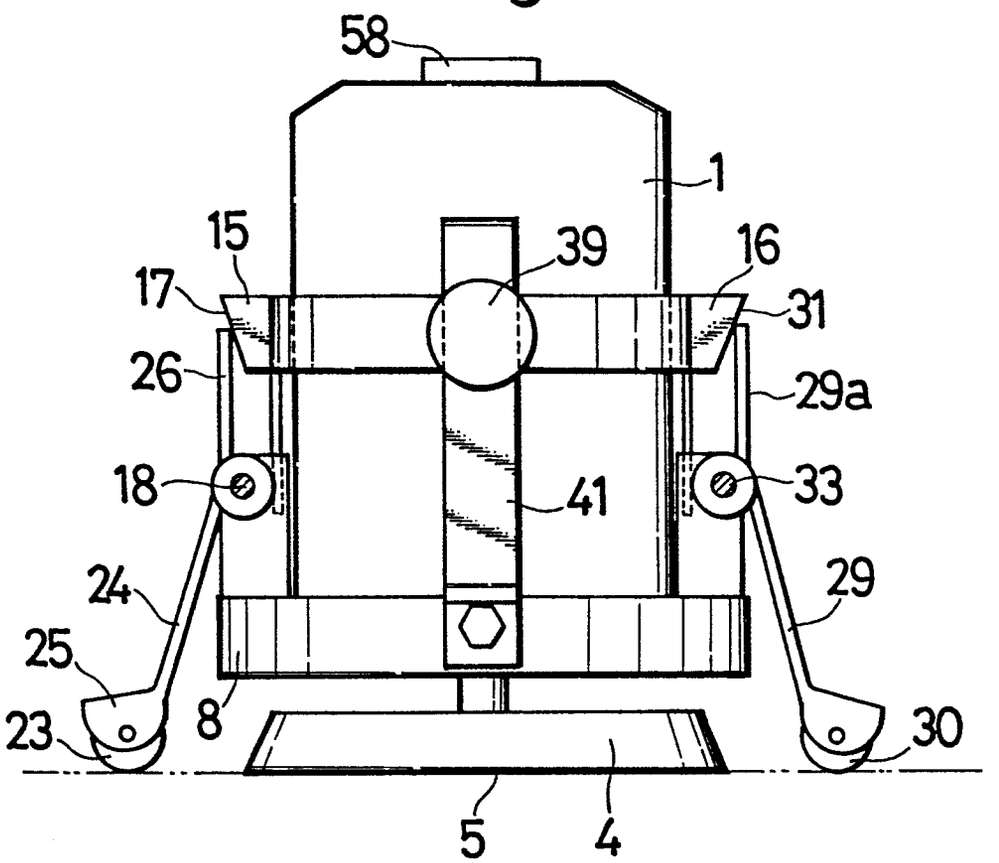
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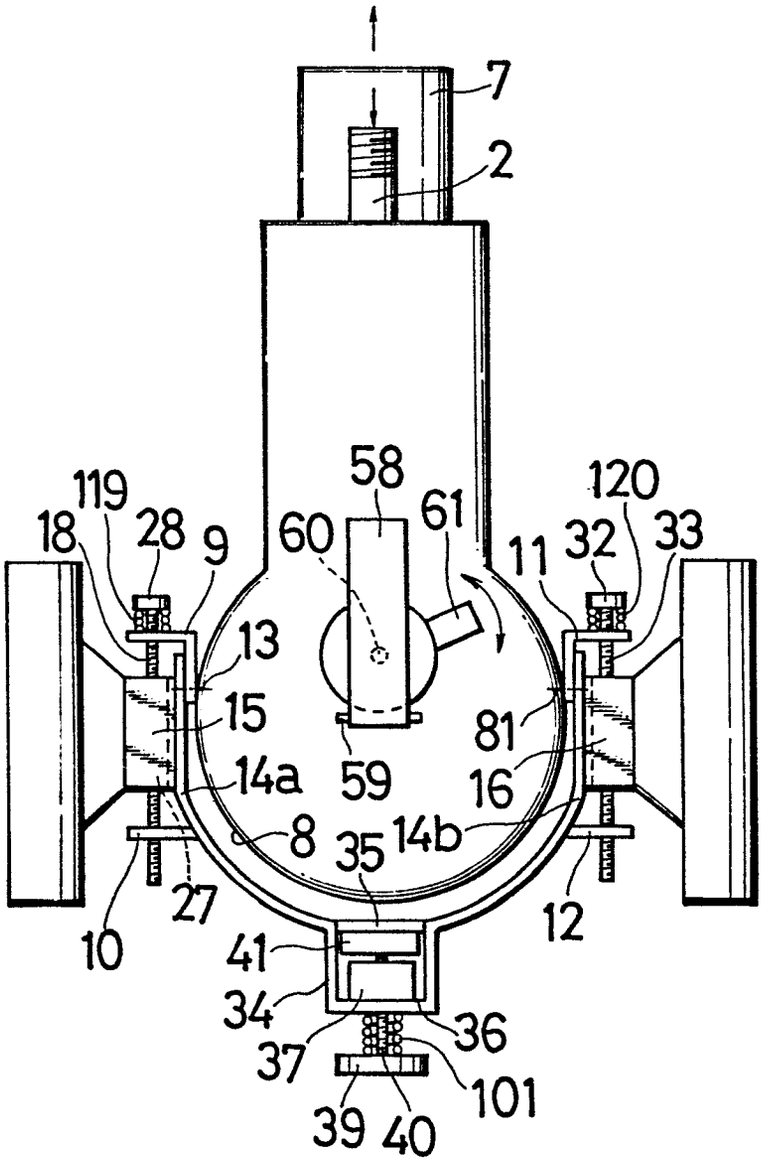
Fig. 2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40

Fig. 4

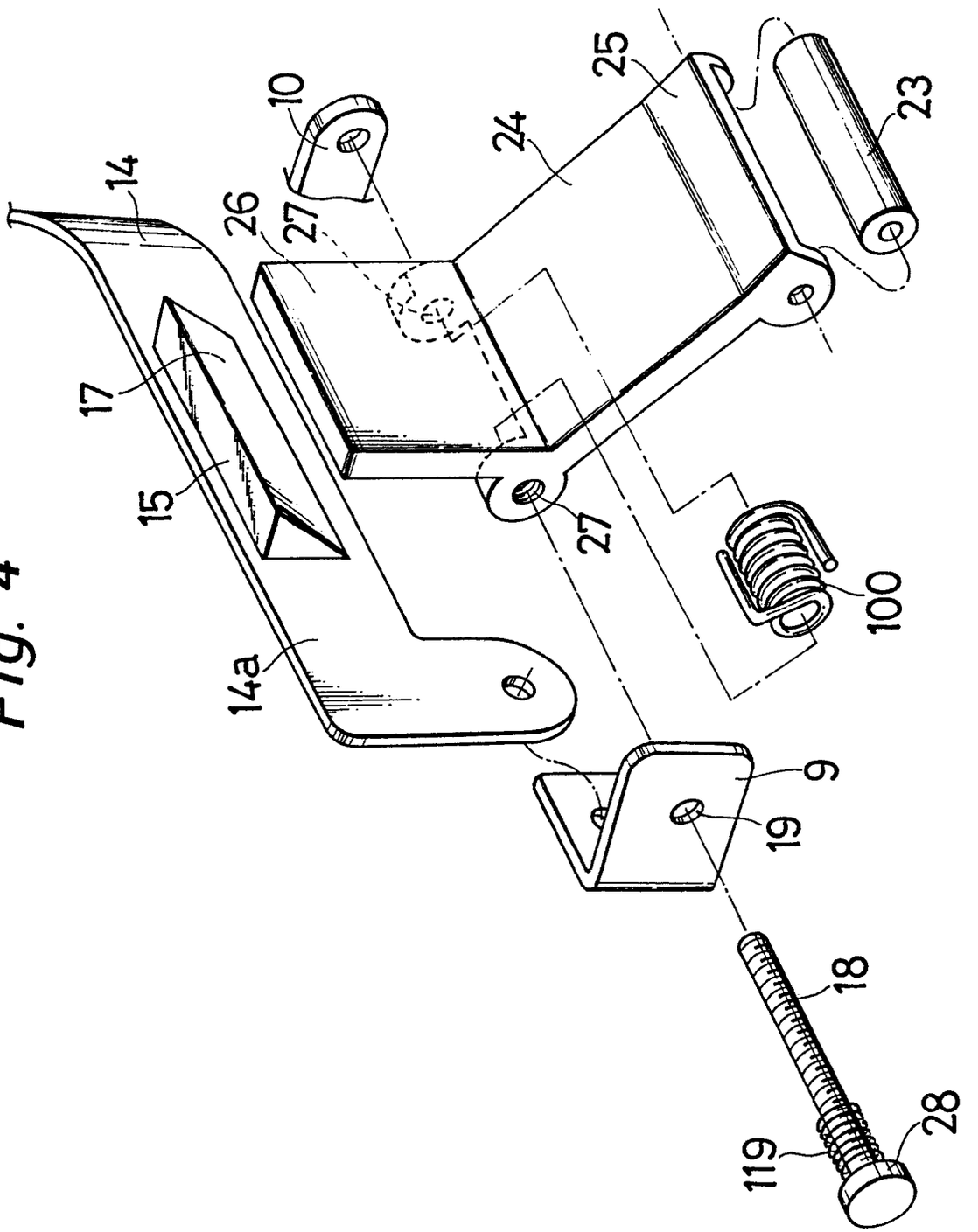
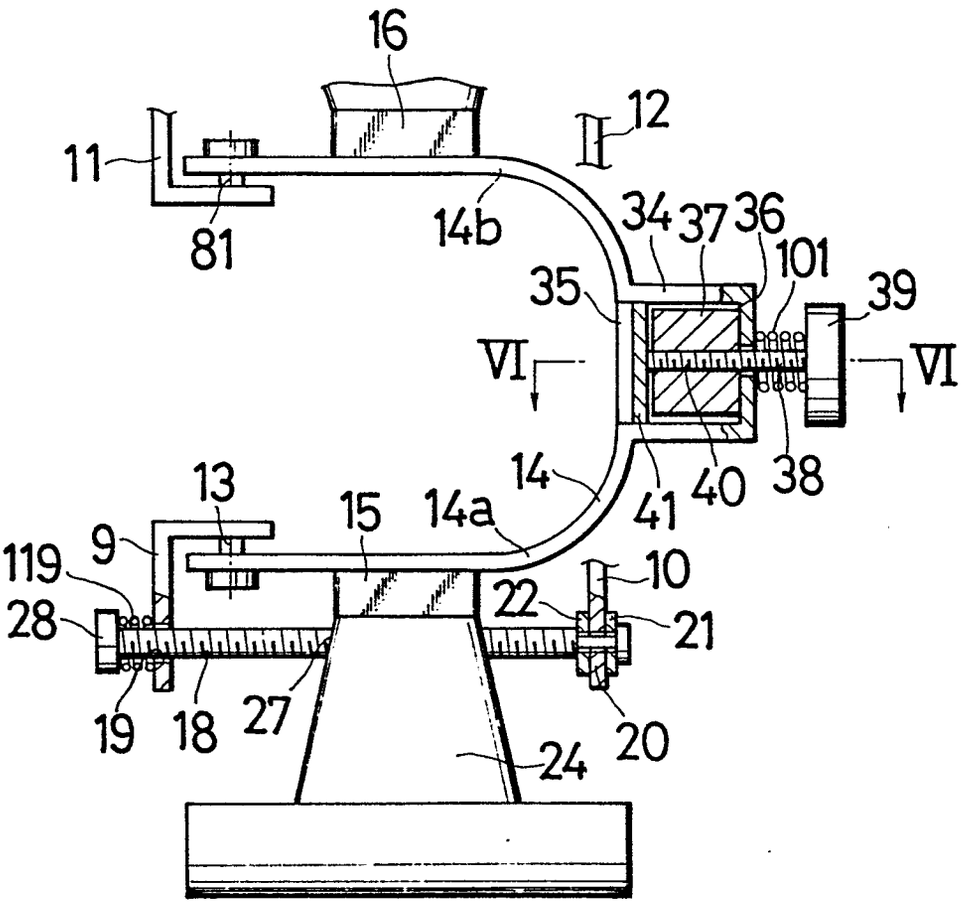


Fig. 5


16
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11
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14b
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VI
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Fig. 6

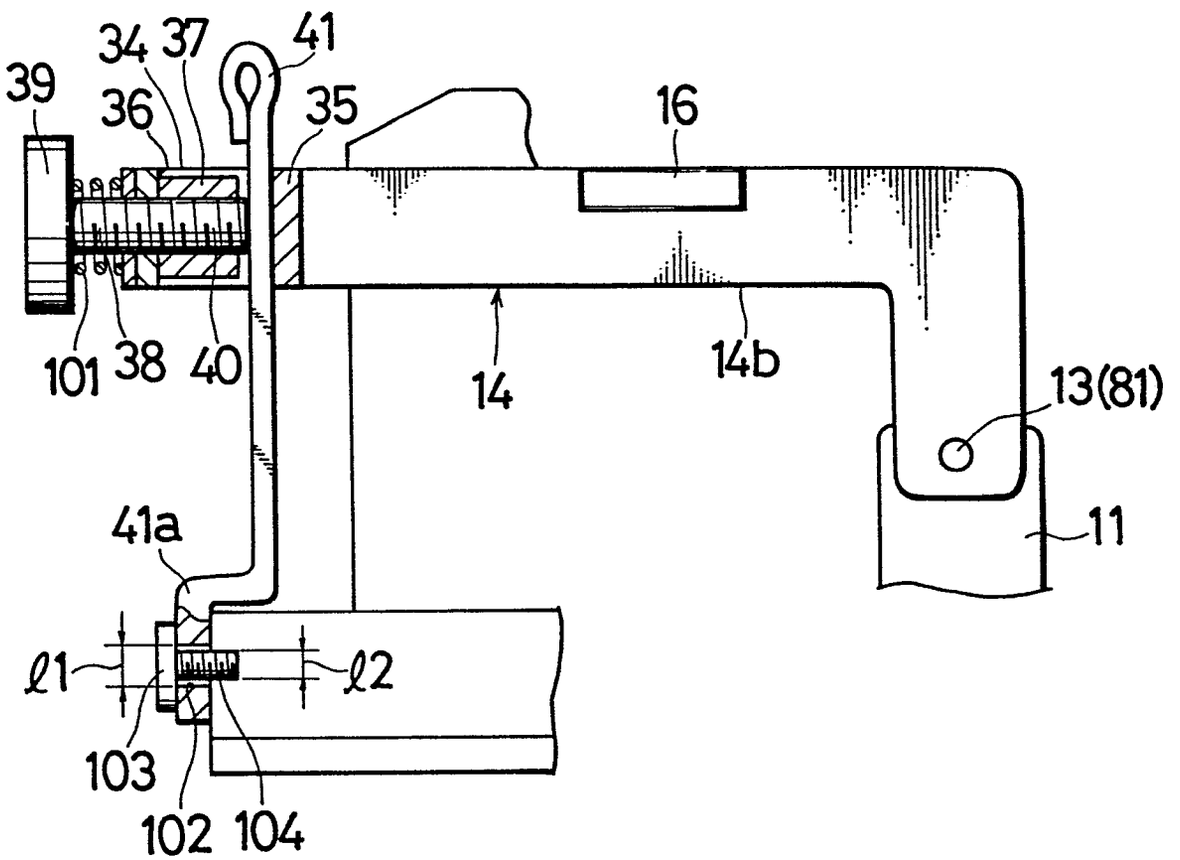
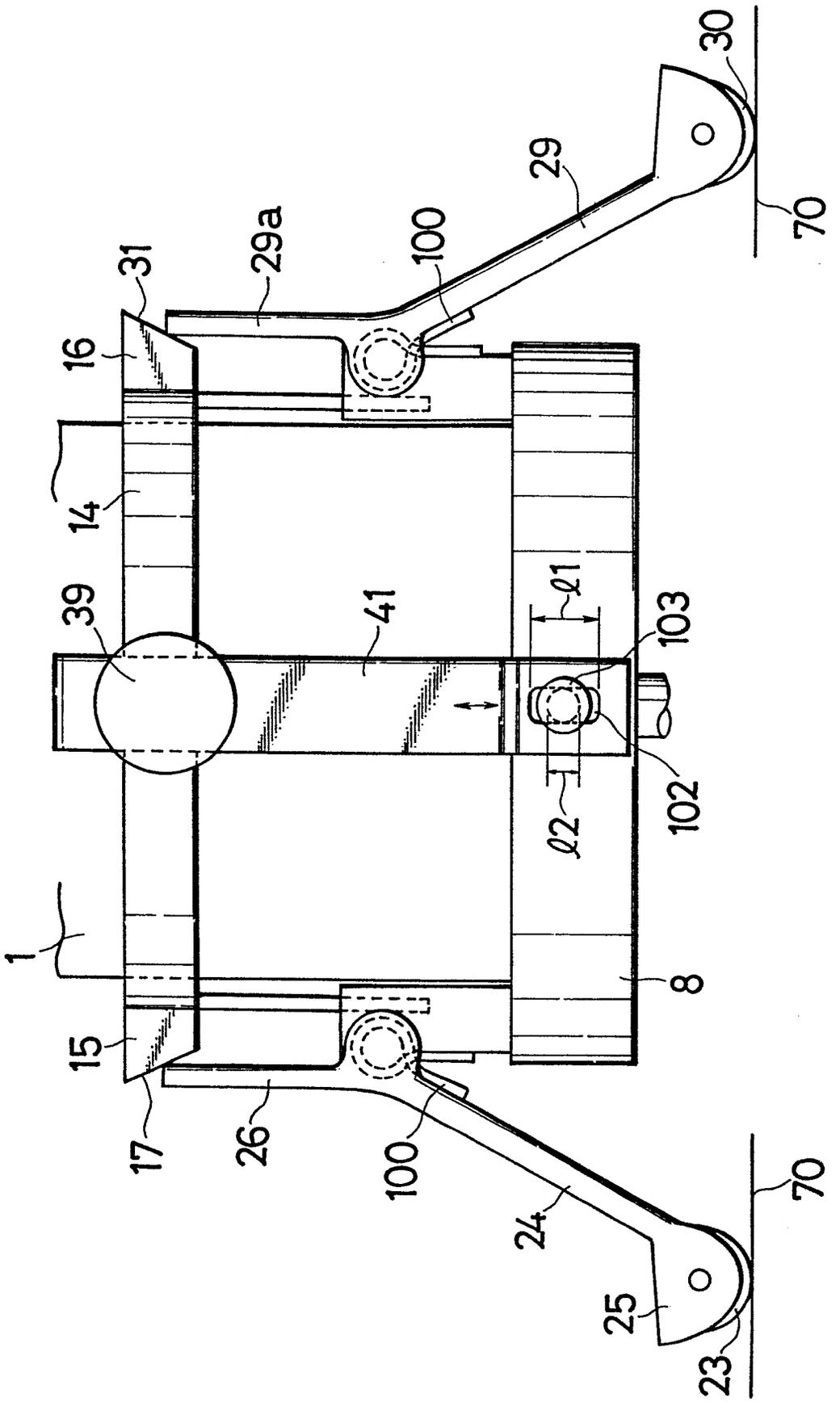


Fig. 7


30
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31
29a
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14
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103
102
ℓ2
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8
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26
100
24
25
23
70

Fig. 8

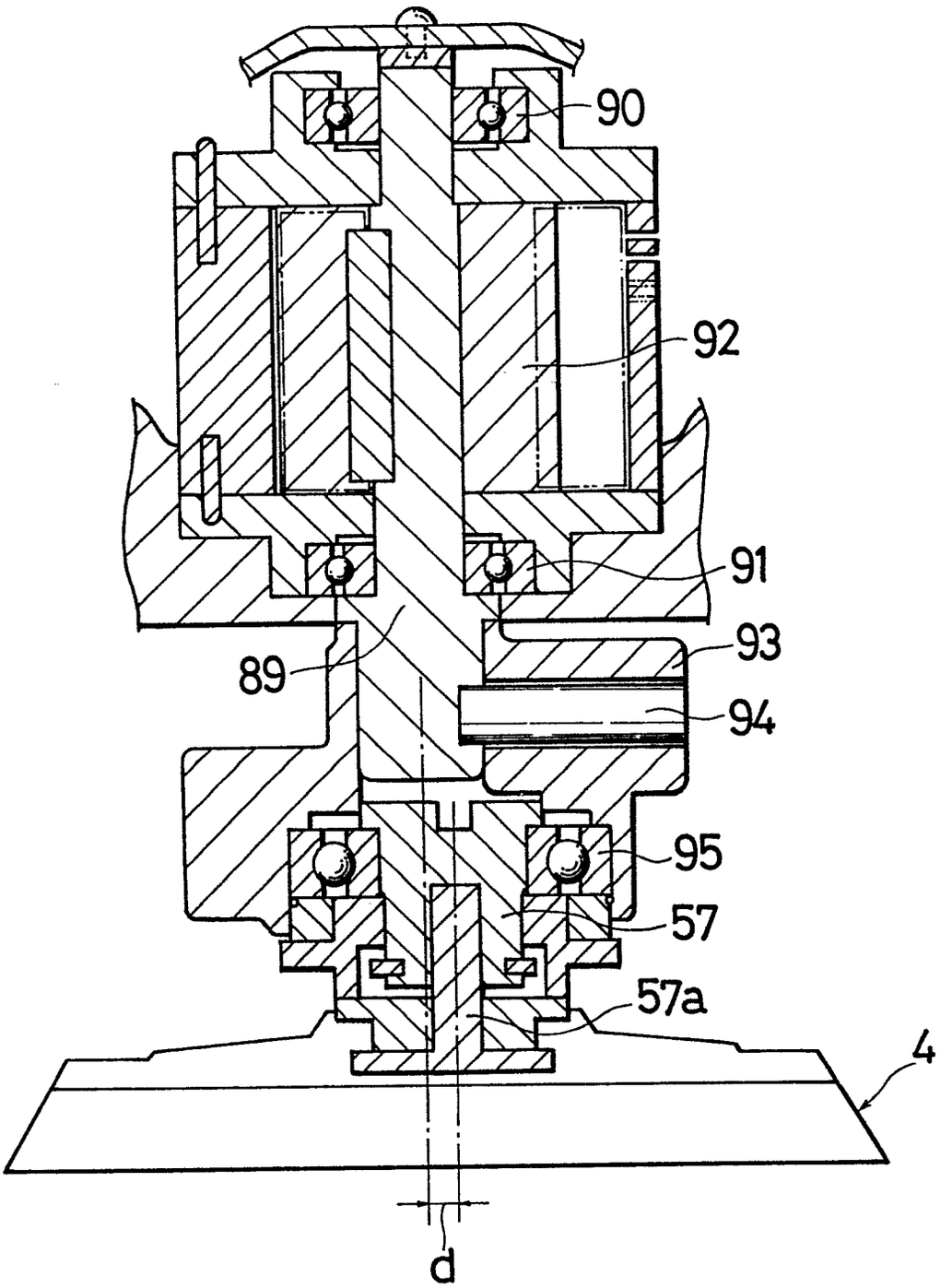


Fig. 9

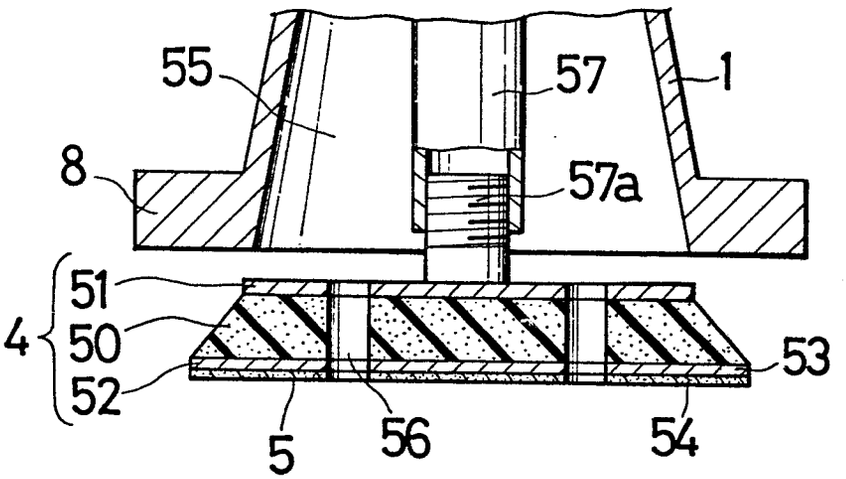


Fig. 10

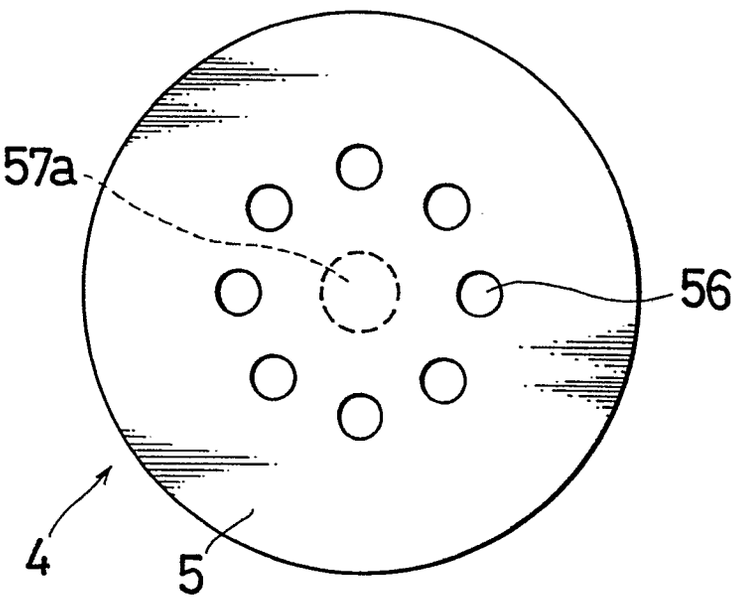


Fig. 11

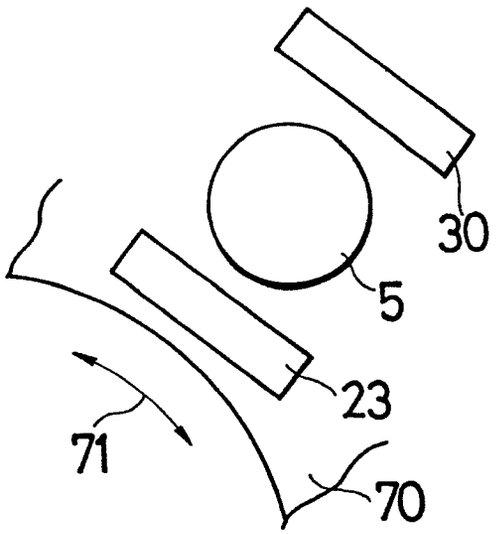


Fig. 12

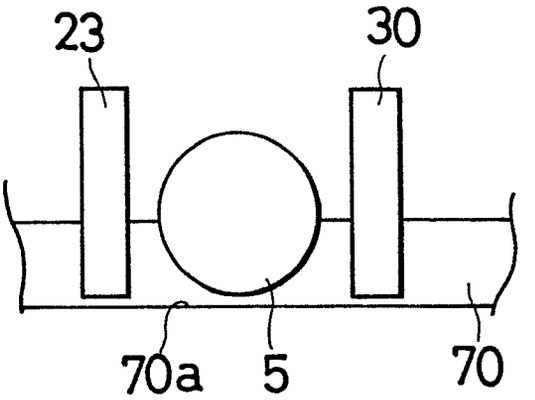


Fig. 13

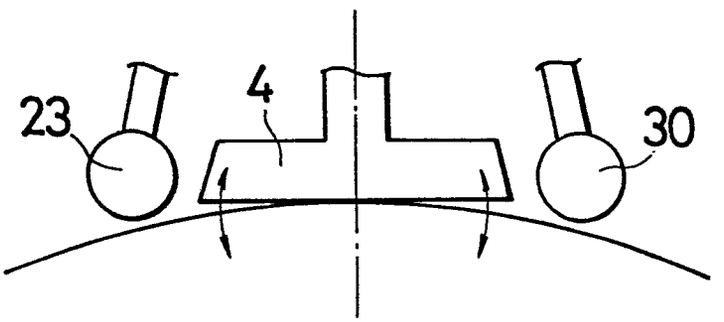
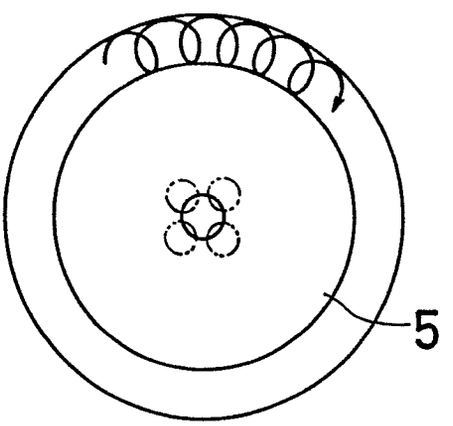


Fig. 14



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EUROPEAN SEARCH REPORT

0167679
Application number

EP 84 20 1060

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	DE-C- 910 146 (KRUGMANN) * Page 2, lines 26-109; figure 1 *	1,2	B 24 B 29/00 B 24 B 23/02
X	CH-A- 96 823 (COMP. ELECTRO-MECANIQUE) * Page 2; figures 1,2 *	1	
A	PATENT ABSTRACTS OF JAPAN, vol. 7, Nr. 92, 16th April 1983, (M208) (1237); & JP-A-58-15662 (HITACHI) 29-01-1985	1	
A	Soviet Inventions Illustrated DERVENT PUBLIC LTD. Week C40, 12th November 1980 Section P61, abstract no. J6914 & SU-A-716791 (KRAMA MECH) 28-02-1980	1	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	US-A-3 648 413 (GODWIN et al.) * Figures 1,2 *	1	B 24 B 23/00 B 24 B 29/00 B 24 D 13/00
A	DE-C-1 097 853 (JÜNGER) * Claim 1; figure 1 *	2	
A	US-A-4 145 848 (HUTCHINS) * Column 2, line 62 - column 3, line 21; figures 3,4 *	2	

-/-

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	28-02-1985	MARTIN A E W

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	DE-A-2 435 042 (ZEITLIN) * Figures 1,3 * -----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

The present search report has been drawn up for all claims

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BERLIN	28-02-1985	MARTIN A E W

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