

May 27, 1958

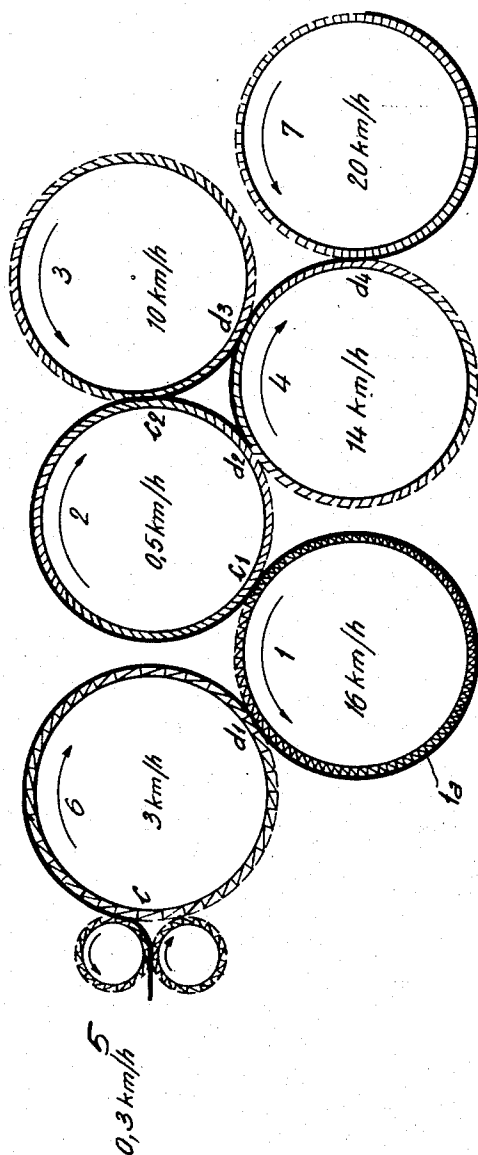
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CARDING DEVICES

2,835,929

Filed April 8, 1954

2 Sheets-Sheet 1

Fig. 1



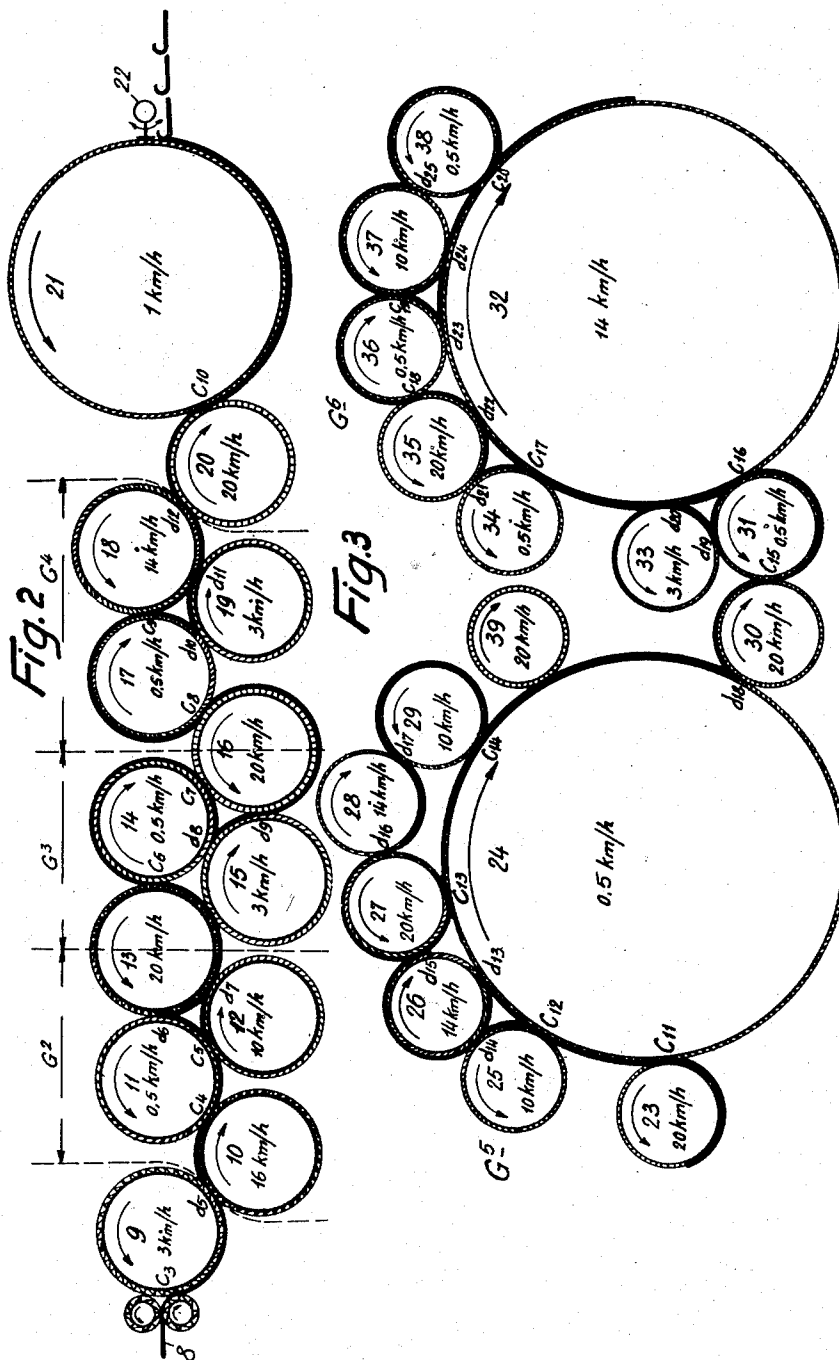
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CARDING DEVICES

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4 Claims. (Cl. 19—99)

This invention relates to machines for carding textile fibres of any kind such as natural, artificial or synthetic fibres, whether blended or not.

This invention aims at providing machines which will not have the well known drawbacks of the machines of the prior art, namely: bad treatment, excessive breakage of the fibres, poor output, and bulky, intricate and expensive installation; such drawbacks resulting from the fact that these machines, which are designed differently according to the kinds of fibrous materials to be carded, are always working on the same principles and classical or conventional methods.

In order to simplify these classical or standard cards and to increase their efficiency and their carding rate as well as their output production, carding-units have been proposed, among others, in which high velocity drums have been replaced by slow velocity drums carrying the fibrous material to be carded, said fibrous material being then operated upon by high velocity carding members.

The applicants' observations and experiments on such types of cards have confirmed that the "carding points or lines" on the slow drums may reach an efficiency approximately three times as high as that of standard or classical "carding points," particularly because the whole of the fibrous material hooked on the slow running drum, under favorable conditions, remains subjected to the action of the high velocity carding members during a considerable longer time (of the order of 20 to 40 times longer), thus ensuring a most efficient carding.

Applicants tried to find out the reasons for such an interesting disposition not being generalized, and they thought that some elements or means must still be lacking which, if they were judiciously associated, would then make it possible to give rise to new combinations adapted to promote simplification and great progress.

Taking into consideration that in a standard or classical card the transfer of the fibrous material from one member to the next is achieved by overspeed, which implies a cycle of speeds increasing in geometrical progression, resulting in an unfavorable disposition requiring too low initial speed and too high final speed, applicants were induced to consider that such a disposition could, in no way, be suitable for feeding a slow running member.

Furthermore, continuing their investigations, applicants realized that, as far as the transfer members are concerned, and since a standard or classical card-clothing is unable to ensure the hooking or catching of the whole of the fibrous material onto a slow running member, it was to be contemplated to substitute for a standard card-clothing of a high running transfer member, a suitable card-clothing definitely specialized, adapted to ensure efficiently the complete transfer and a positive catching of the fibrous material onto a slow running member.

Without innovating in the matter of card-clothing, they started from the consideration, on the one hand, that the standard saw-tooth wire filleting or rigid metal needles card-clothing, have for their main feature to firmly retain the fibres, that this feature is used in standard "card-

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ing-points or lines" (thus fractionating the fibrous material in the course of the treatment thereof between opposite needles, a result which is inconsistent with the result sought for) and from the consideration, on the other hand, that the capacity for a card-clothing to retain the fibres depends mainly on four factors: slanting or obliquity of the card points or staples, height, flexibility, physical characteristics of adhesion and density of said points, staples or needles.

Applicants, taking these data into consideration, after a number of tests, have obtained card-clothings which, applied to a fast running member, would yield the integrity of the fibrous material when engaging a slow running member, this result being due to the fact that these card-clothings showed the characteristic feature of having a low retaining power. Owing to the lack of conventional designation for card-clothings showing such a property, applicants have decided to designate such a kind of card-clothings under the name of "transfer-card-clothings."

Finally, applicants have been led to conceive that, by a judicious combination of members and components or parts (which, taken separately, have no transcendent features), a carding unit, comprising slow running fibrous material carrying member and high speed carding members, would be adapted to contribute (whether in combination with other standard carding members or carding units, or not) in obtaining carding engines meeting the requirements aimed at by the applicants.

Now, therefore, the invention has for its object an improved carding unit, characterized in that it comprises four members or parts in combination and giving two associated carding points on a slow running fibrous material carrying member, namely: a first high speed member, having special transfer card-clothing, providing the first carding point while bringing the fibrous material to the second slow running member; a third high speed running member providing a second carding point, by acting upon the second slow running member; and a fourth high speed running member acting as a delivery member.

According to another feature of the invention, the "transfer-card-clothing" of the "transfer-member" in such a carding unit, is a card-clothing having a "low-retaining power," and which may be either of the rigid or of the flexible type.

According to another feature of the invention, the rigid card-clothing is of the saw-tooth filleting type, whose saw-teeth have small inclination and height.

According to another feature of the invention, the flexible card-clothing is a flexible card-clothing of the "brush" type (bristles of any kind, either metallic, or of animal, vegetable or synthetic origin) fairly high and having a small inclination or no inclination at all.

According to another feature of the invention, the bristles of the card-clothing of the "brush" type are made of high mechanical grade synthetic material, such as "nylon."

In order that the invention may be better understood, and as examples of carrying out the principle itself characterizing such an improved carding-unit, as just above featured, one first embodiment, having no restrictive character, is hereinafter described and diagrammatically illustrated in Fig. 1.

Besides, as it is well known about "carding," that numerous problems, owing to the diversity as to the kinds of textile fibres materials, have been stated; that too, on one and a same carding device of a given type, the processing conditions vary from the feeding up to the delivery of the fibrous material; and knowing that this is the reason why succession of carding engines, called "set of cards" have been adapted for assuming a progressive working from the very raw fibrous material up to the "fibre to fibre,"

that is why five further embodiments of improved carding units according to the invention are then hereinafter described and diagrammatically illustrated in Figs. 2 and 3, which said five further embodiments of carding units make it possible, besides the first embodiment as in Fig. 1, to meet as well, such intricate requirements as above referred to.

Concerning said first embodiment (Fig. 1) of an improved carding unit according to the invention, 1 is the transfer-member and 1a its transfer-card-clothing, which, in this instance, is a rigid transfer-card-clothing designed according to the gist of the invention and as hereinabove disclosed. Such use is in no way restrictive and the clothing may instead be constituted with "nylon" bristles. 2 is the slow running fibrous material-carrying member; 3 is the fast running carding member, and 4 the delivery-member; said four members have suitable card-clothings and velocities; the surface speeds of the card-clothings are indicated by way of examples in kilometers per hour.

This carding unit may be integrated, at any working stage, into a unit or set of cards including either standard components parts, or not, or other groups according to the invention, in any order whatever, and, as an example, the group is preceded by standard feeding members 5, including a lick-in 6.

When leaving the group, the fibrous materials which are brought together under the action of the delivery member 4 may be transported to subsequent members by any known means.

In this first example contemplated, the delivery member 4 gives off the integrity of the fibrous material to the member 7 which is fitted with a transfer-card-clothing similar to that 1a of the member 1. This member 7 may be of the first member of a second set according to the invention, or the fibrous material may be hooked directly on a doffer.

In such an improved set according to the invention, it will be seen that the transfer-card-clothing 1a when in engagement with the slow carrying-member 2, the clothing of which firmly clenches the material, gives up all the material to the card-clothing of 2, providing a positive clenching at c1. The engagement of two clothings having widely different characteristics enables the transfer-type clothings to give up all the fibrous material. At this point, a carding of the material occurs which is all the more efficient that the member 1 is fast and the member 2 is slow.

At point c2 which is the second carding point, the fast carding member 3 cards all the material presented by 2. As it is usual at any carding point, 3 removes a portion of the material. The delivery member will gather all the material by removing at d2 the material carried by 2 and at d3 the material carried by 3, thus avoiding any backward movement of the material and ensuring its regular transfer to the subsequent members.

The fibres are most considerably operated upon at point c2 where all the material is carded under ideal conditions which have never been attained up to the present day.

The action obtained at c2 should be analyzed as this remarkable result depends essentially on the action of the member 1 at c1 and further on the delivery member 4 at points d2 and d3.

Not only the transfer member 1 hooks and cards all the material in c1 but, moreover, it arranges and directs the fibres under conditions liable to improve the quality of the carding operation at point c2.

In the present day carding points, the major portion of the fibres are in disorder; one end thereof is usually driven into the card-clothing and the other end thereof is ill oriented. This results into rough handling, fibre ruptures and disorder.

Conversely, by virtue of the action of c1, the end of the fibres which clench to the card-clothing is not

driven into the clothing and the well cleared free end thereof reaches the carding point c2 ahead and in advance under favorable conditions.

It has been found that, in the present-day cards, the backward motion of a portion of the material clenched at random, possesses obvious disadvantages; some portions thereof passing several times and in disorder under the carding point get over-carded and broken. Such an action obviously leads to a loss of efficiency.

This main drawback does not exist in the carding unit according to the invention. The delivery member 4 causes entirety of the fibrous material to be integrally collected and to be transferred to the subsequent member.

Briefly, it is readily seen that the whole of the fibres passes once, and only once, in point c2, under the best conditions.

As to the power point of view, the action of the third member at c2 is also noteworthy (tests have proved this power to be approximately three times as high as that of actual standard or classical carding points). Actually, the whole of the fibrous material is retained under the action of the carding point during an interval of time which is considerably longer than in classical card-clothings (about 40 times as long). More powerful owing to its duration, this carding action is also of a better quality, thanks of the reasons above mentioned.

Since the steps thus taken afford an efficient carding process, it will always be possible to reduce the excessive carding speed required in classical cards having a poor efficiency, which leads to fibre breaking due to overspeed.

It is to be noted, as compared with classical cards, that the stripper has been omitted, said stripper prejudiciously sinking or dabbing the fibrous material into the card-clothings, the fancy being also omitted, said fancy roller being usually intended to remedy said drawback though it brings disorder into the fibrous material.

As to the other five embodiments, which, as said, make it possible, besides the first embodiment just described and shown in Fig. 1, to meet, as well, said above referred intricate requirements, it will be seen that, according to the invention, on the one hand, a set of carding units may be constructed with standard sized members, or preferably with identical sized ones, excepting large diameter members, and that, on the other hand, parts of cards may be constructed, embodying the use of large drums which, apart peripheral working members, co-operate with one or two carding units, and which comprises the combination of said large drum either with the members located ahead of the fibrous material ingress or the members following the delivery.

Concerning these embodiments, three of them designated by G², G³, G⁴ are shown in Fig. 2, which illustrates a complete carding engine having standard sized components arranged into carding units G², G³, G⁴, which are modifications of the group or set of the carding unit of the first embodiment shown in Fig. 1.

Concerning the two last embodiments, designated by G⁵ and G⁶, these are shown in Fig. 3, which illustrates a part of a card having two large diameter members; these large diameter members, together with the working members arranged about the periphery thereof, realizing, in combination, two other sorts of carding units.

Re: Carding unit G² as a second embodiment (Fig. 2):

First member: transfer 10, with transfer card-clothing (rigid, by way of example).

Second member: slow running, fibrous material-carrier 11, with classical or standard card-clothing.

Third member: fast running carding one 12, with classical card-clothing.

Fourth member: delivery one 13, with transfer card-clothing (rigid by way of example).

The transfer member 10 fed at d5 by the lick-in 9 cooperating with the feeding members 8, hooks the

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fibrous material at *c4* to the slow running fibrous material carrying member 11, with a carding action. The fibres will be carded on 11, at point *c5*, by the fast running carding member 12. The fibrous material, which is divided into fractional parts between members 11 and 12, will gather again at *d6* and *d7*, owing to the action of the delivery member 13.

The delivery member 13 having a transfer card-clothing, may constitute then the first member of the subsequent set. A saving a mounting to one member out of the assembly consisting of two carding units, will thus be achieved.

Re: Carding unit *G*³ as a third embodiment (Fig. 2):

First member: transfer, 13, with transfer card-clothing (rigid, by way of example).

Second member: slow running fibrous material-carrier, 14, with classical card-clothing.

Third member: fast speed running carding one 16, with transfer card-clothing (flexible bristles "nylon," by way of example).

The transfer member 13 hooks the fibrous material at *c6* onto the slow running member 14 with a carding action. The fibres will be carded upon 14 at point *c7* by the fast running carding member 16. The delivery member 15 will take back at *d8* the fibrous material retained by the member 14 and give it up at *d9* to the fast running carding member 16.

From the velocities given by way of illustration, it is readily appreciated that the carding member 16 is faster than the delivery member 15. Accordingly, the carding power of the carding member 16 substantially increases at *c7*, taking hold, then, of the whole of the fibrous material which is in engagement with the delivery member 15, at *d9*.

The fast carding member 16 having a transfer clothing, may be faster than it was previously and may become the first member of the subsequent set. A saving amounting to one member out of the assembly consisting of two carding units thus will be achieved.

Re: Carding unit *G*⁴ as a fourth embodiment (Fig. 2):

First member: transfer 16, with transfer card-clothing (flexible bristles "nylon," by way of example).

Second member: slow running fibrous material-carrier 17, with classical card-clothing.

Third member: fast running carding 18, with classical card-clothing.

Fourth member: delivery member 19, with classical card-clothing.

As in the preceding instance, the carding member is running faster than the delivery member, it takes up the whole of the fibrous material, partially at *c9*, and then, the remainder at *d11*.

The transfer member, 16, hooks the fibrous material at *c8* onto the slow running member 17. The fibres are being carded on 17 at point *c9* by the fast running carding member 18. The fibrous material retained by the member 17 will be moved at *d10* by the delivery member 19 which will in its turn give it up at *d11* to the fast running carding member 18.

This carding-unit provides for the more efficient carding effect by reason of the high surface speed of the carding member and of its appropriate card-clothing whose action is more efficient than that of the transfer clothing.

Re: Carding unit *G*⁵ as a fifth embodiment (Fig. 3):

First member: transfer 23, with transfer card-clothing (flexible "nylon" bristles by way of example).

Second member: slow running fibrous material-carrier 24, having a large diameter (so-called large drum), with classical card-clothing.

Third member: fast running carding 25, with classical card-clothing.

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Fourth member: delivery member 26, with classical card-clothing.

The transfer member 23 hooks the fibrous material at *c11* onto the large slow running drum 24 with a carding action. The fibres will be carded at point *c12* on the peripheral surface of the large drum by the fast running carding member 25. The fibrous material which is divided into fractional parts between the members 24 and 25, will then be gathered at *d13* and *d14* under the action of the delivery member 26.

This carding unit according to the invention being then carried into effect, as shown, in relation with the outer surface of a large slow running drum 24.

Re: Carding unit *G*⁶ as a sixth embodiment (Fig. 3):

First member: transfer 35, with transfer card-clothing (flexible "nylon" bristles, by way of example).

Second member: slow running fibrous material-carrier 36, with classical card-clothing.

Third member: fast running carding 37, with classical card-clothing.

Fourth member: delivery member 32, having a large diameter (so-called large drum) with classical card-clothing.

The transfer member 35 hooks the fibrous material at *c18* onto the slow running member 36 with a carding action. The fibres will be again carded at points *c19* on 36 by the fast running carding member 37. The fibrous material which is divided into fractional parts between the members 36 and 37 will be gathered again at points *d23* and *d24* under the action of the large fast running drum 32.

This carding unit according to the invention is, as shown, carried into effect on the periphery of a large fast running drum 32.

The invention is not restricted to the various embodiments of carding units that have just been described, but it also covers the manner in which they are carried out and associated.

Fig. 2, as said, shows a card made up with standard members all of them having the same size.

Owing to the efficiency of the new carding points, it is generally preferred to do away with the large diameter drums which have a number of drawbacks, namely: intricate structure, excessive costs, large overall dimensions, etc.

Practically, most of the members may have diameters smaller than 50 centimeters, so, it will therefore be possible to manufacture them out of commercial steel tubes.

By way of example, of no restrictive character, Fig. 2 shows an embodiment realized with standard members.

According to the invention, members:

10—11—12—13 constitute the second carding unit *G*² (Fig. 2)

13—14—15—16 constitute the third carding unit *G*³ (Fig. 2)

16—17—18—19 constitute the fourth carding unit *G*⁴ (Fig. 2)

all of which have been described hereinabove.

Ahead of this set of carding units, there have been arranged classical feeding members 8 with a "licker-in" 9. The delivery is ensured by a transfer member 20 which strips the fibrous material from the high speed carding member 18 as at *d12* and hooks it at *c10* onto the doffer 21 with a carding effect; 22 being the doffing comb.

It is easy to see how the fibrous material is passed from one carding unit to the next. The fibrous material which gathers under the action of the delivery member is fed to a transfer member which then brings the said fibrous material onto a slow running member.

Also to be considered within the scope of this invention, are the succession in any order of the carding

units selected out of the first four types as shown in Fig. 1 and in Fig. 2.

As regard the card shown in Fig. 3:

The use of large cylinders may from now on be avoided, owing to the power given to the new carding points.

However, with certain sorts of fibrous materials, and when large members are available, the use of such large cylinders or drums will be beneficial. It is possible, actually, to considerably increase their efficiency by having them utilized as parts of various combinations with one or several carding units according to the invention.

Such large members or drums either slow or fast, may participate, in combination, with the preceding or subsequent elements, to carding units according to the invention. The carding power which, up to now, was confined to the peripheral member might then be sometimes twice as high.

The card portion shown in Fig. 3, together with two large diameter drums, will be described hereinafter.

The transfer member 23 may be supplied directly by classical feeding motion, but it may be also preceded by or make part of one of the four carding units hereinabove described, for instance the transfer member 13 or 16 in Fig. 2.

The members 23, 24, 25, 26 realize the fifth carding unit G⁵ according to the invention and described hereinabove.

It is possible, while keeping within the scope of this invention, to add to the above mentioned carding units auxiliary members which bring along auxiliary carding points or such points that achieve the transfer of the fibrous material from one carding unit to the next.

Such combinations are illustrated in Fig. 3 by way of non restrictive examples.

The delivery member 25 may occupy a different position around the large diameter slow running drum 24 and it may come into engagement with this drum or not.

The fast running carding member 29 cards in c14 the fibrous material carried by the large diameter slow running drum 24. The fraction of fibrous material that it takes along will be detached at d17 by the member 28 which will give it up to the transfer member 27 at d16. This latter member will hook it at c13 onto the large slow drum 24 with a carding effect.

This optional arrangement is of interest since by adding two members 28, 29 a new carding point and a division in fractional part of the fibrous material may then be obtained.

The fibrous material on the large slow drum 24 will be removed at d18 by the transfer member 30.

The members 30, 31, 32, 33 form the sixth carding unit according to the invention, namely the unit G⁶ herein above described.

The large fast drum 32 may also be fitted about its periphery with carding units of any known type or of the type according to the invention.

The large diameter fast running drum 32 partially hooks the material at c17 onto the slow carding member 34 with a carding effect. The fibrous material retained by the latter will be removed as at d21 by the transfer member 35.

This optional device is of interest since by adding a single member 34, an additional carding point is obtained.

The members 32, 35, 36, 37 form the sixth carding unit G⁶ according to the invention and hereinabove described.

The fast large drum 32 partially hooks the fibrous material at c20 onto the slow carding member 33 with a carding effect. The fibrous material retained by the latter will be removed at d25 by the fast carding member 37 and will be partially carded at c19 on the slow member 36. It will then be given up to the large fast drum 32 at d23 and d24.

Through this single optional member 38 two additional carding points are then provided.

The devices proposed constitute a considerable progress over the classical cards in which the transfer devices which insure the transfer on a given large drum to the next, carry out no efficient working whatever on the fibrous material.

It is readily understood that many modifications may be adapted about the feeding and the delivery of the large drums.

Referring to the first, second, third and fourth carding units, it is possible to design any one of the members illustrated, either transfer members or not, with a diameter equal to that of a large drum which, thence, will always be a part of a described carding unit. On the arc travelled along by the fibrous material, any members may then be arranged which provide classical or new carding points.

The fibrous material integrally carried on at the periphery of the slow members stands under ideal conditions to be subjected to the action of a fast running carding member. It is beneficial to arrange about such periphery one or more separate additional carding members such as 39. Should this member be fitted with a classical card clothing, it will derive a fraction of the fibrous material and transfer it onto a subsequent carding unit. In the case this member is a brush as for instance 39, or is fitted with a transfer card clothing, it will hook again in the course of the subsequent revolutions onto the same slow running member while carding, the portion of fibrous material it had derived from said slow member.

Without departing from the scope of the present invention it is possible:

(a) To arrange additional members such as the optional members described which will achieve an additional action upon the fibrous material;

(b) To design carding units having outer shapes apparently different but operating on the same bases;

(c) With a view to mechanically clean the fibrous material, to use special card-clothing, to arrange fancy rollers, carding beaters, or any other known devices, upon either the slow or the fast running members.

What we claim is:

1. In carding apparatus for fibrous material, a carding unit comprising, in combination, a first running roll member of high speed positioned to receive the fibrous material to be carded from a feeding means, a second running roll member adjacent to and cooperating with said first member to receive fibrous material therefrom and to provide a first carding point between said first member and said second member, said first member being provided with card-clothing means having a low retaining power for fibrous material whereby said first member supplies directly to said second member all of the fibrous material received by it from said feeding means, said second member being of a relatively low speed in relation to the speed of said first member, a third running roll member adjacent to and cooperating with said second member to provide a second carding point and of a relatively high speed, and a fourth running roll member of a relatively high speed and positioned adjacent to said third member and disposed to act as a delivery member, said fourth member also being disposed adjacent to and cooperating with said low-speed second member for directly receiving from the second member fibrous material left thereon by the third member.

2. Apparatus according to claim 1, wherein the card-clothing means on the first member comprises sawtooth shaped wire filleting.

3. Apparatus according to claim 1, wherein the second and third running members have card-clothing means thereon for transferring the fibrous material directly from the second running member to the third running member at the second carding point.

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4. Apparatus according to claim 1, wherein said second running member is a large diameter drum, said first, third and fourth running members being arranged about the periphery of said drum.

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