

Feb. 16, 1971

D. WALKER ET AL

3,562,862

METHOD AND MEANS FOR REMOVING IMPURITIES FROM
A CONTINUOUS WEB OF TEXTILE FIBRES

Filed Feb. 17, 1969

4 Sheets-Sheet 1

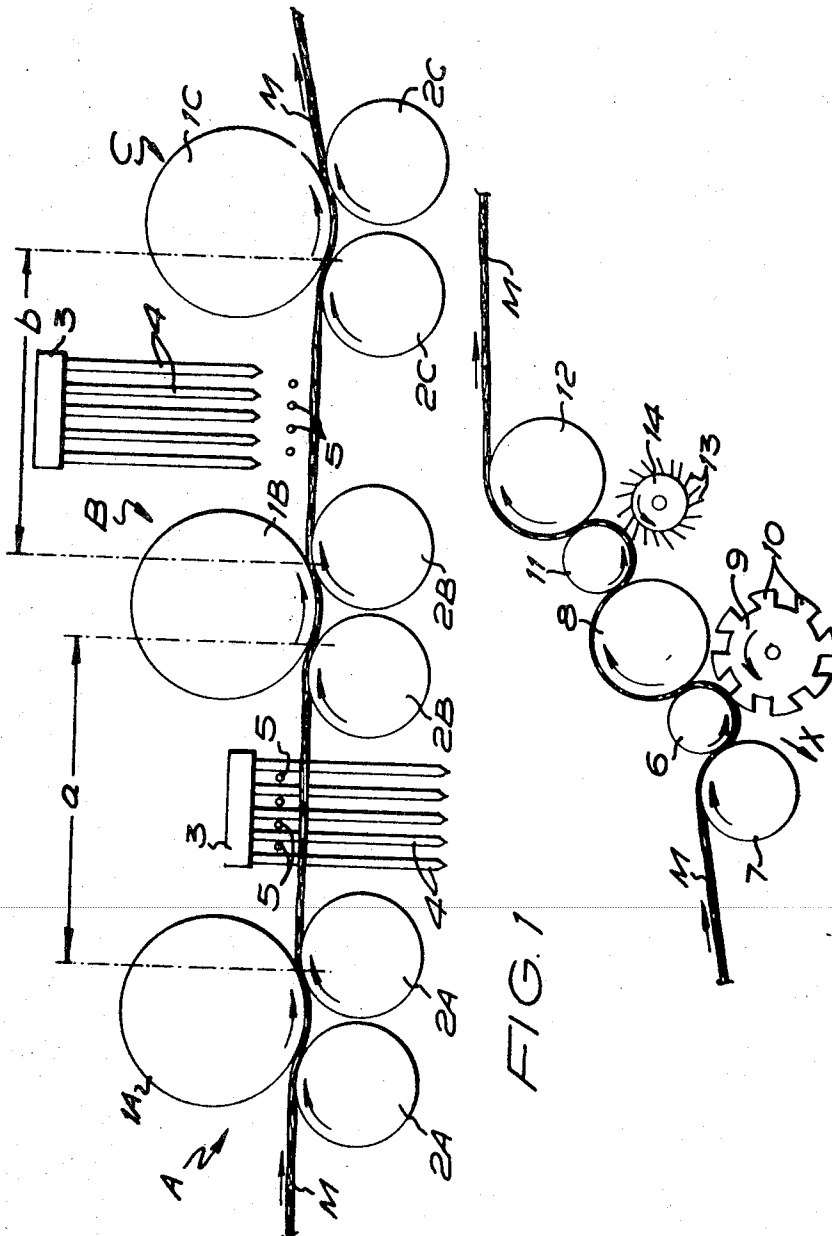


FIG. 1

INVENTOR

DONALD WALKER and
MICHAEL JOHN WALKER

BY *Abraham A. Saffitz*
ATTORNEY

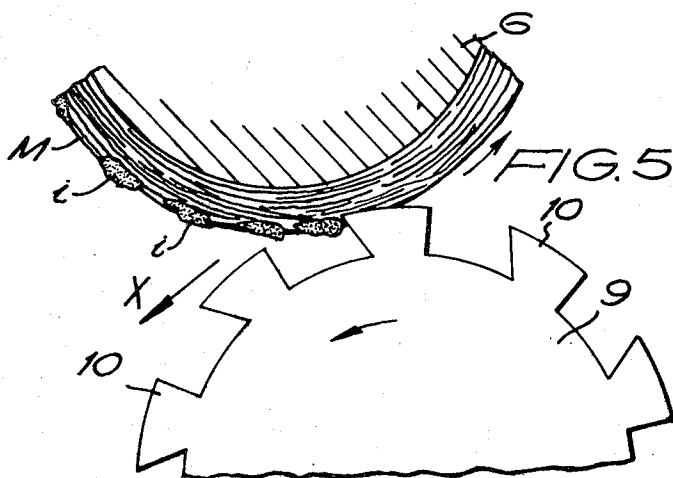
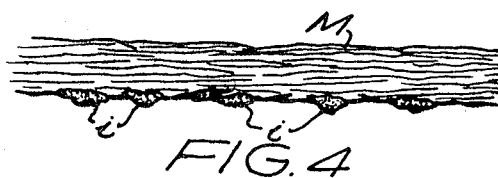
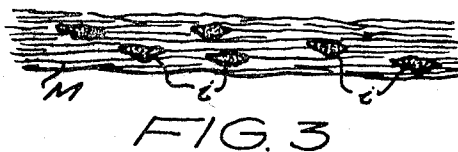
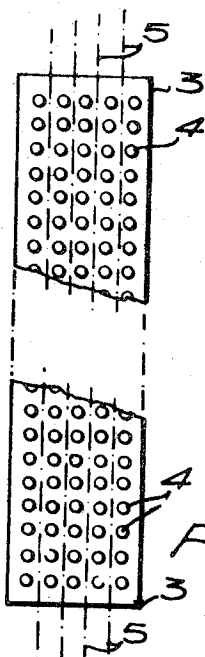
Feb. 16, 1971

D. WALKER ET AL
METHOD AND MEANS FOR REMOVING IMPURITIES FROM
A CONTINUOUS WEB OF TEXTILE FIBRES

3,562,862

Filed Feb. 17, 1969

4 Sheets-Sheet 2



INVENTOR

DONALD WALKER and
MICHAEL JOHN WALKER

BY *Abraham A. Saffitz*
ATTORNEY

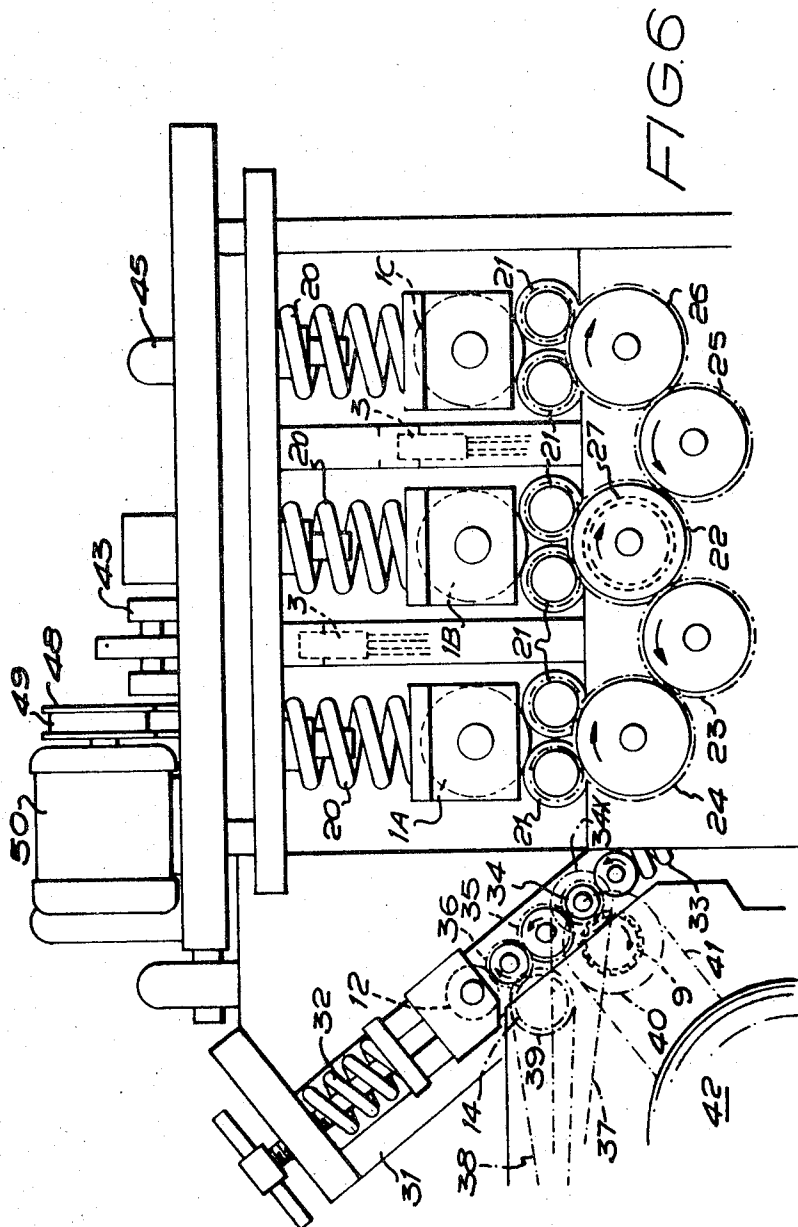
Feb. 16, 1971

D. WALKER ET AL
METHOD AND MEANS FOR REMOVING IMPURITIES FROM
A CONTINUOUS WEB OF TEXTILE FIBRES

3,562,862

Filed Feb. 17, 1969

4 Sheets-Sheet 3



INVENTOR
DONALD WALKER and
MICHAEL JOHN WALKER
BY *Abraham A. Saffitz*
ATTORNEY

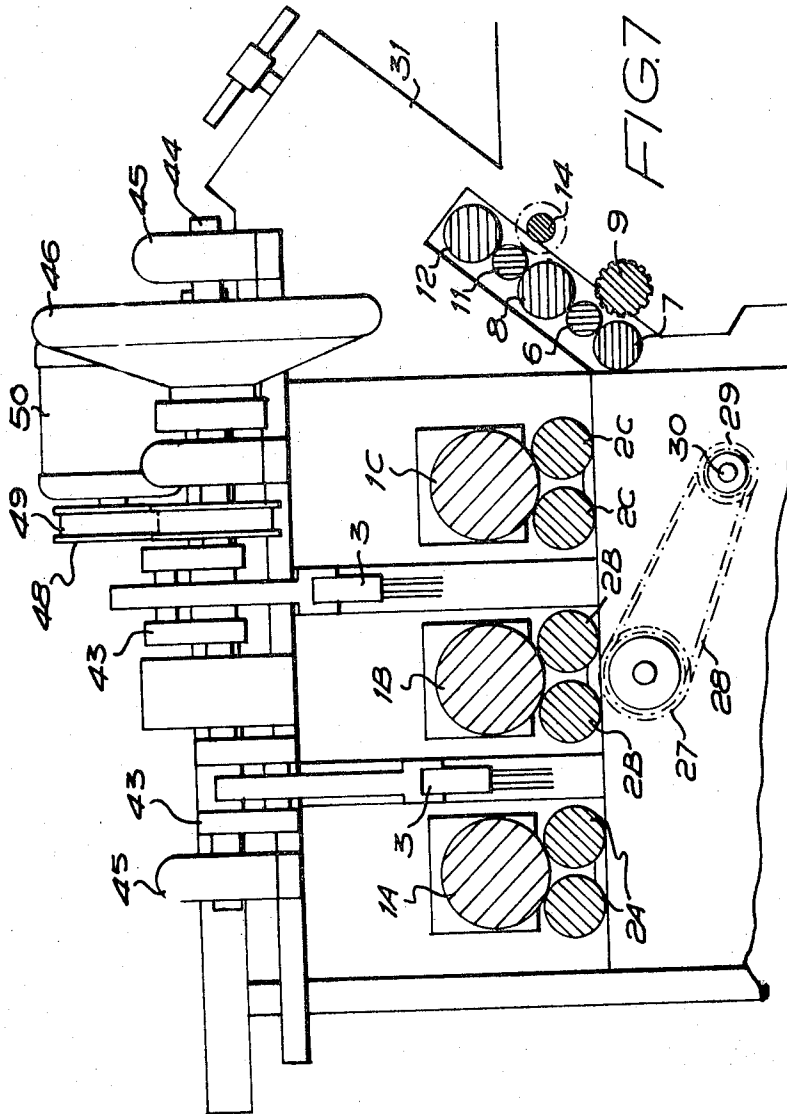
Feb. 16, 1971

D. WALKER ET AL
METHOD AND MEANS FOR REMOVING IMPURITIES FROM
A CONTINUOUS WEB OF TEXTILE FIBRES

3,562,862

Filed Feb. 17, 1969

4 Sheets-Sheet 4



INVENTOR

DONALD WALKER and
MICHAEL JOHN WALKER

BY *Abraham A. Seffitz*
ATTORNEY

1

3,562,862

METHOD AND MEANS FOR REMOVING IMPURITIES FROM A CONTINUOUS WEB OF TEXTILE FIBRES

Donald Walker, 58 Bramley Lane, Lightcliffe, near Halifax, England, and Michael John Walker, 36 Florence Ave., Wilsden, near Bradford, England

Filed Feb. 17, 1969, Ser. No. 799,833

Int. Cl. D01b 3/00

U.S. Cl. 19—84

11 Claims

ABSTRACT OF THE DISCLOSURE

Vegetable and other undesirable matter (e.g., burr, seed and shive in the case of wool) is removed from a continuous web of parallelised textile fibres by the steps of (a) feeding the said web material continuously through a dabbling zone in which the material is nipped at two positions, (b) subjecting the moving material between said two positions to a rapid dabbling operation by which a series of closely spaced pins penetrate the material sufficiently to push said burrs or other larger impurities to one surface thereof, then (c) feeding the material to a stripping zone in which it is carried round a sharply curved support with the impurity-carrying surface outermost so as to cause said impurities to project from said surface, and (d) removing the burrs or other large impurities by a stripping action taking place close to said surface and in a plane substantially tangential to the path of the material. Preferably, the distance between said two nipping positions is no greater than the mean fibre length of the material, said nips are provided by two sets of three rollers each and said stripping is done by rotary beater having longitudinal flutes cooperating with said support. To remove double cuts or tufts from wool or other fibres the material is carried round a further sharply curved support with its tuft-carrying surface outermost and treated by a rotary pinned device cooperating with said further support.

This invention relates to a method of and means for removing vegetable and other undesirable matter from a continuous web of textile fibres.

The means usually employed to remove these impurities, as in the case of wool, vegetable matter such as burr, seed and shive, also double cuts created in shearing, is by extracting in the carding process where fluted rollers working in close proximity to cylinders clothed with suitable garnett wire beat off the unwanted impurities.

The chief object of the present invention is to enable these impurities to be removed from material in which the fibres have already been made substantially parallel and formed into a continuous web without previous treatment for removal of such impurities. In suitable circumstances and with suitable fibres this invention can enable the orthodox method of removal of impurities by the carding process to be dispensed with.

In order to carry out the invention the material is first treated so as to transform it from a sliver or lap of fibres into a thin and even web, for instance by passing it through a gill box or pin drafter.

The method according to the invention includes the steps of feeding the web of parallel fibres continuously through a dabbling zone in which the material is nipped at two positions spaced apart and is tensioned between said two positions, subjecting the moving material between said two positions to a rapid dabbling operation by which a series of closely spaced pins penetrate the material sufficiently to push said burrs or other larger impurities to one surface thereof, then feeding the material to a

2

stripping zone in which the burrs and other larger impurities are removed.

Preferably, the surface speed of the material is slightly greater on leaving the dabbling zone than on entering it so as to substantially tension the fibres without breaking them and so as to thereby facilitate the pushing of the impurities to one surface.

In the case of treating wool containing double cuts which are tufts of short fibres capable of blocking the combs in the subsequent combing treatment, these will also be pushed to the surface of the web by the dabbling operation and may be removed by stripping action in the stripping zone. To ensure their removal, however, the material leaving the stripping zone may be carried round a further roller or like sharply curved support with the impurity-carrying surface outermost and have any remaining double cuts removed by the combing action of a rotary pinned device.

The apparatus for carrying out the method of this invention includes one set of dabber rollers at the entry to said dabbling zone and a second set at the exit from said dabbling zone arranged to nip the material at said two spaced-apart positions, a reciprocating dabbling bar or plate carrying a series of closely spaced pins for penetrating the material in a direction substantially at right angles to the plane in which the material is travelling, means for continuously rotating said dabber rollers and reciprocating said pins whilst maintaining the material substantially tensioned between said two nipping positions, and in said stripping zone means for removing the burrs and other larger impurities.

There may be two or more such dabbling zones which will facilitate a mechanical balancing of the mechanism for reciprocating the pins.

It will be understood that the speeds of the various elements of the apparatus and the degree of penetration of the material by the pins will be governed by the nature of the material being treated and the speed of through-put which it is desired to achieve.

In order that the invention may be fully and clearly comprehended the same will now be described with reference to the accompanying drawings which illustrate diagrammatically and merely by way of example the method according to the invention and the main elements of an apparatus for carrying it out, the mechanism for driving the moving parts being omitted since they can be of orthodox character such as are well known in the textile and engineering trades. In these drawings:

FIG. 1 represents in side-elevation the apparatus of this invention;

FIG. 2 illustrates a portion of a pinned dabbling bar or plate which operates in the dabbling zone;

FIGS. 3 and 4 represent in elevation a portion of the lap of material before and after treatment in the dabbling zone;

FIG. 5 is a fragmentary enlarged view of the support roller and the rotary beater acting on the material;

FIG. 6 is a side-elevation of part of a machine embodying the features represented in FIG. 1 and showing by way of example one suitable arrangement for supporting and driving the various moving parts;

FIG. 7 is an end elevation corresponding to FIG. 6 but viewed from the opposite side of the machine and shown partly in vertical section.

Referring to FIG. 1 of these drawings, this shows three sets A, B, C of dabber rollers comprising upper pressure rollers 1A, 1B, 1C with a rubber or other resilient surface and pairs of lower rollers 2A, 2B, 2C providing two nips at each set between which the material M in the form of a thin and even web is drawn by the rotation of the rollers. The distance *a* between the

3

second nip of set A and the first nip of set B is no greater than and preferably less than the mean fibre length of the fibres to be treated so as to ensure that most of the fibres will be held at both ends in these nips at some period during the action on them of the dabbing pins. The rollers of set B will be arranged to feed the material through at a slightly faster rate (say 10% faster) than it passes through those of set A, this speed increase being only sufficient to tension the fibres without causing breakage of them. This tension is not sufficient to produce a "drafting" action on the material—in the case of wool the tension will only be sufficient to take up the natural "crimp" in the fibres. The distance *a* between the two nip positions defines the first dabbing zone. By using two lower rollers in each set instead of one of the distance *a* is reduced and this enables shorter fibres to be held in the dabbing zone.

A second dabbing zone is defined similarly by the distance *b* between the two corresponding nip positions in set B and set C of the dabbing rollers. The distances *a* and *b* may or may not be equal and the surface speed of the material through set C may be equal to or slightly greater than its speed through set B. Whilst two dabbing zones are illustrated, one may be found to be sufficient in some cases whilst more than two could be provided if desired.

Mounted on suitable guides and extending horizontally across and above the path of the material through the first dabbing zone is a dabber bar 3 in which are set several rows of vertical dabbing pins 4. As shown also in FIG. 2 the bar may have a width of the order of $\frac{3}{4}$ " to 1", the pins may be about $1\frac{1}{2}$ " long and about $\frac{1}{16}$ " diameter and are spaced apart in straight rows along the length of the bar and either in line or staggered across the width of the bar to give the desired density of pins to suit any particular material to be treated. The pins are sufficiently pointed at their tips to enable them to pass between the fibres of the material without damaging the fibres and yet to engage the burrs and other larger impurities without impaling them and to push them through the material to the under surface thereof. FIG. 3 indicates how the burrs and larger impurities *i* are embedded in the lap of material before treatment by the apparatus of this invention—and FIG. 4 indicates the result of the dabber treatment with the impurities pushed to the under surface and partly projecting therefrom almost freed from the fibres.

A similar dabbing bar operates in the second dabber zone and both bars are operated from eccentric motions or any other suitable mechanism which reciprocates the bars out of step with one another at a high speed which may (for example) approach 2000 complete strokes per minute for a through-put speed of material of 1100 inches per minute. Preferably these speeds will be so related as to ensure an overlap of the area of material treated by the pins at each stroke, although the use of two dabbing bars may render this less necessary. The pins may penetrate (for example) $\frac{3}{8}$ " beyond the under surface of the material.

A suitable clearer device is used for preventing uncontrolled fibres from being pulled up when the pins are withdrawn. This is shown as consisting of horizontal parallel wires 5 held taut and stationary between the lateral rows of pins. These will give a good clearing action and yet will yield sideways in the event of any misalignment of a needle occurring and thus will reduce the risk of causing breakage of pins.

Small particles of the impurities and to some extent double cuts tend to fall out of the material and can be taken away with the aid of vacuum extraction.

The material is then lapped about half-way round a small diameter support roller 6 with a metal or other hard surface against which it is nipped by rubber or like surfaced pressure rollers 7, 8. The roller 6 rotates on a fixed axis and since the aforesaid under surface of the

4

material is outermost as it is curved sharply round this roller under slight tension, the burrs and other large impurities are caused to project prominently from this under surface (see FIG. 5).

A fluted beater roller 9 with straight or helical longitudinal flutes is driven (preferably, as illustrated, in the opposite direction to the travel of the material) and is set close enough to the surface of the material on roller 6 to beat off the projecting impurities in a substantially tangential plane indicated by arrow X but not close enough to damage the fibres. The flutes 10 on the beater roller preferably have their leading faces undercut as illustrated to produce a beating edge formed by an angle of less than 90° but slightly rounded. This helps the flutes to detach the impurities from the fibres without cutting the latter. By using helical flutes the impurities are beaten off at an angle across the path of the material and this reduces the risk of removing fibres along with the impurities. This risk may also be reduced by ensuring that the distance between the contact positions of rollers 7 and 8 against roller 6 is less than the mean fibre length of the material. The speed of the beater roller may be approximately 4500 revolutions per minute for the throughput mentioned above.

Any remaining double cuts not removed by beater 9 may be removed by carrying the material partly round a second small diameter support roller 11 against which it is pressed by pressure roller 8 and a further pressure roller 12. The double cuts will be on or projecting from the surface of the material and can be taken off by the forwardly projecting pins 13 of a pinned roller 14 which is rotated in the opposite direction to the travel of the material. The inclination of the pins 13 to the path of the material may be approximately 35° and the speed of roller 14 may be approximately 60 revolutions per minute for the through-put mentioned above. The tips of pins 13 will just clear the surface of the material on roller 11, whereby the pins take off the double cuts without disturbing the web. The double cuts can then be cleared off the pinned roller 14 by any suitable means as is well known in the textile trade, and the cleaned material may be gathered into a sliver for packaging or further treatment.

All moving parts of the apparatus will be driven at the desired speeds and in the desired directions through suitable power transmission means of orthodox kind. In the arrangement illustrated in FIGS. 6 and 7, the upper pressure rollers 1A, 1B, 1C are guided for vertical movement against the action of compression springs 20. Each of the lower rollers has secured on one end of its shaft a spur gear 21 and these are driven in pairs from a train of spur gears 22, 23, 24, 25, 26 from a chain wheel 27 fast with gear 22, this chain wheel 27 being driven through chain 28 from a chain wheel 29 on a motor output shaft 30 (see FIG. 7).

The rollers 7, 6, 8, 11, 12 are supported in end guides 31 in which the shafts of rollers 7, 8, 11, 12 are slidable but the shaft of roller 6 is not slidable. Compression springs 32 are arranged to apply downward pressure on rollers 12, 11 and 8 and to press roller 8 against roller 6, while compression springs 33 press roller 7 upwardly against roller 6. The shafts of rollers 6, 8, and 11 carry spur gears 34, 35, 36, respectively, gear 35 being loose on the shaft of roller 8 so that only rollers 6 and 11 are positively driven, gear 34 being compounded with a chain wheel 34X driven through chain 37 from the main drive of the machine which also drives through chain 38 a chain wheel 39 secured on the shaft of pinned roller 14. Beater roller 9 is driven through a chain wheel 40 and chain 41 from a separate motor 42.

Also in FIGS. 6 and 7 the two dabbing bars 3 are shown as being mounted by cranks 43 set 180° apart on a crankshaft 44 supported in bearings 45, this shaft having a flywheel 46 and being driven through pulleys 47, 48 and a belt 49 from a motor 50.

We claim:

1. A method of removing impurities of the kind herein set forth from a continuous web of textile fibres in which the fibres have already been made substantially parallel, which method includes the steps of feeding the material continuously through a dabbling zone in which the material is nipped at two positions, subjecting the moving material between said two positions to a rapid dabbling operation by which a series of closely spaced pins penetrate the material sufficiently to push the larger of said impurities to one surface thereof, feeding the material to a stripping zone and stripping said larger impurities from said one surface.

2. The method claimed in claim 1, wherein said two positions at which the material is nipped in the dabbling zone are spaced apart by a distance no greater than the mean fibre length of the fibres being treated and wherein the surface speed of the material is slightly greater on leaving the dabbling zone than on entering it so as to substantially tension the fibres without breaking them and so as to thereby facilitate the pushing of said larger impurities to said one surface of the material.

3. A method of removing impurities of the kind herein set forth from a continuous web of textile fibres in which the fibres have already been made substantially parallel, which method includes the steps of feeding the material continuously through a dabbling zone in which the material is nipped at two positions spaced apart and is tensioned between said two positions, subjecting the moving material between said two positions to a rapid dabbling operation by which a series of closely spaced pins penetrate the material sufficiently to push the larger of said impurities to one surface thereof, then feeding the material to a stripping zone in which it is carried round a sharply curved support with the impurity-carrying surface outermost so as to cause said larger impurities to project from said surface, and removing said larger impurities by a stripping action taking place close to said surface and in a plane substantially tangential to the path of the material.

4. The method claimed in claim 3, and for treating wool or other material in which said impurities include double cuts or other undesirable tufts of fibres, including the further steps of carrying the material after leaving said stripping zone round a further sharply curved support with the impurity-carrying surface outermost and removing said tufts by a further stripping action.

5. Apparatus for removing impurities of the kind herein set forth from a continuous web of textile fibres in which the fibres have already been made substantially parallel, comprising in combination a first set and a second set of dabber rollers defining between them a dabbling zone and arranged to nip said material at two spaced apart positions and to tension the material fed continuously through said zone, a rapidly reciprocating dabbling bar carrying a series of closely spaced pins for penetrating the material in a direction substantially at right angles to the plane in which the material is travelling and sufficiently far into

the material to push the larger of said impurities to one surface thereof, means for continuously rotating said dabber rollers and reciprocating said pins, and stripping means located in a stripping zone for removing the larger of said impurities from said surface of the material to which they have been pushed.

6. Apparatus as claimed in claim 5, wherein each said set of dabber rollers consists of three rollers providing two nips on the material, the second nip of the first set and the first nip of the second set being the nipping positions specified in claim 5.

7. Apparatus as claimed in claim 5, wherein said dabbling pins are arranged in a plurality of rows extending transversely to the path of the material.

8. Apparatus as claimed in claim 5, wherein said dabbling pins are arranged in a plurality of rows extending transversely to the path of the material, and including a clearer device arranged to cooperate with said dabbling pins and with the entry surface of the material to prevent fibres from being pulled out of the material on the withdrawal strokes of the pins, said clearer device consisting of horizontal parallel wires held taut and stationary between the transversely extending rows of pins.

9. Apparatus as claimed in claim 5, wherein said means for removing the impurities in said stripping zone includes a small diameter support roller with a hard surface and pressure rollers arranged to slightly tension the material against the said support roller and to press against said support roller at points spaced apart round its circumference a distance less than the main fibre length of the material, a rotary beater with longitudinal flutes set close enough to said support roller to knock the impurities off the exposed surface of the material and means for driving said support roller and said beater.

10. Apparatus as claimed in claim 9, wherein said rotary beater is arranged to be rotated in a surface direction opposite to the direction of travel of the material and said flutes have their leading faces undercut.

11. Apparatus according to claim 5 and for additionally removing tufts from said material, including a second small diameter support roller beyond said stripping zone with pressure rollers to press the material at two points against said second support roller as the material is carried therearound with its impurity-carrying surface outermost, a rotary pinned device having forwardly projecting pins arranged to move in the direction opposite to that of the material for removing said tufts, and means for driving said second support roller and said pinned device.

References Cited

UNITED STATES PATENTS

3,200,445 8/1965 Morgan 19—84

FOREIGN PATENTS

2,018 1876 Great Britain 19—84
2,445 1875 Great Britain 19—84

DORSEY NEWTON, Primary Examiner