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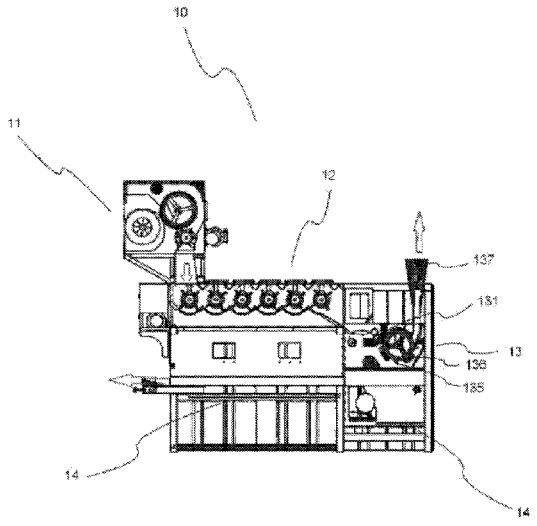

Figure 1

(57) Abstract: The present invention belongs to production technologies of yarns obtained from synthetic and/or natural fibers and relates to a pre-cleaning machine (10) which provides cleaning of foreign substances, which exist in raw materials particularly like cotton, with high efficiency, and which provides obtaining of high quality yarns by providing mixing in a homogenous manner.

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SPECIFICATION

A PRE-CLEANING MACHINE THAT IS SUITABLE FOR USE IN TEXTILE SECTOR

TECHNICAL FIELD

The present invention belongs to production technologies of yarns obtained from synthetic and/or natural fibers and relates to a pre-cleaning machine which provides cleaning of foreign substances, which exist in raw materials particularly like cotton, with high efficiency, and which provides obtaining of high quality yarns by providing mixing in a homogenous manner.

From another perspective, the present invention relates to a pre-cleaning machine which provides cleaning of dirt and impurities in fiber raw materials and which eliminates formation of extra mixture and cleaning load in machines that exist at the continuation of yarn production network and which provides the targeted quality of the yarn as a result of production processes.

PRIOR ART

Yarn is the state where each of the long thin fibers of woven substances (cotton, linen, wool, silk, nylon, etc.) are bent and drawn; and textile is the process of making yarn suitable for production of seaming, crochet, knitting, weaving, embroidery and rope.

Cotton is mostly used as raw material in filature sector. Cotton filature is shortly named as filature in the sector. Cotton obtained from fields is firstly subjected to ginning processes and cocoons are removed and is subjected to cleaning processes and afterwards it is subjected to threshing-carding processes before being transferred to the other yarn production network. Here, cotton raw materials include big amount of foreign substances even though said cotton raw materials are cleaned in gin machines. These foreign substances have to be separated from cotton. This cleaning directly affects yarn quality.

Threshing-carding processes are the processes of mixing of fibers, which have the type and quality as diverse as possible, in accordance with the characteristic of the yarn to be obtained. Here, efficiency of mixing processes is a substantially important process in determining yarn quality. Here, said mixing process is named as threshing, and the mechanically opening processes for the mixture obtained after the threshing process are

called carding processes. In short fiber filature, before the raw materials of the yarn, planned to be produced in the present condition, are fed to the thresh-card group, said raw materials are mixed by means of manual or automatic feeding systems by machine operators in inclined openers. The mixed raw materials are pressed again and made ready for feeding to thresh-card group. In these systems, it is not possible to obtain homogenous mixture. Thus, extra mixing and cleaning load occurs in machines at the continuation of production network, and the quality of the yarn obtained as a result of the processes is lower than desired.

When it is planned to realize production by means of more than one fiber, cleaning process is realized by making an average adjustment of cleaning machines in accordance with the characteristic of the mixture and not in accordance with the characteristic of each fiber group. While each fiber must be cleaned at adjustments which are suitable for the cleaning conditions in accordance with physical characteristics of said fiber, thresh-card group operation system does not enable this cleaning process. Since cleaning adjustment which is unique to raw material cannot be realized, averagely 3-10% of the spinnable useful fibers are thrown to the waste line. These fibers thrown to the waste line are mixed with the first quality fibers at specific proportions and are subjected to cleaning process as from the beginning of the thresh-card process again, and they are made into spinnable form and tried to be recovered. Therefore, since the same fiber is subjected to more than one thresh-card process, sources like energy, labor power, machinery, production duration are used in an inefficient manner. This increase in source consumption and as a result of this, the increase in production costs of yarn leads to increase of the unit price of yarn.

As a result, cottons, which are not sufficiently cleaned in ginning and thresh-card processes, lead to unfavorable technical problems for yarn quality. Besides, in machines used in the other production network, deformation may increase in the operating equipment like bearing, belt, pulley, wire, brush, etc., and spare part cost may increase and moreover, unplanned stoppings may occur due to instant failures.

It has been detected that ginning and thresh-card processes are not sufficient for the cleaning processes in obtaining yarn particularly from cotton fibers because of the technical disadvantages mentioned here, and cleaning processes with high efficiency must be realized and cleaning machines for obtaining high quality yarns must be used.

BRIEF DESCRIPTION OF THE INVENTION

In the related technical field, it is known that the raw material fibers must be added to the production network in a clean form for obtaining yarn. During collection and production, the dirt or foreign raw materials which occur at fibers must be cleaned for obtaining high-quality yarn and must be purified from fibers. Moreover, in cases where the cleaning processes are not substantially realized, deformation may increase in the operating equipment like bearing, belt, pulley, wire, brush, etc., and spare part cost may increase and moreover, unplanned stoppings may occur due to instant failures. In order to eliminate said technical problems, the present invention is a pre-cleaning machine which is suitable for use in textile sector. Said pre-cleaning machine enables removal of dirt and foreign substances with high efficiency from fibers thanks to included elements and the embodiments thereof. Moreover, since the cleaning process is not repeated, energy consumption is reduced. Thanks to the more efficiently cleaned raw material, deformations which may occur in the operating equipment of all machines in machinery will be prevented, by means of this, it is foreseen that the machine and auxiliary part usage and machine lifetime are extended between 20% and 60%.

As known in the art, in threshing-carding processes, the cleaning processes are realized by making an average adjustment of cleaning machines in accordance with the characteristic of the mixture and not in accordance with the characteristic of each fiber group before obtaining the mixtures from more than one fiber type. Particularly the subject matter pre-cleaning machine can enable mixing of yarns in a homogenous structure by being used before threshing-carding processes in the production network. Since the raw material mixtures which are aimed to be produced will be cleaned at suitable adjustments in accordance with the fiber characteristic of each raw material in the subject matter pre-cleaning machines before mixing, spinnable fiber loss will be prevented. Within this context, the cleaning quality is increased and thus, product with higher quality is obtained at the end of the process. Since raw materials are cleaned at unique adjustments, it is foreseen that the unplanned stoppings are reduced and throwing of the useful fiber, which has proportion of 3-10%, is prevented, and the unit production amounts increase by 2-15% per spindle since re-cleaning process is not applied.

BRIEF DESCRIPTION OF THE FIGURES

In Figure 1, the representative view of the subject matter pre-cleaning machine together with the sections thereof is given.

In Figure 2, the representative view of the beater together with the sections thereof is given.

In Figure 3, the representative view of the configuration of the grid which is made of perforated sheet materials is given.

In Figure 4, the representative view of the configuration of the grid in the form of spaced triangular prism is given.

In Figure 5, the representative view of the padding cylinder is given.

In Figure 6, the representative view of the feeding cylinder is given.

In Figure 7, the representative view of the taker-in cylinder is given.

In Figure 8, the representative view of the segment is given.

In Figure 9, the representative view of the blade is given.

REFERENCE NUMBERS

10 Pre-cleaning machine
- 11 Cotton input section
- 12 Beater section
  - 121 Beater
    - 1211 Beater cylinder
    - 1212 Butt wedge
  - 122 Grid
  - 123 Beater outlet
- 13 Taker-in section
  - 131 Carrier apparatus
  - 132 Padding cylinder
  - 133 Feeding cylinder
  - 134 Taker-in cylinder
  - 135 Blade
  - 136 Segment
  - 137 Hood
- 14 Waste carrying section

DETAILED DESCRIPTION OF THE INVENTION

In this detailed description, the subject matter relates to a pre-cleaning machine (10) which is suitable for use in production technologies of yarns obtained from synthetic and/or natural fibers, and is explained with references to examples without forming any restrictive effect only in order to make the subject more understandable.

The representative view of the subject matter pre-cleaning machine (10) is given in Figure 1. The pre-cleaning machine (10) comprises elements for providing purifying of cottons from foreign substances and dirt.

The pre-cleaning machine (10) essentially comprises at least two sections, namely at least one beater section (12) and at least one taker-in section (13) in order to subject the cottons to said cleaning processes and in order to realize these processes with high efficiency. Besides these sections, the pre-cleaning machine (10) comprises at least one cotton input section (11) through which the raw materials are input and where the inputting processes are facilitated, and at least one waste carrying section (14) which enables removal of the dirt, obtained as a result of realization of cleaning processes, from machines.

In the subject matter pre-cleaning machine (10), the processes of purifying of cottons from dirt and from foreign substances are realized in two parts. In the beater section (12), dirt and foreign substances are released from cottons mechanically. The processes of removal of dirt and foreign substances from cottons are provided by means of elements which exist in the taker-in section (13).

The subject matter pre-cleaning machine (10) comprises at least one beater section (12) as mentioned also beforehand. The beater section (12) is the section where the first intervention to the dirt and foreign substances, which exist in cottons, is realized by means of the elements included. Thanks to the items in this section, dirt and foreign substances begin to be released mechanically in cotton.

The beater section (12) comprises at least one beater (121). In the preferred application, the number of beaters (121) is more than one. Here, in a preferred application, the beaters (121) have cylinder geometry structure. The beater (121) comprises a beater cylinder (1211) and more than one butt wedges (1212) which exist on said beater cylinder (1211). The butt wedges (1212) interact with cottons and contact with the foreign substances and dirt, and as a result of this contact, the dirt and the foreign substances are removed from the cottons or

at least mechanically released so as to be easily separated from the cottons. The butt wedges (1212) preferably have rectangular prism geometry structure and are positioned on the beater cylinder (1211). The beater (121) is positioned in an orthogonal manner to the long edge of the pre-cleaning machine (10) in order not to form bending and breaking at the fibers. Since it is positioned in this manner, the beaters (121) provide minimization of clogging of fibers at the passages and provide serial fiber passage. In Figure 2, the representative view of the beater is given.

The beater section (12) comprises at least one grid (122). Since the cotton which interacts with the beater (121) mechanically releases the foreign substances and dirt included in the cotton, the cotton is transferred through the perforations to the waste carrying section (14) which exists under the grid (122). The grid (122) moreover forms a base for advancing of the cottons which contact with the beater (121). Therefore, there must be a specific distance between the beater (121) and the grid (122) in accordance with the type of cottons. The protection scope of the invention is not limited with the distance between the grid (122) and the beater (121). In a preferred application, the grids (122) are made of steel sheet materials.

In a preferred application, the grid (122) is made of perforated sheet materials. In Figure 3, the representative view of the configuration of the grid (122) made of perforated sheet materials is given. As shown in Figure 3, the grid (122) has a beater (121) centered geometry for being able to take dirt around the movement of the beater (121). The middle part of the grid (122) is in hollow form in a compliant manner to the beater (121) and the right-left edges thereof are at a high level. The edge parts are at a high level, the middle part of the grid (122) is in hollow form, in other words, the region with pluralities of perforation sections is hollow form which is in parallel direction to the beater (121). In case it is preferred, the grid (122) can have a configuration including triangular prisms with specific intervals that can be adjusted manually or by means of automation. The view of the grid (122) made of cylindrical centered triangular prisms is given in Figure 4. Dirt, obtained by means of beaters (121), passes through the determined intervals of triangular prisms and is advanced to the waste carrying section (14). As also shown in Figure 4, in triangular prisms arrayed at specific intervals, in the same manner, there is a configuration where the middle region is hollow and the right-left edges are at a high level in a compliant manner to the movement of the beater (121).

As shown in Figure 1, the pre-cleaning machine (10) comprises at least one beater outlet (123) which provides passage of the cotton, processed in the beater section (12), to the taker-in section (13) which is the next process step after the cotton passes through the

beater (121)-grids (122). In a preferred application, the beater outlet (123) is positioned at the lower vicinity of the last beater (121). The beater outlet (123) has an inclined structure for providing easily movement of the cotton. The cotton coming from the beater (121) and the grid (122) comes to the beater outlet (123), and from here, the cotton is enabled to be transferred to the taker-in section (13).

The beater section (12) has removed the crimping and breakages, which may occur in the fiber, thanks to the beater (121)-grid (122) mechanism included. The number of beaters (121) seriously affects the quality in the fiber. Increase of the number of beaters (121) directly affects the quality and provides variety. The grids (122) positioned at the lower vicinity of the beater (121) can be designed such that the system, which provides transfer of the waste directly onto the band, is controlled both by means of the manual hand wheel and with the help of automation. In the manual system, the angle of the grids (122) can be manually adjusted at the desired level. The pouring amount of the waste onto the band can be adjusted. Automatic usage will decrease work load and will provide time saving at the same time.

The subject matter pre-cleaning machine (10) comprises at least one taker-in section (13). Said taker-in section (13) provides the functions of removal of dirt and foreign substances, which remain in the cotton together with the items therein, even after application of processes at the beater section.

The taker-in section (13) comprises at least one carrier apparatus (131) for providing transferring of the cotton, coming from the beater outlet (123), to the taker-in section (13). In a preferred application, the carrier apparatus (131) is essentially a conveyor band.

The taker-in section (13) comprises at least one cylinder which provides guidance of the cotton to the elements which will provide removal of foreign substances and dirt after carrying of cotton by means of carrier apparatus. In a preferred embodiment of the present invention, there are two cylinders, namely, padding cylinder (132) and feeding cylinder (133). Accordingly, in a preferred application, the padding cylinder (132) is positioned at the upper vicinity of the carrier apparatus (131) and enables carrying of cotton to the feeding cylinder (133).

The subject matter pre-cleaning machine (10) comprises more than one feeding cylinder. There is feeding cylinder (133) provided such that the two cylinders are preferably at mutual positions and at specific interval distances. The cotton coming from the padding cylinder

(132) comes to the feeding cylinder (133), and from here, the cotton is transferred to the taker-in cylinder (134) where the cleaning processes shall be realized.

The taker-in section (13) is the section where the cotton is essentially cleaned and purified from foreign substances. Accordingly, the taker-in section (13) comprises more than one cleaning apparatus. As the cleaning apparatus, the subject matter pre-cleaning machine (10) comprises at least one blade (135) and at least one segment (136). Said blade (135) and said segment (136) are positioned at the taker-in section (13) and in an orthogonal manner to the long edge of the pre-cleaning machine (10). In a preferred application, the pre-cleaning machine (10) comprises more than one blade (135) and segment (136). In Figure 1, the positions of the blade and the segments at the pre-cleaning machine (10) are shown in a representative form.

There is at least one taker-in cylinder (134) which provides rotation and movement of the cotton, coming from the feeding cylinder, between the blades (135) and the segments (136). There is at least one wire winding on the taker-in cylinder (134). The ends of said wire winding has needle-like structure. The dirty cottons coming from the feeding cylinder (133) are held to these wires provided on the taker-in cylinder (134) and afterwards, they pass through the blades (135). The cotton, processed between the blades (135) and the taker-in cylinder (134), is firstly removed from coarse neps. The distance of the blade (135) with respect to the taker-in cylinder (134) can be adjusted according to the cotton type. The blade distance is reduced in each step, and cleaning is realized in a stepped manner from the coarser neps towards the thinner neps.

The taker-in cylinder (134) provides rotation and movement of the cotton, coming from the feeding cylinder (133) and which is in specific dimensions, between the blade (135) and the segments (136) in order to be able to remove the foreign substances and dirt from the cotton. Afterwards, the cleaned cotton is transferred outwardly from the pre-cleaning machine (10) by means of at least one hood (137), and the collected foreign substances and dirt are transferred to the waste carrying section (14). As known, the waste carrying section (14) is positioned at the lower vicinity of the taker-in section (13) and the beater section (12).

In Figure 8, the representative view of the segment (136) is given.

In Figure 9, the representative view of the blade (135) is given.

The present invention owners have detected that there has to be specific distances for the transfer of cotton between the blade (135) and the segments (136) and the taker-in cylinder (133) in order to be able to realize cleaning processes with high efficiency in the taker-in section (13). Here, the distance values which must be provided are changing in accordance with the structure of cotton. The protection scope of the present invention is not limited with the values of said distance intervals. In Figure 7, the representative view of the taker-in cylinder (134) is given.

By means of operation of taker-in cylinder (134), it is enabled that the neps are completely cleaned from the fiber. The operation of specially-winded wires, provided on the blade (135) and the taker-in cylinder (134), in a compliant manner with each other do not allow passage of neps. The adjustable blade (135) structure eliminates the disadvantage which occurs due to variety in fiber raw material. The taker-in blades (135) are used for separating the neps, which exist in the fiber which passes between the taker-in cylinder (134) and the blades (135), with the help of blades (135). Since the distance between the taker-in cylinder (134) and the sharp end of the blade (135) is adjustable, the efficiency of cleaning, made in accordance with fiber types, is increasing.

In the invention, neps, which are in different dimensions in each step, are caught by the blades (135) which exist in the subject matter pre-cleaning machine (10) and are separated from the fiber. Segments have been placed between passages between these blades (135). There is specially designed graph FD9 wire at the segments (136). The foreign substances which exist in raw materials with different characteristics and which have different dimensions can be cleaned with high efficiency in these segment groups in a stepped manner by means of changing the position of the segment (136) group. By means of this, the undesired substances in the fiber are cleaned in accordance with the dimension thereof, and a higher quality and more homogenous fiber will be obtained.

Since sufficient cleaning and opening cannot be provided in standard taker-in wire, specially-designed taker-in cylinder (134) wire is used. The taker-in wire is V6 type, and the distance between the threads and the thread angle are narrow, and in the V8 type taker-in wire designed specially, the distance between the threads and the thread angle are wider. This taker-in wire grabs the fiber in a better manner and releases the fiber from neps by means of the blade system. As taker-in wires, preferably type V6 wires are used. In case it is preferred, type V8 wires can also be used as taker-in wires. However, V6 type wires are preferred to be used since distances between threads and angles thereof are wider than V8 type wires.

Before realizing the raw material mixtures of the yarn which is planned to be produced, since each raw material will be cleaned at suitable adjustments in accordance with fiber characteristic, spinnable fiber loss will be prevented. Within this context, the cleaning quality is increased and thus, a product with higher quality will be obtained at the end of the process. Since the raw materials are cleaned at unique adjustments, it is foreseen that the unplanned stoppings are reduced and since the useful fiber pouring with proportion of 3-10% is prevented, and since re-cleaning process is not applied, the unit production amounts per spindle will increase by 2-15%. Moreover, since the cleaning process is not repeated, reduction in energy consumption is also provided. Thanks to the raw material cleaned in a more efficiently manner, the deformation, which may occur in the operating equipment of all machines which exist in the machinery, will be prevented, and thanks to this, it is foreseen that machine and auxiliary part usage and machine lifetime will extend by 20-60%. When the daily production is taken as a base, the production amount of one combing machine is between 140 and 160 kg/hour. The daily production in a company, where twenty combing machines exist, is between 2800 and 3200 kg/hour. Daily production between 67200 and 76800 kilograms is planned. Companies consume one-hour duration for cleaning and maintenance in each shift on the average. Because of this, loss, which is between 3*2800-3200=8400-9600 kilograms, occurs in fiber production. By means of this machine, it is foreseen that the maintenance is realized once a day. By means of this, 5600-6400 kilograms of fiber is included to daily production. By preventing this production loss, the maintenance and cleaning duration is minimized.

The protection scope of the present invention is set forth in the annexed claims and cannot be restricted to the illustrative disclosures given above, under the detailed description. It is because a person skilled in the relevant art can obviously produce similar embodiments under the light of the foregoing disclosures, without departing from the main principles of the present invention.

CLAIMS

1. The present invention is a pre-cleaning machine (10) which is suitable for use in production technologies of yarns obtained from synthetic and/or natural fibers, **characterized in that:**
   - the subject matter pre-cleaning machine (10) comprises at least one beater section (12) where the first cleaning processes are realized for providing purifying of the dirty cotton from dirt and foreign substances and for providing mixing of said cottons in a homogenous manner, and for providing mechanically releasing of at least dirt and foreign substances in cottons, and at least one taker-in section (13) where the foreign substances and dirt, coming from the beater section (12), are completely cleaned and removed from the structures,
   - said beater section (12) comprises at least one beater (121) and at least one grid (122), and wherein said beater (121) comprises a beater cylinder (1211) and at least one butt wedge (1212) positioned on the beater cylinder (1211),
   - said taker-in section (13) comprises at least one taker-in cylinder (134) including the wire winding, providing holding of the dirty cottons, at its upper position, and at least one blade (135) which provides removal of dirt and foreign substances held at the taker-in cylinder (134), and at least one segment (136).

2. The pre-cleaning machine (10) according to claim 1, **wherein** said beater section (12) comprises more than one beater (121) and grid (122).

3. The pre-cleaning machine (10) according to any one of the preceding claims, **wherein** the beater (121) and the grid (122) are positioned in an orthogonal manner to the long edge of the pre-cleaning machine (10).

4. The pre-cleaning machine (10) according to claims 1-3, **wherein** said butt wedges (1212) are positioned at the upper vicinity of the beater cylinder (1211) and have rectangular cylinder form.

5. The pre-cleaning machine (10) according to claims 1-3, **wherein** said butt wedges (1212) have round cross-section or bent sheet form.

6. The pre-cleaning machine (10) according to any one of the preceding claims, **wherein** said grid (122) is positioned in a parallel manner to the beater (121), and the middle part has a curved hollow form depending on the shape of the beater (121).

7. The pre-cleaning machine (10) according to claims 1-6, **wherein** said grid (122) has a structure which is in perforated sheet form.

8. The pre-cleaning machine (10) according to claims 1-6, **wherein** said grid (122) is configured together with more than one triangular prism with adjustable intervals for transferring the dirt, obtained from beaters (121), to the waste carrying section (14).

9. The pre-cleaning machine (10) according to claim 8, **wherein** the grid (122) has a structure where the pouring amount of the waste onto the band can be adjusted by adjusting the angle thereof such that the system, which provides the waste to be directly applied onto the band, is controlled both manually by means of hand wheel and automatically with the help of automation.

10. The pre-cleaning machine (10) according to any one of the preceding claims, **wherein** the taker-in section (13) comprises more than one blade (135) and segment (136).

11. The pre-cleaning machine (10) according to any one of the preceding claims, **wherein** the wires provided in said taker-in cylinder (134) are in type V6.

12. The pre-cleaning machine (10) according to any one of the preceding claims, **wherein** the taker-in cylinder (134), the blade (135) and the segments (136) are positioned in an orthogonal manner to the long edge of the pre-cleaning machine (10).

13. The pre-cleaning machine (10) according to any one of the preceding claims, **wherein** at least one cotton inlet section is provided for providing taking of dirty cottons to the pre-cleaning machine (10).

14. The pre-cleaning machine (10) according to claim 13, **wherein** at least one condenser is provided for providing taking of dirty cottons to the pre-cleaning machine (10).

15. The pre-cleaning machine (10) according to any one of the preceding claims, **wherein** the beater section (12) comprises at least one beater outlet (123).

16. The pre-cleaning machine (10) according to any one of the preceding claims, **wherein** at least one carrier apparatus (131) is provided for providing transferring of the cotton, coming through the beater outlet (123) in the taker-in section (13), to the taker-in section (13) elements.

17. The pre-cleaning machine (10) according to any one of the preceding claims, **wherein** at least one cylinder is provided which provides guiding of the cotton to the elements which will provide removal of foreign substances and dirt after carrying the cotton by means of the carrier apparatus (131).

18. The pre-cleaning machine (10) according to claim 17, **wherein** as said cylinder, it comprises padding cylinder (132) and feeding cylinder (133).

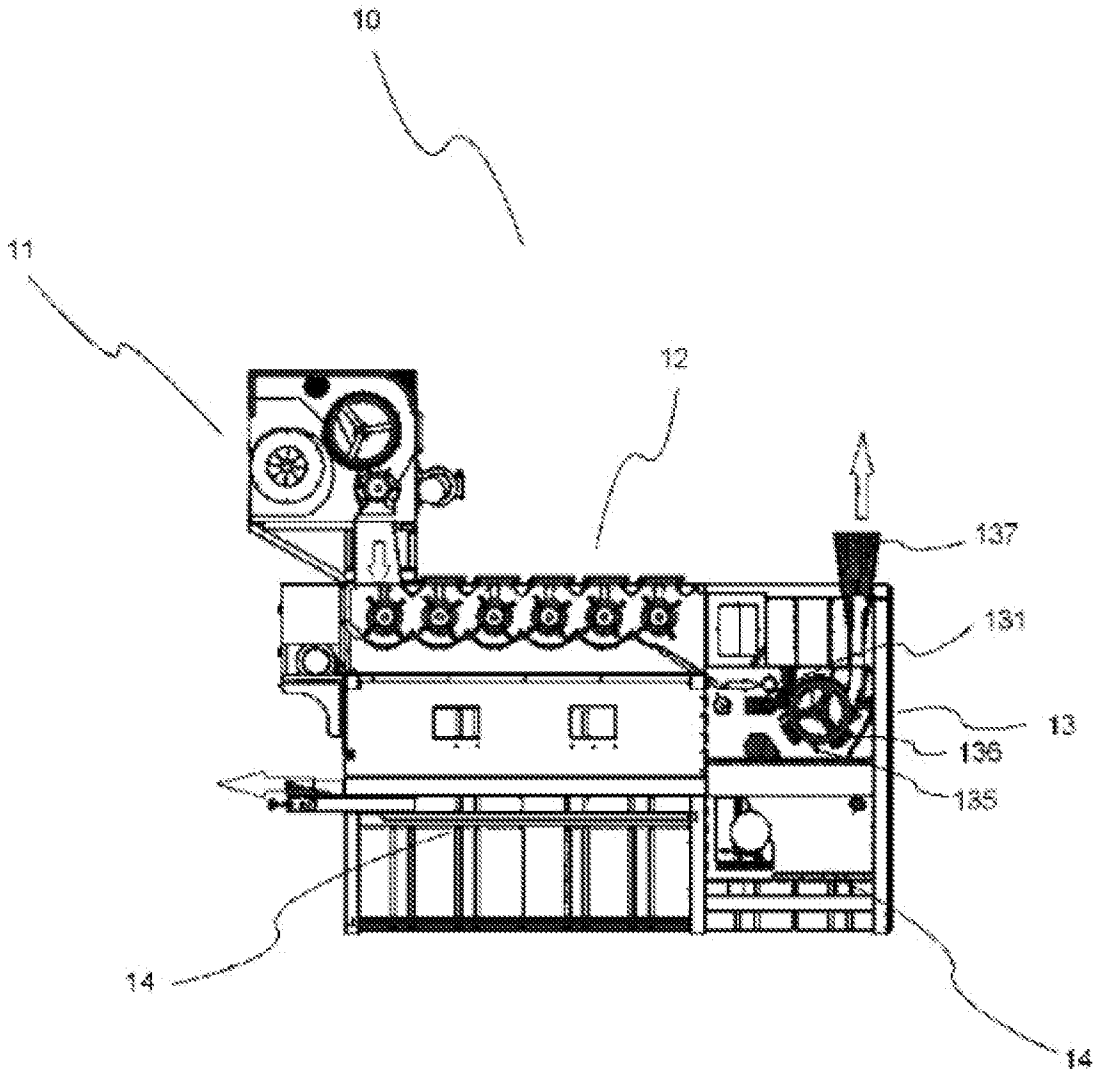

Figure 1

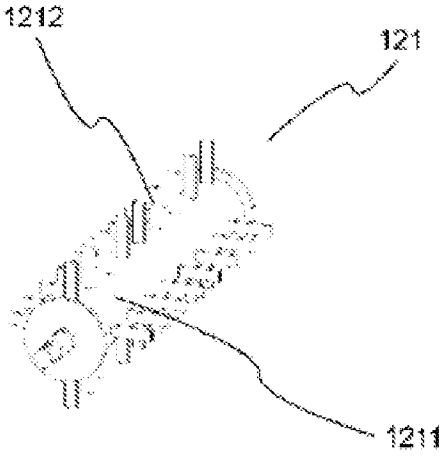

Figure 2

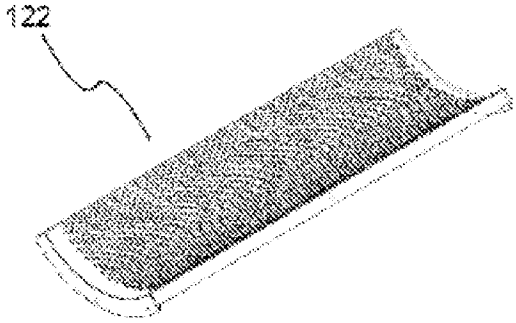

Figure 3

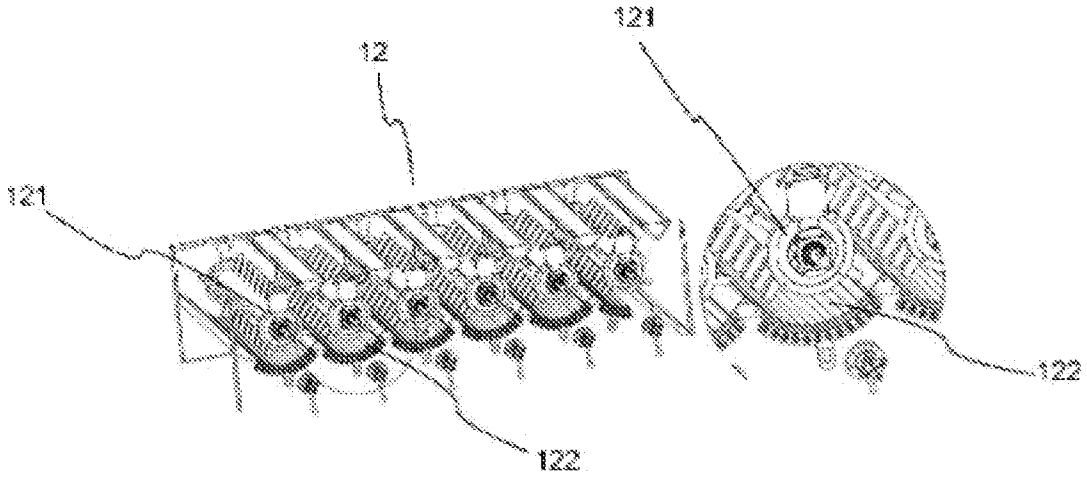

Figure 4

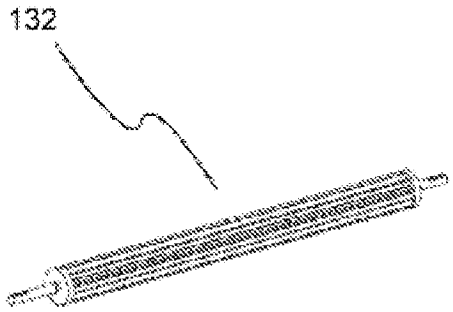

Figure 5

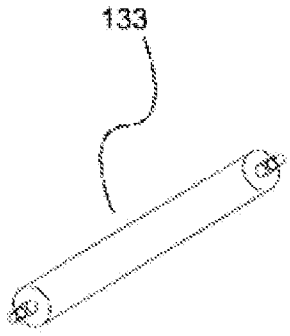

Figure 6

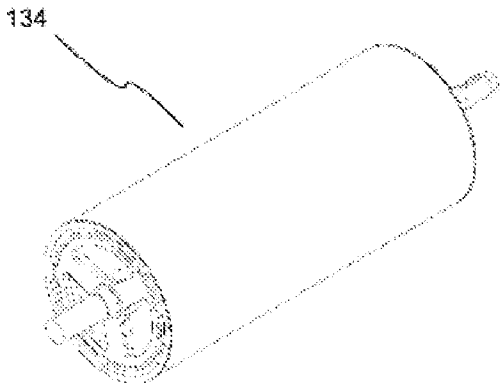

Figure 7

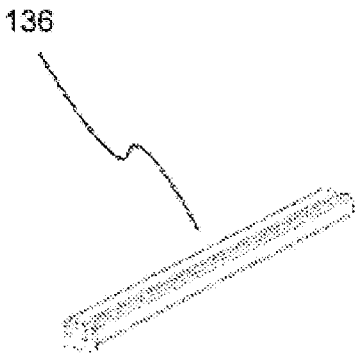

Figure 8

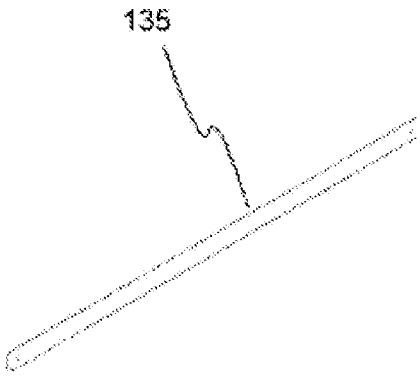

Figure 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/TR2023/050702

A. CLASSIFICATION OF SUBJECT MATTER

D01B 1/04 (2006.01)i; D01B 1/26 (2006.01)i; D01B 1/24 (2006.01)i; D01G 9/00 (2006.01)i; D01B 1/40 (2006.01)i; D01G 9/04 (2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D01B; D01G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Turkpatent database

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO Abstract & Fulltext databases, Search terms used: "cotton, fiber, pre-cleaning, beater, licker_in, taker_in, grid, wire, blade "

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6539585 B1 (US AGRICULTURE [US]) 01 April 2003 (2003-04-01) Abstract, Figures: 1-5, Description "Summary of the invention" section, Description Cloumn 5 Lines 13-67, Column 6 Lines 1-67, Column 7 Lines 1-67.	1-18
X	CN 205046235 U (HU YUBAI) 24 February 2016 (2016-02-24) Abstract, Figures 1-5, Description (Epodoc translation) "Summary of the invention" section, "Embodiment 1" section	1-18
X	CN 204104364 U (NANJING RES INST AGRICULTURAL MECHANIZATION MINISTRY AGRICULTURE) 21 January 2015 (2015-01-21) Abstract, Figure: 1, Description (Epodoc translation) "Utility model content" section, Claims: 1-9	1-18

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
04 December 2023	**04 December 2023**

Name and mailing address of the ISA/TR	Authorized officer
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