Oct. 20, 1925. 1,558,414

M. THOMA

TEXTILE MACHINERY FOR FIBER PREPARATION

Filed May 21, 1924

Fig. 1.

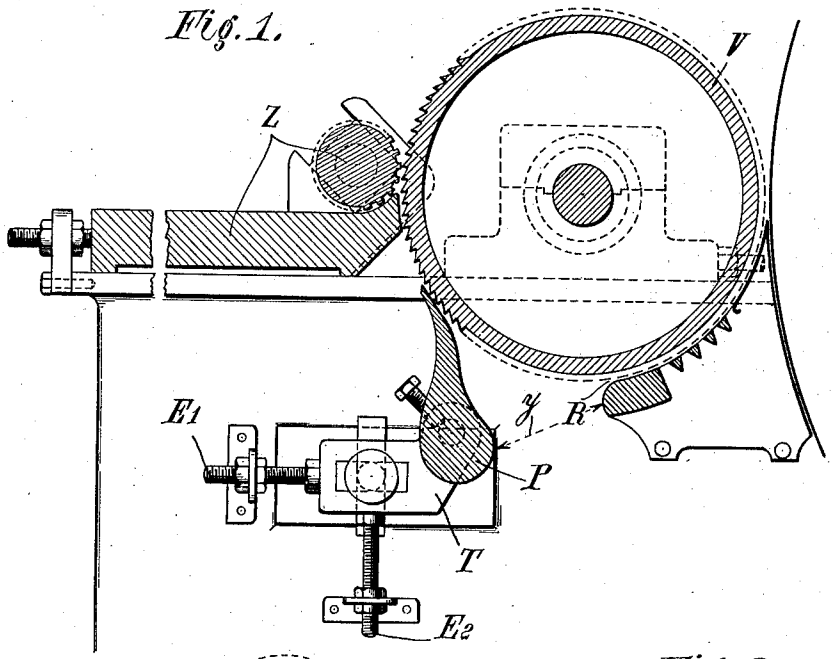
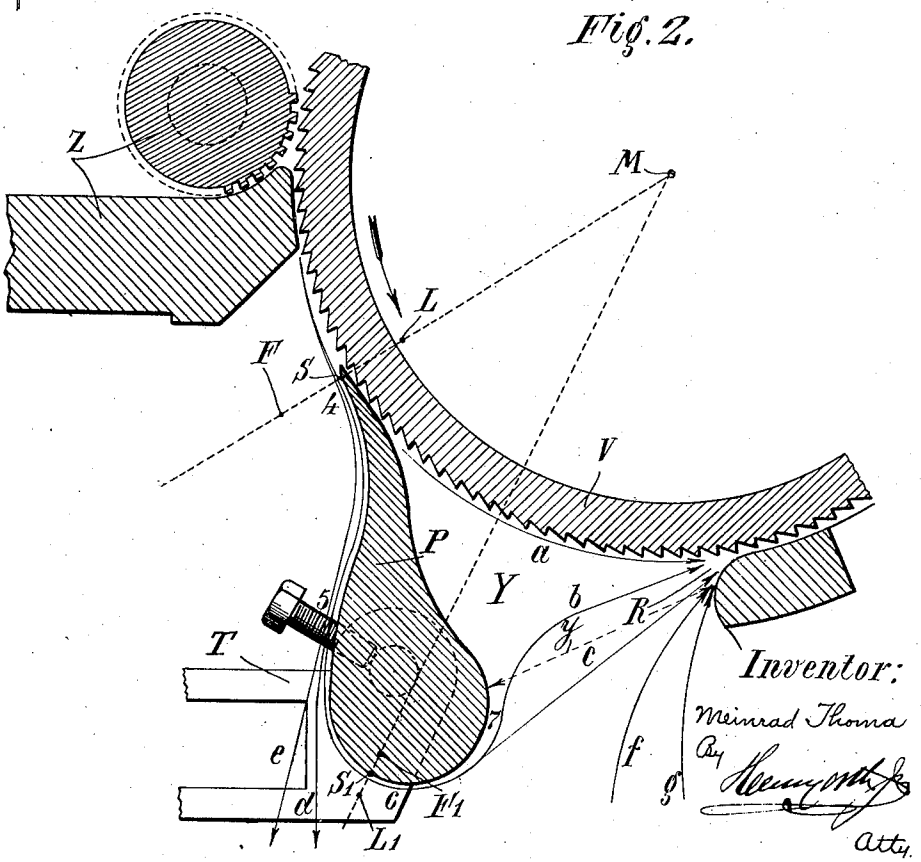


Fig. 2.



Inventor:
Meinrad Thoma
By
Atty.

Patented Oct. 20, 1925. 1,558,414

UNITED STATES PATENT OFFICE.

MEINRAD THOMA, OF ZURICH, SWITZERLAND.

TEXTILE MACHINERY FOR FIBER PREPARATION.

Application filed May 21, 1924. Serial No. 714,895.

To all whom it may concern:

Be it known that I, MEINRAD THOMA, a citizen of the Republic of Switzerland, residing at Torgasse 2, Zurich, Switzerland, have invented certain new and useful Improvements in Textile Machinery for Fiber Preparation, of which the following is a specification, reference being had therein to the accompanying drawing.

With certain textile machinery used in the fiber preparation, such as openers, scutchers, cotton carding engines and the like, it is essential that a separation of the dirt and mote from the fibers is effected simultaneously with a deviation of the air.

The hitherto known arrangements utilized to this end for instance, with carding engines in which a conventional knife of triangular cross-section cooperates with a feed-roller, the table, the licker-in and the grid for the purpose of separating or removing impurities, such as motes, shale, husks, broken seeds and the like, presents the drawback that a comparatively large quantity of good fibers fit for spinning are removed and get mixed with the proper waste, whereby they are lost for further treatment; this loss is quite considerable.

In consequence of the necessity to place the edge of the knife very near (approximately at a distance of 10/1000″) to the licker-in in order to remove all the impurities from the mass of fibers the following draw-backs have presented themselves in practice: The considerable quantity of air, which is carried along with the licker-in and to which a rotary motion is imparted, is projected against the surface of the knife remote from the licker in, as the clearance of 10/1000″ between the cutting edge of the knife and the licker V is too small to admit passage to the whole quantity of air rotating with the licker-in. The air projected against the lateral surface of the knife is heavily whirled, and these whirls effect an opening and separating action on the fibrous material covering the circumference of the licker-in so that a considerable quantity of this material gets into the waste chamber. The deviation of the air along the surface of the knife is effected by continuous whirls and the whirls diminish only by degrees with an increased distance from the licker-in whereupon the air flows to the waste chamber. At the rear of the knife a partial vacuum is present so that part of the deviated air flows around the lower edge of the knife and along its surface to the intake of the grid. The abrupt deviation of the air around the lower edge of the knife causes further whirls, so that the air flowing to the intake of the grid has no uniform flow but is in a state of continuous whirling in the space behind the knife. The narrower the profile of the knife is the more intense is the upward flow of the air to the intake of the grid, and it has been observed that short bits of fibers, dust and light impurities, which have been removed by the edge of the knife and the removal of which is absolutely necessary in order to obtain a good product, are again carried by the air to the intake of the grid and thus contaminate again the fibrous material.

In order to overcome this drawback it has already been proposed in the German Letters Patent No. 286043 to increase considerably the width of the knife in order to decrease the strength of the air current passing around the lower edge of the knife so that the separated impurities are not again returned into the working process; the contemplated action to return the loosened fibers is however, not reached without returning at the same time the separated impurities consisting of dust and short fibers.

With all the hitherto known knives and arrangements an undesirable separation of fibers at the edge of the knife can only be avoided by increasing the clearance between knife and licker-in, for instance to 30–40/1000″, in order to decrease the whirling of the air, as in this case nearly the total quantity of air rotating with the licker-in can pass between the edge of the knife and the circumference of the licker-in, so that the impact of the air on the lateral face of the knife is much smaller and the intensity of the whirling is diminished. However, the disadvantage presents itself that the removal of the impurities at the knife edge is not sufficient; the linings of the cylinder, of the flats and of the doffer are too quickly blocked up with short fibers, motes, leaves and the like and the intensity of the carding action is thereby considerably reduced and the quality of the treated fibers is also impaired.

Furthermore to the adjustment of the knife relatively to the licker-in and of the direction of the air current involved thereby as disclosed in the British Letters Patent

No. 14521 of 1902 the above mentioned drawbacks are inherent as a diminution of the whirling of the air obtained by a suitable adjustment of the knife influences unfavorably the intensity of the cleaning, as the adjustment of the knife causes an increase of the clearance between the knife edge and the circumference of the licker-in.

The present invention has for its object to do away with the afore-mentioned disadvantages. The device, according to the invention for removing the impurities is provided with a plate adapted to deviate the air and to serve as a knife of such a shape that its working faces correspond substantially to the natural stream lines of the air and the knife edge of which can be adjusted to a distance of approximately 5/1000″ from the circumference of the licker-in for the purpose of obtaining an intense cleaning action in connection with a complete avoidance of the air whirls which have a separating effect on the fibrous material.

The working faces of the plate and particularly the face along which the air flows when moving away from the licker-in are preferably formed as parabolas which can be calculated from the constant speed of the licker-in and from the quantity of air dragged along by the licker-in, which quantity may also be taken to be constant, these two known terms permit the calculation of the parabola. It is considered superfluous to state here the mathematical deduction by which the formula for the parabola is derived.

A constructional example of the subject matter of the present invention is illustrated in Figs. 1 and 2 of the accompanying drawings in which:

Fig. 1 shows a portion of a carding engine with the licker-in arrangement in a vertical section and Fig. 2 shows on an enlarged scale a vertical section of a part of the licker-in arrangement proper together with the deviating blade.

Referring now to the illustrated constructional example V denotes the licker-in, Z is the feed device, P is the deviating plate which is pivoted in a known manner to a support T, and R designates the intake of the grid. The support T is mounted in the engine frame and is adjustable in the vertical and in the horizontal direction by means of the screw threaded spindles E^1 and E^2. All the other parts of the carding engine do not differ from the conventional construction and it is therefore not deemed necessary to describe them in detail. Fig. 2 shows on a larger scale the shape of the profile of the deviating plate P, the working faces, i. e. the lateral face and the lower face from 4 to 7, along which the air flows, are substantially formed by two parabolas joining together and having the foci F and F^1 respectively, and being accurately determined by taking into consideration the quantity and the speed, these parabolas correspond to the natural stream lines of the air coming from the licker-in. The upper portion of the lateral face is so arranged relatively to the licker-in that the center M of the licker-in, the vertex S, the point of intersection L of the directrix and the focus F are all situated on a straight line, the part 4, 5 forming the parabola determined by F, L and S. The air carried along with the licker-in is not projected towards an opposing surface but it will glide gently and without the formation of whirls along the upper deviating face 4—5 and it will not cause the undesirable separation of useful fibers as has been the case by the whirls caused with the known arrangements. Owing to the adjustment of the knife edge of the deviating blade to a distance of 5/1000″ from the circumference of the licker-in almost the total quantity of air is deviated, so that a partial vacuum is caused in the space behind the plate P. The size of the profile of the deviating plate is so chosen that it reaches into a zone in which the suction action produced by the intake R of the grid on the lowermost face 6 of the plate P is not very effective so that the flow of air along the lines *b* and *c* is exceedingly gentle. The bulk of the deviated air will flow off along the stream lines *d* and *e* and will conduct the removed or separated impurities to a waste chamber arranged below the plate. The bulk of the air flowing to the intake R of the grid will move from nearer zones along the stream lines *f* and *g*, a further portion of air, i. e. the air carried along with the licker-in and not deviated by the plate P, flows in the direction *a* to the intake R.

The lower part of the working face of the plate P is defined by a second parabola, which causes the rising air currents *b* and *c* to separate by degrees from the currents indicated by *d* and *e* and to be guided past the lowermost portion of the plate P without the formation of whirls. F^1 is the focus, S^1 is the vertex, and L^1 is the point of intersection of the directrixes of this second parabola and the points M, F^1, and S^1 and L^1 are situated on a straight line, the curve 5, 6, 7 representing this second parabola to which the above points belong. The focal distance of this parabola is smaller than that of the parabola 4, 5 owing to the smaller quantity of air and its velocity, the curvature of this natural stream line is therefore more abrupt.

Owing to the sharp adjustment of the deviating plate to the licker-in a very thorough cleaning effect is obtained. The smallest impurities are intercepted and carried away whereby the clothing of the cylinder, of the flat and of the doffer are relieved and

their life is prolonged. The removal of good fibers in consequence of the whirling of the air is totally excluded, as the air is led off along natural stream lines without any interruption or whirling.

As has been mentioned above the separation of the currents *b* and *c* from the currents *e* and *d* occurs by degrees and the flow of the currents *b* and *c* along the parabola is absolutely smooth. In consequence thereof only a small movement of air occurs in the space Y (Figs. 1 and 2) situated between the plate P and the intake R of the grid and there will be no whirls generated in this space. Therefore the distance *y* may be made comparatively large, for instance 3½", i. e. a dimension which had never been obtained by known devices of this type. This large free space presents the advantage that impurities of quite a small size, such as dust, grit and the like, which possess only a small adhesion to the clothing are removed by the centrifugal action of the licker-in, a fact which further improves the quality of the product. With the hitherto known knives the size of the space Y was only very limited, as otherwise the whirls would have had a larger area presented to them to act upon whereby the faulty separation of good fibers would have been increased. By means of the combination of the air deviating plate with a grid, the projecting inner end of which has the form of a cusp or beak, the space Y may be further enlarged whereby the removal of small impurities is further increased.

In case of a change of speed of the licker-in and of the speed of air depending thereon and of the stream lines a compensation may be effected by a change of the adjustment of the plate. If, for instance, the speed of the licker-in be increased, the focal distance of the parabolas must also be increased as in this case the natural stream line of the discharged air is more stretched. To this end the adjustment is so performed that the deviating plate is displaced by a small amount towards the right hand side (when looking at Fig. 1 or 2) and is turned about its fulcrum through a small angle in the anti-clockwise direction, which adjustment is an equivalent to an increase in the focal distance.

I claim:

1. In textile machinery, a device for removing impurities, particularly in openers, scutchers and carding engines, comprising a licker-in and a plate to deviate the air and to act as a knife cooperating with the licker-in, the profile of the plate having its working surfaces substantially defined by two parabolas joined to each other the focal distance and directrix of which are directly dependent on the discharged quantities of the air and the speeds of the air, so that the air guided by the working surfaces flows along natural stream lines, the shape of the plate permitting of an adjustment of the distance between the knife edge and the circumference of the licker-in to 5/1000 of an inch, whereby air whirls having a separating effect on the fibrous material are avoided and an intensive cleaning is obtained.

2. In textile machinery, a device for removing impurities, comprising a licker-in, and a plate to deviate the air and to act as a knife cooperating with the licker-in, the profile of the plate increasing in thickness from a knife edge at one end to a well rounded portion at the other end, and the length of the profile from the knife edge to the rounded end corresponding approximately to the radius of the licker-in, so that it projects into a calm zone, the front part of the plate being approximately tangential to the circumference of the licker-in to gently deviate the air along natural stream lines and avoid any whirls of air.

3. In textile machinery, a device for removing impurities, comprising a licker-in and a plate to deviate the air and to act as a knife cooperating with the licker-in, the profile of the plate increasing in thickness from a knife edge at one end to a well rounded portion at the other end, and the length of the profile from the knife edge to the rounded end corresponding approximately to the radius of the licker-in and projecting into a calm zone, the front part of the plate being approximately tangential to the circumference of the licker-in to gently deviate air along natural stream lines and avoid any whirls of the air, and means to adjust the plate in horizontal, vertical and angular directions so that a distance between the knife edge and the licker-in may be obtained of 5/1000 of an inch, and the position of the plate may be adapted to conditions due to a change of speed of the licker-in.

4. In textile machinery for fiber preparation, the combination of a licker-in with a plate to deviate the air and to act as a knife cooperating with the licker-in, the profile of the plate being substantially defined by two parabolas joined to each other, the focal distance and directrix of which are directly dependent on the discharged quantities of air and the speed of the air, so that the air guided by the working surfaces flows along natural stream lines, means adapted to adjust the distance between the knife edge and the circumference of the licker-in to 5/1000 of an inch, and a licker-in grid of a prolonged cusp-type.

5. In textile machinery for fiber preparation, the combination of a licker-in with a plate adapted to deviate the air and to act as a knife cooperating with the licker-in,

the profile of the plate being substantially defined by two parabolas joined to each other, the focal distance and directrix of which are directly dependent on the discharged quantities of air and the speeds of the air, so that the air guided by the working surfaces flows along natural stream lines, means to adjust the distance between the knife edge and the circumference of the licker-in to 5/1000 of an inch, and a licker-in grid of a prolonged cusp-type, the intake of the licker-in grid being arranged at a distance from the knife plate that equals approximately the length of the profile of the plate to permit a separation of impurities by centrifugal action in the enlarged space between the intake of the grid and the knife plate.

In testimony whereof I affix my signature.

MEINRAD THOMA.