



EP 2 311 580 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
08.08.2012 Bulletin 2012/32

(51) Int Cl.:
B08B 5/02 (2006.01) **B08B 5/04 (2006.01)**
B26D 7/08 (2006.01) **B26D 7/18 (2006.01)**

(21) Application number: **09013098.0**

(22) Date of filing: **16.10.2009**

(54) **Dust-removing apparatus**

Staubentfernungsvorrichtung

Appareil dé poussierant

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL
PT RO SE SI SK SM TR

(43) Date of publication of application:
20.04.2011 Bulletin 2011/16

(60) Divisional application:
11191084.0 / 2 425 902

(73) Proprietor: **SHINKO CO., LTD.**
Taisho-ku
Osaka-shi
Osaka (JP)

(72) Inventor: **Uzawa, Hiroshi**
Izumi-shi
Osaka (JP)

(74) Representative: **HOFFMANN EITLE**
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)

(56) References cited:
EP-A1- 1 674 398 **WO-A1-2004/041697**
DE-A1- 1 786 108 **DE-A1- 19 519 544**
US-A- 2 163 687 **US-A- 3 460 418**

EP 2 311 580 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

[0001] This invention relates to a dust-removing apparatus.

[0002] Generally, as shown in Figures 10 and 11, a slitter apparatus 44, provided with a slitter blade 43 driven to rotate, is used to obtain belt bodies 42 by cutting base material (a continuous sheet of film, paper, etc.) 41 into a predetermined width. The base material 41 runs continuously in an arrow R direction, and the base material 41 of several dekameters to several kilometers is continuously cut by plural slitter blades 43 fixed to a rotation shaft 45 driven to rotate (by a driving means not shown in Figures) with a predetermined interval.

[0003] When the base material 41 is cut, slit powder is generated and stuck to end edges of the slitter blades 43 and the belt bodies 42.

[0004] Conventionally, an air gun is used to remove the stuck slit powder in many cases. However, when the slit powder on the slitter blades 43 and the belt bodies 42 is blown off by the air gun, the powder is scattered around and may be stuck again to the base material 41 and the belt bodies 42.

[0005] Or, as shown in Figures 10 and 11, although a suction dust-removing apparatus, having a cover 46 surrounding the slitter blade 43 as the air is sucked in an arrow U direction and a suction piping 47, is used in some cases, the slitter powder, once stuck, can not be easily removed and the slitter blades 43 and the belt bodies 42 can not be sufficiently clean. And, installation space of the slitter apparatus 44 is generally small, so it is often difficult to place the suction dust-removing apparatus as shown in Figures 10 and 11.

[0006] Therefore, it was also considered to apply a dust-removing apparatus of air jet-suction type (refer to Japanese patent No.2820599) formerly proposed by the inventor of the present invention.

[0007] The dust-removing apparatus described by the Japanese patent No.2820599 can certainly remove dust put lightly on the surface of running sheet body and sheets. Especially, dust put lightly on flat and broad plane can be easily and certainly removed.

[0008] However, it was revealed that sufficient dust removal is difficult in the slitter apparatus 44 of Figures 10 and 11.

[0009] That is to say, firstly, the slitter powder is stuck on the end edges of the slitter blades 43 and the belt bodies 42 relatively firmly. Secondly, it is quite difficult to efficiently suck complicated suction areas.

[0010] A dust-removing apparatus according to the preamble of claim 1 is known from EP-A-1674398.

[0011] Therefore, it is an object of the present invention to provide a dust-removing apparatus with which dust stuck relatively firmly on portions having complicated configurations such as the end edges (edge portions) of the slitter blades and the belt bodies can be certainly and efficiently removed.

[0012] This object is solved according to the present

invention by dust-removing apparatus including features of claim 1. Furthermore, a detailed embodiment is described in the dependent claim 2.

[0013] The present invention will be described with reference to the accompanying drawings, in which:

Figure 1 is a simplified top view showing an example of application of the present invention;

Figure 2 is a front view showing an embodiment of the present invention;

Figure 3 is a top view;

Figure 4A is a side view for explanation of a principal portion;

Figure 4B is a cross-sectional view at b-b line of Figure 3 for explanation of a principal portion;

Figure 4C is a cross-sectional view at c-c line of Figure 3 for explanation of a principal portion;

Figure 4D is a cross-sectional view at d-d line of Figure 3 for explanation of a principal portion;

Figures 5A and 5B are enlarged cross-sectional views at E-E line of Figure 4A;

Figure 6 is a top view showing another embodiment of the present invention;

Figure 7 is a front view;

Figures 8A and 8B are explanatory views of principal construction;

Figures 9A, 9B and 9C are explanatory views of principal construction each of which respectively shows an embodiment;

Figure 10 is a top view of a conventional example; and

Figure 11 is a side view of the conventional example.

[0014] Preferred embodiments of the present invention will now be described with reference to the accompanying drawings.

[0015] A slitter apparatus 2, provided with slitter blades 1, is shown as a concrete example to which a dust-removing apparatus of the present invention is applied.

Base material 3 such as plastic film, paper, cloth, etc. is cut with a predetermined width dimension by the plural slitter blades 1 to make belt-shaped continuous sheet bodies S. The base material 3 is continuously conveyed (running) in a direction of an arrow R, the plural slitter blades 1 are fixed to a rotation shaft 4, driven to rotate by a driving means not shown in Figures, with a predetermined interval to continuously cut the base material having length of several dekameters to kilometers.

[0016] Slit powder is generated in the cutting process described above, and stuck to a peripheral end edge 11 of the slitter blade 1 and end edges 5 of the sheet body S. Dust such as the slit powder is removed by the dust-removing apparatus of the present invention having a dust-removing head 10.

[0017] First, the dust-removing head 10, disposed as to correspond to the slitter blade 1 drawn on an upper position of Figure 1, is described. As shown in Figures 2 through 5B, a slit groove 7, through which the (rotating)

peripheral end edge 11 of the slitter blade 1 is running, is formed on the above-mentioned dust-removing head 10.

[0018] A jet nozzle 12 to exhale air toward the running peripheral end edge 11 and a suction hole 14 to inhale the exhaled air are disposed on an inner face 7A of the slit groove 7 of the dust-removing head 10.

[0019] In Figures 2 and 3, double-hatching represents air discharging ducts 21 and single-hatching represents air suction ducts 22.

[0020] The jet nozzle 12 is provided with a blade edge jet nozzle 12a formed toward a blade edge 8 of the peripheral end edge 11 of the slitter blade 1 and side jet nozzles 12b formed on the left and right sides of the peripheral end edge 11. The blade edge jet nozzle 12a is connected to a middle one of the three air discharging ducts 21 parallel in Figure 3, and formed as a small round hole smaller than the diameter of the middle air discharging duct 21 as to increase the flowing speed and let the air jet strongly hit the blade edge 8.

[0021] And, each of the upper and lower air discharging ducts 21 is communicatively connected to the side jet nozzle 12b in Figure 3. Each of the upper and lower air discharging ducts 21 in Figure 3 is a circular hole not opening on a forth end face 13A of a head body 13 and formed before the forth end face 13A for a predetermined dimension. As described above, the upper and lower two closed end portions among the three air discharging ducts 21 are communicatively connected to the side jet nozzle 12b, and the side jet nozzle 12b opens on the side face of the inner face 7A of the slit groove 7 (upper and lower faces shown in Figures 3, 5A, and 5B) to jet air toward the peripheral end edge 11 of the slitter blade 1. The side jet nozzle 12b, as shown in Figure 2, is formed as a straight slit hole corresponding to a radial line (diameter line) 15 on an axis point 0₁ when observed in a direction of an axis L₁ of the slitter blade 1. Then, the side jet nozzle 12b as a straight slit hole is formed in a direction at right angles with the both side faces of the inner face 7A of the slit groove 7 (refer to Figures 4A and 4B).

[0022] And, as clearly shown in Figures 4A and 3, one unit of the suction hole 14, the jet nozzle 12, and another unit of the suction hole 14 are serially disposed from a slit upstream end 7B, where the slitter blade 1 rotating in an arrow C direction intrudes to the slit groove 7, toward a slit downstream end 7C where the slitter blade 1 goes out of the slit groove 7. As shown in Figure 4A, the suction holes 14 are disposed on a bottom face of the inner face 7A of the slit groove 7.

[0023] The head body 13 is a short cylinder of which diameter is decreasing approximately or gradually toward the forth end side in Figures, a connection plug for suction air piping is screwed to a tapped hole 16 on a base end face 13B, and the tapped hole 16 is communicatively connected to the air suction ducts 22 composed of two parallel circular through holes.

[0024] Figures 5A and 5B are enlarged cross sectional

views at E-E line in Figure 4A. Figure 5A shows a case in which the side jet nozzles 12b as a straight slit blow the air from the side faces 7A of the slit groove 7 (upper and lower faces in Figure 5A) in directions at right angles with the radial line 15. On the contrary, Figure 5B shows a case in which the side jet nozzles 12b as a straight slit blow the air from the side faces 7A of the slit groove 7 in oblique directions (especially toward the inner portion of the slit). In Figure 5B, there is an advantage that the air jetted to the peripheral end edge 11 of the slitter blade 1 in Figure 2 is certainly sucked into the suction holes 14 on the upstream and downstream sides. In other words, it is an advantage that dust is not scattered out of the slit groove 7.

[0025] Next, another embodiment shown in Figures 6 and 7 is described. Figures 6 and 7, showing the dust-removing head 10 applied to a lower half of Figure 1, correspond to Figures 2 and 3.

[0026] In Figure 1, the continuous sheet body S cut and separated by the slitter blade 1 separates the neighboring sheet bodies in upper and lower oblique directions and gives sending force (refer to Figure 11 showing the conventional 1 example). Therefore, the dust-removing heads 10 do not interfere with the continuous sheet bodies S when disposed as shown in Figure 1.

[0027] Explanation of the dust-removing head 10 is omitted because the configuration and construction of the dust-removing head 10 are similar to that of Figures 2 through 5B. The end edge 5 of work W such as a continuous sheet body goes through the slit groove 7 and dust such as slitter powder stuck to the end edge 5 is removed.

[0028] A jet nozzle 12 to exhale air toward the running work end edge 5 and a suction hole 14 to inhale the air exhaled from the jet nozzle 12 are disposed on an inner face 7A of the slit groove 7 of the dust-removing head 10.

[0029] The jet nozzle 12 is provided with a far end edge jet nozzle 12c formed toward a far end edge portion 5A of the end edge 5 of the work W and obverse and reverse jet nozzles 12d. The jet nozzle 12 is composed of three nozzles.

[0030] Further, (as clearly shown in Figure 6) a unit of the suction hole 14, the jet nozzle 12, and another unit of the suction hole 14 are serially disposed from a slit upstream end 7B, where the end edge 5 of the work W intrudes to the slit groove 7, toward a slit downstream end 7C where the end edge 5 goes out of the slit groove 7.

[0031] And, the obverse and reverse jet nozzles 12d are formed into a straight slit hole at right angles with the far end edge portion 5A when observed in a direction at right angles with the work W as shown in Figure 6.

[0032] In Figure 6 (Figure 2), a mark 17 represents a joint for discharge air piping to which a discharge air piping, not shown in Figures, is connected. The joint 17 is screwed to a tapped hole 18 on the peripheral face of the head body 13, and communicatively connected to three air discharging ducts in longitudinal direction through crossing two side holes 19 and 20.

[0033] Other than the continuous sheet body S as shown in Figures 6 and 7, separated rectangular sheet pieces, namely, leaf bodies may be inserted to the slit groove 7 of the dust-removing head 10 of the present invention to remove dust on the end edges (sides) of the leaf bodies (not shown in Figures).

[0034] The configuration and construction of Figures 5A and 5B can be applied to the embodiment shown in Figures 6 and 7.

[0035] Next, Figures 8A and 8B are explanatory views in which the slit groove 7 is drawn into a perspective view with solid lines, and the jet and suction of the air are simply shown with arrows.

[0036] In Figures 8A and 8B, an arrow F shows the air jet direction from the blade edge jet nozzle 12a or the far end edge jet nozzle 12c, arrows G show the air jet directions from the side jet nozzles 12b or the obverse and reverse jet nozzles 12d. Especially, in Figure 8B, the arrows G show the oblique jet to the inner side of the slit groove 7. And, arrows H show the air suction direction by the suction holes 14.

[0037] Then, Figures 9A, 9B, and 9C respectively show other embodiments showing that the present invention, not restricted to Figures 8A and 8B, may be modified. That is to say, Figure 9A shows that air may be sucked by the side faces of the slit groove 7 in directions of arrows H1 and H2 other than the arrows F, G, and H in Figures 8A and 8B.

[0038] And, Figure 9B shows that the air may be sucked, different from Figure 8B, on a center position of the innermost face of the slit groove 7 in an arrow H0 direction and jetted from the both end sides as shown with arrows F1 and F2 which are preferably oblique. And, the side faces are similar to that of Figure 9A.

[0039] Further, Figure 9C shows that plural air jets F3 and plural suctions H3 are conducted to exemplify that air jets and suctions can be freely increased. And, on the side faces of the slit groove 7, the air may be jetted from the end portions as shown with arrows G3 and G4, and sucked on the center as shown with arrows H4. That is to say, Figure 9B and Figure 9C conduct suction and jet on opposite positions each other on the side faces.

[0040] Although the dust-removing head 10 has been mainly described above because the principal portion of the present invention is the dust-removing head 10, the dust-removing apparatus of the present invention is, other than the dust-removing head 10, composed by adding pipings, a blower unit, a suction device, valves, etc. not shown in Figures.

[0041] And, it is also possible to add a supersonic wave generator and an ion generator when desired.

[0042] The present invention, as described above, can remove relatively firmly stuck dust such as slitter powder and resolve the problem of dust scattering toward outside because the dust-removing head 10, having the slit groove 7 in which the peripheral end edge 11 of the slitter blade 1 runs through, is provided, and the jet nozzle 12 for jetting air toward the running peripheral end edge 11

and the suction hole 14 to suck the air jetted out of the jet nozzle 12 are disposed on the inner face 7A of the slit groove 7 of the dust-removing head 10.

[0043] And, the dust relatively firmly stuck to the end edge 5 of the continuous sheet body S or leaf bodies can be certainly and efficiently removed, and environment can be kept clean without dust scattering toward outside (re-stuck can be prevented) because the dust-removing head 10, having the slit groove 7 in which the end edge 5 of work W composed of the continuous sheet body S or leaf bodies passes through, is provided, and the jet nozzle 12 for jetting air toward the passing end edge 5 and the suction hole 14 to suck the air jetted out of the jet nozzle 12 are disposed on the inner face 7A of the slit groove 7 of the dust-removing head 10.

[0044] And, the peripheral end edge 11 of the slitter blade 1 can be certainly and swiftly made clean because the jet nozzle 12 is provided with the blade edge jet nozzle 12a disposed toward the blade edge 8 of the peripheral end edge 11 of the slitter blade 1, and the side jet nozzles 12b each of which is disposed respectively on the left side and the right side of the peripheral end edge 11. Especially, even slitter powder firmly stuck to the blade edge 8 can be certainly removed.

[0045] And, a portion where the dust is stuck most (the end edge 5 of the work W) can be concentratedly and efficiently made clean because the jet nozzle 12 is provided with the far end edge jet nozzle 12c disposed toward the far end edge portion 5A of the end edge 5 of the work W and the obverse and reverse jet nozzles 12d each of which is disposed respectively toward the obverse face and the reverse face of the end edge 5.

[0046] And, the dust is prevented from being blown by the air jet from the jet nozzle 12 and scattered toward outside because one unit of the suction hole 14, the jet nozzle 12, and another unit of the suction hole 14 are serially disposed from the slit upstream end 7B, where the rotating slitter blade 1 intrudes to the slit groove 7, to the slit downstream end 7C, where the slitter blade 1 goes out of the slit groove 7.

[0047] And, the dust is prevented from being blown by the air jet from the jet nozzle 12 and scattered toward outside because one unit of the suction hole 14, the jet nozzle 12, and another unit of the suction hole 14 are serially disposed from the slit upstream end 7B, where the running end edge 5 of the work W intrudes to the slit groove 7, to the slit downstream end 7C, where the end edge 5 goes out of the slit groove 7.

[0048] And, the air is blown to the slitter blade 1 with strong pressure to easily and efficiently remove the dust on areas of relatively broad width because the side nozzles 12b form the straight slit hole corresponding to the radial line 15 on the axis point 0₁ when observed in the direction of the axis L₁ of the slitter blade 1.

[0049] And, the air is blown to the slitter blade 1 with strong pressure to easily and efficiently remove the dust on areas of relatively broad width because the obverse and reverse jet nozzles 12d form the straight slit hole at

right angles with the far end edge portion 5A when observed in the direction at right angles with the work W.

Claims

1. A dust-removing apparatus comprising:

a dust-removing head (10), having a slit groove (7) adapted to receive a peripheral end edge (11) of a slitter blade (1) running there-through and
 10 a jet nozzle (12) adapted to jet air toward the running peripheral end edge (11) **characterized in that** suction holes (14) adapted to suck the air jetted out of the jet nozzle (12) are disposed on an inner face (7A) of the slit groove (7) of the dust-removing head (10),
 15 wherein the jet nozzle (12) is provided with a blade edge jet nozzle (12a) disposed toward a blade edge (8) of the peripheral end edge (11) of the slitter blade (1), and side jet nozzles (12b) each of which is disposed respectively on a left side and a right side of the peripheral end edge (11); and one of the suction holes (14), the blade edge jet nozzle (12a), and another of the suction holes (14) are serially disposed from a slit upstream end (7B), where the rotating slitter blade (1) intrudes to the slit groove (7), to a slit downstream end (7C), where the slitter blade (1) goes out of the slit groove (7).

2. The dust-removing apparatus as set forth in claim 1, wherein the side nozzles (12b) form a straight slit hole corresponding to a radial line (15) on an axis point (01) when observed in a direction of an axis (L1) of the slitter blade (1).

Patentansprüche

1. Staubentfernungs Vorrichtung mit:

einem Staubentfernungs Kopf (10) mit einer Schlitzaußensparung (7), die geeignet ist, einen äußeren Endkeil (11) eines Schneidmessers (1) aufzunehmen, der dadurch läuft, und einer Strahldüse (12), die geeignet ist, Luft zu dem laufenden äußeren Endkeil (11) zu düsen, **dadurch gekennzeichnet, dass** Saugöffnungen (14), die geeignet sind, Luft anzusaugen, die aus der Strahldüse (12) gedüst wird, an einer Innenfläche (7A) der Schlitzaußensparung (7) des Staubentfernungs Kopfs (10) angeordnet sind, wobei die Strahldüse (12) mit einer Messerkeil-Strahldüse (12a), die zu einem Messerkeil (8) des äußeren Endkeils (11) des Schneidmessers (1) hin angeordnet ist, und Seitenstrahldüsen

(12b) versehen ist, jede von welchen entsprechend auf einer linken und einer rechten Seite des äußeren Endkeils (11) angeordnet ist; und eine der Saugöffnungen (14), die Messerkeil-Strahldüse (12a) und eine andere der Saugöffnungen (14) von einem schlitzvorgelagerten Ende (7B), wo das Rotationsschneidmesser (1) in die Schlitzaußensparung (7) eindringt, zu einem schlitznachgelagerten Ende (7C), wo das Schneidmesser (1) aus der Schlitzaußensparung (7) austritt, in Reihe angeordnet sind.

2. Staubentfernungs Vorrichtung nach Anspruch 1, bei der die Seitendüsen (12b) eine gerade Schlitzöffnung ausbilden, die einer radialen Linie (15) an einem Achsenpunkt (01) entspricht, wenn in einer Richtung einer Achse (L1) des Schneidmessers (1) betrachtet.

Revendications

1. Appareil d'enlèvement de poussière comprenant :

une tête d'enlèvement de poussière (10), ayant une rainure à fente (7) conçue pour recevoir un bord d'extrémité périphérique (11) d'une molette de coupe (1) avançant à travers celle-ci, et une buse à jet (12) conçue pour projeter de l'air vers le bord d'extrémité périphérique avançant (11) **caractérisé en ce que** des trous d'aspiration (14) conçus pour aspirer l'air projeté à partir de la buse à jet (12) sont disposés sur une face intérieure (7A) de la rainure à fente (7) de la tête d'enlèvement de poussière (10), dans lequel la buse à jet (12) est munie d'une buse à jet à bord de lame (12a) disposée vers un bord de lame (8) du bord d'extrémité périphérique (11) de la molette de coupe (1), et de buses à jet latérales (12b) chacune d'elles étant respectivement disposée sur un côté de gauche et un côté de droite du bord d'extrémité périphérique (11) ; et un des trous d'aspiration (14), la buse à jet de bord de lame (12a) et un autre des trous d'aspiration (14) sont disposés en série à partir d'une extrémité amont de fente (7B), où la molette de coupe rotative (1) s'immisce dans la rainure à fente (7), jusqu'à une extrémité aval de fente (7C), où la molette de coupe (1) sort de la rainure à fente (7).

2. Appareil d'enlèvement de poussière selon la revendication 1, dans lequel les buses latérales (12b) forment un trou à fente droite correspondant à une ligne radiale (15) sur un point d'axe (01) quand on regarde dans une direction d'un axe (L1) de la molette de coupe (1).

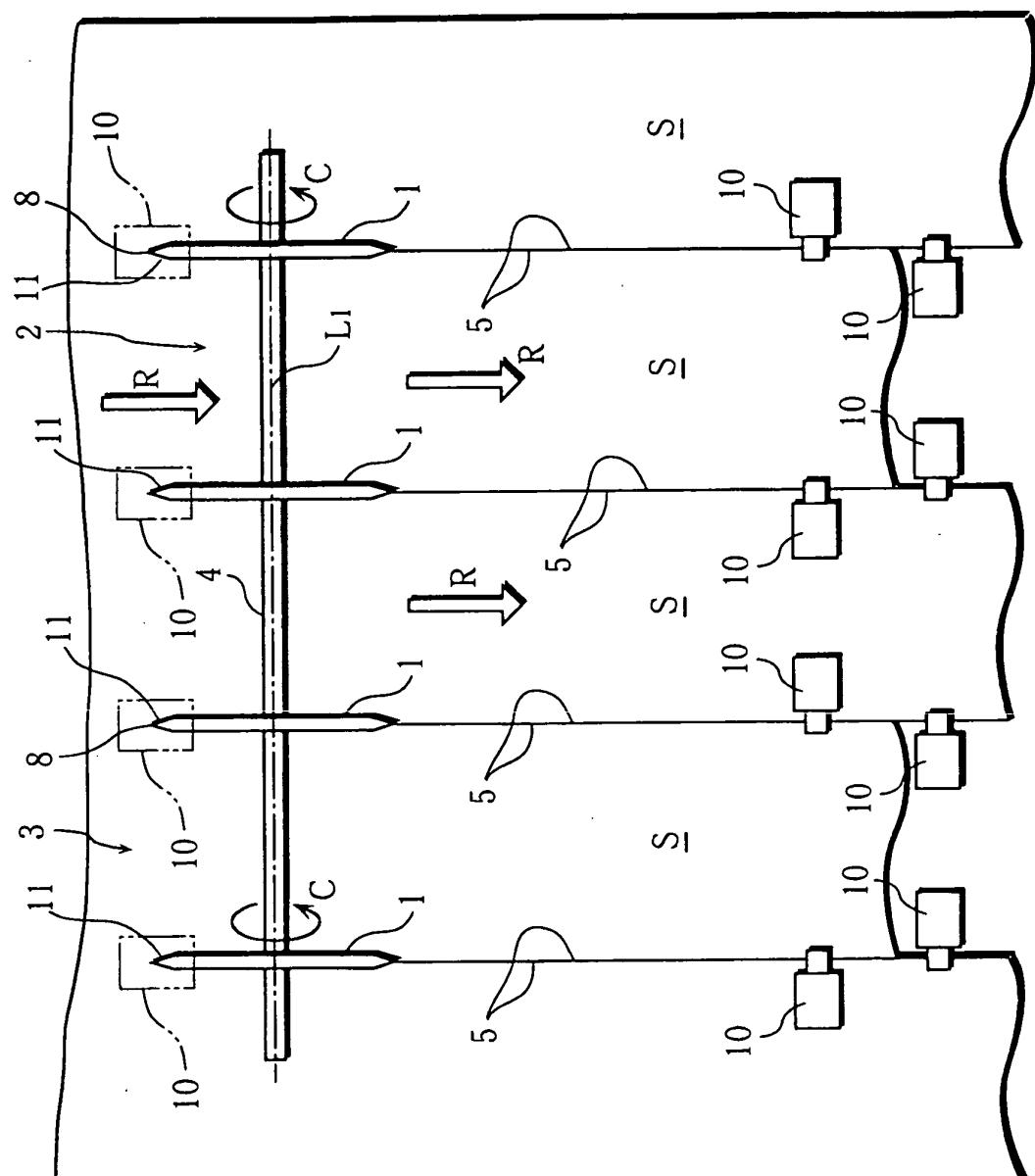


FIG. 1

FIG. 2

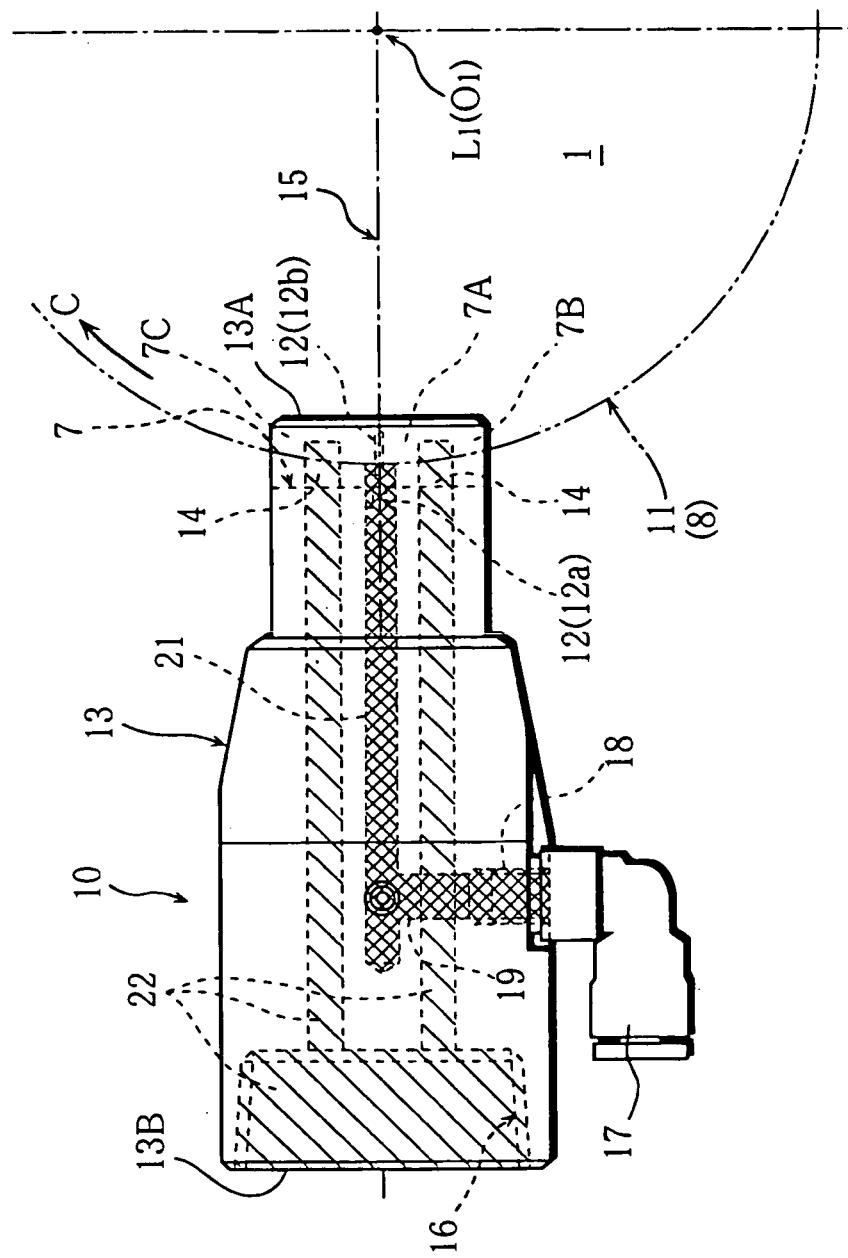


FIG. 3

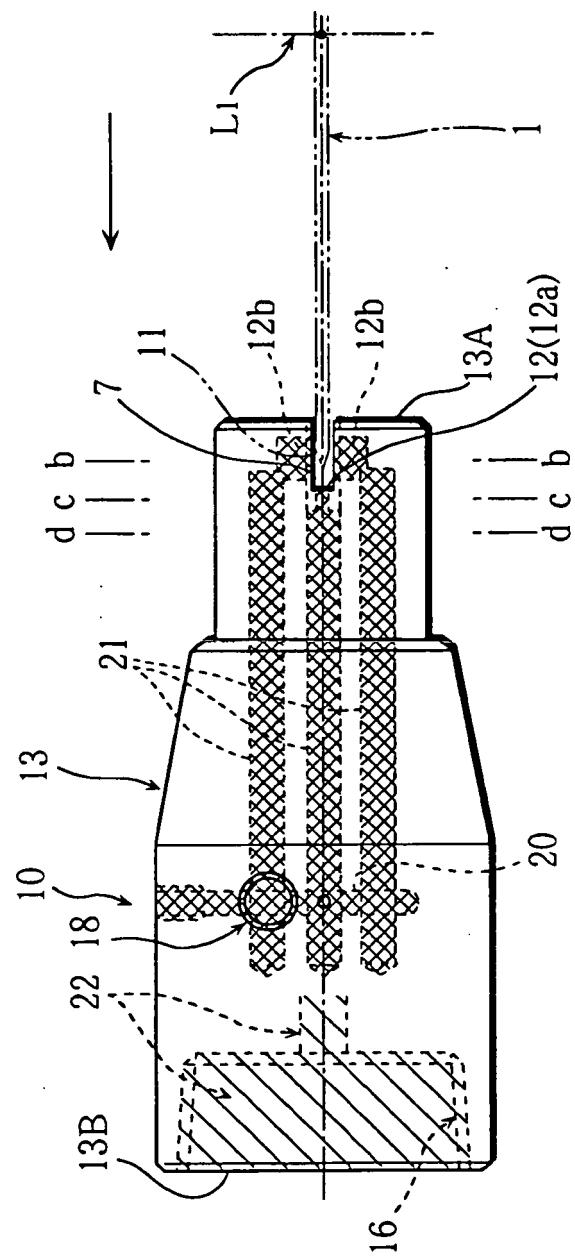


FIG. 4A

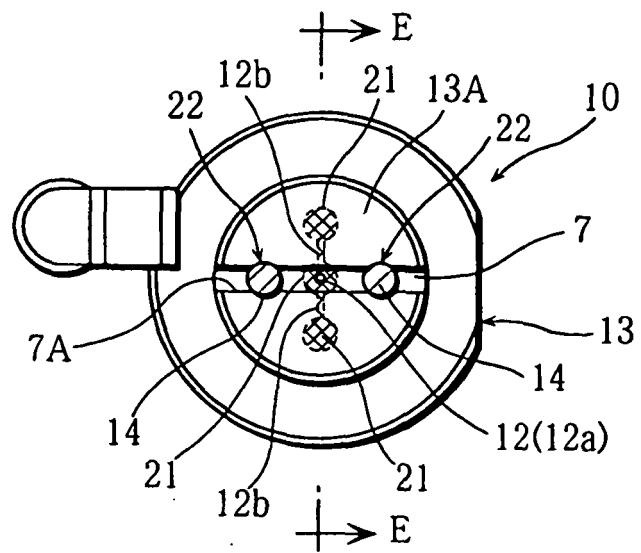


FIG. 4B

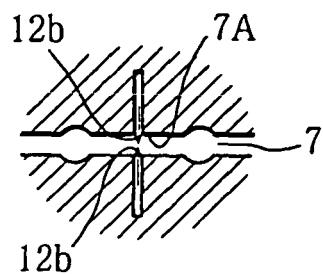


FIG. 4C

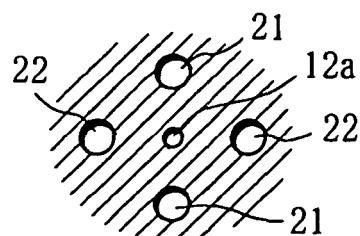


FIG. 4D

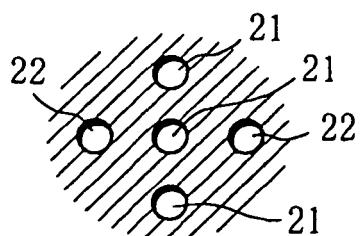


FIG. 5A

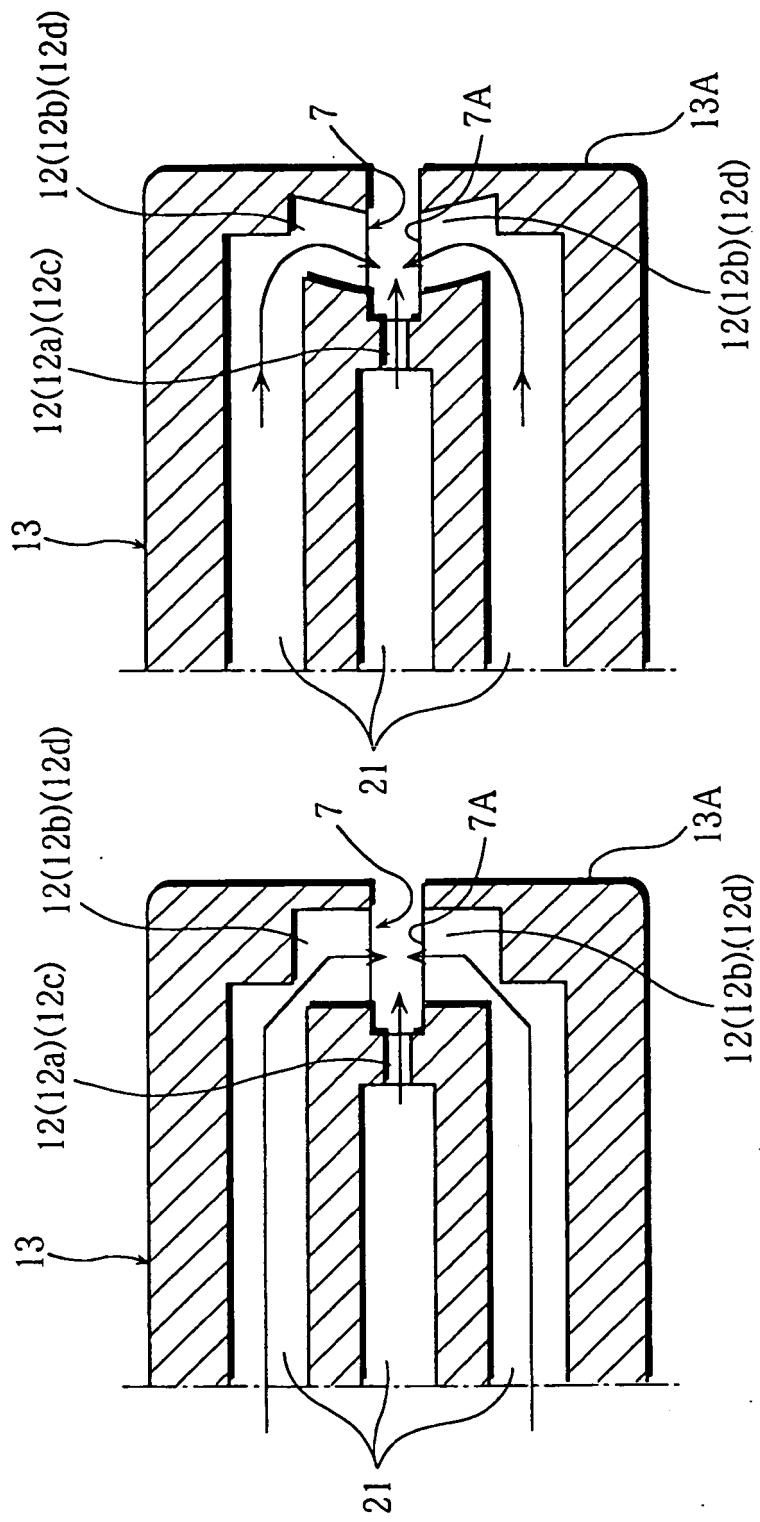


FIG. 5B

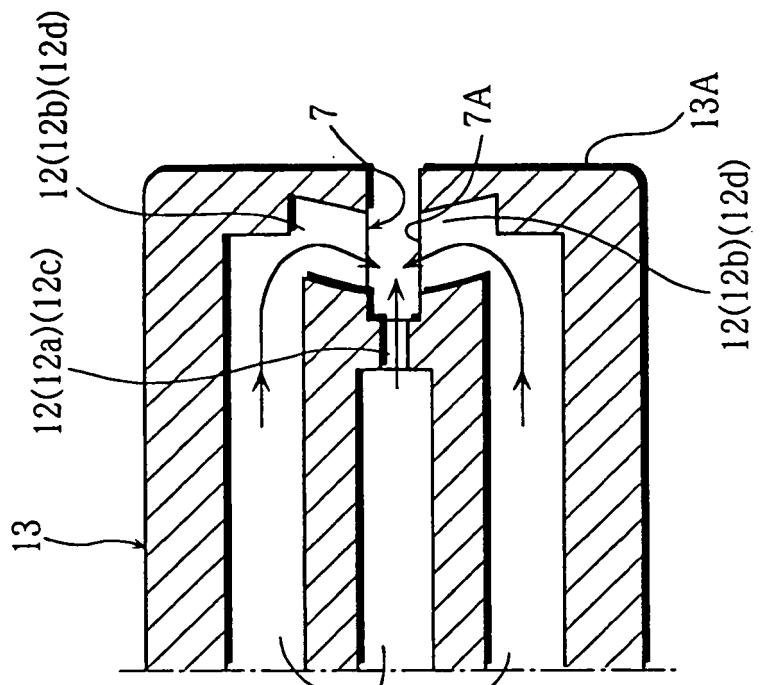


FIG. 6

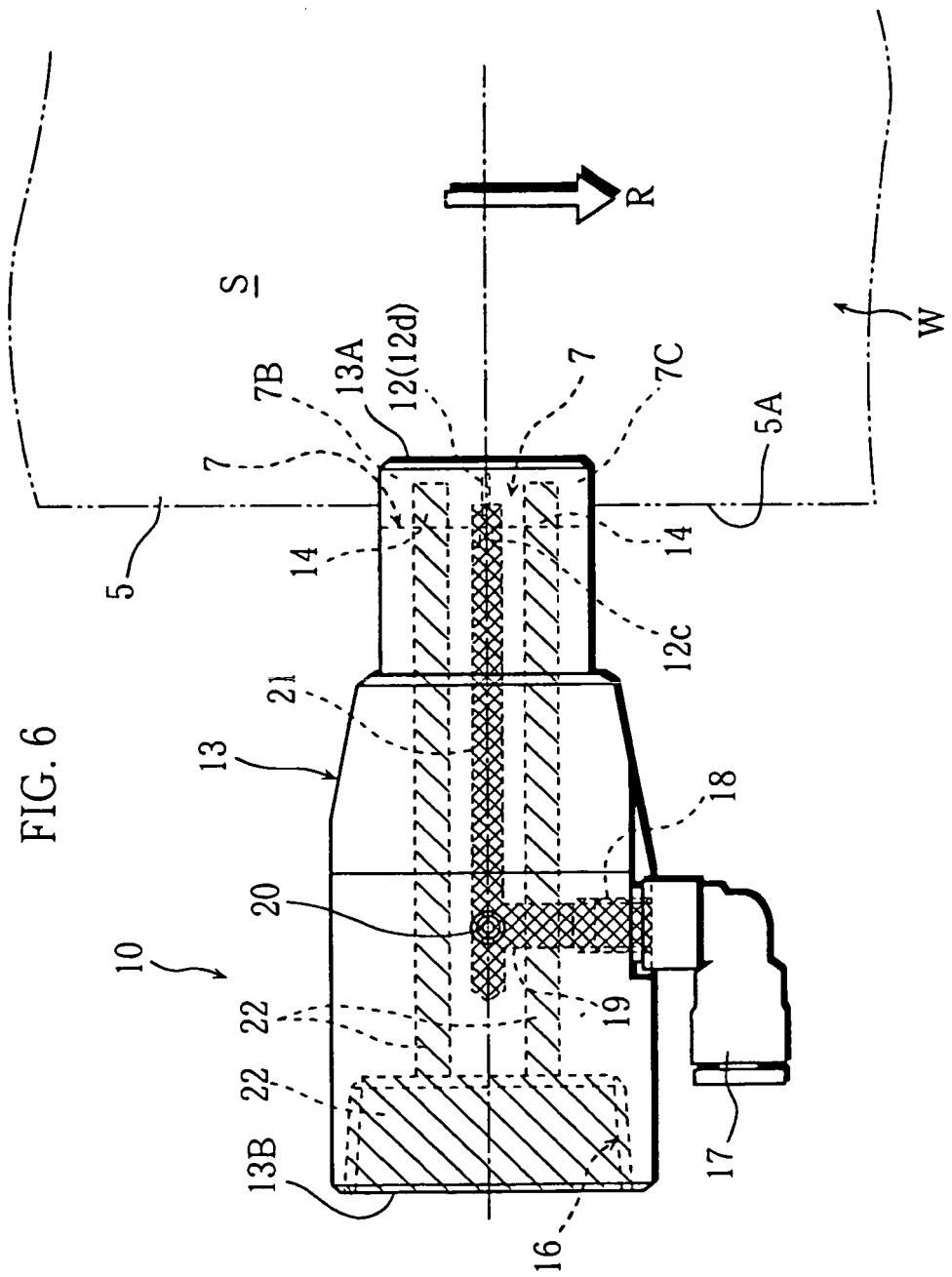


FIG. 7

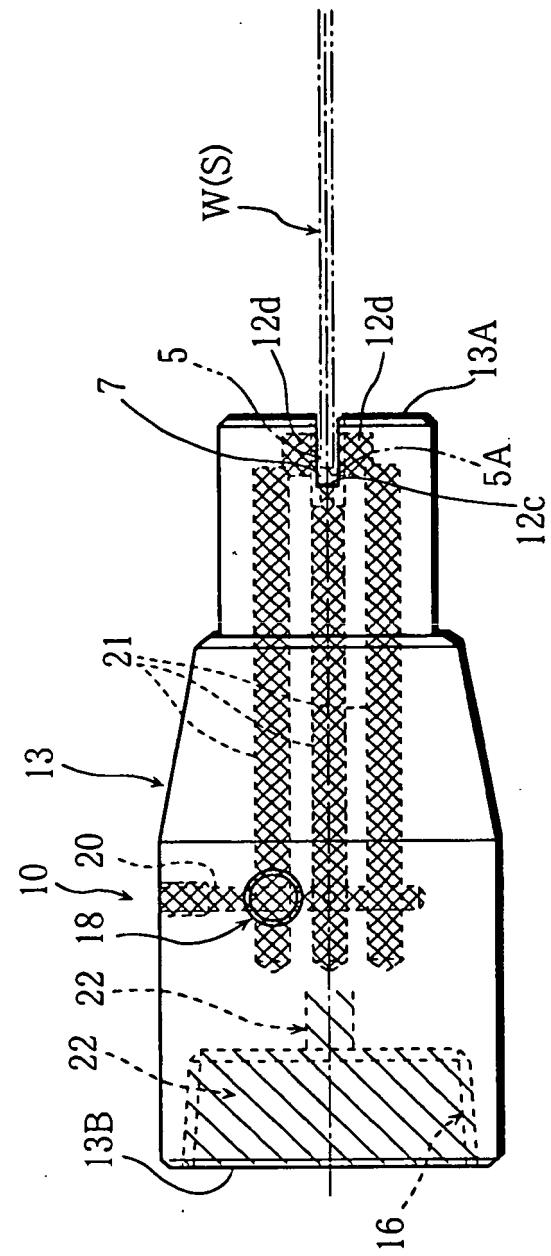


FIG. 8B

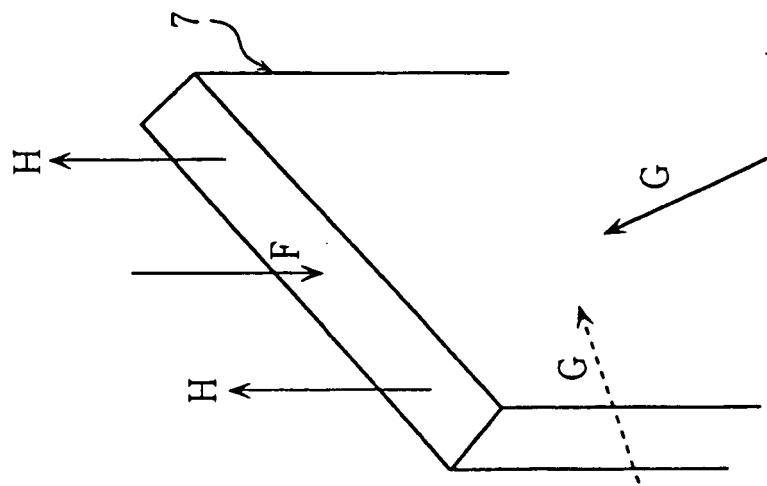


FIG. 8A

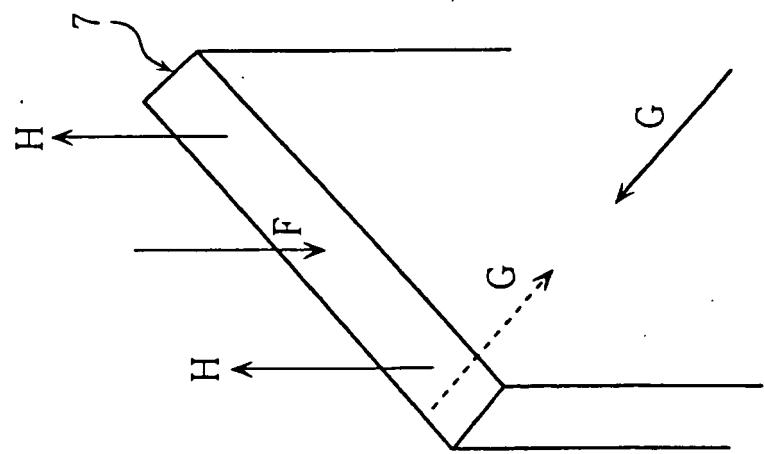


FIG. 9A

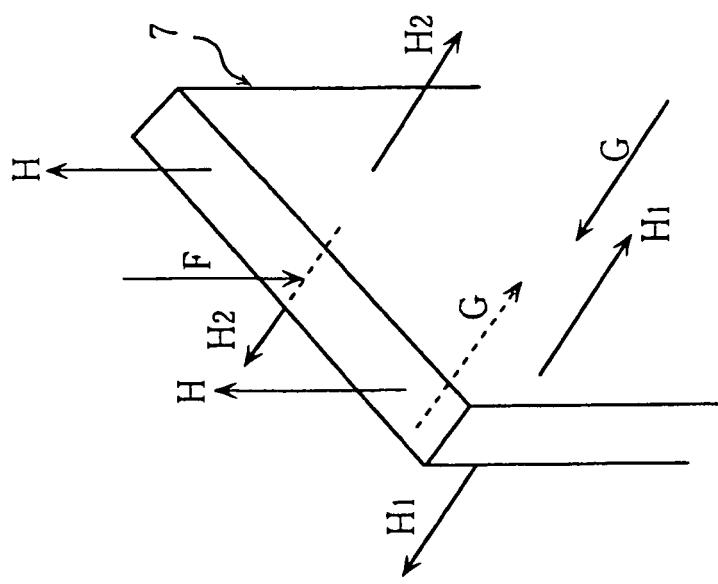


FIG. 9B

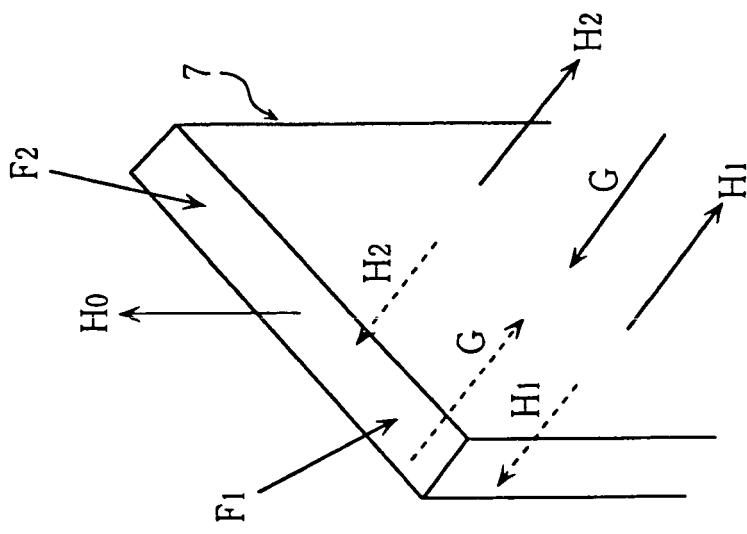


FIG. 9C

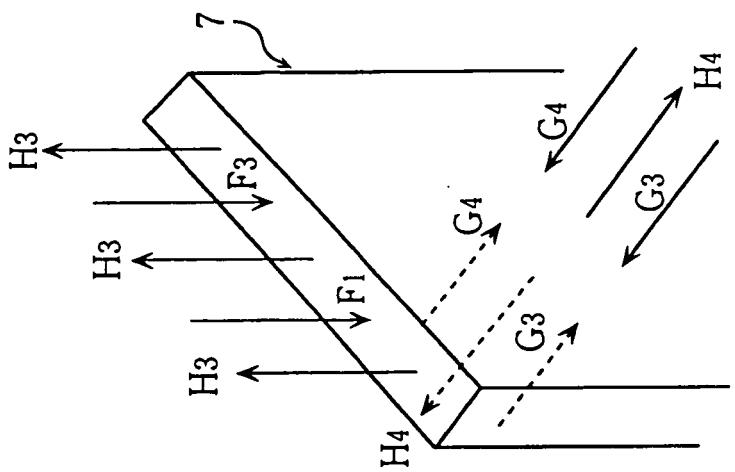


FIG. 10
PRIOR ART

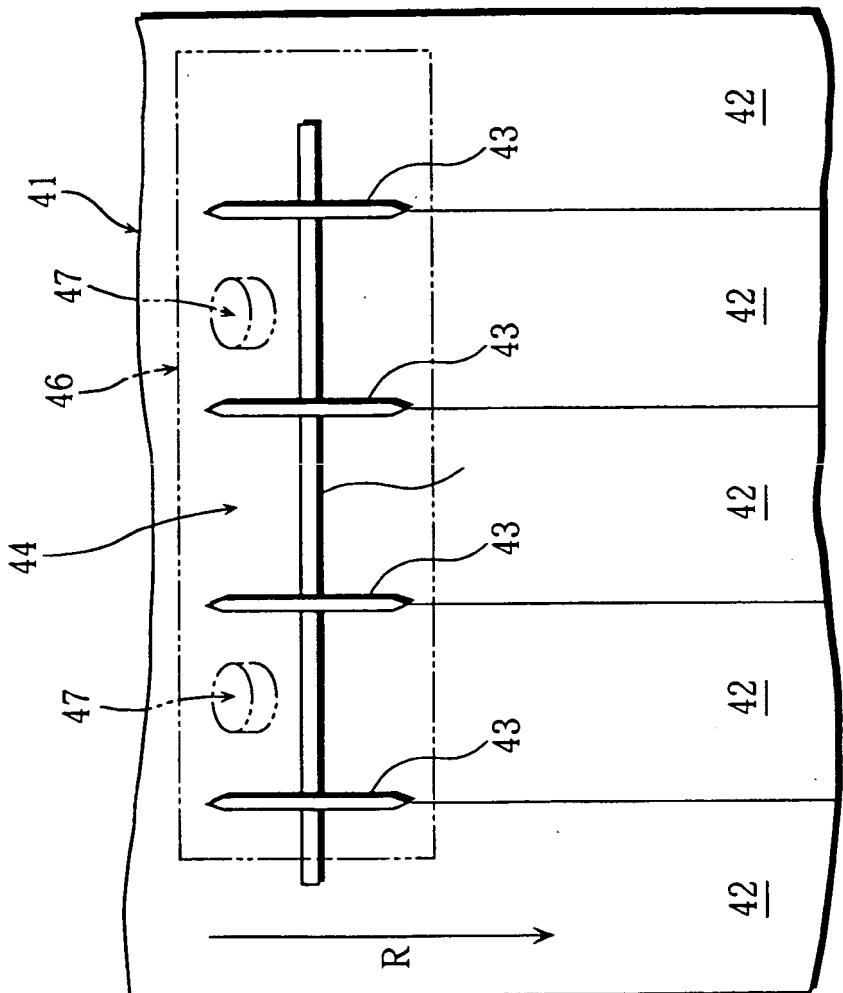
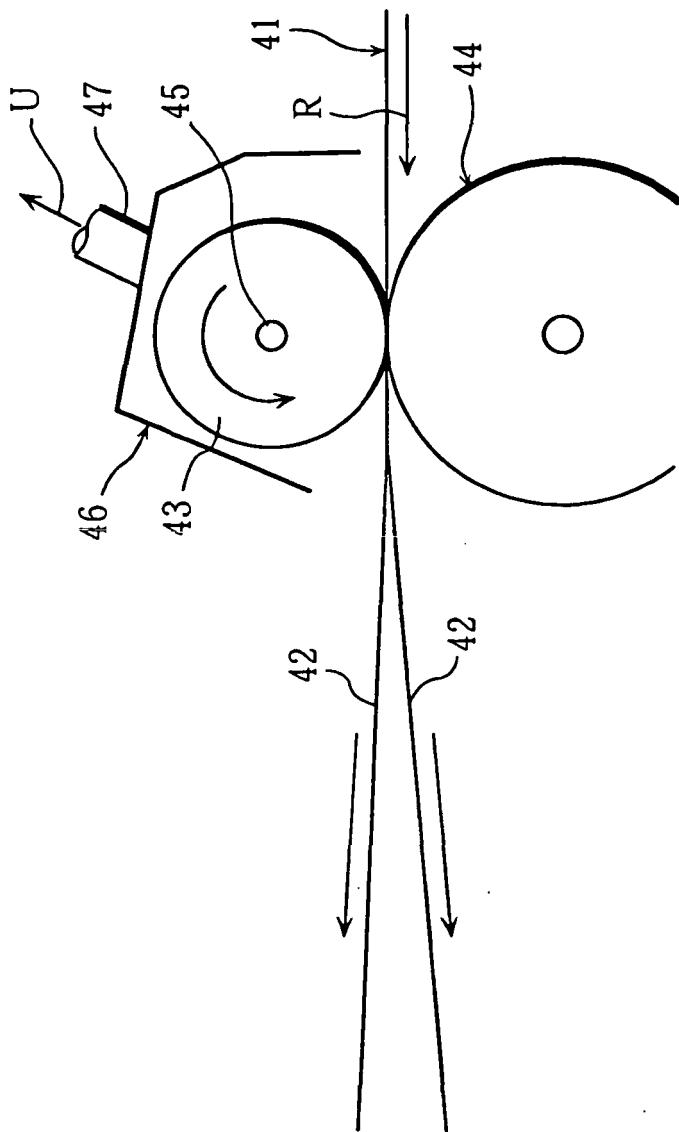


FIG. 11
PRIOR ART



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2820599 B [0006] [0007]
- EP 1674398 A [0010]