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(54) **Method of, and device for, chamfering the edge of felt material**

(57) The method comprises the steps of infiltrating water through the edge of the felt material, freezing and hardening the edge of the felt material, adjusting the angle of a cutting device, running the cutting device over the edge of the felt material with a given inclination and cutting the edge of the felt material at a fixed angle. The method may be carried out with a device comprising a worktable 1 to receive and support the edge of the felt

material F, a running guide 11 provided along the edge of the felt material on the worktable, and a uniting or mounting device 20 which supports a cutting device running along the edge of the felt material at a given angle and slides freely on the worktable. The cutting device is provided at the front of the felt material to cut a soaked edge of the felt material with an even chamfer at a given angle after freezing the edge of the felt material by jetting out freezing gas against the edge.

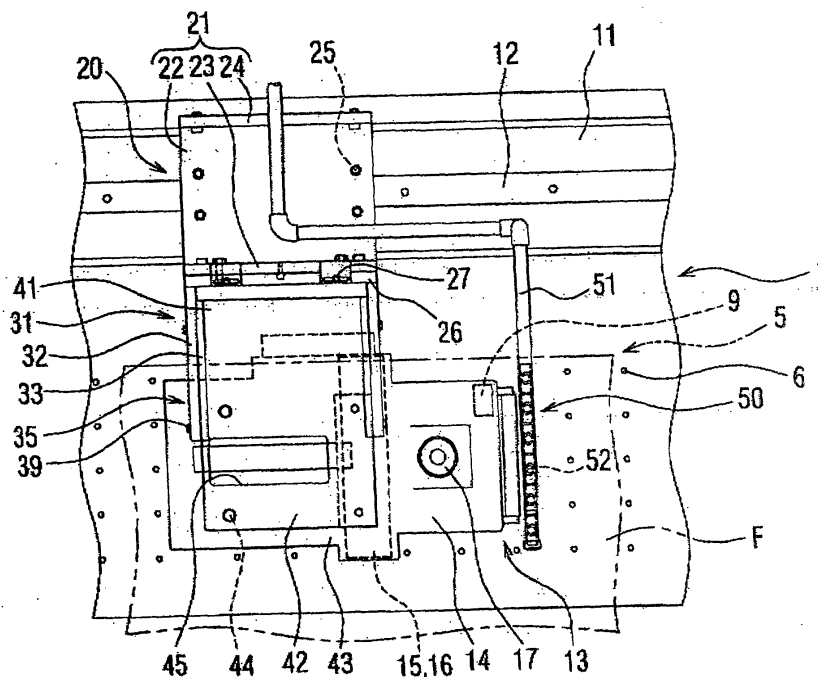


FIGURE 1

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Description

[0001] This invention relates to a method of, and a device for, cutting the edge of felt material such as that called "Punch Carpet" at an accurately chamfered or slanted angle. For example, to make the thickness of the overlapped ends of a felt cover the same as the cover when wound around a drum of a flat sheet ironing machine.

[0002] In the case of a conventional flat sheet ironing machine, a drum covered with resilient pads is wound by a felt cover, and it presses the passing objects such as sheets. As shown in FIGURE 12, for example, the drum D is wound twice around its trunk by felt F which is as thick as 7~8mm, and the outermost end of the felt is cut around the end of its buried inner part, and by roughly overlapping both ends the felt is fixed.

[0003] While the drum D wound with felt F is rotating, it keeps on pressing the heated chest touching its outer surface. So inevitably felt F gets longer. Then the overlapped end of the outermost part becomes tripled, thus the tripled part forms a kind of ridge. Because of this ridge, the drum cannot be true circle. When you cut the excessively overlapped part, the part around the boundary becomes weak, and if you use it without cutting, you cannot expect stable finish of the pressed objects because of its difference in level. To make matters worse, pressing power around the ridge is not only uneven but the material around becomes weaker, and while the rest of its part is still intact, the part around the ridge breaks apart. It is then necessary to replace the cover.

[0004] Even if you put each end of the felt together in order to avoid this overlap, double winding of the felt inevitably produces the ridge, so you need to adopt single winding. Otherwise, in the long run you cannot escape from the brakeage. Single winding, however, is subject to make felt F moving sideways on the drum after the long use, and its surface becomes wavy because its confronting ends become apart or overlapped.

[0005] The idea to cut both inner and outer ends of the felt slantingly thinner and overlap the both shaved ends to make the total thickness of the felt even seems plausible, but as felt F is needle punched, cutting work yields fine cotton waste and needs a waste collecting device as well as is extremely difficult.

[0006] Therefore this invention was made to get over the above-mentioned difficulties. By cooling and hardening the edges of felt before cutting, you can easily cut it off slantingly and avoid fine waste being produced in the course of cutting work. When you overlap the slantingly cut edges each other, the height of the overlapped part becomes as high as the rest of the felt, hence the diameter of cross section of the drum becomes almost truly circular. Consequently you can get equal pressure upon the sheets. This invention is to provide you with the way and the device to cut the edge of felt off in the above-mentioned manner.

[0007] According to a first aspect of the present inven-

tion, there is provided a method of chamfering an edge of felt material, the method comprising the steps of:

- a) infiltrating water through the edge of the felt material;
- b) freezing and hardening the edge of the felt material;
- c) adjusting the angle of a cutting device;
- d) running the cutting device over the edge of the felt material with a given inclination;
- e) cutting the edge of the felt material at a fixed angle.

[0008] Preferably, the edge of the felt material is frozen and hardened by jets of freezing gas.

[0009] According to a second aspect of the present invention, there is provided a device for chamfering an edge of felt material, the device comprising :

- a) a worktable to receive and support the edge of the felt material;
- b) a running guide provided along the edge of the felt material on the worktable; and
- c) a uniting or mounting device which supports a cutting device running along the edge of the felt material at a given angle, and slides freely on the worktable led by the running guide;

wherein the cutting device is furnished at the front of the felt material on the worktable to cut a soaked edge of the felt material with an even chamfer at a given angle after freezing the edge of the felt material by jetting out freezing gas against the edge.

[0010] Preferable and/or optional features of the second aspect of the invention are set forth in claims 4 to 12, inclusive.

[0011] The invention will be described, by way of example only, with reference to the accompanying drawings, wherein:

Figure 1 is a plan view of one embodiment of a device according to the second aspect of the invention,

Figure 2 is a side view of the device shown in Figure 1,

Figure 3 is a front view of the device shown in Figure 1,

Figure 4 is a fragmentary perspective view of the device shown in Figure 1,

Figure 5 is a front view of the angle adjusting device, part of which is removed to show the inside,

Figure 6 is a side cross section of the angle adjusting device,

Figure 7 is a plan view to show the cutting device running on the cutting worktable,

Figure 8 is a side view of the cutting device,

Figure 9 is another side view of the chief section of the cutting device in use,

Figure 10 is a side cross section of the drum with felt on its rolling face,

Figure 11 is a flow chart to show one example of the method according to the first aspect of the invention, and

Figure 12 is a side cross section of the drum wound with felt by the conventional method.

[0012] In order to cut the edge of felt material slantingly (chamfered), you have to go through the process S1 to wet the edge of felt F with chilled water, the process S2 to cool and harden the edge by jetting cool air out against the edge, the process of S3 to set the angle of cutting device 13 to meet the needed angle of inclination at the edge, the process S4 to make Cutting device 13 run along the edge with a given angle, and the process S5 to cut the edge at a given angle to make a slanting (chamfered) face on the felt.

[0013] The felt cutting device consists of a Cutting worktable 1 to position the edge of felt F, running guide 11 fixed on the cutting table 1 along the edge, a uniting (or mounting) device 20 which is slidably mounted on the cutting table 1 led by the running guide 11 at any give angle against the face of a felt edge, and cooling device 50 which is fixed to the front of cutting device 13 and makes the wet felt edge cool and harden by jetting cooling gas at the felt.

[0014] Running guide 11 comprises three Guide rails 12, which are firmly fixed at the upper, left and right sides.

[0015] Uniting device 20 comprising a Base body 21, which is mounted on guide rail 12 at any given angle, Slide base 26, which is united to the Base 21 adjustable to upper and lower directions, and the base 31, which firmly supports and unites cutting device 13 through angle adjusting device 35 to slide base 26.

[0016] The base 31 to support cutting device 13 comprises of a pair of fixing plates 32, which is a set at the upper part of slide base 26 and facing each other at the front and the rear of the cutting device 13, a pair of movable plates 33 united by angle adjusting device 35 so that they can move freely to the right and left along the face of fixing plates 32, and uniting device 41, which unite cutter 13 to movable plate 33.

[0017] The angle-adjusting device 35 is fixed, on the outer face of movable plate 33, by a guiding pin 37 that is slidable in a curved channel 36 on the inner wall of the fixed plate 32, and is fixed with fixing screw 39 inserted from outside of fixing plate 32 to movable plate 33 through arcuate opening 38.

[0018] Connection device 41 consists of a support plate 42 which rests on the front and rear part of movable plate 33, fixing plate 43 fixed to the mounting part around the centre of the cutting device 13 and united to supporting plate 42, and to uniting post 44 which is united to the support plate 42.

[0019] In addition, the felt fixing device 5 which can firmly affix felt F on the worktable by sucking air strongly

at the suction device 8 through suction holes 6 open on the working face of the cutting table 1 can be furnished, and this felt fixing device 5 can be operated in response to a sensing device 9 which senses the freezing of Felt F.

[0020] Further it can also be provided with a waste collecting bag 62 that collects the waste felt F cut off by cutter 13, and waste collecting device 60 that has a drying device 64 which dries the waste.

[0021] As detailed above, the edge of felt is wetted by chilled water, hardened by a jet of cool air, and cut by cutter 13 with a given precise slanting angle, then the thickness of the overlapped edges becomes almost uniform with the rest of the parts, which makes the covered drum almost rightly cylindrical as a whole.

[0022] The base 21 of the uniting device 20 that is united to three faces of guide-rail 12 of running-guide 11 on the cutting table 1 makes the cutting device 13 slide smoothly on the edge, even if only one side of the heavy cutting device 13 is supported by uniting device 20. And by setting felt F on the cutting table 1, it make the work smooth on long felt F too, with the running of Uniting device 20 and Cutting device 13.

[0023] Angle-adjusting device 35 of device 20 adjusts the slanting angle of cutting device 13 through connection device 41, by sliding "Sliding Board 33" or screwing it at a right angle as well as adjusting the height, and thus form a neatly slanted face by cutting off the edge of felt at a given angle. At this time, as the edge of felt is frozen by jetting cool air, cutting by cutting device 13 is made easy and the fiber of un-knitted felt F doesn't fray or split finely.

[0024] Connection device 41 of device 20 connects the cutting device 13, which has difference in level on its face, to movable plate 33 through Supporting plate 42, enabling the adjustment of the slanting angle of Movable plate 33 itself against Fixed plate 32 and unites cutting device 13 to cooperative set device 20 and support firmly.

[0025] Felt Fixing Device 5 draws the felt F firmly to the worktable to prevent it from moving during a cutting operation.

[0026] Waste Collecting Device 60 prevents powdered fiber-waste, cotton waste and others from flying, and by drying the frozen waste it enables them to be reused.

[0027] Hereunder we explain the operation of this invention by referring to Figures 1 to 11.

[0028] Reference numeral 1 signifies Cutting Work Table. The length of this table 1 is equivalent to that of the felt cover to be mounted, for example, around the periphery of Drum D of a flat sheet ironing machine, and a little wider than the width necessary to have Cutting Device 13 run and set Felt F as later described, and has a stipulated height of table-top.

[0029] On this Cutting Work Table 1, is arranged Felt-fixing device 5 that sucks and fixes a felt F that is mounted on the tabletop mentioned above. Felt fixing device 5 comprises a Suction Hopper 7 which has a plurality of

Suction Holes 6 all over its face from under the working face and is connected to Suction device 8 such as a Vacuum Pump through an appropriate suction pipe. This suction device 8 is controlled by Sensing device 9 in the form of a thermal sensor to detect the freezing temperature when felt F has been frozen by the later stated cooling device 50. And it is designed to stop when cutting process comes to an end, as felt hardening device 5 functions following Suction device 8 turns on when the freezing process of felt F starts.

[0030] Cutting worktable 1 is of steel with a give section, and on top of its working table is fixed a running guide 11 on which runs Cutting device 13 along the edge of the felt F to be cut with a given slant. This running guide 11 is made of steel and is of inverted channel shape. On the top, right and left walls of it are firmly fixed guide rails 12, and by being united by uniting (or mounting) device 20 later explained Cutting device 13 is mounted in a slidable manner and cooling device 50 is also attached.

[0031] Cutting device 13 which is guided by Guide rails 12 has a cutting body 14 mainly of rectangular cast metal which is placed with its own weight and Running device 15 which is united to cutting body 14 so that it will run on the working face of Cutting work table 1 and cutter 16 which appears and disappears freely at an arranged protruding distance from the bottom of Cutting body 14.

[0032] This cutter 16 is arranged symmetrically for example 180° or in the quite the opposite place in the Running device 15 (i.e. running roller which is driven rotating itself) which is set in an exposable manner at the bottom of cutting device 14, and it cuts the edge of felt F to a given depth running along the felt edge by the rotation of this running roller. The exposure of the blade is adjustable taking how deep it cuts the felt into account. At the rear of this cutter 16 are openings i.e. suction port 61 of Waste collecting device 60, which is to be described later.

[0033] This cutting device 13 is united to Running guide 11 by Uniting device 20 which is mounted by Guide rail 12 in a slidable manner. This Uniting device 20 includes angle-adjusting device 35 which adjusts the angle of inclination of Cutter 16 in Cutting device 13, namely the angle of entire Cutting device 13.

[0034] This Uniting device 20 comprises a Base 21, which is mounted on the Guide Rail 12 in a slidable manner, Slide base 26 which is united to Base 21 in a manner that is slideable upward and downward, and fixing base body 31 to support Cutting device 13 and unites it to Base 21 through Angle Adjusting Device 35.

[0035] Base 21 is arranged at the side of Upper base 22 which is at the top of Running Guide 11 and Cutting device 13 of running guide 11, and is formed of inverted channel shape with side sliding base 23 which has the height as tall as the upper part of Upper Base 22 and Side base 24 which is at the opposite side of Running Guide 11 where there is no Cutting device 13. And inside

of each Base 22, 23, 24 is Cam Follower 25 arranged in movable and spinable manner at the upper face and right and left sides of running guide 11. This Cam Follower 25 surround Running Guide 11 biting each Guide Rail 12, and along Running Guide 11 Cutting Device 13 is led smoothly.

[0036] Slide Base 26 is able to slide up and down by screwing and unscrewing the up-down adjusting screw 27 which is put on to the side of Side Slide base 23. This up-down adjusting screw 27 has a butterfly-like shape as shown in the Drawing, but it can have a handle (not shown).

[0037] Supporting Base 31 has various shapes to suit the outer shape of Cutting Device 13 as shown in Figure 4. As the drawing shows it has a pair of Fixing plates 32 at the front and rear of Cutting Device 13 on the Slide Base 26, a pair of Movable plates 33 at the front and rear coordinated by Angle Adjustment Device 35 which enables it to move right and left along this Fixing plate 32, and Uniting Device 41 to unite Cutting Device 13 to Movable plate 33.

[0038] Fixing plate 32 and Movable plate 33 are rectangular plates which lie along right and left of Cutting device 13, and can be fixed firmly along fixing plate 32.

[0039] As shown in Figures 4 and 6, Angle Adjusting board 35 fixes Guiding Pin 37 in arcuate Guide channel 36 in Fixing plate 32 to the outside of Movable plate 33. The pin 37 is, at the same time, inserted into the arcuate fixing hole 38. Then Fixing screw 39 is screwed into Movable plate 33 from the outside of Fixing plate 32. By loosening Fixing screw 39, Movable plate 33 can be moved along Guide slot 36 against Fixing plate 32. By fixing screw 39 the angle of moveable position can be maintained.

[0040] Uniting device 41 consists of Support plate 42 on the front and rear pair of Movable plate 33, Fixing plate 43 which is fixed to the protruding part in the center of Cutting Device 13 and united to Support plate 42, and Uniting Post 44 which rests on the rear top of Cutting device 13 and is united to Support plate 42. Sign 45 in the drawing shows an evading hole to avoid Operating Handle 14 prepared on top of Cutting device 13.

[0041] The make-up of the Uniting Device 41 is designed to make Movable plate 33 fit the uneven top of Cutting device 13, therefore, depending upon the shape of Cutting device 13, its make-up is not limited to the example of this drawing.

[0042] On the other hand, Cooling & Hardening device 50 is located at the front of Cutting device 13 as shown in Figures 1, 3, 7, 8, and jet out freezing gas such as liquefied nitrogen to freeze the cold water emitted on the edge of felt F to be cut slantingly. As shown in the drawings, this Cooling device 50 has a supply pipe 51 which is united to a gas cylinder containing cooling gas (not shown) and plural Jetting pipes 52 which diverge from supply pipe 51 and have jetting outlets on the edge of felt F. And it is designed to run along with the movement of Cutting Device 13 by fixing supply pipe 51 on

Base body 21 of uniting device 20.

[0043] This Cooling & Hardening device 50 is also designed to jet out cold water for cooling using replacing switch (not shown), hence extra outlet to jet out cooling water becomes unnecessary. In this case, as the first step, Cooling & Hardening Device 50 runs backward with Cutting device 13 and Coordinated set 20 on the cutting work table 1 jetting out water on the edge of felt F, then as the second step, waiting for cold water to percolate sufficiently across the edge of felt, replacing the switch, jetting out freezing gas, driving Device 50 forward with Cutting device 13 and uniting device 20, you can cut frozen edge at a given angle by Cutting device 13.

[0044] Supply pipe 51 is turned toward the front of Cutting device 13 on Base 21, and along the front edge of Cutting device 13 it is bent upward and then bent along the front edge. Plural Jetting pipe 52 diverges along this front edge. And Jetting pipe 52 is formed bendable with plural hollow structures as shown in the drawings, and its Jetting port is made horizontally long so that it lies along the front edge of Cutting device 13.

[0045] In Figure 9, another embodiment is shown. It has Waste collecting device 60 which collects the waste made by cutting felt F with Cutting device 13. This Waste collecting device 60 has Waste collecting bag 62 which collects the waste made by cutting felt F with Cutting device 13, and Drying device 63 which dries the waste.

[0046] It has, for example, in the box-like equipment placed on top of the rear of Cutting device 13, Waste collecting bag 62 which is connected to Suction port 61 opened at the rear of Cutter 16 of cutting device 13 and at the end of the bag is a Suction device 63 in the form of a vacuum pump coordinated, and beneath waste collecting bag 62 is Drying device 64.

[0047] This waste-collecting device 60 is not necessarily mounted on Cutting device 13. Although the drawing is abbreviated, some appropriate waste collecting pipe can be connected to Suction port 61 (the pipe should be made flexible), then for example, you can lead it to Waste collecting device 62, Suction device 63, and Drying device 64 placed on somewhere appropriate of the edge of Cutting table 1.

[0048] Next referring to Figure 10, we present the explanation of an example about this invention. Set Felt F, which is to be wound around the Drum D of sheet-roll-machine, on Cutting table 1. The side of the edge of felt that is to be slantingly cut must be put facing upward. Then provide cooled water on the face and soak the edge. (Soaking process.... Step 1: S1) In soaking by the replacing switch let the cooled water jet out from Jetting pipe 52 of Cooling device 50 and let Cutting device 13 run. At this moment you do not make Cutter 16 of Cutting device 13 run and make it just run on the edge to be processed. In this process, you can choose either soaking the edge by jetting cold water or by immersing it in stored cold water.

[0049] Then, Cutter 16 of Cutting device 13 is to be

adjusted to have its proper width of blade pushed out from the bottom, and then Cutting device 13 is to be tilted by the operation of Angle adjusting device 35 of uniting device 20; 10 degrees or so. (THE PROCESS OF SETTING ANGLE OF INCLINATION—Step 3: S3) Then adjust the height of Cutting device 13 by moving Slide base 26 following the required height and thickness of the edge of felt.

[0050] Aside from the adjustment of inclination of Cutting device 13, you prepare to make liquefied nitrogen cooling gas jet out from Jetting pipe 52 of Cooling and hardening device 50 by turning Replacing switch. When liquefied nitrogen gas is jetted out, as its temperature is -196 °C, a water soaked wet edge of felt is instantly frozen by the jet of cooling gas. (Cooling & hardening process - Step 2: S2) Cooling & Hardening process S2 by Cooling and hardening device 50 can be done prior to the process of Tilting angle setting process S3, when gas jetting from Cooling & Hardening device 50 stationed at the front of Cutting device 13 is done against the edge of felt by the running of Cooperating set device 20 and Cutting device 13.

[0051] In short, as all you have to do is to have Cutting device 13 whose angle of inclination is set run after the edge of felt becomes cooled and hardened as is stated later, either Inclination angle setting process S3 to adjust the angle of Cutting device 13 which runs on the edge of felt or Cooling & Hardening process S2 to cool and harden the edge can be first. Incidentally, at this time when felt F is frozen hard, felt F is stuck fast to the face of worktable by Felt fixing device 5.

[0052] Next, after setting the angle of inclination of Cutting device 13 through the process of Grade setting process S3 Cutting device 13 is to run along Running guide 11 with tilted Cutter 16 along the edge of felt F. (RUNNING PROCESS ---STEP 4: S4) This way, by letting Tilted Cutter 16 run along the edge of felt F, Cutter 16 of Cutting device 13 cuts off the cooled and hardened edge of felt F into an inclined plane with a given inclination. (Cutting process -STEPS: S5) When cutting work of the surface of one side is finished, the felt F is to be turned over, and the edge of the other end is to be cut off with inclination. And then, as shown in Figure 11, finished felt F is to be wound on a resilient support made of springs, which covers the whole surface of Drum D of the ironing machine, by overlapping both edges of the opposite side of slantingly processed ends.

[0053] As is the composition of this invention, in cutting the edges of felt F with inclination, the edges can be cut easily just as in cutting metal precisely as the edges are frozen before cutting. Therefore the thickness or the height of the processed section overlapped with each other is almost the same as the rest of felt F on Drum D of Sheet-roll machine; hence the cross section of Drum D is almost circular. This enables Drum D to produce uniform pressure on all the surface of sheet.

[0054] This is to freeze the edge by jetting out freezing gas on the edge after making the edge wet with cold

water, and then cut the edges with tilted Cutting device 13 running along the edge, thus make the slanting section with given inclination. This invention produces felt to cover Drum D with the same thickness whose edges are cut off with given inclination. In addition, the surface of processed felt F is smooth without unevenness.

[0055] As this invention has such processes as S1 to wet the edge of felt F with cold water, S2 freezing process to freeze the edge, S3 the adjustment of Cutter 16 and the adjustment of angle of Cutter 13, S4 running process of Cutting device 13 on the edge, and S5 to cut the edges with inclination, it can cut unwoven felt F easily with precise inclination just like cutting metal.

[0056] As cooling gas to freeze the edge of water-infiltrated felt F is nitrogen, its jet freezes the edge instantly. And the gas is safe if it is diffused into the air, and free from harmful influence upon human health and the things around. (However, of course, a local exhauster is to be equipped.) In addition, by Waste collecting device 60, the waste fiber caused through cutting work is collected into Waste collecting bag 62, which prevents the diffusion of waste and contribute to keep the working environment clean. The cut waste is dried by drying device 64 for its reuse, so it is not wasted.

[0057] On the other hand, this invention has Cutting work table 1 which holds the edge of felt F and is equipped with Running guide 11 along the edge, Cutter 16 at its bottom, uniting device 20 which sets Cutting device 13 at a given angle of inclination in running along the edge of felt F, and enables Cutting device 13 to slide freely on Cutting work table 1, and Cooling device 50 which is arranged at the front of Cutting device 13 and freezes the edge by jetting out freezing gas against the edge of long moistened felt. So it can finish the process of freezing the wet edge of felt F, the process of each S1, S2, S3, S4, or S5 like running on the edge and cutting the edge by inclined Cutting device 13 quickly.

[0058] In addition, this invention is equipped with guiding rail 12 on the top and on both sides of running guide 11 of cutting work table, and on this guide rail 12 base body 21 of uniting device 20 has been equipped by biting each other. So heavy Cutting device 13 made of cast metal can run without vibration along running guide 11 on the edge of felt if supported only one side by Supporting base body 31 of uniting device 20, and it can make the edge of felt F into a neat section with given inclination free from fine splits or unevenness.

[0059] And as uniting device 20 makes Base body 21 (which is held by guide rail 12 by biting each other slide free) support Supporting device 31 through Slide base 26 and Angle adjusting device 35, it can set the height of Cutting device 13 by sliding it upward or downward in accordance with the thickness of the edge and the angle of inclination of Cutting device 13 and Cutter 16 easily.

[0060] Supporting base body 31 of uniting device 20 has Fixing board 32 which are a set of plates placed front and rear facing each other on top of Slide base 26,

Moveable plate 33 which is cooperated by moveable angle adjusting device 35 along this Fixing plate 32, and Uniting device 41 which makes Cutting device 13 united to Moveable plate 33. And Angle adjusting device 35 fixes Guiding pin 37 which is put in the arc-shaped guiding gutter 36 in the inner wall of Fixing plate 32 slide free on the outside of Moveable plate 33. And at the same time Angle adjusting device 35 makes fixing screw 39 screwed into moveable board 33 from the outside of Fixing board 32 by piercing into Adjusting & fixing hole 38 opened in Fixing board 32, so it can freely adjust the angle of Cutting device 13 supported by Uniting device 41 by deciding and fixing the position of Moving plate 33 with Fixing screw 39 as well as with the adjustment of Moveable plate 33 on the fixing plate 32.

[0061] As Uniting device 41 consists of supporting board 42 which is bridged over a set of moveable plate 33, fixing plate 43 which is united to supporting board 42, and uniting post 44 which is united to supporting plate 42, it can have co-supportive structure with cutting device 13 which has variety of shapes, and at the same time can have a wide use.

[0062] And as this invention is equipped with felt fixing device 5, it can fix felt F on the worktable 1 by adsorbing it onto the surface of the table. Felt F is firmly fixed in being cut by cutting device 13 that runs on cutting table 1. Therefore when the edge of felt is cut with inclination, the section can be precise, which makes the thickness of the overlapped part of the felt the same as the rest of the felt wound around drum D. Hence the cross section of the drum D around which processed felt is wound can be truly circular.

[0063] The embodiments described above are given by way of example only, and modifications will be apparent to persons skilled in the art without departing from the scope of the invention as defined by the appended claims.

[Explanation of reference numerals]

[0064]

D----	Drum
F---	Felt material
S----	Elastic material
S1---	Soaking process
S2---	Freezing process
S3---	The process to set the angle of inclination
1---	Cutting worktable
5---	Felt fixing device
6---	The hole to inhale and adsorb felt
7---	Adsorbing hopper
8---	Suction device

(continued)

9---	Sensor
11---	Running guide
12---	Guide rail
13---	Cutting device
14---	The body of cutting device
15---	Running device
16---	Cutter
20---	Uniting or mounting device
21---	Base body
22---	Upper base
23---	Side slide base
24---	Side base
25---	Cam follower
26---	Slide base
27---	upward & downward adjusting screw
31---	Fixing base body
32---	Fixing plate
33---	Moveable plate
35---	Angle adjusting device
36---	guide channel
37---	Guiding pin
38---	Adjusting & fixing hole
39---	Fixing screw
41---	Uniting device
42---	Support plate
43---	Fixing plate
44---	Uniting post
45---	Escaping hole
50---	Freezing device
51---	Supply pipe
52---	Jetting pipe
60---	Waste collecting device
61---	Suction port
62---	Waste collecting bag
63---	Suction device
64---	Drying device

Claims

1. A method of chamfering an edge of felt material, the method comprising the steps of:
 - a) infiltrating water through the edge of the felt material;
 - b) freezing and hardening the edge of the felt material;
 - c) adjusting the angle of a cutting device;
 - d) running the cutting device over the edge of the felt material with a given inclination;
 - e) cutting the edge of the felt material at a fixed angle.
2. A method as claimed in claim 1, wherein the edge of the felt material is frozen and hardened by jets of freezing gas.
3. A device for chamfering an edge of felt material, the device comprising :
 - a) a worktable to receive and support the edge of the felt material;
 - b) a running guide provided along the edge of the felt material on the worktable; and
 - c) a uniting or mounting device which supports a cutting device running along the edge of the felt material at a given angle, and slides freely on the worktable led by the running guide;

wherein the cutting device is furnished at the front of the felt material on the worktable to cut a soaked edge of the felt material with an even chamfer at a given angle after freezing the edge of the felt material by jetting out freezing gas against the edge.
4. A device as claimed in claim 3, wherein the running guide includes guide rails at the upper, left, and right side.
5. A device as claimed in claim 3 or claim 4, wherein the uniting or mounting device has a base body attached to a guide rail of the running guide, a slide base connected to this base body, and a base body to support cutting device with an angle adjusting device
6. A device as claimed in claim 5, wherein the supporting base has a pair of fixing plates facing each other at the upper front and the upper back of the cutting device on the slide base, a pair of sliding plates at the front and the back united by angle adjusting device which moves to the left and to the right along the face of the fixing plate, and a uniting device to unite the cutting device to the sliding plate.

7. A device as claimed in claim 6, wherein the angle-adjusting device fixes an adjustable guiding pin that is put inside the fixing plate, which is to be put into an arc-shaped guiding slot when viewed from its side, by putting screws along the guiding slot into the adjusting holes of the fixing plate dotted in the arc against the movable plate from the outside of the fixing plate. 5
8. A device as claimed in claim 6 or claim 7, wherein the uniting device is fixed to the support plate between the front and rear moveable plates and to a protruding part around the middle of the cutting device, and stands on fixing plate which is united by support plate and on the rear top of cutting device. 10 15
9. A device as claimed in anyone of claims 2 to 7, further comprising a fixing device to adhere and fix felt by means of suction to the working face of the worktable. 20
10. A device as claimed in claim 9, wherein the felt fixing device includes a sensor to detect the freezing of felt. 25
11. A device as claimed in any one of claims 3 to 10, further comprising a dust-collecting device with a bag to collect waste felt rubbish and a drying device to dry waste felt. 30
12. A device as claimed in any one of the claims 3 to 11, further comprising means for jetting a freezing gas at the soaked edge of the felt material.
13. A device for chamfering an edge of felt material substantially as hereinbefore described with reference to Figures 1 to 9, of Figure 10 of the accompanying drawings. 35

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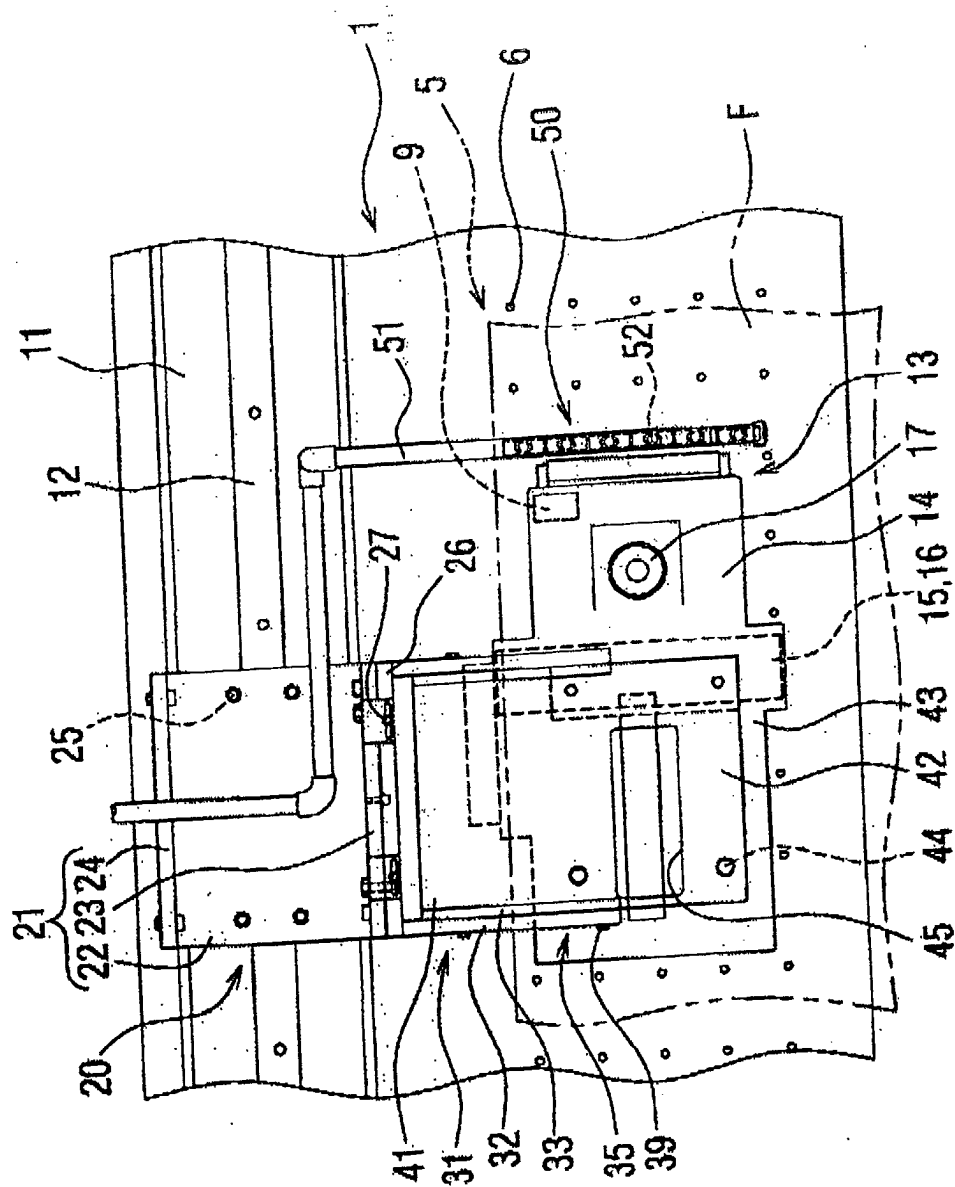


FIGURE 1

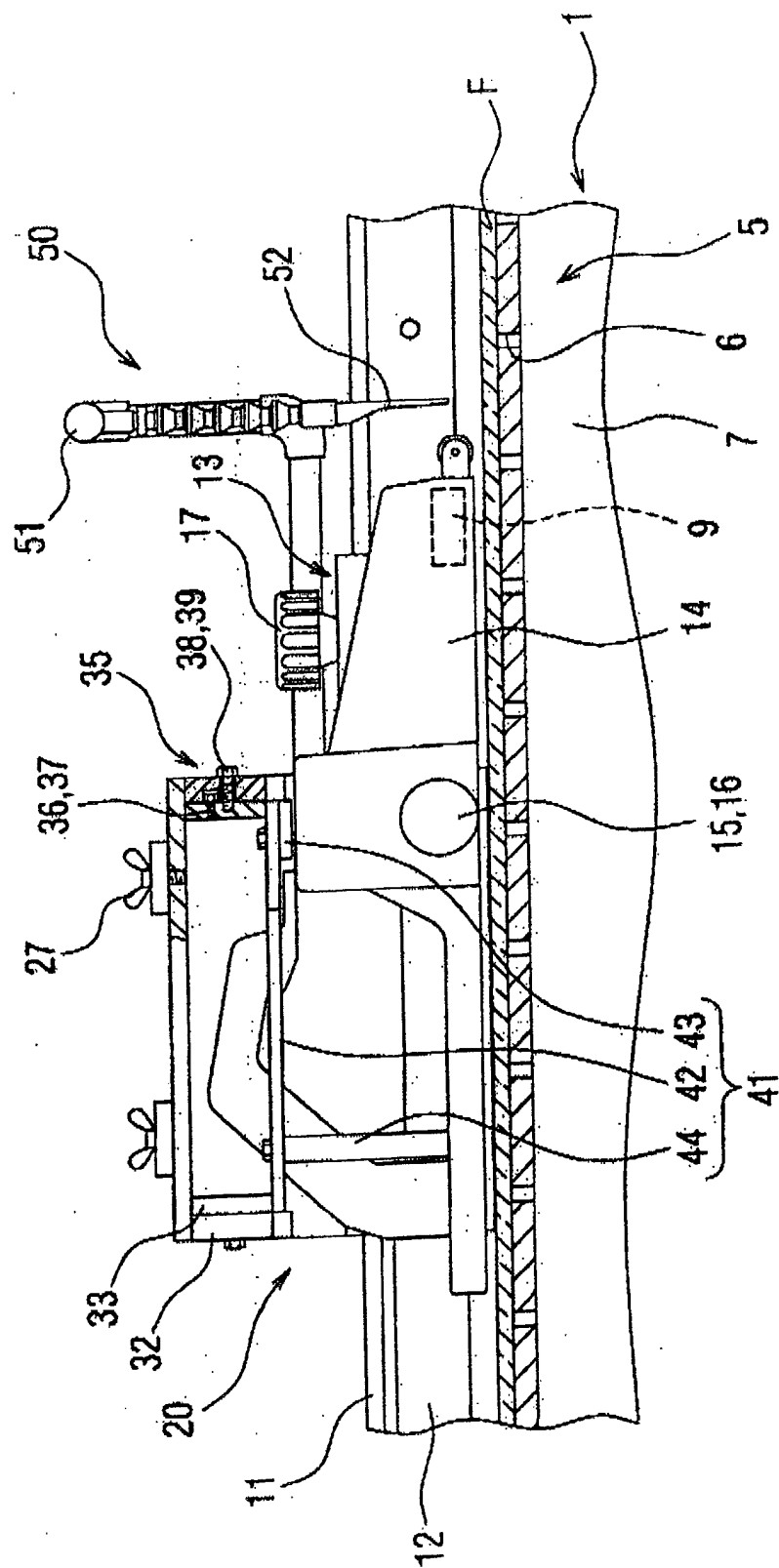
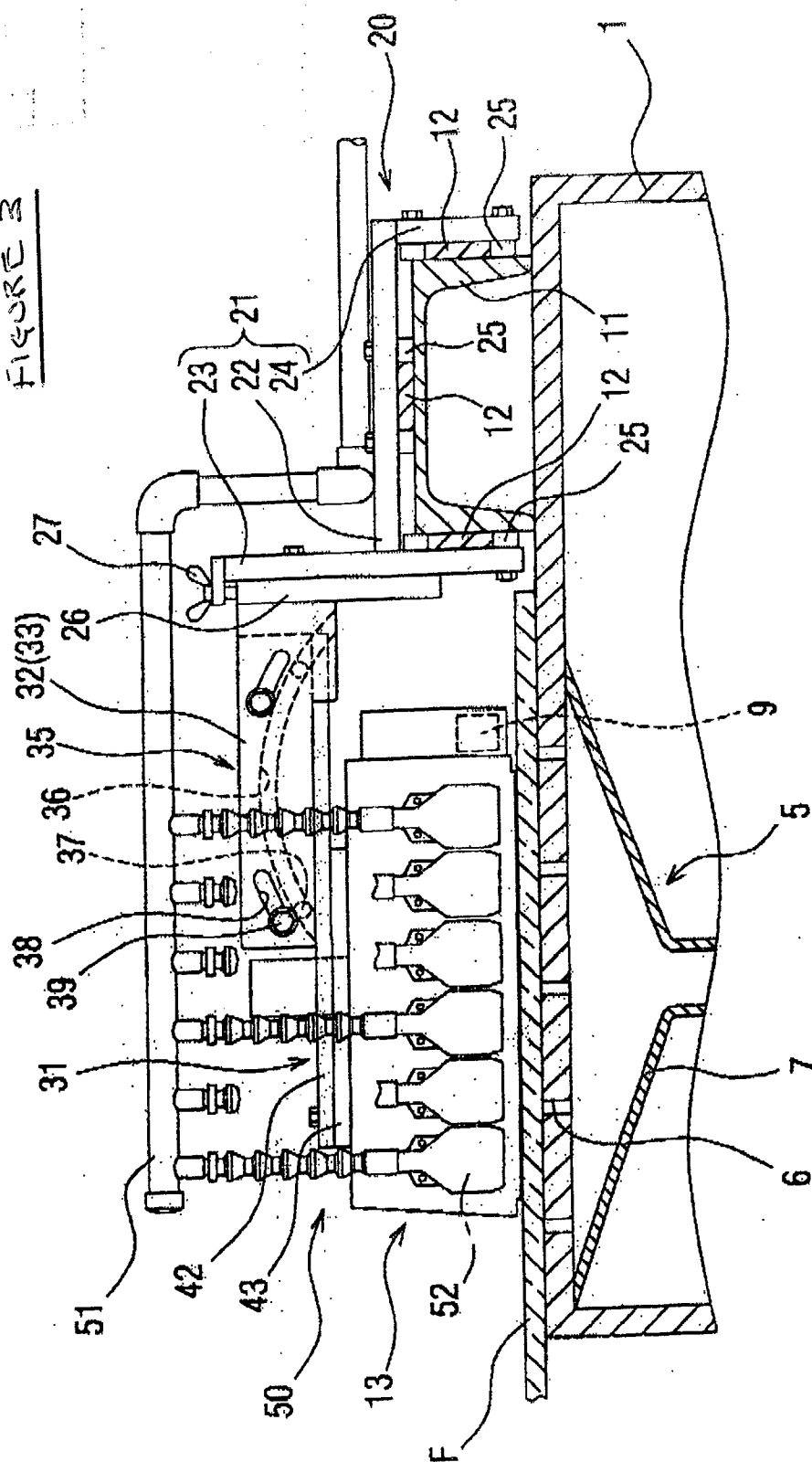


FIGURE 2

FIGURE 3



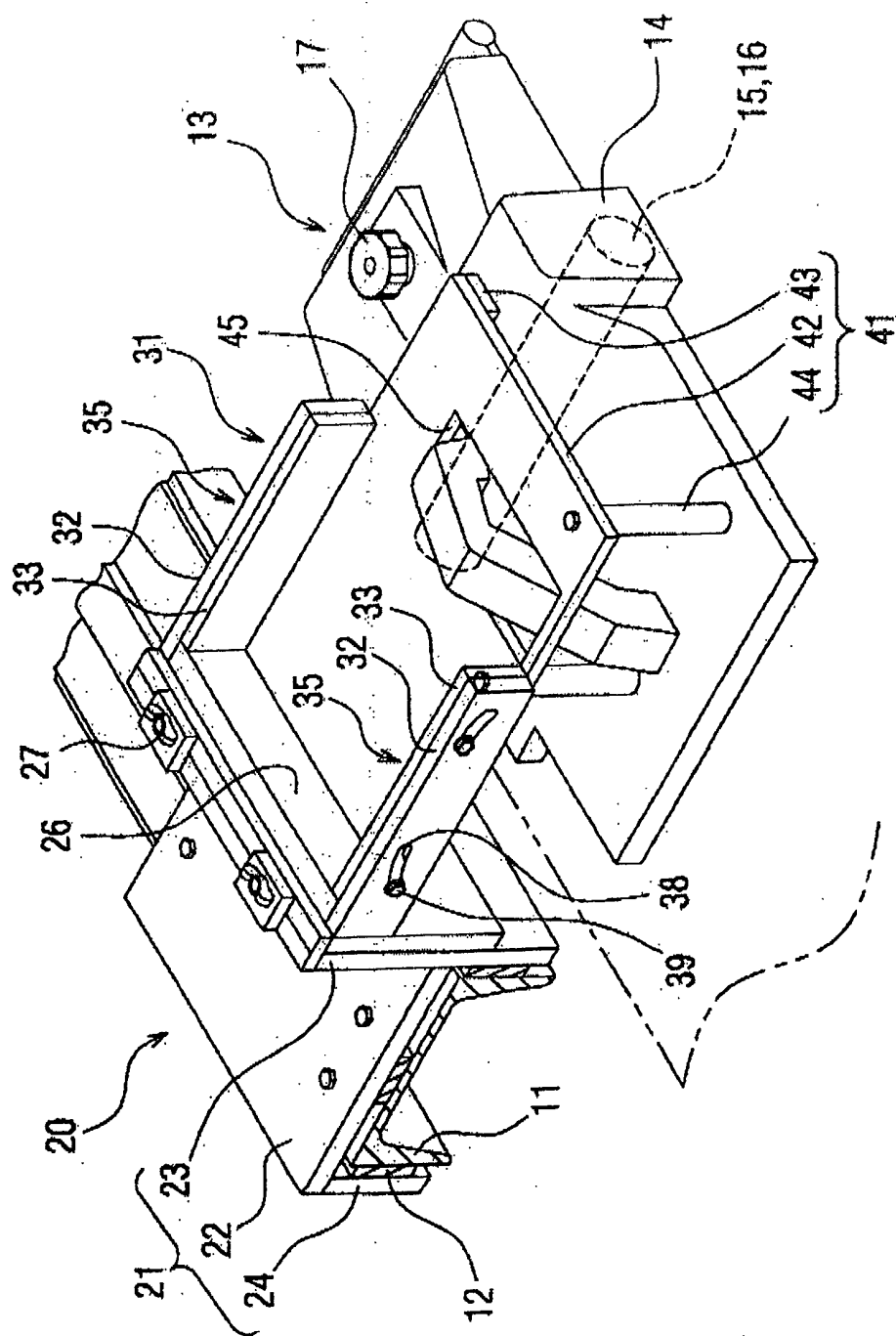
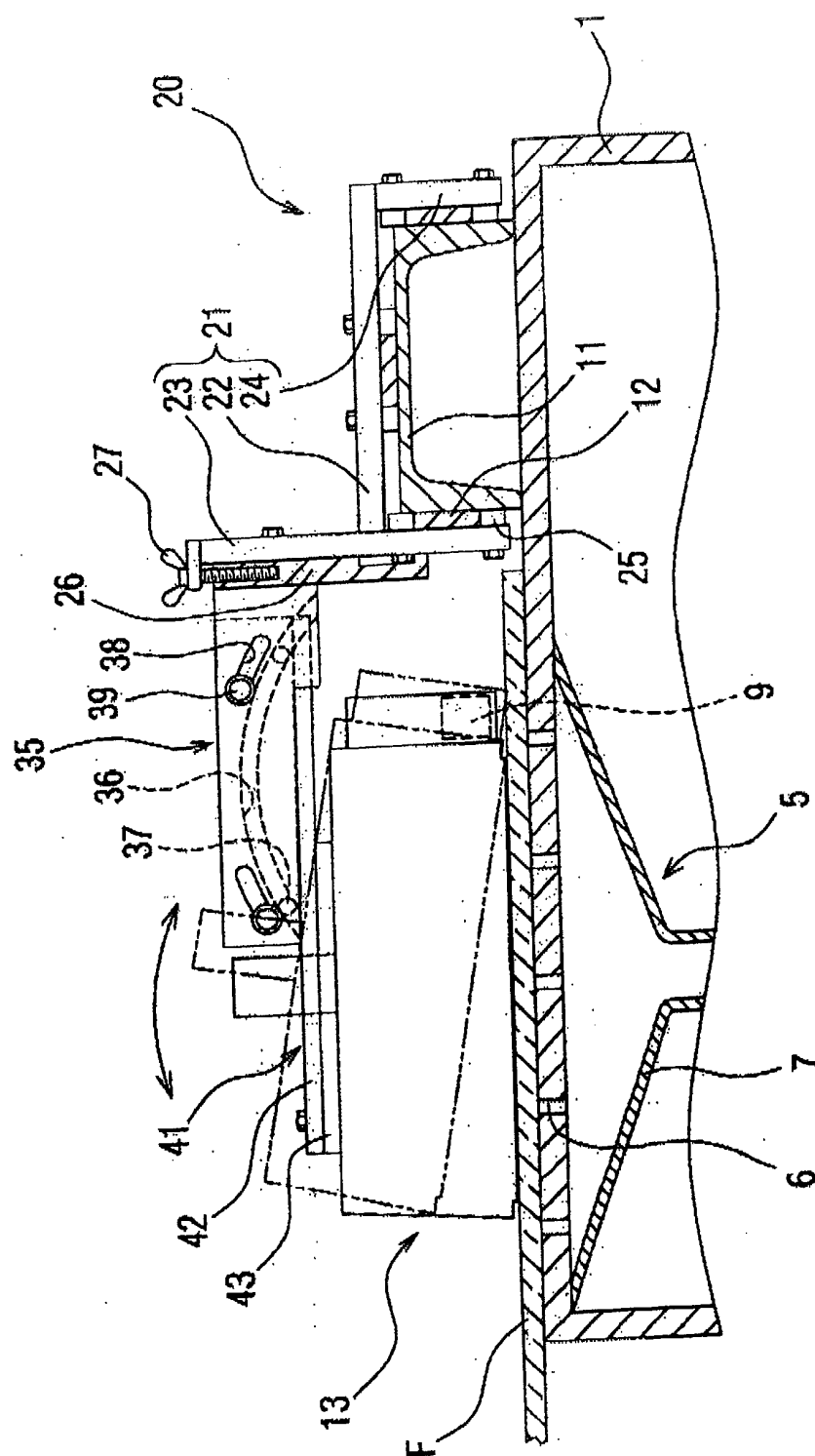


FIGURE 4



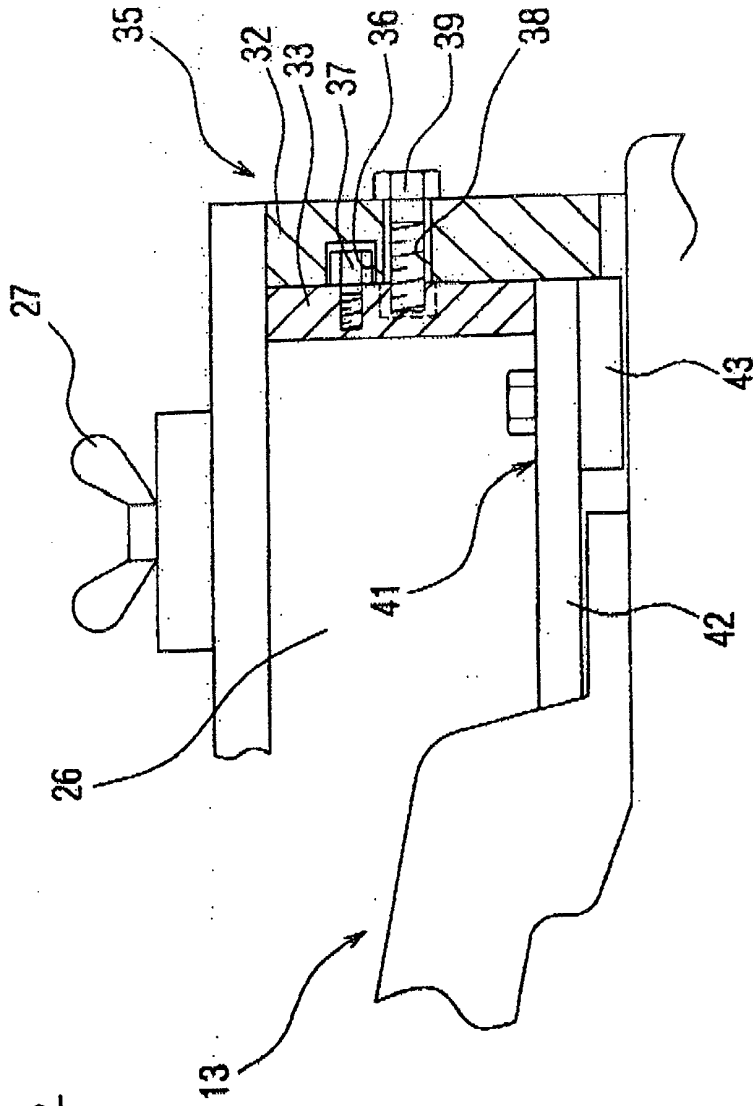


FIGURE 6

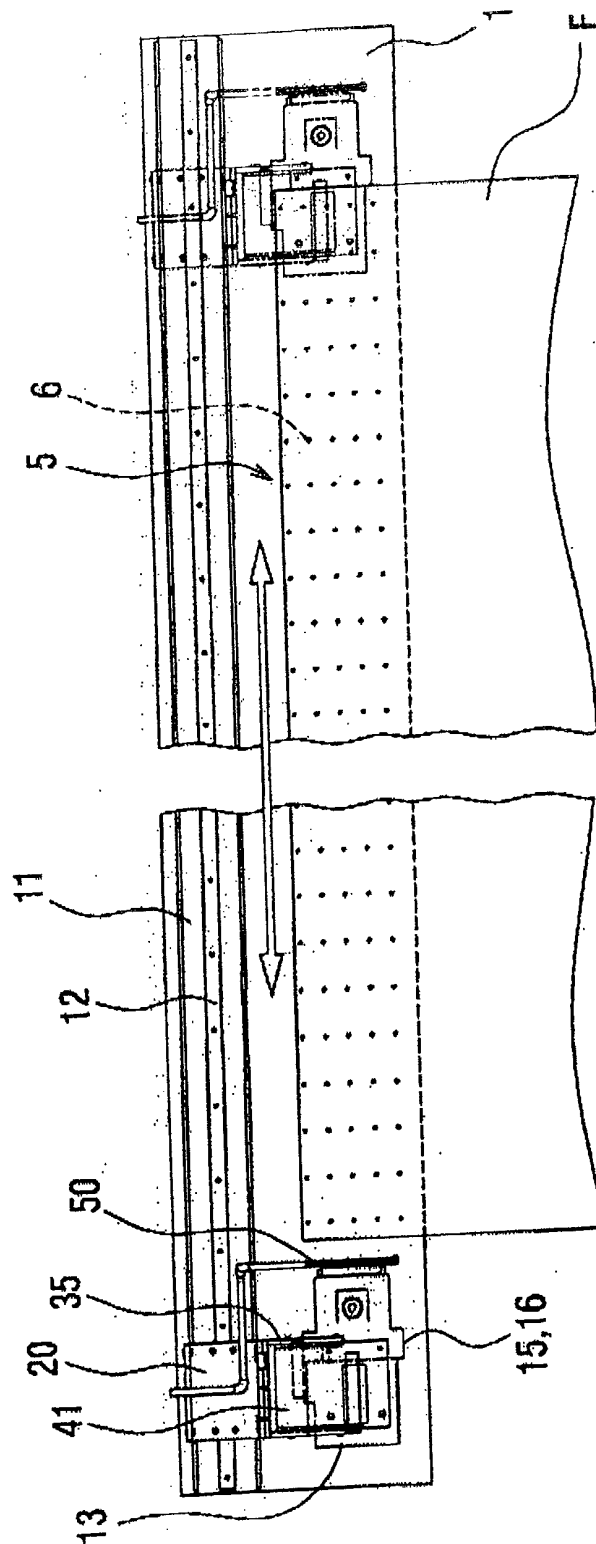


FIGURE 7

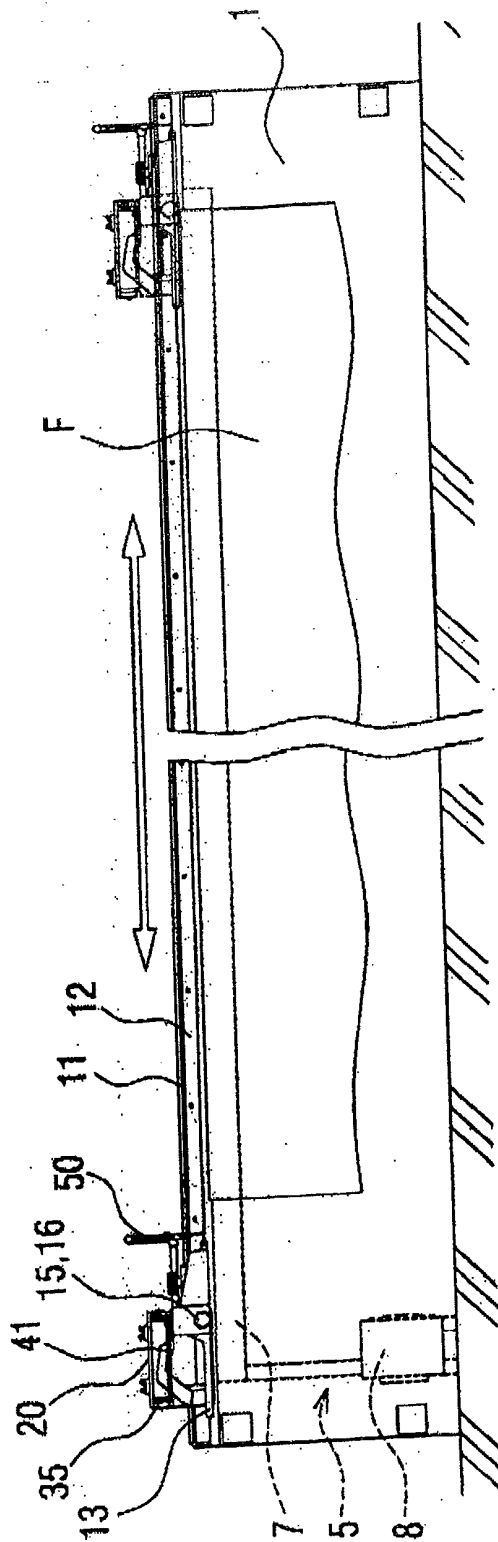


FIGURE 2

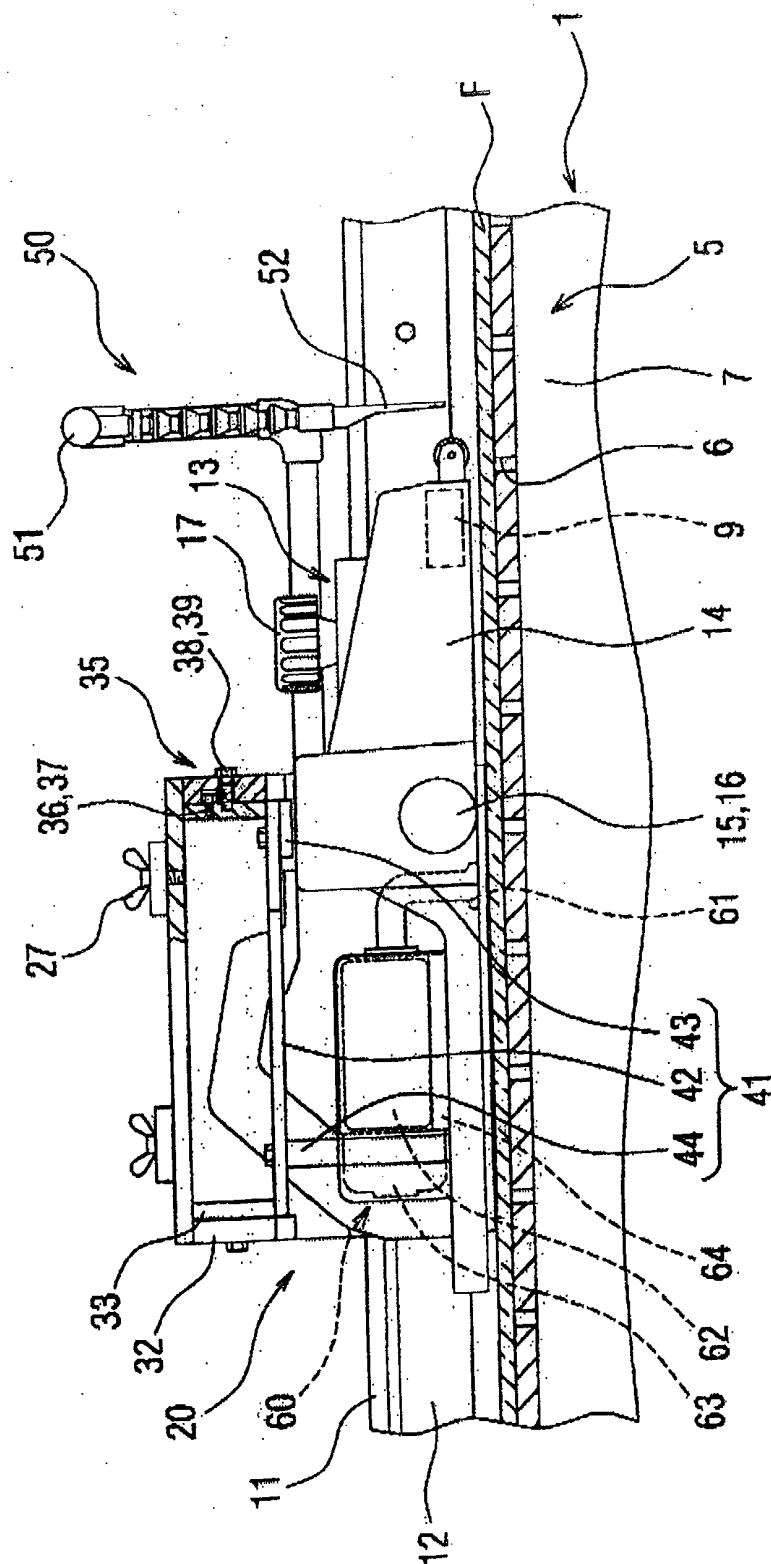


FIGURE 9

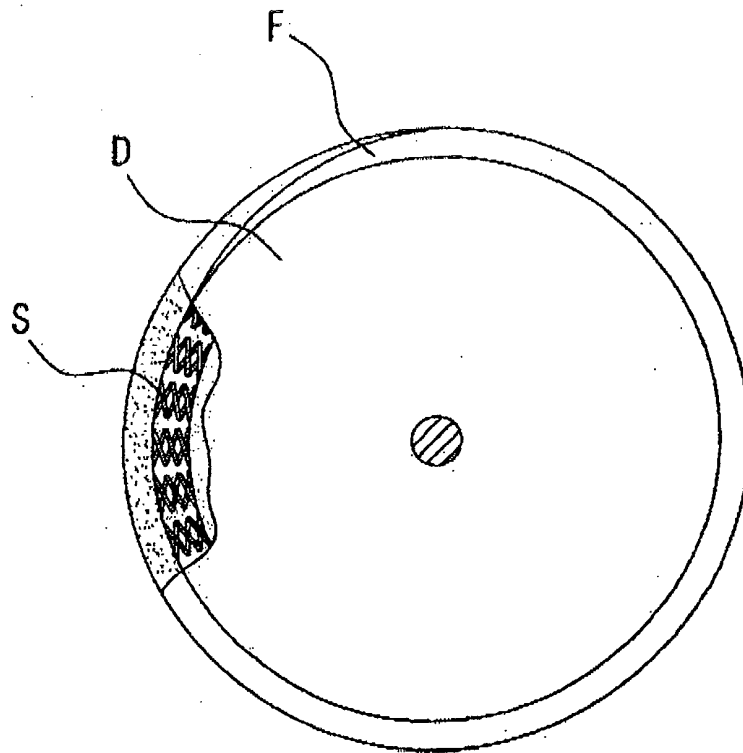
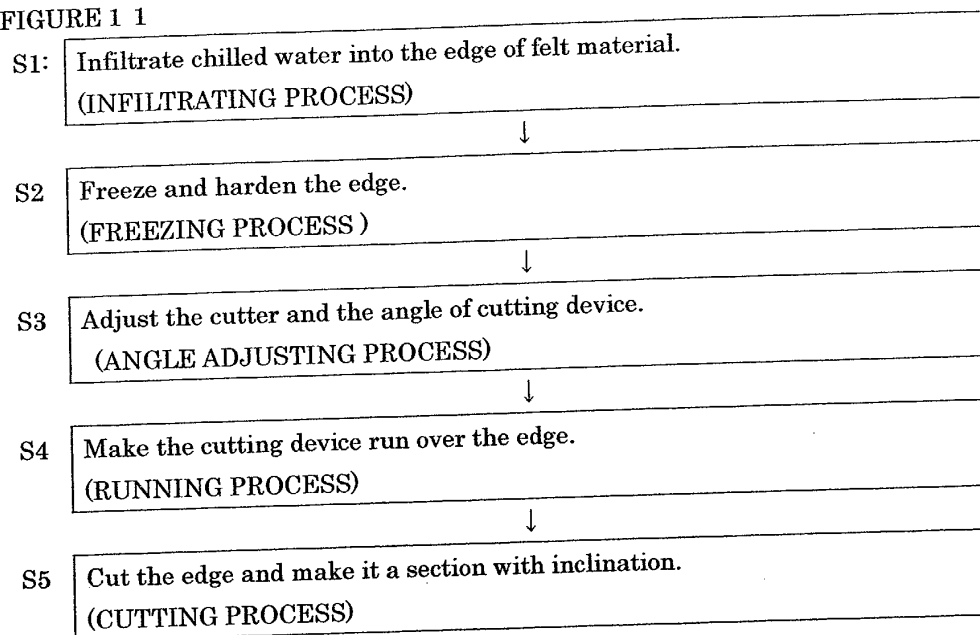


FIGURE 10

FIGURE 1 1



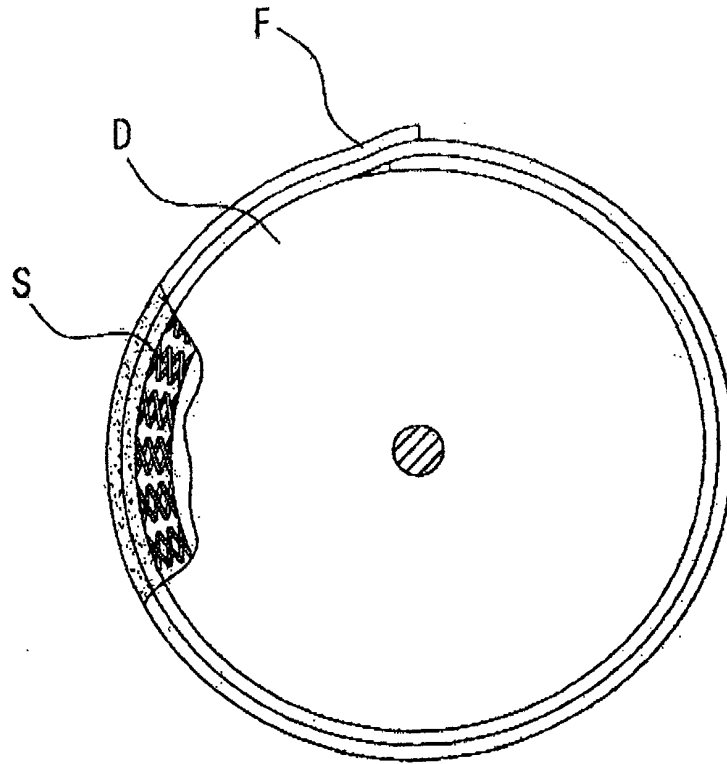


FIGURE 12