

(19)



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(11)

**EP 0 485 597 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:

**25.09.1996 Bulletin 1996/39**

(21) Application number: **90907435.3**

(22) Date of filing: **15.05.1990**

(51) Int Cl.<sup>6</sup>: **D21G 3/00**

(86) International application number:  
**PCT/JP90/00611**

(87) International publication number:  
**WO 91/18147 (28.11.1991 Gazette 1991/27)**

(54) **DOCTOR APPARATUS**

SCHABER

RACLETTE

(84) Designated Contracting States:  
**DE FR GB**

(43) Date of publication of application:  
**20.05.1992 Bulletin 1992/21**

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<b>US-A- 2 477 339</b>	<b>US-A- 3 085 275</b>

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## Description

### specification

The invention relates to a doctor apparatus comprising a blade adapted to abut against a roll, a platelike blade holder and support members, said blade being interposed between said support members and said blade holder which is mounted on said support members by means of mounting screws in such a manner that the blade holder engages the blade through a free end thereof, the apparatus further comprising a reinforcing plate superposed and mounted on said blade holder by said mounting screws in such a way that said reinforcing plate has a free end cooperating with the free end of said blade holder, the free end of said reinforcing plate being adapted to be pressed against said blade holder to cause the free end of said blade holder to move to engage said blade. Such an apparatus is known from GB-A-368 472.

Such a doctor blade apparatus is used for permitting raw material to be satisfactorily accumulated on a paper making roll and water to be satisfactorily fed to the roll and removing foreign matters adhered to a surface of the roll such as paper powders, pitch, tailings or the like from the roll to keep it clean, and more particularly to a doctor blade apparatus adapted to permit a pressure distributed at an edge of the blade pressedly contacted with the roll to be adjusted so as to be substantially uniform.

A conventional doctor blade supporting structure which has been known in the art includes an adjusting means which acts to permit a blade for peeling off dusts adhered to a surface of a roll from the roll to be contacted at a tip end thereof with the roll surface at a uniform linear pressure or a contact pressure of the blade uniformly distributed in an axial direction of the roll.

In general, a blade for a doctor blade supporting structure is required to exhibit satisfactory holding force, stability and flexibility; therefore, the blade for the conventional doctor blade supporting structure is generally made of a relatively thin sheet material such as metal, plastic or the like into any desired thickness depending upon applications thereof. Unfortunately, this causes the blade to be pivotally moved with respect to the roll, resulting in the contact pressure of the blade being apt to be varied. In view of such a problem, a structure as shown in Fig. 7 is proposed and used, wherein a blade (G) is vertically interposed between a blade holder (F) made of a relatively rigid plate material and support members (C) and the blade holder (F) keeps the blade (G) at a posture. The support members (C) each are held directly on a doctor bag (E) using a screw means or pivotally supported on a pivot rod (D). Then, the blade (G) is vertically moved through a pressurized air tube (A) and an open tube (B) each interposedly arranged between the doctor bag (E) and the support member (C) to adjust a position of the blade (G).

The blade holder (F) comprises a single plate member formed into a shape of continuously extending in an axial direction of a roll, to thereby prevent a contact pressure of the blade (G) with respect to the roll from being varied in use. However, in order that the contact pressure of the blade (G) can be uniformly distributed in the axial direction of the roll, it is necessary to uniformly adjust contact between a surface of the roll and the blade (G). Unfortunately, this needs a considerable amount of labor. Further, a width of the blade holder (F) is finished by machining, however, a thickness of a blank for the blade holder (F) and its length are used as those of the holder (F) without being subject to finishing by machining, resulting in failing to form a contact end between the blade holder (F) and the blade (G) with high accuracy.

It would be considered that the accuracy of the contact end is increased by various processing techniques. However, this requires a considerable amount of labor and time and many processing machines, leading to a significant increase in manufacturing costs.

In view of the foregoing, the present situation is to escape an error occurring at the contact end utilizing crook of the blade holder (F); however, in order to accomplish the purpose, it is required to reduce a degree of crook of the blade holder (F) when the doctor blade supporting structure is directed to applications wherein the blade (G) is abutted against the roll at a high pressure, resulting in a relief being lost. This requires to further increase the accuracy of the contact end, so that it is highly difficult to press the blade against the roll at a constant linear pressure.

In accordance with the present invention, a doctor apparatus of the kind as described and as defined in the precharacterizing clause of claim 1, is characterized by the free end of said reinforcing plate being pivotally movable with respect to a supporting point; and finely adjusting screws which are threaded into one of the support members and said reinforcing plate and which are abuttedly engaged with the other; the adjusting screws being arranged so as to permit a gap to be defined between said blade holder and said reinforcing plate or support members in a position spaced from said supporting point, and to be adjusted by turning said adjusting screws so that said reinforcing plate pivots at said supporting point to thereby press said free end thereof against said blade holder, which causes said blade holder to move to engage with said blade.

Preferable embodiments are defined in the dependent claims.

Such construction of the present invention permits the structure to effectively absorb strain of each of the roll and blade occurring during operation of the structure while contacting the blade with the roll, so that a linear pressure of the blade with respect to the roll may be automatically corrected so as to be uniform over a whole width of the blade.

In particular, the structure of the present invention

is so constructed that the blade holder is pressedly fixed by the reinforcing plate on which the blade holder is mounted by means of the mounting screws and the finely adjusting screws are arranged so as to permit the gap to be defined between the blade holder and the reinforcing plate or support members so as to render the blade holder approachable or accessible to the blade through the free end of the reinforcing plate positioned on the side of the blade. Thus, tightening of each of the finely adjusting screws causes a tip end of the blade to be lowered and pressedly abutted against the roll, whereas loosening of the screw causes pressing force of the blade against the roll to be reduced; thus, adjustment of the pressing force is highly facilitated to satisfactorily increase holding force and stability of the blade, to thereby permit the blade to be uniformly pressed against the roll at a constant linear pressure. Also, the above-described construction permits the crook of the blade holder in a direction of a thickness thereof to be reinforced, so that the blade holder itself may be formed into a reduced thickness as compared with the prior art. This results in distortion and bending of the blade in a longitudinal direction thereof permitting the blade to exhibit improved response performance or characteristics.

Accordingly, the present invention keeps the blade at a satisfactory posture while eliminating a necessity of subjecting the reinforcing plate to fine processing and permits the blade holder to prevent the contact pressure of the blade from being varied because the blade is uniformly abutted against a surface of the roll. Also, the present invention permits the contact pressure of the blade with respect to the surface of the roll to be uniformly distributed in an axial direction of the roll and also permits the reinforcing plate to be formed into a reduced thickness.

In the accompanying drawings,

Fig. 1 is a fragmentary vertical sectional view showing an embodiment of a doctor blade supporting structure according to the present invention;

Fig. 1A is a fragmentary vertical sectional view of the structure of Fig. 1 in use;

Fig. 2 is a plan view of the doctor blade supporting structure shown in Fig. 1;

Fig. 3 is a fragmentary vertical sectional view showing another embodiment of a doctor blade supporting structure according to the present invention;

Fig. 3A is a fragmentary vertical sectional view of the structure of Fig. 3 in use;

Fig. 4 is a plan view of the doctor blade supporting structure shown in Fig. 3;

Fig. 5 is a fragmentary vertical sectional view showing a further embodiment of a doctor blade supporting structure according to the present invention;

Fig. 6 is a fragmentary vertical sectional view showing still another embodiment of a doctor blade supporting structure according to the present invention; and

Fig. 7 is a fragmentary vertical sectional view showing a conventional doctor blade supporting structure.

Figs. 1 to 2 illustrate an embodiment of a doctor blade supporting structure according to the present invention. A doctor blade supporting structure of the illustrated embodiment includes a blade 1 adapted to be abutted against a roll R, which blade is mounted on support members 4 by means of mounting screws 3 provided for assembling a blade holder 2. The doctor blade supporting structure also includes a reinforcing plate 5 arranged in a manner to be laminated or superposed on the blade holder 2. Further, the structure includes finely adjusting screws 10 each of which acts to permit a gap to be defined between the blade holder 2 and the reinforcing plate 5 or each of the support members 4 so that the blade holder 2 may be moved through a free end 5<sub>1</sub> of the reinforcing plate 5 defined on the side of the blade 1 so as to be approachable or accessible to the blade 1. The blade 1 is firmly held on the support members 4.

The reinforcing plate 5, as shown in Fig. 2, comprises a plurality of rectangular plate elements arranged on the blade holder 2 in a manner to be spaced at intervals. It is preferable that the plate elements of the reinforcing plate 5 are separately fixedly held on the support members 4 by means of the mounting screws 3, respectively. Such arrangement effectively prevents distortion and bending actions of the blade 1 in a longitudinal direction thereof from being deteriorated, to thereby substantially improve responsibility of the blade in the longitudinal direction. In particular, when the blade 1 is pivotally arranged through a support shaft 8 and held on the support members 4 each mounted through air tubes 6 on a doctor bag 7, it is preferable that the plate elements of the reinforcing plate 5 formed into the same width as the support members 4 are fixed together with the blade holder 2 by means of the mounting screws 3.

The finely adjusting screws 10 are threadedly arranged in threaded holes 9 formed through the reinforcing plate 5 in a manner to be movable in an axial direction thereof in the holes 9 and then inserted into through-holes formed via the blade holder 2 so as to be abutted against the support members 4, so that threaded insertion of the finely adjusting screws 10 through the reinforcing plate 5 permits the other end of each of the plate elements of the reinforcing plate 5 to be approachable or accessible to the blade holder 2 to form a gap therebetween.

In another embodiment of the present invention shown in Fig. 3, finely adjusting screws 10 inserted in through-holes formed via a blade holder 2 each are tapped with respect to a support member 4 and abutted at a head portion thereof against a lower surface of a reinforcing plate 5. Also, the reinforcing plate 5 is formed with holes 10<sub>1</sub> each of which permits a hexagon wrench to operatively engage therethrough with the head portion of the finely adjusting screw 10 to vertically move it,

to thereby cause the other end of the reinforcing plate 5 to be vertically moved to define a gap between the reinforcing plate 5 and the blade holder 2, so that a posture of contact of a blade 1 with respect to a roll R may be adjusted.

At least one of the mounting screws 3 may be kept somewhat loosened when the adjustment is carried out, to thereby facilitate operation for the adjustment.

Alternatively, in each of the embodiments described above, the plate elements of the reinforcing plate 5 each may be formed with a hole 11 for receiving the mounting screw therein as shown in Figs. 1 and 3.

In the embodiment of the present invention shown in Fig. 3, the reinforcing plate 5, as shown in Fig. 4, comprises a single plate member of a pectinate or rugged shape so that a free end 5<sub>1</sub> of the reinforcing plate may be provided with a plurality of projections. Such construction of the reinforcing plate 5 facilitates assembling, mounting and handling of the reinforcing plate 5.

In a still further embodiment of the present invention shown in Fig. 5, between a support member 4 and a portion of a blade holder 2 overlapped with a reinforcing plate 5 and positioned around a mounting screw 3 arranged on the side of a blade 1 is formed a gap 12, so that threaded insertion of the mounting screw 3 into the support member 4 permits the reinforcing plate 5 and blade holder 2 to be moved together, to thereby vertically adjustably move an end of a blade 1 which is contacted with a roll R. Thus, it will be noted that the mounting screws 3 each function also as a finely adjusting screw.

In still another embodiment of the present invention shown in Fig. 6, air tubes 6 and 6 are arranged below an extension line C<sub>1</sub> defined by extending a line defined between an edge of a blade 1 and a portion of the blade 1 held on support members 4. Also, the air tubes 6 are arranged opposite to each other in a V-like or Y-like manner about an intersection between a line C<sub>2</sub> extending from the edge of the blade 1 at an angle  $\epsilon$  of 6 to 30 degrees and preferably 10 to 15 degrees below the extension line C<sub>1</sub> and a vertical line C<sub>3</sub>. Such construction permits a contact angle of the blade with respect to a roll R to be increased, to thereby decrease a variation of the contact angle due to wearing of the blade 1, resulting in facilitating adjustment of a contact pressure of the blade with respect to the roll R and removal of any tailings from the roll R. Also, such construction permits the blade 1 to be uniformly pressed against the roll R.

#### Industrial Applicability

The present invention is so constructed that the reinforcing plate is arranged in a manner to be superposed on the blade holder and the finely adjusting screws each are arranged so as to permit a gap to be defined between the blade holder and the reinforcing plate or support member, resulting in the blade holder being approachable or accessible to the blade through the free

end of the reinforcing plate defined on the side of the blade. Such construction provides a relief for fine adjustment without requiring to form the contact end of the blade holder with high accuracy. Also, it permits crook of the blade holder to be reduced during pressing of the blade against the roll, to thereby keep the blade at a natural posture. Further, it permits the blade to be significantly reinforced against the crook of the blade holder while exhibiting a function of pressing the roll at a predetermined line pressure, so that the blade holder may be formed into a reduced thickness as compared with the prior art. This results in distortion and bending of the blade in a longitudinal direction thereof allowing the blade to exhibit a more satisfactory function. In addition, crook of the blade holder in a radial direction of the roll can be reduced to substantially improve response performance or characteristics of the blade in the longitudinal direction and a doctor line pressure can be rendered uniform over a whole width of the roll, so that the doctor blade supporting structure of the present invention is widely and readily applicable to existing apparatus while ensuring positive operation of the blade at a low cost and permitting the blade to positively exhibit satisfactory holding force, stability and flexibility. Thus, the present invention can be highly effectively available as a doctor blade supporting structure for a paper making roll.

#### **Claims**

1. A doctor apparatus comprising a blade (1) adapted to abut against a roll (R), a platelike blade holder (2) and support members (4), said blade (1) being interposed between said support members (4) and said blade holder (2) which is mounted on said support members (4) by means of mounting screws (3) in such a manner that the blade holder (2) engages the blade (1) through a free end thereof, the apparatus further comprising a reinforcing plate (5) superposed and mounted on said blade holder (2) by said mounting screws (3) in such a way that said reinforcing plate has a free end (5<sub>1</sub>) cooperating with the free end of said blade holder (2), the free end of said reinforcing plate being adapted to be pressed against said blade holder to cause the free end of said blade holder to move to engage said blade (1); characterized by

the free end (5<sub>1</sub>) of said reinforcing plate (5) being pivotally movable with respect to a supporting point; and  
finely adjusting screws (10) which are threaded into one of the support members (4) and said reinforcing plate (5) and which are abuttedly engaged with the other; the adjusting screws (10) being arranged so as to permit a gap to be de-

fined between said blade holder (2) and said reinforcing plate (5) or support members (4) in a position spaced from said supporting point, and to be adjusted by turning said adjusting screws (10) so that said reinforcing plate pivots at said supporting point to thereby press said free end (5<sub>1</sub>) thereof against said blade holder (2), which causes said blade holder to move to engage with said blade (1).

2. A doctor apparatus as defined in Claim 1, characterized in that said reinforcing plate (5) comprises a plurality of rectangular plate elements arranged on said blade holder (2) in a manner to be spaced at intervals;

said plate elements of said reinforcing plate are respectively fixed on said support members (4) by means of said mounting screws (3) to hold said blade (1); and  
said finely adjusting screws (10) are threadedly arranged on a portion of said reinforcing plate (5) opposite to the free end (5<sub>1</sub>) thereof.

3. A doctor apparatus as defined in Claim 1, characterized in that said reinforcing plate (5) comprises a plate member formed with holes (10<sub>1</sub>) for operating said finely adjusting screws (10);

said support members (4) each are pivotally arranged through air tubes (6) on a doctor bag (7); and  
said finely adjusting screws (10) each are threadedly inserted into said support member and abutted at a head portion thereof against a bottom surface of said reinforcing plate (5).

4. A doctor apparatus as defined in any one of Claims 1 to 3, characterized in that said blade (1) is pivotally supported on said support members (4);

said support members (4) each are arranged through air tubes (6) on a doctor bag (7); and said air tubes (6) are arranged below an extension line (C<sub>1</sub>) defined by extending a line defined between an edge of said blade (1) and a portion of said blade held on said support members (4) and in a manner to slant to each other at an intersection between a line extending from the edge of said blade (1) at an angle of 6 to 30 degrees below the extension line (C<sub>1</sub>) and a vertical line.

#### Patentansprüche

1. Rakeleinrichtung mit einem Rakelmesser (1) zum Anliegen an einer Walze (R) und einem plattenför-

migen Messerhalter (2) und Haltegliedern (4), wobei das Rakelmesser (1) zwischen den Haltegliedern (4) und dem Messerhalter (2) angeordnet und der Messerhalter (2) auf den Haltegliedern (4) durch Befestigungsschrauben (3) in solcher Weise befestigt ist, daß der Messerhalter (2) an dem Rakelmesser (1) mit seinem freien Ende angreift; mit einer Verstärkungsplatte (5), die über dem Messerhalter (2) liegt und auf diesem durch die Befestigungsschrauben (3) in solcher Weise befestigt ist, daß ein freies Ende (5<sub>1</sub>) der Verstärkungsplatte mit dem freien Ende des Messerhalters (2) zusammenwirkt, wobei das freie Ende der Verstärkungsplatte zum Anpressen gegen den Messerhalter ausgebildet ist, um zu bewirken, daß das freie Ende des Messerhalters sich zum Angriff an dem Rakelmesser (1) bewegt;  
dadurch gekennzeichnet, daß

das freie Ende (5<sub>1</sub>) der Verstärkungsplatte (5) gegenüber einem Auflagepunkt schwenkbar gelagert ist;  
daß in die Halteglieder (4) oder die Verstärkungsplatte (5) Feineinstellschrauben (10) eingeschraubt sind, die an dem jeweils anderen Teil(en) angreifen;  
daß die Feineinstellschrauben (10) dazu angeordnet sind, einen Zwischenraum zwischen dem Messerhalter (2) und der Verstärkungsplatte (5) oder den Haltegliedern (4) in einem Abstand von Auflagepunkt zu definieren, und durch Verdrehen einstellbar sind, so daß die Verstärkungsplatte um den Auflagepunkt verschwenkt wird und ihr freies Ende (5<sub>1</sub>) gegen den Messerhalter (2) drückt und dieser sich zum Angriff an dem Rakelmesser (1) bewegt.

2. Rakeleinrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Verstärkungsplatte (5) eine Mehrzahl von rechteckigen Plattenelementen aufweist, die auf dem Messerhalter (2) im Abstand voneinander angeordnet sind;

daß die Plattenelemente der Verstärkungsplatte jeweils auf den Haltegliedern (4) durch die Befestigungsschrauben (3) zum Halten des Rakelmessers (1) befestigt sind; und  
daß die Feineinstellschrauben (10) in einen Abschnitt der Verstärkungsplatte (5) eingeschraubt sind, der von dem freien Ende (5<sub>1</sub>) entfernt liegt.

3. Rakeleinrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Verstärkungsplatte (5) aus einer Platte besteht, die Öffnungen (10<sub>1</sub>) zum Betätigen der Feineinstellschrauben (10) aufweist; daß jedes der Halteglieder (4) schwenkbar durch Luftleitungen (6) an einem Rakeibalken

(7) angeordnet ist; und  
daß jede der Feineinstellschrauben (10) in das Halteglied eingeschraubt ist und mit einem Kopfteil an einer Bodenfläche der Verstärkungsplatte (5) anliegt.

4. Rakeleinrichtung nach einem der Ansprüche 1 bis 3,  
dadurch gekennzeichnet, daß das Rakelmesser (1) auf den Haltegliedern (4) schwenkbar gelagert ist;

daß jedes der Halteglieder (4) durch Luftleitungen (6) auf einem Rakelbalken (7) angeordnet ist; und

daß die Luftleitungen (6) unterhalb einer Verlängerungslinie ( $C_1$ ) liegt, die sich von einer Kante des Rakelmessers (1) zu einem Abschnitt des Rakelmessers erstreckt, der an den Haltegliedern (4) gehalten ist, und zwar in einer Weise, daß die Luftleitungen gegeneinander um einen Punkt geneigt sind, der an der Schnittstelle zwischen einer vertikalen Linie und einer Linie liegt, die sich von der Kante des Rakelmessers (1) unter einem Winkel von 6 bis 30° unterhalb der erstgenannten Verlängerungslinie ( $C_1$ ) erstreckt.

#### Revendications

1. Raclette comprenant une lame (1) conçue pour venir en butée contre un rouleau (R), un dispositif de maintien de la lame en forme de plaque (2) et des barres de soutien (4), ladite lame (1) étant interposée entre lesdites barres de soutien (4) et ledit dispositif de maintien de la lame (2) qui est monté sur lesdites barres de soutien (4) au moyen de vis de montage (3), de façon telle que le dispositif de maintien de la lame (2) s'engage avec la lame (1) par une extrémité libre de celui-ci, l'appareil comprenant en outre une plaque de renforcement (5) superposée et montée sur ledit dispositif de maintien de la lame (2) par lesdites vis de montage (3), de façon telle que ladite plaque de renforcement ait une extrémité libre ( $5_1$ ) coopérant avec l'extrémité libre dudit dispositif de maintien de la lame (2), l'extrémité libre de ladite plaque de renforcement étant conçue pour être pressée contre ledit dispositif de maintien de la lame pour forcer l'extrémité libre dudit dispositif de maintien de la lame à se déplacer pour s'engager avec ladite lame (1); caractérisé en ce que l'extrémité libre ( $5_1$ ) de ladite plaque de renforcement (5) est mobile de façon pivotante par rapport à un point d'appui; et par des vis d'ajustement fin (10) qui sont vissées à l'intérieur de l'une des barres de soutien (4) ou de ladite plaque de renforcement (5) et qui viennent en butée avec ladite plaque de renforcement (5) ou

l'une des barres de soutien (4) respectivement; les vis d'ajustement (10) étant disposées de façon à permettre de définir un espace entre ledit dispositif de maintien de la lame (2) et ladite plaque de renforcement (5) ou des barres de soutien (4), dans une position espacée dudit point d'appui, et de façon à permettre d'ajuster l'espace en tournant lesdites vis d'ajustement (10), de sorte que ladite plaque de renforcement pivote au niveau dudit point d'appui pour ainsi presser son extrémité libre ( $5_1$ ) contre ledit dispositif de maintien de la lame (2), ce qui force ledit dispositif de maintien de la lame à se déplacer pour s'engager avec ladite lame (1).

2. Raclette tel que défini dans la revendication 1, caractérisé en ce que ladite plaque de renforcement (5) comprend une pluralité d'éléments de plaque rectangulaires disposés sur ledit dispositif de maintien de la lame (2), de façon à être espacés selon des intervalles;

lesdits éléments de plaque de ladite plaque de renforcement sont respectivement fixés sur lesdites barres de soutien (4) au moyen desdites vis de montage (3) pour maintenir ladite lame (1); et

lesdites vis d'ajustement fin (10) sont disposées par vissage sur une partie de ladite plaque de renforcement (5) opposée à l'extrémité libre ( $5_1$ ) de ladite plaque.

3. Raclette tel que défini dans la revendication 1, caractérisé en ce que ladite plaque de renforcement (5) comprend une barre de plaque munie de trous ( $10_1$ ) pour pouvoir agir sur lesdites vis d'ajustement fin (10);

chacune desdites barres de support (4) est disposée de façon pivotante sur un sac de raclette (7) par l'intermédiaire de tubes à air (6); et chacune desdites vis d'ajustement fin (10) est insérée par vissage dans ladite barre de support et mise en butée par sa portion de tête contre une surface inférieure de ladite plaque de renforcement (5).

4. Raclette tel que défini dans l'une quelconque des revendications 1 à 3, caractérisé en ce que ladite lame (1) est supportée de façon pivotante sur lesdites barres de support (4);

chacune desdites barres de support (4) est disposée de façon pivotante sur un sac de raclette (7) par l'intermédiaire de tubes à air (6); et lesdits tubes à air (6) sont disposés en dessous d'une ligne de prolongement ( $C_1$ ) définie en prolongeant une ligne définie entre un bord de ladite lame (1) et une partie de ladite lame

maintenue sur lesdites barres de support (4) et de façon à être inclinés l'un vers l'autre au niveau d'une intersection entre une ligne se prolongeant depuis le bord de ladite lame (1) selon un angle de 6 à 30 degrés en dessous de la ligne de prolongement ( $C_1$ ) et une ligne verticale.

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Fig. 1

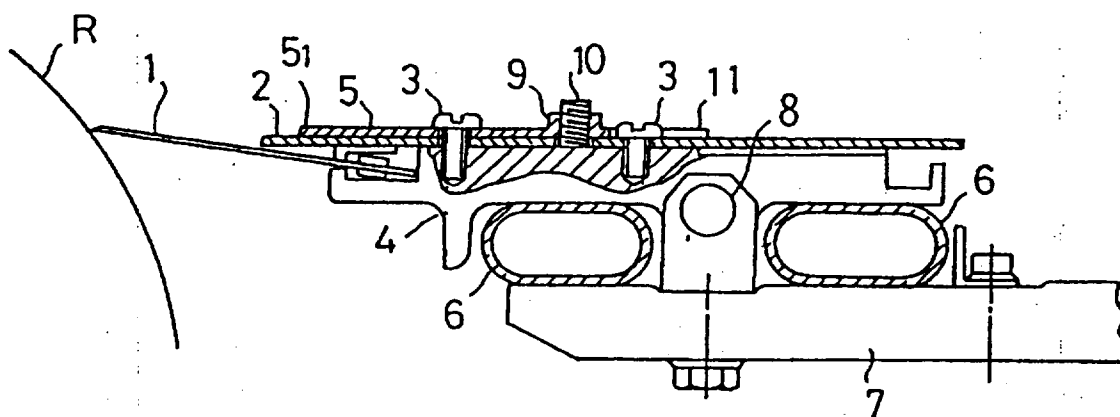


Fig. 1 (A)

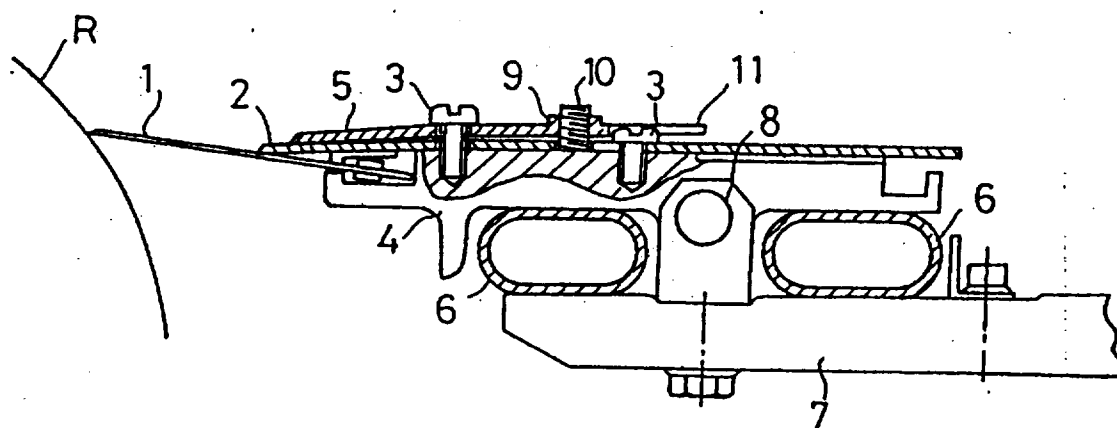




Fig. 2

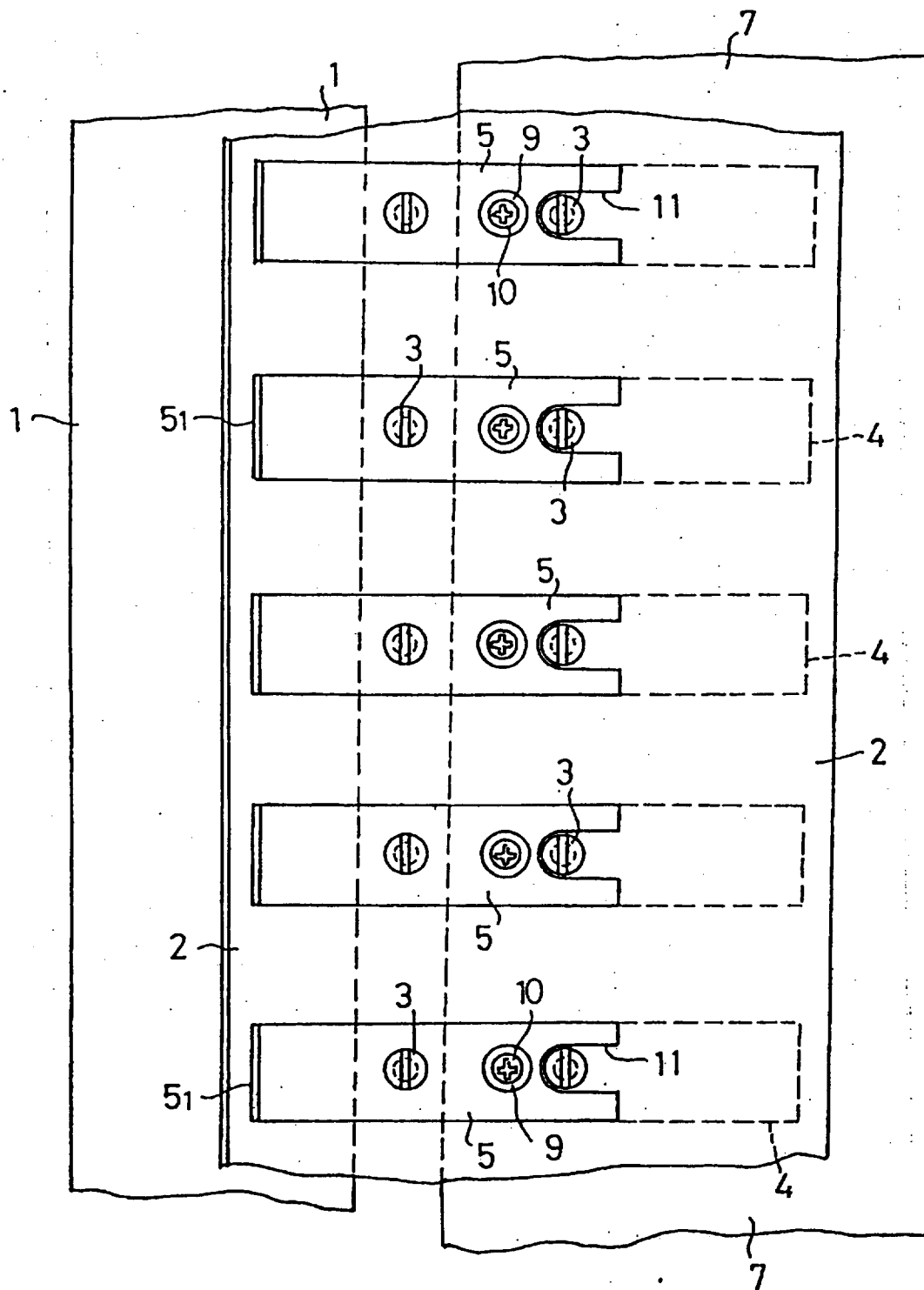


Fig. 3

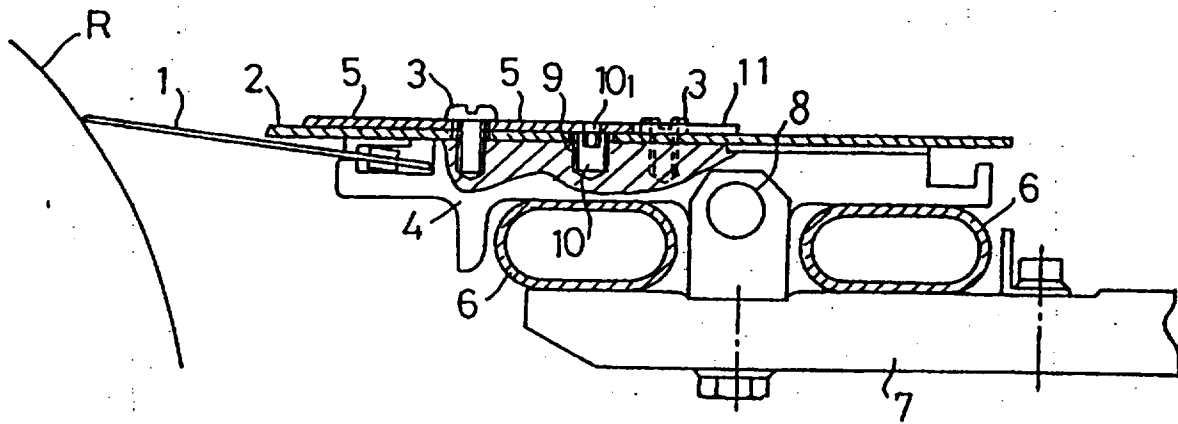


Fig. 3 (A)

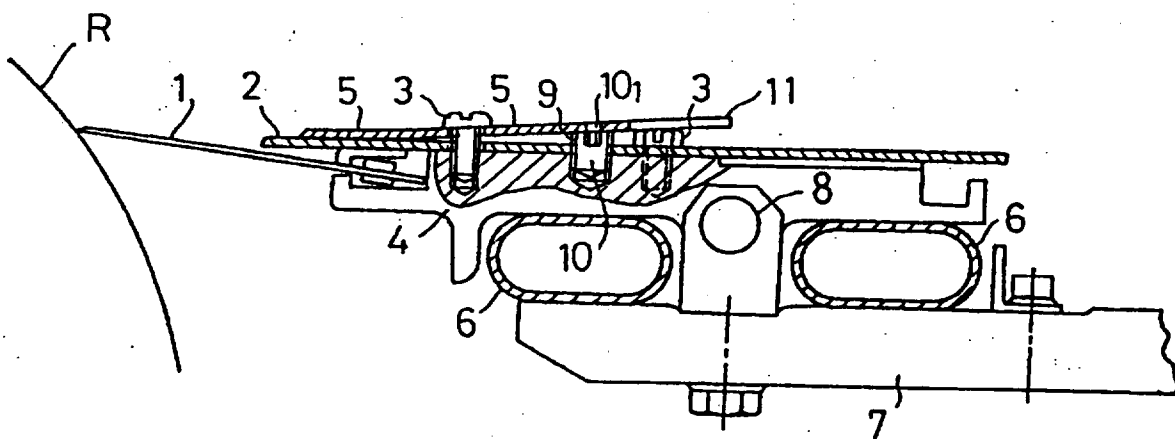


Fig. 4

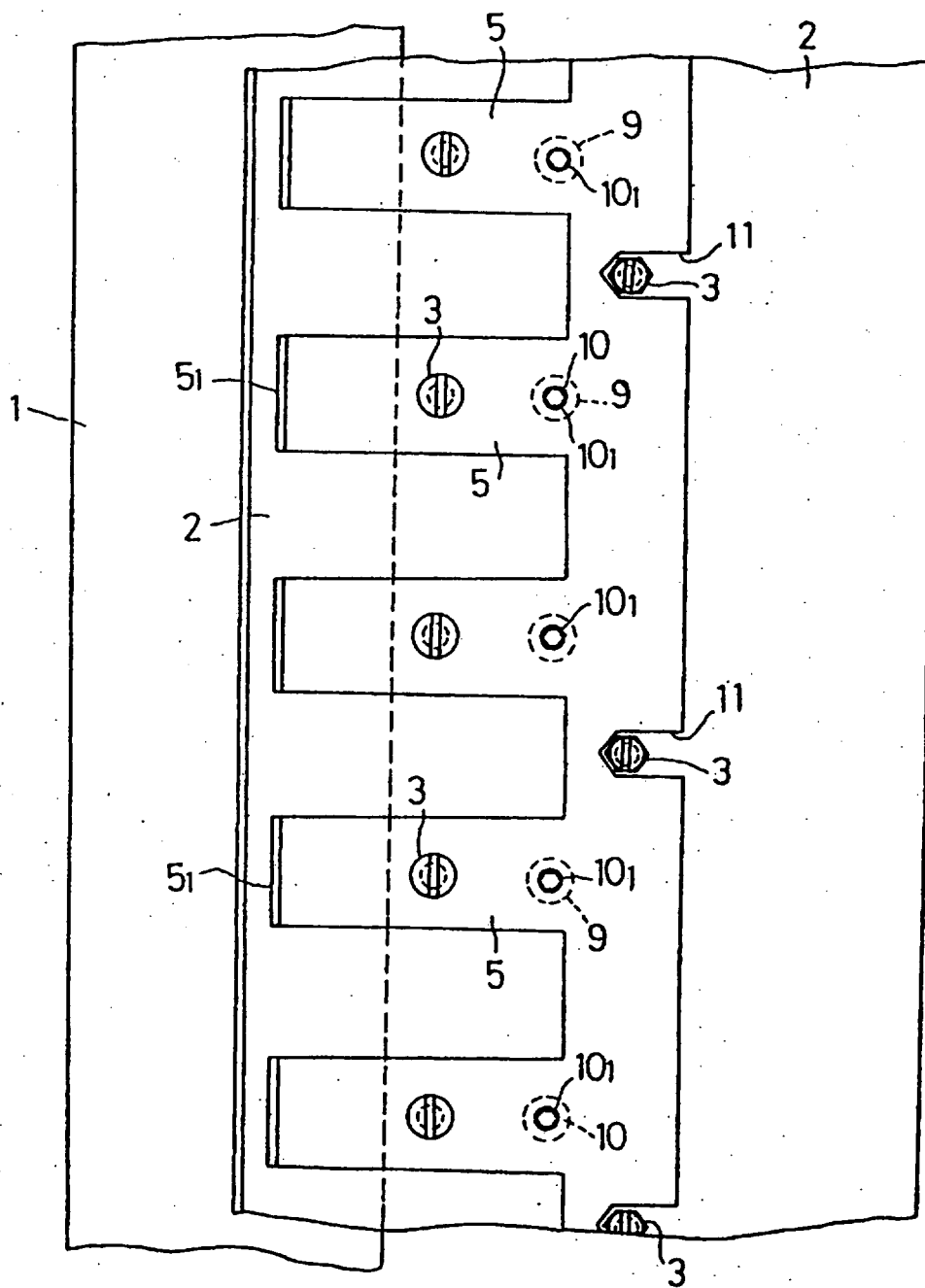


Fig. 5

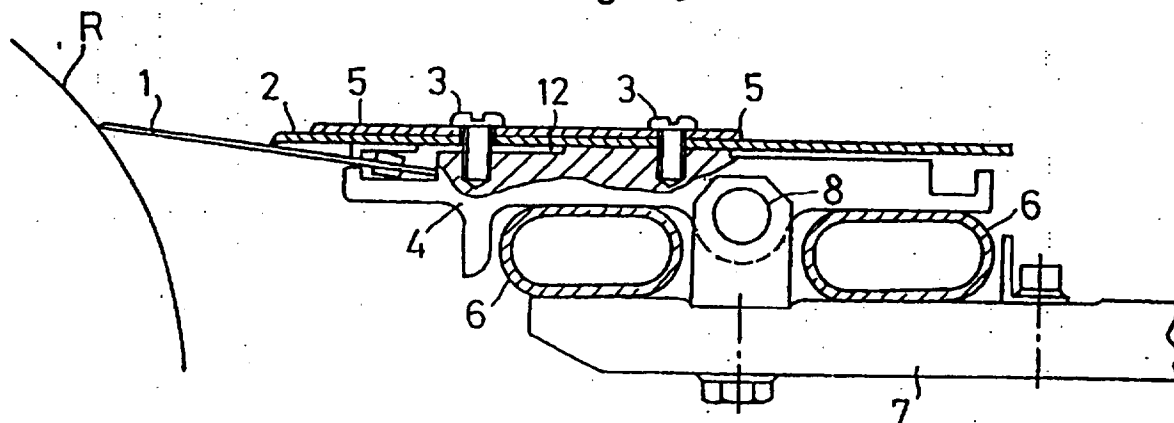


Fig. 6

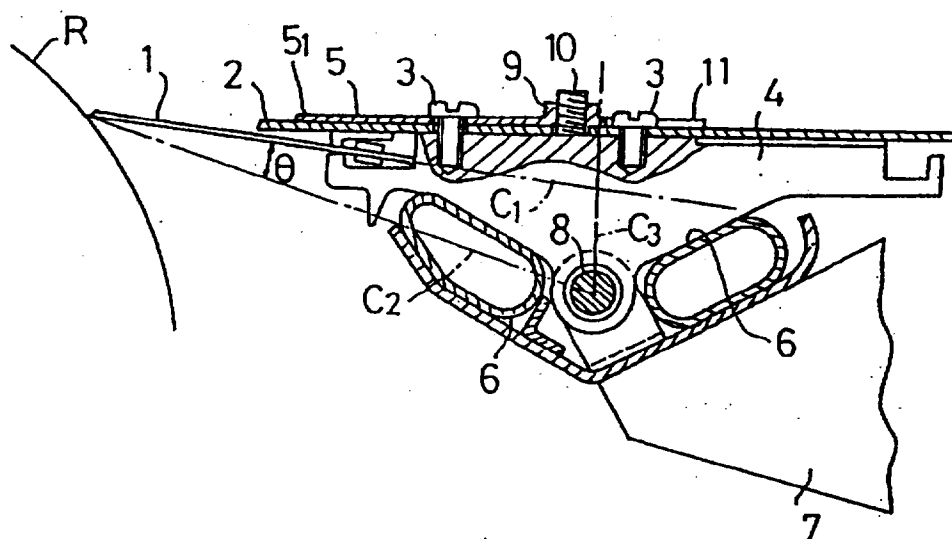


Fig. 7

