July 6, 1937. P. VAN HILLE ET AL 2,086,308

CARDING MACHINE

Filed Aug. 31, 1934 3 Sheets-Sheet 1

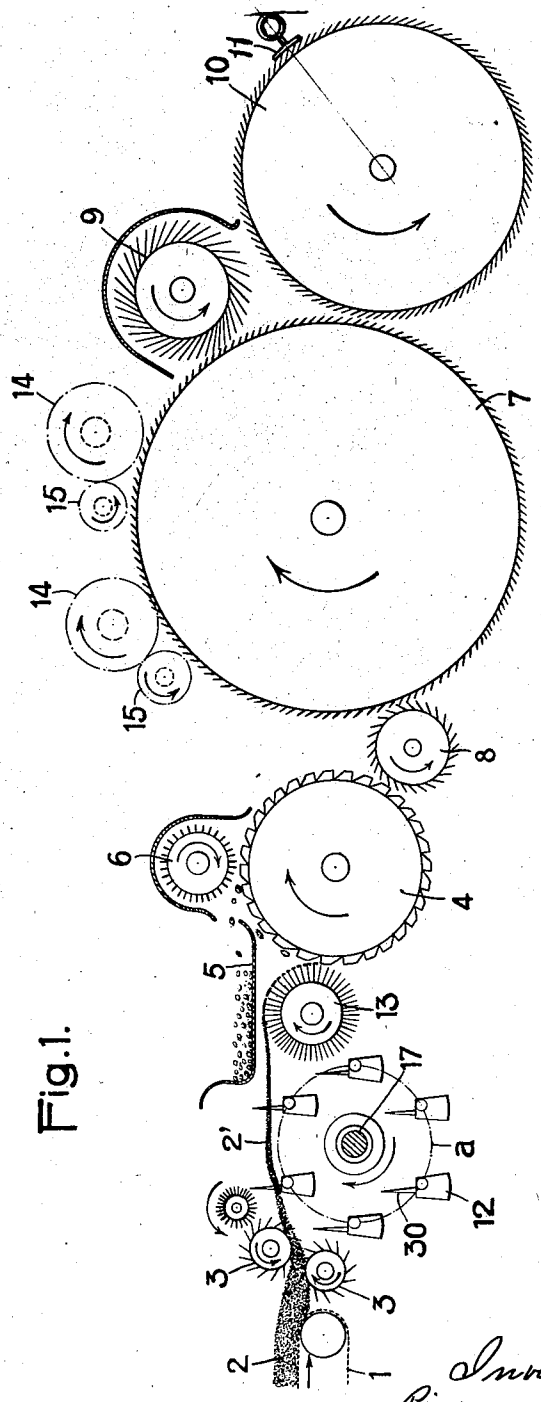


Fig.1.

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Fig. 2.

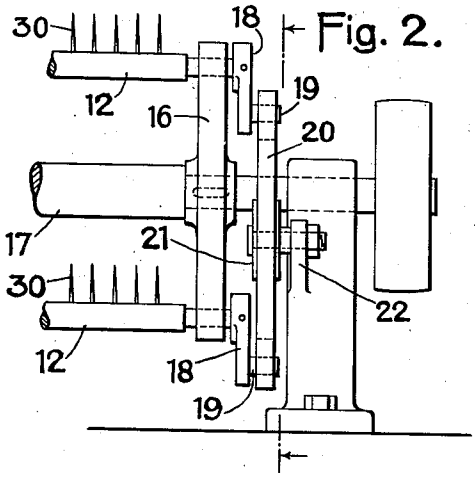


Fig. 3.

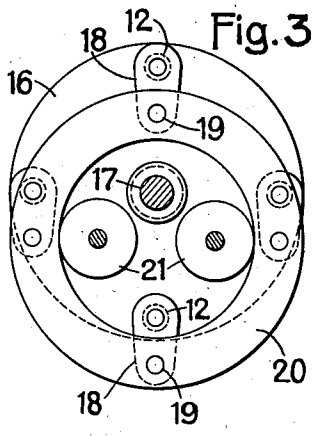


Fig. 4.

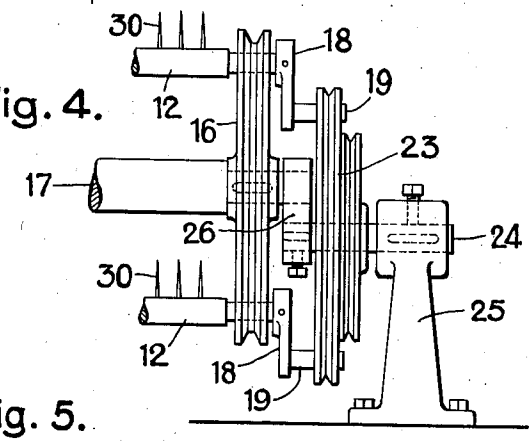


Fig. 5.

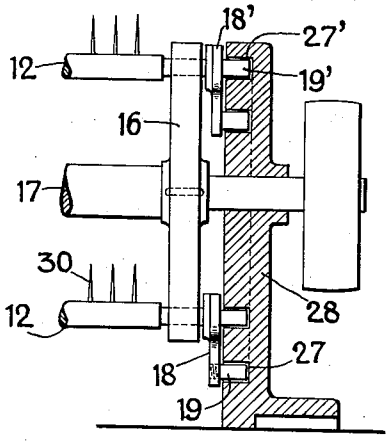
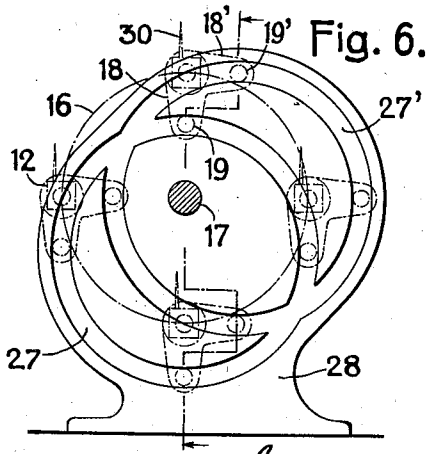


Fig. 6.



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Fig. 7.

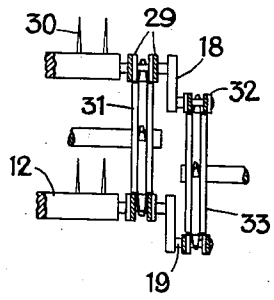


Fig. 8.

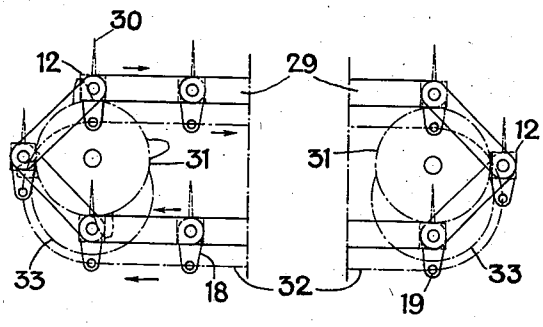


Fig. 9.

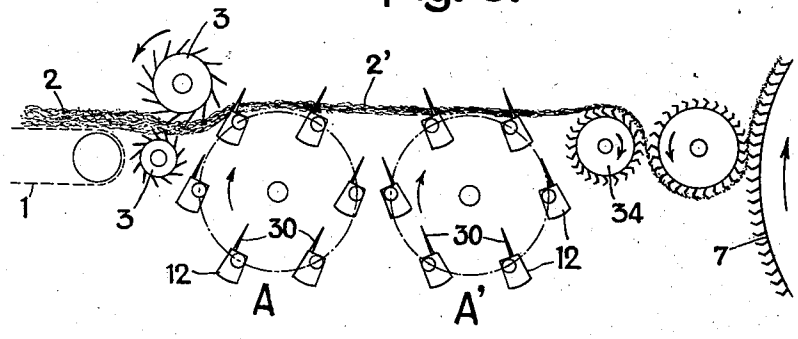


Fig.10.

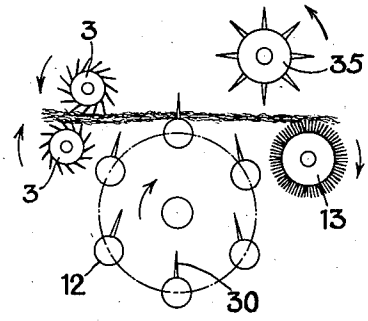
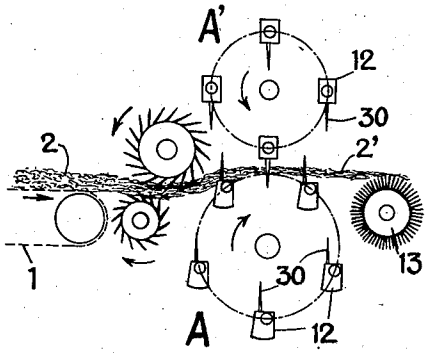


Fig. 11.



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UNITED STATES PATENT OFFICE

2,086,308

CARDING MACHINE

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Application August 31, 1934, Serial No. 742,328
In France October 3, 1933

1 Claim. (Cl. 19—105)

The present invention relates to carding machines used for loosening masses of textile fibres, straightening the filaments, rendering them parallel and cleaning them.

In practice these operations are effected by carding but as is well known repeated carding has the disadvantages of tearing, fatiguing and breaking many of the fibres, of holding back and piling up a large number at each carding or working point and of rolling up some of them into neps, and thus resulting in a large percentage of noils and loss and depreciation of the material being worked upon.

The object of the invention which applies more particularly to fibres of some length such as wool, various kinds of hair, silk, schappe, flax, hemp, jute, ramie, etc., is to remedy these disadvantages by suppressing or at any rate reducing as much as possible the multiple carding or working points of the standard carding machines at present in use, in which the disadvantages in question are particularly noticeable with fibres of great length.

To this end the invention has for its object improvements consisting in converting the tangled mass fed into the machine at its entry or before its entry into a thin sheet composed of parallelized and well combed fibres, by submitting the said mass for this purpose to one or more highly repetitive loosening-combing operations; the improved machine in order to accomplish the loosening-combing at entry comprises one or more devices located following the feed rollers and which comprise a set of movable needle carrying bars forming combs having a very rapid circular or rectilinear movement of translation during which the needle bars remain constantly parallel with themselves or substantially so, and also with their needles pointed to the same direction, these needle bars being disposed so that their needles enter and leave the material preferably perpendicular thereto or at least at an angle in the neighbourhood of a right angle.

In addition to the loosening, the combing and the parallelization of the fibres, the rapid beating of the mass by the needle bars causes a considerable quantity of the impurities to fall out which greatly facilitates the subsequent cleaning operation.

By operating in this manner important advantages are obtained the principal of which are:—

(*a*) Less fatigue of the fibres, fewer breakages resulting in less waste and improvement in the value of the product;

(*b*) More complete cleaning owing to the extraction of foreign bodies being rendered easier;

(*c*) An increase in production compared with the usual carding machines not provided with the improvements according to the invention;

(*d*) Simplification of the operation and the possibility of constructing machines and sets of machines at a lower price, costing less to maintain and taking less power. Since the invention enables the carding or working points to be suppressed or at any rate reduced in considerable proportion, either single carding machines can be used in place of duplex machines or the number of and location of the existing members can be left unchanged but their closeness and regulation can be such that they card the least possible; this is due to the preliminary loosening and combing effected one or more times at the entry to the machine.

In order that the invention may be better understood and by way of non-limiting examples, some embodiments of the invention are described below with reference to the accompanying drawings.

In the drawings:—

Figure 1 represents a carding machine of ordinary kind altered in accordance with the invention and suitable for operating upon washed wool in bulk, unloosened and containing burrs, grains, grass, straw, neps etc.;

Figures 2 and 3 are respectively a detail front view and end view showing a construction of driving mechanism for the rapidly moved needle bars or combs effecting loosening and combing at entry by repeated action;

Figure 4 is a similar view to Figure 2 showing a first modification of the said mechanism;

Figures 5 and 6 are similar views to Figures 2 and 3 respectively showing a second modification;

Figures 7 and 8 are respectively a front view and end view showing an arrangement of needle bars which can also be used for carrying the invention into practice and giving the needle bars a rectilinear movement of translation and

Figures 9, 10, and 11 are details showing modified arrangements for effecting loosening and combing at entry.

Referring to the carding machine shown in Figure 1, this comprises as usual a feed conveyor 1 bringing the material to be worked 2 in the form of a tangled mass charged with impurities to the feed rollers 3 provided with pins, a burring roller or licker-in 4 provided, for example, with a rigid covering of saw teeth between which the fibres enter while the burrs and other impurities remain upon the periphery and are re-

moved into a tray 5 by a bladed roller 6 which rapidly rotates; 7 is the swift or great drum which is rotated sufficiently rapidly and is relatively large so that the fibres are distributed over a large surface and so that the sheet or slice at its issue shall be of uniform character; 8 is the transferring roller removing the fibres from the licker-in 4 and transferring them to the swift 7; 9 is the fancy drum by which the fibres are removed from the pins of the swift 7 and transferred to the doffer 10 from which they are detached in the form of a sheet by the doffing comb 11 to be subsequently condensed into slivers and to form, for example, bobbins or another sheet in the well-known manner.

According to the invention immediately after the feed rollers 3 is located a rapidly moving loosening-combing device consisting in the illustrated example of a set of movable needle bars 12 forming combs having a rapid movement of translation along a circle a with their needles always pointed to the same direction. The rollers 3 being provided with strong pins so as to retain a powerful hold on the fibres and turning very slowly, while the needle bars 12 are given a very rapid motion, the result is that the mass 2 of tangled fibres is transformed into a thin sheet 2' of parallelized and strongly combed fibres. As the needles 30 of the bars 12 always remain parallel with themselves they enter the material perpendicularly and leave it in the same way and completely discharge the fibres they have received from the feed rollers 3 upon the roller brush 13.

The peripheral speed of the brush 13 is a little greater than the speed of the needle bars 12 so that drawing as well as a further loosening and combing of the fibres is effected, especially of the ends released by the feed rollers.

The licker-in 4 accordingly receives from the roller brush 13 a thin sheet consisting of parallelized and well combed fibres, whereas in the ordinary carding machine it is necessarily fed with masses, tufts or bundles of fibres slightly and insufficiently loosened by the breast roller (with a risk of carding and dividing the vegetable impurities at the same time as the wool and rendering their extraction practically impossible). It will readily be understood therefore that cleaning is rendered much easier by the invention and also more complete especially since the rapid beating of the needle bars 12 against the sheet 2' causes many of the impurities to fall out. Owing to the rapid loosening and combing and the repeated action effected at entry by the needle bars 12, as shown in Figure 1 all the usual carding or working points can be suppressed except that formed between the swift 7 and the fancy drum 9 which is necessary for collecting the material and feeding it out in a uniform sheet or slice.

In certain cases, however, particularly with very tangled and felted materials or with some remixed waste fibres, if it is desired to suppress all the working or carding points it will be necessary to increase the loosening combing operation by slowing down the feed by the rollers 3, which may lead to considerable reduction in the output of the machine. For such cases it may be advantageous to have the swift 7 combined with some pairs of worker 14 and stripper 15.

The high speed movement of the needle bars 12 which effect a frequently repeated loosening-combing operation can be effected in various ways.

The drive described in the U. S. patent application Ser. No. 731,951 filed June 22, 1934, by van Hille, can be used, this device being characterized by a differential gear for the purpose of giving the needle bars a practically unlimited speed by a simple and robust mechanism and of maintaining the direction of their needles parallel with themselves during the working of the fibrous material.

When the diameter of the path of the needle bars 12 becomes very small, as is the case when short wool is being treated, a device of the kind shown in Figures 2 and 3 can be used in view of the lack of room. In this device the needle bars 12 are driven at each end by a disc 16 keyed upon a rotating shaft 17, the end of each needle bar which passes loosely through the disc 16 having a crank 18 of which the crank pin 19 passes loosely through a ring 20 eccentric with respect to the disc 16 and guided, for example, by regulatable rollers 21 the spindles of which are carried by fixed supports 22.

A first modification (Figure 4) of this device consists in replacing the eccentric ring 20 by a disc 23 eccentric with respect to the needle bar carrying disc 16 and through which the ends of the crank pins 19 loosely pass. The disc 23 turns loose upon a fixed pin 24 mounted in the support 25 and upon the end of which is fixed a bracket 26 supporting the principal shaft 17. The rotary movement can be transmitted by ropes or belts either to the disc 16 carrying the needle bars 12 or to the eccentric disc 23 guiding the crank pins 19.

A second modification (Figures 5 and 6) consists in providing the ends of the needle bars 12 passing through the supporting disc 16 with bell cranks 18, 18' of which the crank pins 19, 19' are guided respectively in circular grooves 27, 27' formed in a fixed support 28 out of register with one another and eccentric with respect to the disc 16 carrying the needle bars 12.

For material with very long fibres such as certain kinds of wool, goat hair, hemp, jute, etc., it may be desirable to give the needle bars 12 a rectilinear movement of translation by mounting them, as shown in Figures 7 and 8, on a chain 29 passing over pinions 31, the needle bars being maintained parallel with themselves and with their needles always pointed to the same direction, for example, by providing them with cranks 18 and engaging the crank pins 19 thereof by a chain 32 passing over pinions 33, the chain 32 being arranged parallel to the chain 29 but at a different level.

It is obvious that the loosening-combing operation at entry can be varied in numerous ways in practice according to the nature and length of the fibres treated.

For material with long fibres difficult to work, the arrangment shown in Figure 9 can be used, where several groups or sets A, A^1 of needle bars 12 with a circular movement of translation and with suitable and regulatable drawing between the successive groups or sets A, A^1 of needle bars are provided, the roller brush 13 of Figure 1 then being replaced by a roller 34 furnished with pins.

For some materials, such as short curled wool, a stripping roller 35 (Figure 10) will be added which facilitates drawing by the roller brush 13 in that the roller 35 forces the fibres to be engaged by the drawing brush 13 and thus prevents

the material collecting together and passing in lumps.

Further, in the case of short wool, it may be desirable in order to reduce the distance between the feed roller 3 and the drawing and delivering brush 13 so as to avoid holes in the sheet or slice to incline the pins somewhat as shown in Figure 10, i. e. slightly forwardly where they enter the fibres and slightly rearwardly where they leave them. This result can be obtained, for example, by giving the guide grooves 27, 27' (Figure 6) an oval form, or by providing eccentric gears in the differential mechanism of the driving device for the needle bars forming the subject of the above mentioned patent application.

Finally, to obtain very intensive loosening without having to increase the speed of the needle bars or their drawing effect with respect to the feed rollers, according to Figure 11, a lower group A of needle bars 12 can be provided in combination with an upper group A^1 of needle bars 12 operating in synchronism in the manner of the known intersecting gill boxes.

It will readily be understood that many variations and improvements in details and various equivalents can be used without departing from the scope of the present invention. For example burring rollers, licker-in rollers, breast rollers etc., can be interposed for improving the cleaning effect or increasing production.

From another point of view some wools or other textile materials may be better worked upon if they are placed in humid condition upon the conveyor chain and heated, either by heat radiating tubes or radiators, placed within the endless conveyor, or under the needle bars 12, or formed by the shaft 17, or again by the licker-in being supplied internally with steam. Such heating causes the wool to swell, unfelts it and facilitates loosening, combing and burring. Finally, in the drive of the needle bars 12 the addition of springs, weights, fixed or elastic guides, slides, connecting rods, elliptic grooves, etc., can in some cases avoid the provision of a drive at both ends and thus facilitate the operation of the mechanism.

What we claim is:—

A carding mechanism having a reduced number of carding points comprising slow speed feed rollers, a loosening combing device receiving the fibres from said feed rollers and having a greater speed of rotation than said feed rollers, said combing device comprising bars having needles thereon which remain parallel during the rotation of said device so that said needles will enter the fibres substantially perpendicularly and leave said fibres in the same way, a roller brush having a greater peripheral speed than said combing device and receiving the fibres from said combing device, a licker-in receiving the fibres from said roller brush, a bladed roller cooperating with said licker-in to remove impurities from the fibres, a swift, a transferring roller transferring said fibres from said licker-in to said swift, a doffer, a fancy drum removing said fibres from said swift and transferring the same to said doffer and a doffing comb cooperating with said doffer.

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