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(71) Applicant: **KABUSHIKI KAISHA HOKY**
498 Komagidai
Nagareyama-shi, Chiba-Ken(JP)

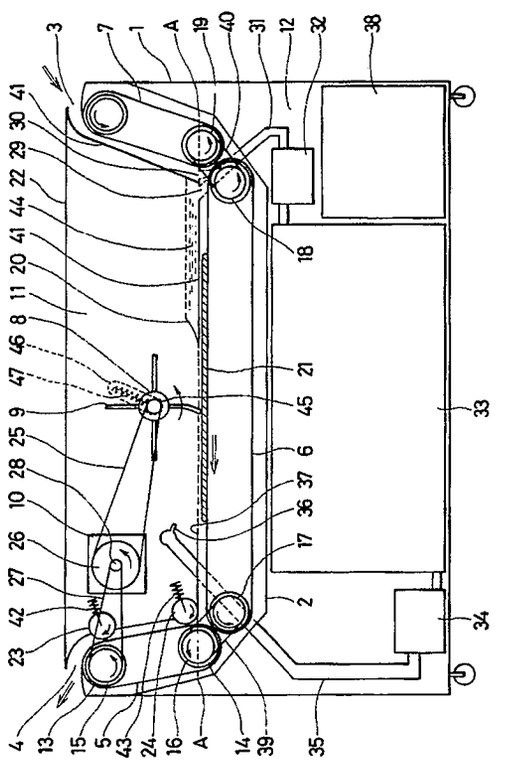
(72) Inventor: **Muta, Koichi**
663-206, Higashifukai
Nagareyama-Shi, Chiba-Ken(JP)

(74) Representative: **Hillier, Peter et al**
Reginald W. Barker & Co., 13, Charterhouse Square
London, EC1M 6BA(GB)

(54) Washing machine.

(57) A washing machine for effectively washing a floorcloth, a mop or the like article (21) is disclosed. A housing (1) of the washing machine includes a washing chamber in which at least one rotary washer (8) is arranged. A plurality of flat beating blades each having excellent flexibility are mounted around a rotational shaft (45) of the rotary washer (8) in the axial direction of the same in parallel with each other while extending in the radial direction. As an article (21) to be washed is conveyed on a conveyor (7), it is first immersed in a bath of washing water and then reaches the rotary washer (8) so that the article (21) to be washed is repeatedly beaten by the foremost end parts of the beating blades (9) as the rotary washer (8) is rotationally driven by a motor (10). While a washing operation is performed, dirty water is splashed away from the washing article (21) and at the same time foreign matters such as dust or the like on the surface of the washing article (21) are removed therefrom. To enhance a washing effect, each of the beating blades (9) is molded of rubber or thermoplastic elastomer having excellent wear resistance. Alternatively, the beating blade (9) may be made of a leaf spring (50) with a beating piece (51) attached to the part of the beating blade (9) adapted to come in contact with the washing article (21). In addition, to enhance a washing effect remarkably, the part of the beating blade (9) adapted to come in contact with the washing article (21) is formed with a number of small projections (48). One surface of the beating blade (9) may be laminated with a film of plastic to improve a property of wear resistance of the beating blade (9).

FIG. 1



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WASHING MACHINE

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates generally to a washing machine preferably employable for washing a floorcloth, a mop, a tile carpet, a pad or the like article. More particularly, the present invention relates to a compact washing machine which can be used by transporting it to a floor washing/cleaning site or the like location with the aid of an operator.

DESCRIPTION OF THE RELATED ART

To perform a floor washing/cleaning operation, a floorcloth having a heavy thickness is usually used to sustain an ample quantity of water in the floorcloth.

Fig. 6 is a perspective view which illustrates a conventional floor mop in an operative state. As is apparent from the drawing, a floorcloth M is secured to a mop holder MH including a rod-shaped handle. When it is found that the floorcloth M becomes dirty as it is used, an operator removes the floorcloth M from the mop holder MH and then immerses it in a sink, a bucket or the like container to wash it with his hands. However, a manual washing operation has drawbacks that it takes long time under a heavy manual load and moreover the dirty floorcloth can not be cleaned to full satisfaction. For this reason, in a case where a floor having a wide area in a building is to be cleaned for the purpose of maintenance, the current status is such that an operator in charge of maintenance services for the building brings a number of floorcloths to a washing/cleaning site and after completion of a washing/ cleaning operation, he brings the dirty floorcloths back to his workshop so as to wash them in his washing machine. In this case, since a number of floorcloths should preliminarily be prepared in the workshop, it is required that each of the floorcloths is sewn to have a heavy thickness and moreover dirty matters often penetrate into the interior of the floorcloth. Accordingly, when any floorcloths are to be washed in an ordinary washing machine, a washing operation takes long time while consuming a large quantity of water, resulting in the washing operation being performed at a high cost.

SUMMARY OF THE INVENTION

The present invention has been made with the foregoing background in mind.

An object of the present invention is to provide a washing machine for washing a floorcloth, a mop or the like article wherein a washing operation can be performed with a small quantity of water within a short period of time.

Other object of the present invention is to provide a washing machine for washing a floorcloth, a mop or the like article wherein the washing machine is designed and constructed in compact structure and yet it containes cleaning water and a water tank in itself.

Another object of the present invention is to provide a washing machine for washing a floorcloth, a mop or the like article wherein the washing machine is designed and constructed in a portable type so as to allow an operator to bring the washing machine to a washing or cleaning site with his hands.

Further another object of the present invention is to provide a washing machine for washing a floorcloth, a mop or the like wherein a washing operation can be performed at a high operational efficiency in the washing/cleaning site.

To accomplish the above objects, the present invention provides a washing machine for washing a floorcloth, a mop or the like article (hereinafter generally referred to as an article), wherein the washing machine comprises a housing which is divided into two sections, one of them being an upper hollow section and the other one being a lower hollow section, the upper hollow section including an inlet port at its one end for introducing the article to be washed into the interior of the housing and an outlet port at the opposite end to the foregoing one for discharging the washed/dewatered article from the housing to the outside; at least one conveying means for conveying the article to be washed, the washing article and the washed article while the article is immersed in a bath of washing water in the upper hollow section, the conveying means further serving to convey the washed/dewatered article toward the outlet port on the upper hollow section; at least one rotary washer adapted to be rotated above the moving article on the conveying means at a high rotational speed, the rotary washer being provided with a plurality of beating blades which are arranged around a rotational shaft of the rotary washer in the axial direction of the same in parallel with each other while extending in the radial direction, each of the beating blades serving to repeatedly beat the article to be washed with the foremost end part thereof as the rotary washer is rotationally driven; driving means for rotationally driving the rotary washer; an electricity supplying source

mounted on the housing for driving the conveying means, the rotary washer and the driving means; a plurality of squeezing rollers for dewatering the residual water in the washed article; and a washing water recirculating system for feeding clean washing water to the article to be washed, the washing article and the washed article, the washing water recirculating system including a filter for filtering dirty water recovered from the washing article and removing foreign matters in the dirty water; whereby a washing operation is performed by repeatedly beating the washing article with the foremost end parts of the beating blades, splashing dirty water away from the washing article and removing the foreign matters on the surface of the washing article as the rotary washer is rotationally driven.

It is desirable that each of the beating blades is molded of rubber or thermoplastic elastomer.

To enhance a washing effect, each of the beating blades is formed with a heavily thick portion at the foremost end part thereof to impart a strong impact to the article.

It is acceptable that each of the beating blades is composed of a leaf spring and a beating piece made of a material having excellent wear resistance with a suitable magnitude of weight given thereto is attached to the part of the leaf spring adapted to come in contact with the article to be washed.

The part of the beating blade adapted to come in contact with the article to be washed may be formed with a number of small projections.

It is acceptable that rubber or a film of thermoplastic resin having excellent wear resistance is laminated on one surface of the beating blade adapted to come in contact with the article to be washed.

Each of the beating blades may spirally extend in the axial direction of the rotary washer on the outer peripheral surface of the rotational shaft of the rotary washer.

To assure that dirty water is splashed away from the washing article equally toward the both sides of the washing article, it is desirable that each of the beating blades is symmetrically divided into two parts in the axial direction at the central part thereof, one of them spirally extending in a certain one direction away from the central part of the beating blade and the other one spirally extends in the opposite direction to the foregoing one away from the central part of the beating blade.

A washing chamber in the upper hollow section of the housing is provided with dirty water receiver upstream of the rotary washer in the vicinity of the beating blades so as to allow dirty water splashed away from the washing article to be received in the dirty water receiver.

With the washing machine of the present invention constructed in the above-described manner, an article to be washed is first immersed in a bath of washing water so that an ample quantity of water is soaked in the article to be washed. As the rotary washer is rotationally driven, the article is repeatedly beaten by the beating blades on the rotary washer with a high intensity of beating force, whereby dirty matters in the washing article are floated up on the surface of the washing article under the beating effect derived from the repeated beating operations.

A fundamental principle of the washing operation to be performed by the washing machine of the present invention will be summarized in the following.

(a) A dirty article to be washed is immersed in a bath of washing water and dirty matters in the article to be washed are dissolved in the washing water (see Fig. 2a).

(b) As the rotary washer is rotationally driven, an impact force is repeatedly imparted to the surface of the washing article from the beating blades, whereby the upper surface of the washing article is compressed by the beating blades (see Fig. 2b).

(c) As the beating operation is continuously performed as mentioned in the preceding paragraph (b), dirty water is floated up to the surface region of the washing article and foreign matters such as dust or the like on the surface of the washing article are removed therefrom with the foremost end parts of the beating blades (see Fig. 2c).

(d) To prevent the splashed dirty water from mixing with clean washing water, the dirty water is brought in the dirty water receiver (see Fig. 2d).

Now, the content of the paragraph (b) will be described in more details below with reference to Fig. 2b.

An impact force F received by the surface of the washing article is represented by the following equation.

$$F = (mV_1 - mV_2)/T$$

where T designates a beating time, m designates a mass of the foremost end part of each beating blade, V_1 designates a circumferential speed of the foremost end part of each beating blade before it collides against the washing article and V_2 designates a circumferential speed of the foremost end part of each beating blade after it has collided against the washing article. Therefore, mV_1 represents a kinetic quantity held by the foremost end part of each beating blade before it collides against the washing article and mV_2 represents a kinetic quantity held by the foremost end part of each

beating blade after it has collided against the washing article. Thus, the term (mV_1 - mV_2) represents a kinetic quantity which has been imparted to the washing article. Consequently, the washing article receives a higher intensity of impact force as the beating time T is shortened more and more, whereby dirty water in the washing article is floated up under the effect of the compressive force given by the beating blades. Since each beating blade is designed in a flat plate-shaped configuration, the dirty water is floated up more effectively as the rotary washer is rotationally driven.

Additionally, since each of the beating blades is designed in a flat plate-shaped configuration as mentioned above in contrast with a conventional brush composed of a number of bristles, the dirty water is reliably splashed away from the washing article. While the beating blades are rotated at a high speed as the rotary washer is rotationally driven, the washing article moves slowly while coming in contact with the foremost end parts of the beating blades. Consequently, a specific location on the washing article is repeatedly beaten by the beating blades with the result that a washing effect can substantially be enhanced and a washing operation can be performed within a substantially shortened period of time.

The splashed dirty water is collected in the dirty water receiver without any possibility that it mixes with clean washing water. Thus, there is no fear that the washed article is contaminated with the splashed dirty water again. Since a required quantity of washing water is set to such an extent that the article to be washed is fully immersed in a bath of washing water, the total quantity of washing water required for the washing operation can be reduced substantially. This leads to a desirable merit that a washing water reservoir can be designed in smaller dimensions.

Further, since each beating blade is molded in the flat plate-shaped configuration, dirty water can be splashed away from the washing article more effectively. When each beating blade is formed with a heavily thick portion at the foremost end part thereof, a higher intensity of impact force is imparted to the washing article, whereby dirty water is quickly floated up on the upper surface of the washing article and then splashed away therefrom more effectively.

In a case where the main body of each beating blade is made of a leaf spring and fixedly secured to a rotational shaft of the rotary washer, the result is that the beating blade has an increased rigidity. In addition, in a case where the part of the beating blade adapted to come in contact with the washing article is formed with a number of small projections, the projections adequately enter the rugged fine surface structure of the washing article, resulting in foreign matters on the surface of the washing article being removed therefrom at a high efficiency.

In a case where a beating piece made of a material having excellent wear resistance with a suitable mass or weight given thereto is attached to the part of the beating blade adapted to come in contact with the washing article, an effect for splashing the dirty water away from the washing article can be improved remarkably.

Additionally, in a case where one surface of the beating blade adapted to come in contact with the washing article is laminated with a film Of thermoplastic resin having excellent wear resistance, a property of wear resistance of each beating blade can be improved substantially, whereby a running life of the beating blade can be elongated without an occurrence of fine splitting in the surface structure of the beating blade.

Further, in a case where the beating blade is arranged while spirally extending in the axial direction on the outer peripheral surface of the rotational shaft of the rotary washer, an operative behavior of the beating blade becomes smooth with the result that not only a noise generated during a washing operation can be attenuated but also an injury or damage of the washed article can be reduced substantially.

It is acceptable that each beating blade is divided into plural parts in the axial direction of the rotary washer. This leads to a desirable result that a higher intensity of impact force can be imparted to the washing article and dirty water can intensely be splashed away from the washing article.

Other objects, features and advantages of the present invention will become apparent from reading of the following description which has been made in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated in the following drawings in which:

Fig. 1 is a sectional side view which schematically illustrates the structure of a mop washing machine in accordance with an embodiment of the present invention;

Fig. 2a to Fig. 2d are a fragmentary side view of the mop washing machine in Fig. 1, particularly illustrating an operative state of a rotary washer including four beating blades, respectively;

Fig. 3a and Fig. 3b are a plan view which illustrates that a plurality of beating blades each spirally extending in the axial direction are arranged around a rotational shaft of the rotary washer to slantwise splash dirty water in the dotted line-marked direction, respectively;

Fig. 4a to Fig. 4d are a fragmentary view of the rotary washer, particularly illustrating by way of example a beating blade(s) mounted around the rotary washer in accordance with a modified embodiment of the present invention, respectively;

Fig. 5 is a fragmentary sectional side view of a mop washing machine in accordance with another embodiment of the present invention; and

Fig. 6 is a perspective view of a conventional mop, particularly illustrating an operative state of the mop.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now, the present invention will be described in detail hereinafter with reference to the accompanying drawings which illustrate preferred embodiments of the present invention.

Fig. 1 is a sectional side view which schematically illustrates the structure of a mop washing machine in accordance with an embodiment of the present invention, and Fig. 2a to Fig. 2d are a fragmentary view of the mop washing machine in Fig. 1, particularly illustrating the operative state of a beating blade, respectively. The mop washing machine includes a housing 1 which is divided into two sections via a partition 2, one of them being an upper hollow section 11 serving as a washing chamber and the other one being a lower hollow section 12 serving as a water reservoir. A ceiling plate 22 is arranged across the top end of the upper hollow section 12. The lower hollow section 11 includes a washing water tank 33, a filter 22 for filtering dirty water while serving also as a dirty water reservoir so as to allow the filtered waste water to be delivered to the washing water tank 33, a battery case 38 and a pump 34 for delivering washing water to the washing chamber.

The washing chamber in the upper hollow section 11 is equipped with a plurality of belt conveyors serving as mop conveying means for a mop 21 which will be described later. The belt conveyors are arranged in the region extending from a mop inlet 3 on the upper/right end of the housing 1 to a mop outlet 4 on the left/upper end of the housing 1 via the bottom of the washing chamber. In addition, the washing chamber is equipped with a rotary washer 8 at the substantially central part thereof as well as a pair of compression springs 42 and 43 for squeezing residual water in the mop 21 when the mop 21 passes by the squeezing rollers 23 and 24.

The rotary washer 8 located at the substantially central part of the washing chamber is constructed such that it includes a plurality of plate-shaped flexible beating blades 9 each of which is molded of thermoplastic material having excellent wear resistance and radially extends from the outer peripheral surface of a rotational shaft 45 of the rotary washer 8 in parallel with the rotational shaft 45. The rotary washer 8 is rotationally driven at a high speed by a motor 10 via power transmitting means such as pulleys and others.

The mop conveying means are described in more details in the following.

In practice, the washing chamber is provided with three belt conveyers 5, 6 and 7 in the washing chamber. Each of the belt conveyors 5, 6 and 7 is formed with a large number of small projections on the upper surface in order to prevent the mop 21 to be conveyed from being deviated from a given position during a washing operation. The rotational shaft 45 of the rotary washer 8 is rotatably supported by bearings 46 in the form of vertically extending elongated holes so as to move in the vertical direction. As is apparent from Fig. 1, since the rotational shaft 45 is normally biased in the downward direction by springs 47, the rotary washer 8 is upwardly displaced against the resilient force of the springs 47, whereby the rotary washer 8 can safely ride over the mop 21 no matter how far a thickness of the mop 21 varies. The rotary washer 8 is rotationally driven by the motor 10 at an increased speed via an endless belt 25 and a pulley 26. In addition, the driving power of the motor 10 is transmitted to a pulley 15 fixedly mounted on the roller 13 of the belt conveyor 5 so that the pulley 15 is rotated at a reduced speed.

Other pulley 16 for the belt conveyor 5 serves to transmit the driving power derived from the motor 10 to a pulley 17 for the belt conveyor 6 via an endless belt 39 and other pulley for the belt conveyor 6 serves to transmit the driving power to a pulley 19 for the belt conveyor 7 via an endless belt 40, whereby a series of conveying operations are successively performed by the belt conveyors 5, 6 and 7. The squeezing rollers 23 and 24 are normally brought in close contact with the rollers 13 and 14 for the belt conveyor 5. Specifically, the squeezing rollers 13 and 14 are normally brought in close contact with the surface of the moving mop 21 under the effect of the resilient force given by the coil springs 42 and 43. To adequately adjust an intensity of the squeezing power, the washing machine is equipped with adjusting means (not shown) adapted to be actuated by a dial.

To facilitate recovering of the dirty water splashed by the beating blades 9 and moreover prevent the recovered dirty water from being flowing back to the rotary washer 8 side to soil the mop 21 again, a front edge plate 20 is arranged upstream of the rotary washer 8. A dirty water receiver 44 is arranged in the form of a hollow space defined by the front edge plate 20 and a guide plate 41. The dirty water receiver 44 is

provided with an outlet port 29 through which the dirty water received in the dirty water receiver 44 is discharged to the washing water reservoir 33 via the filter 32. Additionally, the dirty water receiver 44 is provided with another outlet port 30 for keeping the surface level of the dirty water in the dirty water receiver 44 constant. These outlet ports 29 and 30 are communicated with the washing water reservoir 33 in the lower hollow section 12 via a piping 31 and the filter 32.

Washing water in the washing water reservoir 33 is pumped up by the pump 34 to reach a feed port 36 via a piping 35 from which the washing water in turn is sprayed over a plain plate 37 (of which position is represented by line A - A in Fig. 1) at a predetermined rate.

A mop 21 to be washed is introduced into the washing machine via the inlet port 3. As the belt conveyor 7 is driven, the mop 21 is first immersed in a bath of washing water and then displaced toward the region below the rotary washer 8. When it is confirmed that the mop 21 has reached the position directly below the rotary washer 8, a controller (not shown) commands the washing machine to rotate the rotary washer 8 at a high speed so as to allow a plurality of beating blades 9 radially extending from the rotational shaft 45 of the rotary washer 8 to repeatedly beat the mop 21. At this time, since the circumferential speed around the rotary washer 8 is substantially higher than the moving speed of the mop 21, a specific location on the mop 21 is repeatedly beaten by the beating blades 9. Here, the number X of beating operations to be performed for the mop 21 per unit time is represented by the following equation.

$$X = (L \times N \times n)/V \times 60$$

where L designates an effective width (see Fig. 2b) of each beating blade 9 to come in contact with the mop 21, V designates a moving speed of the mop 21, N designates the number of revolutions of the rotary washer 8 and n designates the number of the beating blades 9.

For example, it is supposed that the contact width of the beating blade 9 is set to 10 mm, the mop 21 is conveyed at a moving speed of 150 mm/sec, the rotary washer 8 is rotated at a rotational speed of 4,500 rpm and the rotary washer washer 8 includes four beating blades 9, the above equation indicates that a specific location on the mop 21 is beaten twenty times by the beating blades 9 per one second.

As the mop 21 is repeatedly beaten by the beating blades 9 in the above-described manner while it passes past the region directly below the rotary washer 8, dirty water soaked in the mop 21 is forcibly removed therefrom by the beating blades 9 and foreign matters such as dust or the like adhesively remaining on the surface of the mop 21 are scraped off, whereby the mop 21 can completely be cleaned within a short period of time.

It goes without saying that a washing effect can substantially be enhanced by arranging a plurality of rotary washers each including plural beating blades in parallel with each other in the axial direction of the rotary washer.

The dusts and the dirty water removed from the mop 21 are splashed up over the separation plates 20 to enter the dirty water receiver 44. Thus, the mop 21 is not exposed to the dirty water again. Now, the mop 21 is ready to absorb clean washing water which is being sprayed through the nozzle 36, because a washing operation has been completed.

The dirty water in the dirty water receivers 44 is discharged through the outlet ports 29 and 30 to reach the filter 32 serving also as a dirty water reservoir in which it is stored and filtered. At this time, a reduced quantity of washing water reserved in the washing chamber is detected by a detecting gauge (not shown). In response to a signal from the detecting gauge, the pump 34 in the lower hollow section 12 is operated so that washing water in the washing water reservoir 33 is pumped up and fed to the washing chamber to compensate for the reduction of the washing water.

Since the washing water feed port 36 in the form of a nozzle is arranged downstream of the rotary washer 8 on the mop conveying passage, washing water sprayed through the feed nozzle 36 exhibits an effect for thrusting dusts on the bottom of the washing chamber as well as dust floating on the surface level of washing water toward the outlet port side. Consequently, the washed mop 21 is rinsed out.

Subsequently, as the conveyor 5 conveys the washed mop 21 past the squeezing rollers 23 and 24, the mop 21 is squeezed by the rollers 23 and 24 so that the residual water in the mop 21 is removed therefrom. An extent of squeezing by the squeezing rollers 23 and 24 can adequately be adjusted by a dial (not shown) as desired. Thus, the mop 21 can be squeezed to a required quantity of residual water to be removed therefrom.

The present invention has been described above with respect to the case where a rotary washer includes a plurality of beating blades which are linearly arranged in the axial direction while extending in the radial direction. With this arrangement, however, it has been found that sound generated when the beating blades collide against a mop is sometimes heard by an operator as unpleasant noise.

According to other embodiment of the present

invention, to attenuate the noise, the rotary washer 8 is modified as shown in Fig. 3a and Fig. 3b such that each beating blade 9 is spirally arranged in the axial direction. An attenuating effect is derived based on the fact that the beating location is successively displaced as the rotary washer 8 is rotated in contrast with the aforementioned linear arrangement wherein a single beating blade beats the mop with its full width across a specific location. In the modified embodiment, dirty water and dust on the surface of the washing mop are splashed away in the rightward or leftward direction depending on the direction of spiral extension of the beating blade.

In a case as shown in Fig. 3a, each beating blade 9 spirally extends in the leftward direction. This causes dirty water and dust to be splashed away in the dotted line-marked leftward direction. Therefore, it is required that a dirty water receiver is arranged on the left-hand side of the washing machine as seen in the drawing. Moreover, in this case, there is a tendency that the mop itself is deviated from the conveying passage in the dotted line-marked direction.

To eliminate the foregoing undesirable tendency, it is acceptable that each beating blade is divided into two parts at its central part, one of them spirally extending in the leftward direction and the other one spirally extending in the rightward direction, as shown in Fig. 3b.

In the case shown in Fig. 3b, the right-hand half of the beating blade has a right lead and the left-hand half of the same has a left lead as seen in the direction of movement of the mop. With this arrangement, two pulling forces are exerted on the mop in the dotted line-marked directions so as to allow the mop to be pulled in the opposite directions under the effect derived from the both left and right leads as mentioned above, whereby the aforementioned tendency that the mop is deviated in the leftward direction is canceled with the tendency that it is deviated in the rightward direction. In this case, dirty water and dust are splashed away in the both directions, it is desirable that dirty water receivers are arranged at suitable locations on the both sides of the washing machine.

As is apparent from the above description, since the foremost end of each beating blade is rotated at a high speed while receiving a large magnitude of impact load, it is required that the beating blade has an excellent wear resistance.

In view of the foregoing fact, modification may be made for each beating blade as shown in Fig. 4a to Fig. 4d.

Specifically, Fig. 4a shows a case where a body of the beating blade 9 molded of rubber is laminated with a film of nylon. The lining material should not be limited only to nylon. Other thermoplastic material, e.g., polyethylene, polypropylene, polyvinyl chloride or the like are preferably employable because they exhibit excellent wear resistance when they are used in the form of a film. The laminating technique employed for the beating blade has been described in detail in an official gazette of Japanese Laid-Open Patent NO. 104321/1990 of which patent application was already filed by the common applicant to the present invention. The beating blade as constructed by employing the prior laminating technique in the above-described manner has excellent flexibility derived from the rubber used as a substrate as well as excellent wear resistance derived from a film of nylon.

Fig. 4b shows a case where the foremost end part of the beating blade 9 is formed with a large number of independent projections 48 of which substrate is composed of rubber and a film of nylon is laminated on one surface of the beating blade 9 in the same manner as mentioned above. As the rotary washer is rotated, these projections 48 penetrate into the weaving structure of a cloth on the surface of the mop to enhance a washing effect. If rubber only is used for forming the projections 48, there is a tendency that the fabric on the surface of the mop is injured or damaged. In contrast with this, when a film of nylon is laminated on the beating blade 9, injury or breakage of the fabric on the surface of the mop can be reduced remarkably by virtue of a property of slidability specific to the nylon film.

Fig. 4c shows a case where a thick wall portion 49 is formed at the foremost end part of the beating blade 9. In this case, since a mass of the foremost end part is increased by arrangement of the heavy thick portion 49, an intensity of impact force can be increased substantially.

Finally, Fig. 4d shows a case where a leaf spring 50 made of a metallic material is used for each beating blade 9 and a beating piece 51 is attached to the foremost end of the leaf spring 50 by rivets to increase a mass of the foremost end part of each beating blade.

Fig. 5 is a fragmentary side view which schematically illustrates a mop washing machine in accordance with another embodiment of the present invention. In this embodiment, a plurality of rotary washers are arranged one after another in the direction of movement of a mop in parallel with each other in the housing of the washing machine. As is apparent from the drawing, while the mop moves in the interior of the housing of the mop washing machine to pass by the plural rotary washers, the mop repeatedly receives two operations, one of them being an operation of allowing the mop to be immersed in a bath of washing water and the other one being a beating operation.

Thereafter, the remaining water in the mop is removed therefrom by a pair of squeezing rollers. Since dirty water introduction plate is arranged upstream of each rotary washer in the vicinity of the same, a washing effect can be improved substantially.

Referring to Fig. 5, the shown belt conveyor includes two rollers at the left-hand end/right-hand ends thereof to serve as sprockets, and an endless roller chain extends around the both sprockets with holder for the mop 21 secured thereto. After the mop 21 is repeatedly beaten while it is kept immersed in a bath of washing water, the washed mop 21 is squeezed and dewatered between a pair of upper and lower rollers.

With the mop washing machine of the present invention constructed in the above-described manner, while a mop is immersed in a bath of washing water, the mop moves in the interior of the housing of the washing machine to pass by a rotary washer(s) so as to allow the mop to be vigorously beaten by a plurality of beating blades on the rotary washer(s) rotating at a high rotational speed. Thus, foreign matters such as dust or the like on the surface of the mop are continuously removed therefrom and dirty water soaked in the mop is continuously removed therefrom by repeated beating operations, whereby the mop can effectively be cleaned within a remarkably shortened period of time.

In addition, since the washing machine is constructed such that a washing operation is performed while the rotary washers(s) is brought in contact with the mop, the washing machine can be designed and constructed in compact structure. Further, the washing machine can be used by transporting it to a washing site. Since a battery is mounted on the washing machine as an electricity power supply source, the washing machine can be used even at the location where a water supply system and an electricity supply network are not available.

While the present invention has been described above with respect to a few preferred embodiments thereof, it should of course be understood that the present invention should not be limited only to these embodiments but various changed or modifications may be made without departure from the scope of the invention as defined by the appended claims.

Claims

1. A washing machine for washing a floorcloth, a mop or the like article (21), characterized in that a housing (1) of the washing machine is divided into two sections, one of them being an upper hollow section (11) and the other one being a lower hollow section (12), that the upper hollow section (12) includes a washing chamber in which at least one rotary washer (8) is arranged and a plurality of flat beating blades (9) each having excellent flexibility are mounted round a rotational shaft (45) of the rotary washer (8) in parallel with each other in the axial direction of the rotary washer (8) while extending in the radial direction, and that as an article (21) to be washed is conveyed on conveying means (7), it is first immersed in a bath of washing water and then reaches the rotary washer (8) so that the article (21) is repeatedly beaten by the foremost end parts of the beating blades (9) as the rotary washer (9) is rotated by a motor (10), whereby a washing operation is performed such that dirty water is splashed away from the washing article (21) and at the same time foreign matters such as dust or the like on the surface of the washing article (21) are removed therefrom.

2. A washing machine for washing a floorcloth, a mop or the like article (21) as claimed in claim 1, characterized in that each of the beating blades (9) is molded of rubber or thermoplastic elastomer.

3. A washing machine for washing a floorcloth, a mop or the like article (21) as claimed in claim 1 and 2, characterized in that each of the beating blades (9) has a heavily thick portion (49) formed at the foremost end part thereof.

4. A washing machine for washing a floorcloth, a mop or the like article (21) as claimed in claim 1, characterized in that each of the beating blades (9) is composed of a leaf spring (50) and a beating piece (51) made of a material having excellent wear resistance is attached to the part of the beating blade (9) adapted to come in contact with the article (21) to be washed.

5. A washing machine for washing a floorcloth, a mop or the like article (21) as claimed in any one of claims 1 to 4, characterized in that the part of the beating blade (9) adapted to come in contact with the article (21) to be washed is formed with a number of small projections (48).

6. A washing machine for washing a floorcloth, a mop or the like article (21) as claimed in any one of claims 1 to 3 and 5, characterized in that each of the beating blades (9) spirally extends in the axial direction on the outer peripheral surface of the rotational shaft (45) of

the rotary washer (8).

7. A washing machine for washing a floorcloth, a mop or the like article (21) as claimed in claim 6, characterized in that each of the beating blades (9) is symmetrically divided into two parts in the axial direction at the central part thereof, one of them spirally extending in a certain one direction away from the central part of the beating blade (9) and the other one spirally extending in the opposite direction to the foregoing one from the central part of the beating blade (9).

8. A washing machine for washing a floorcloth, a mop or the like article (21) as claimed in any one of claims 1 to 3, 6 and 7, characterized in that a film of thermoplastic resin having excellent wear resistance is laminated on one surface of the beating blade (9) adapted to come in contact with the article (21) to be washed.

9. A washing machine for washing a floorcloth, a mop or the like article (21) as claimed in any one of claims 1 to 8, characterized in that the washing machine is provided with a dirty water receiver (44) upstream of the rotary washer (8) in the vicinity of the beating blade (9) so as to allow dirty water splashed away from the washing article (21) to be received in the dirty water receiver (44).

FIG. 1

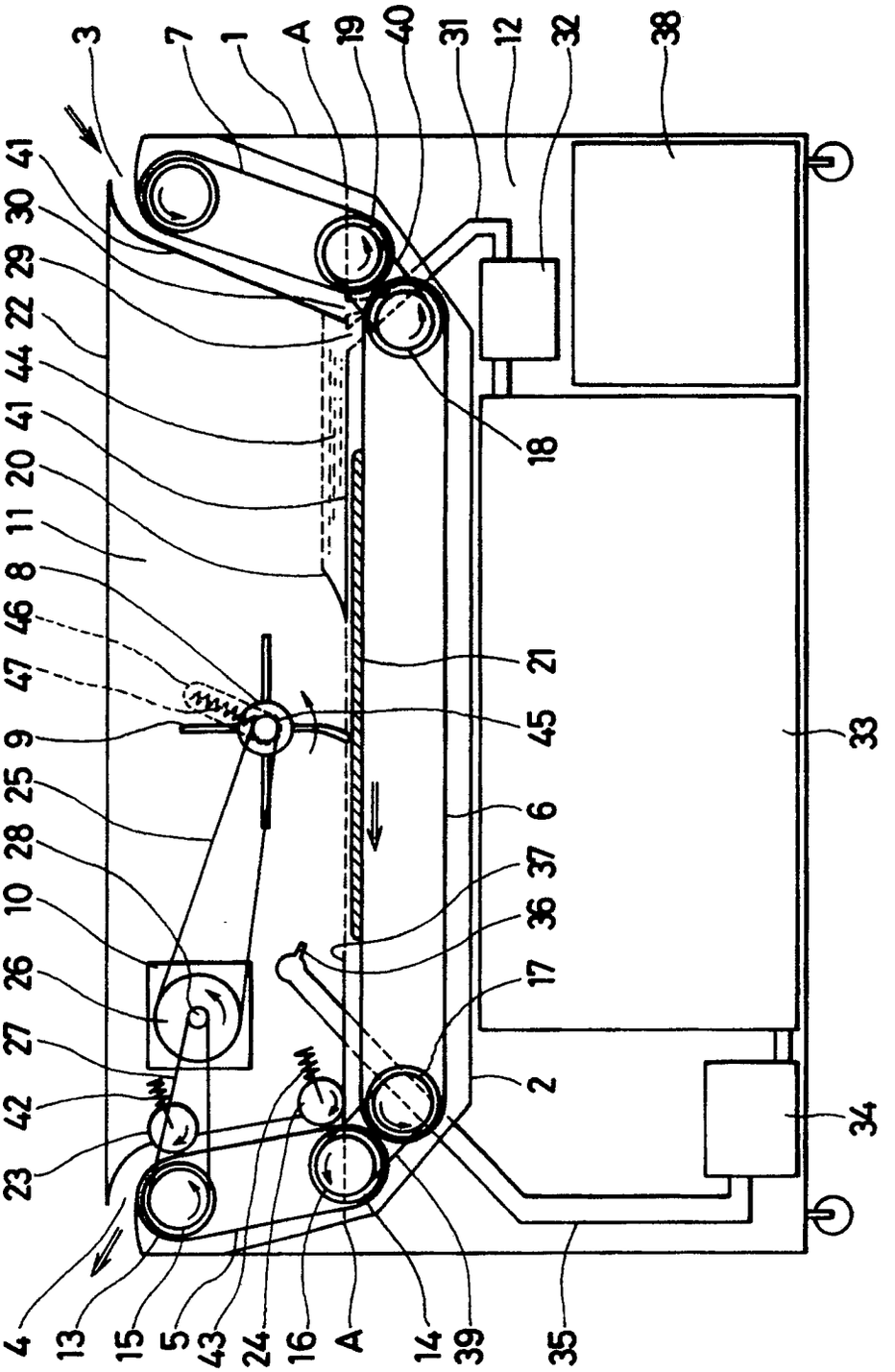
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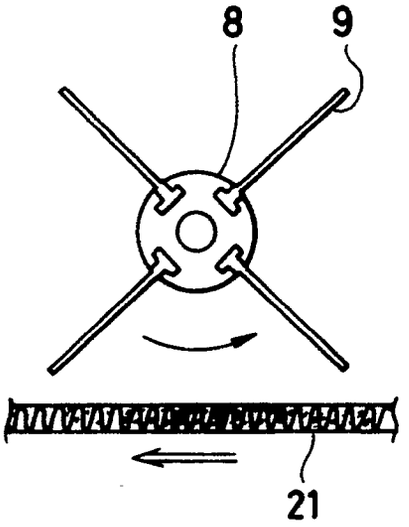
FIG. 2a



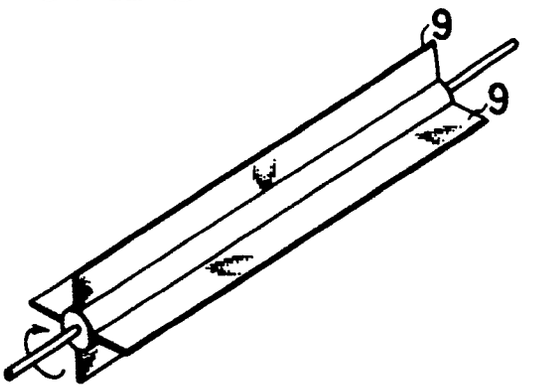
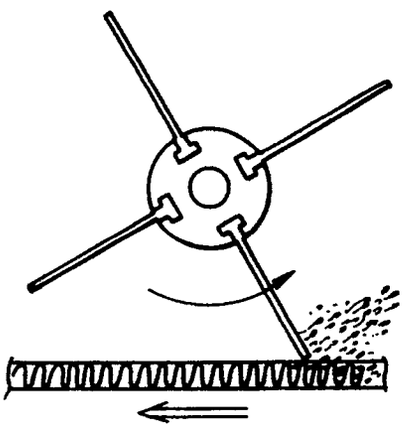


FIG. 2b

FIG. 2c



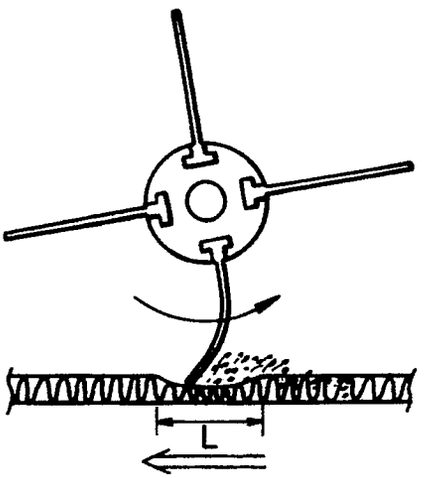


FIG. 2d

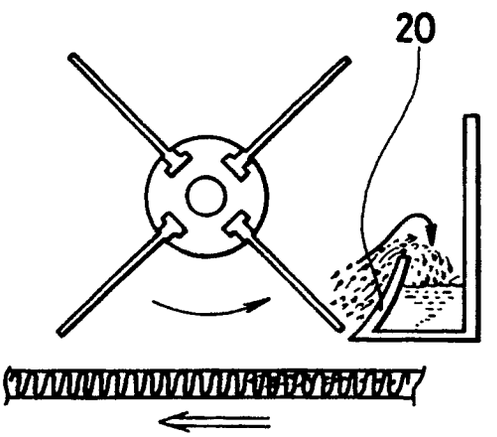


FIG. 3a

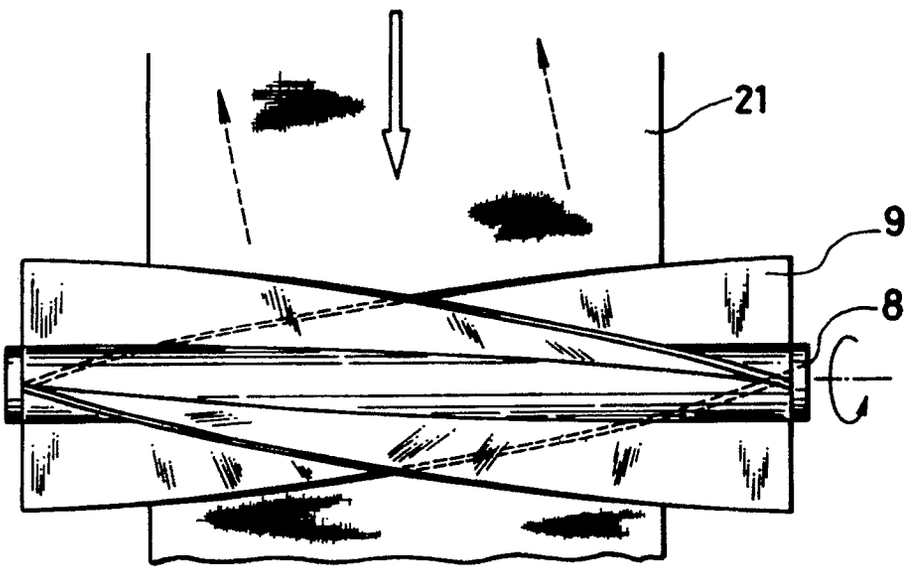
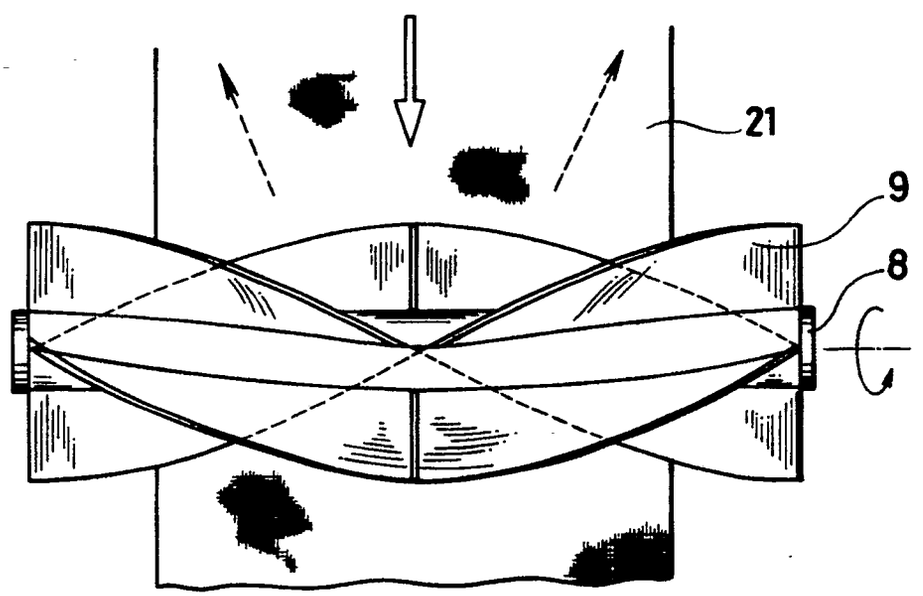


FIG. 3b



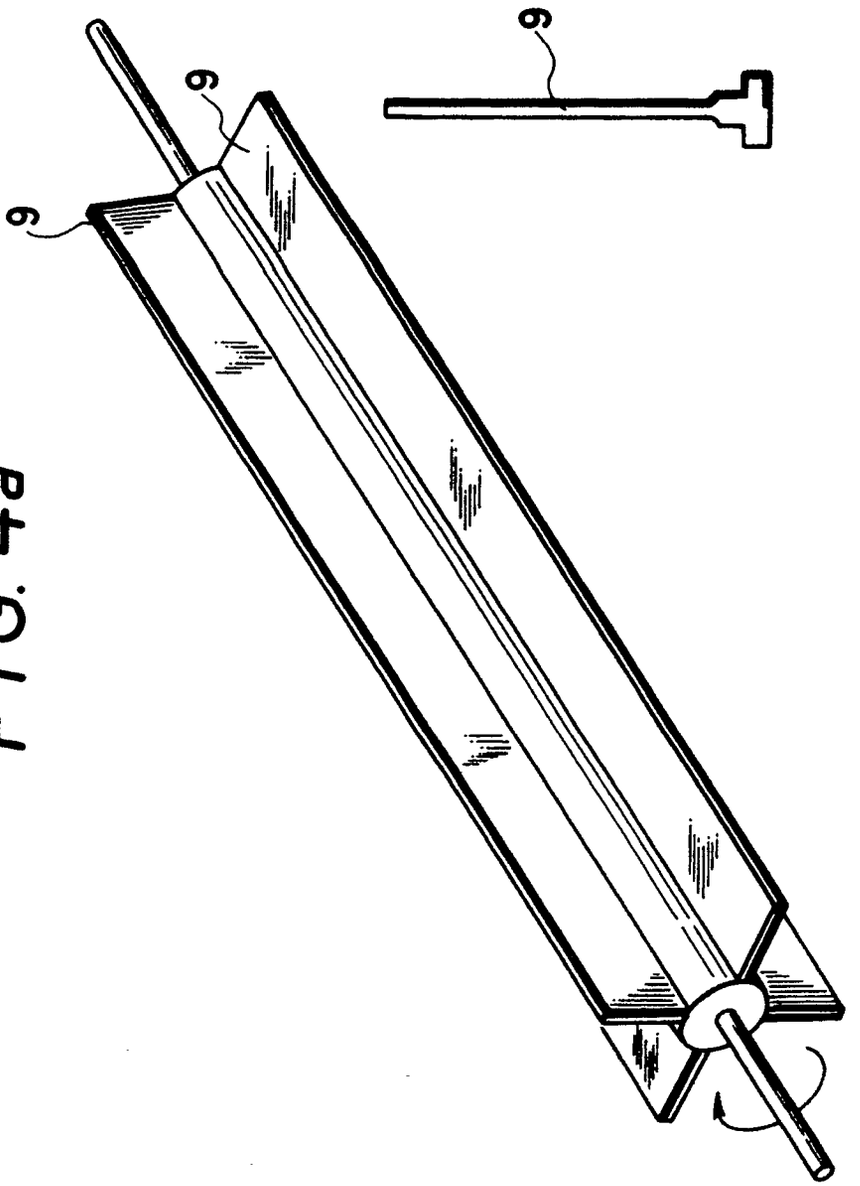


FIG. 4a

FIG. 4b

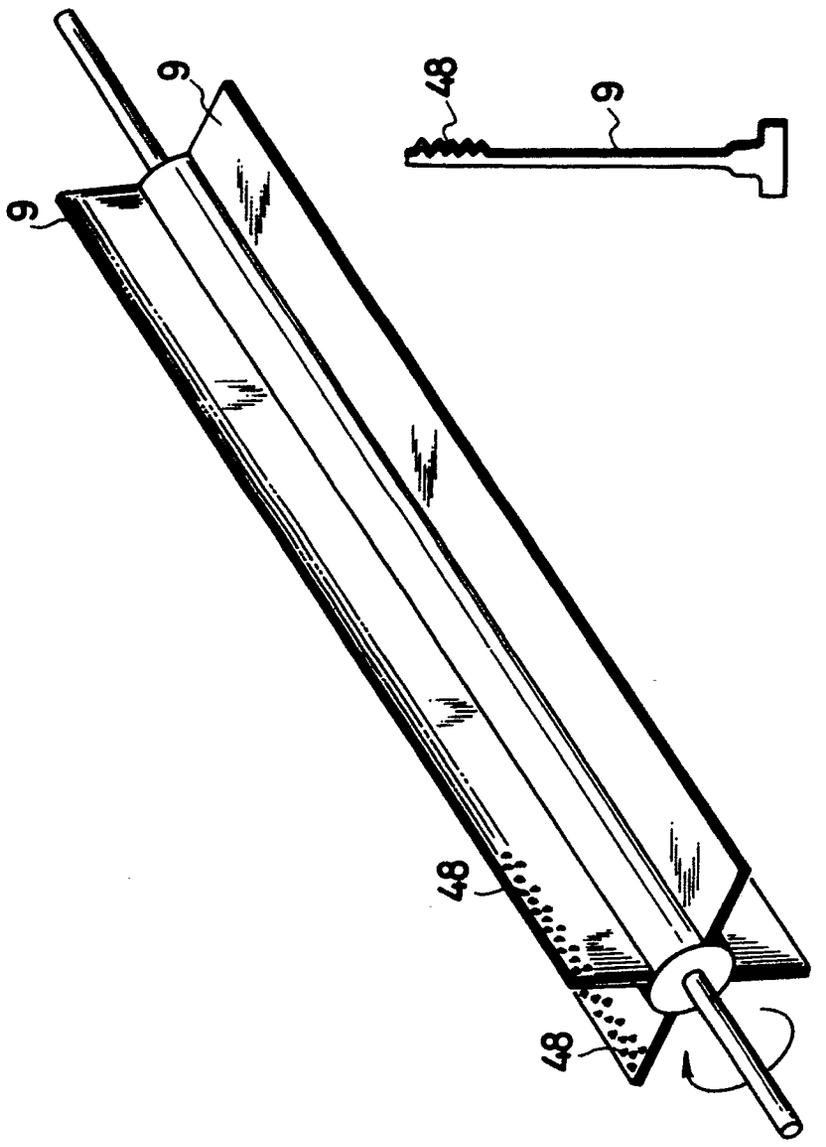
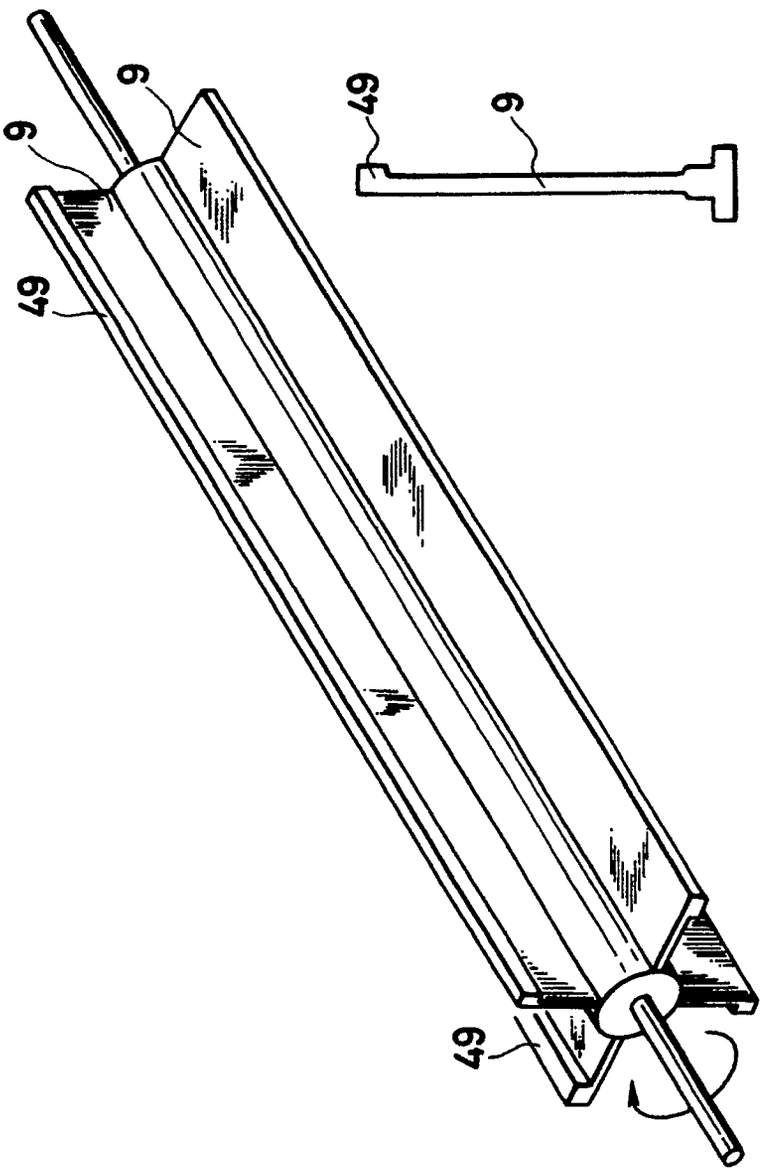


FIG. 4c



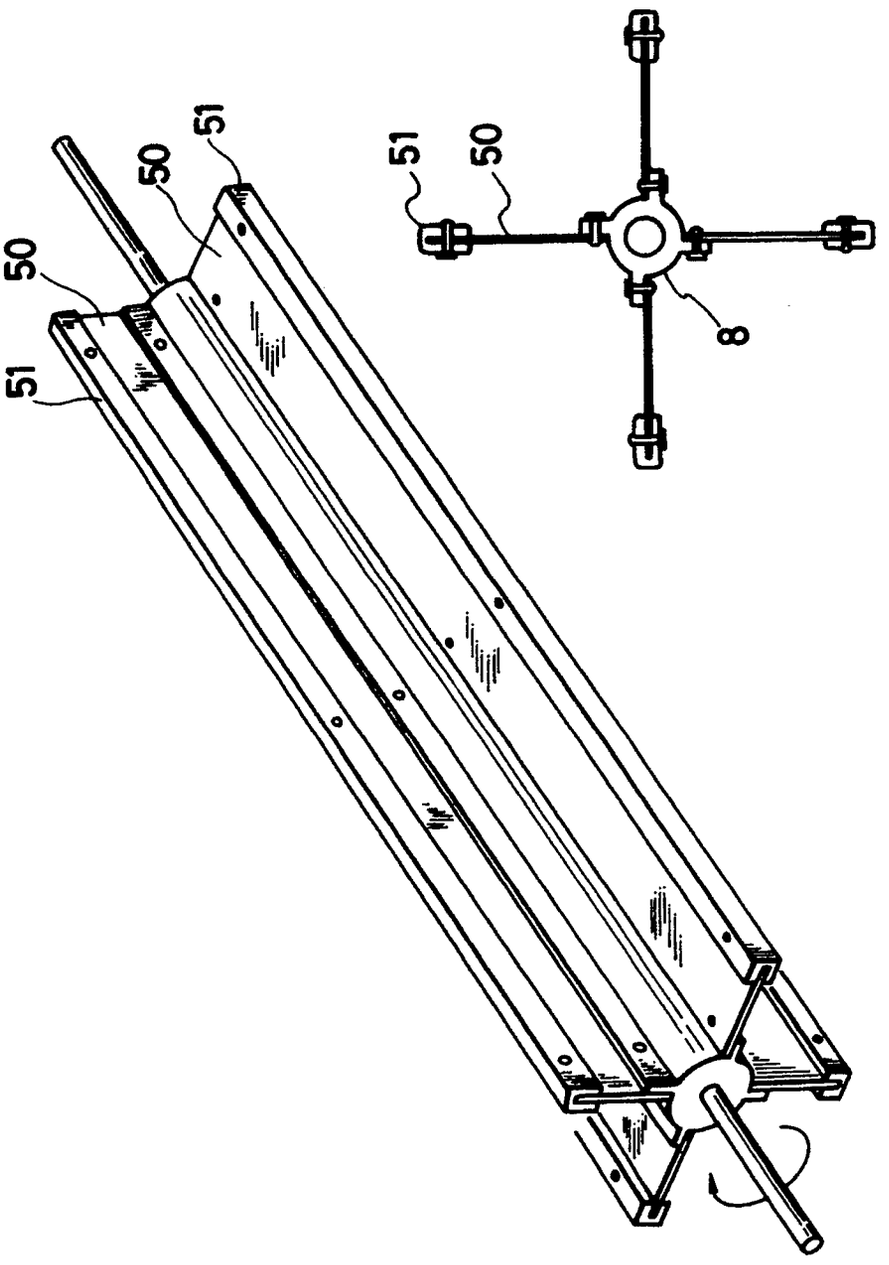


FIG. 4d

FIG. 5

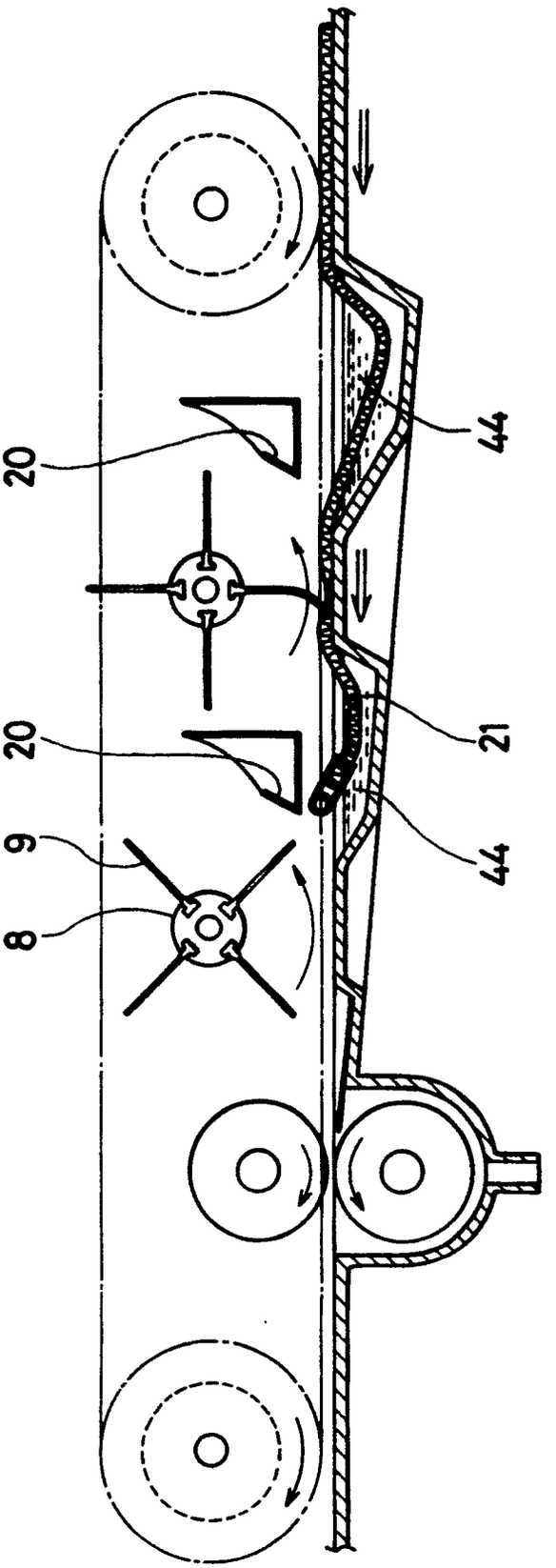


FIG. 6