International Patent Application PCT/IN 2011/000856

Report of International Search Authority, Vienna

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
IN 2011/000856

Box No. V **Reasoned statement under 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-27	YES
	Claims	----	NO
Inventive step (IS)	Claims	1-27	YES
	Claims	----	NO
Industrial applicability (IA)	Claims	1-27	YES
	Claims	----	NO

2. Citations and explanations:

The following documents have been cited in the Search Report:

D1: WO2007019716 A1 (MASCHINENFABRIK RIETER AG) 22.02.2007
(Fig. 1 - 3; page 9, line 19 - page 12, line 27;)
D2: EP1213378 B1 (MASCHINENFABRIK RIETER AG) 22.02.2006
(Fig. 1; paragraphs [0021] - [0025];)
D3: US2004016076 A1 (GAUTSCHI et al.) 29.01.2004
(Fig. 1, 2; paragraph [0029];)
D4: WO2007033503 A1 (MASCHINENFABRIK RIETER AG) 29.03.2007
(Fig. 1 - 4; claim 1;)

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Form PCT/ISA/237 (Box No. I) (July 2011)

Abstract

The present invention relates to a method and apparatus of carding staple fibres like cotton. More particularly, the present invention is directed to an apparatus for carding of staple fibres with minimum number of moving parts and to reduce the need for close tolerances, especially where moving parts are involved, in order to improve the manufacturability of the apparatus. Density of input tufts to the carding machine is reduced. Diameter of carding cylinder [7] is reduced, with corresponding increase in its rotational speed, to maintain the peripheral speed. An air guiding element [6] and one air deflection element [8a,8b] is used for capturing long fibres [18] on a perforated roller [10]. This

enables elimination of close-set moving parts and simplification of design. Advantageously, the present invention minimizes the damage to the fibres so that they retain their natural and desirable properties.

Figures 1 to 4

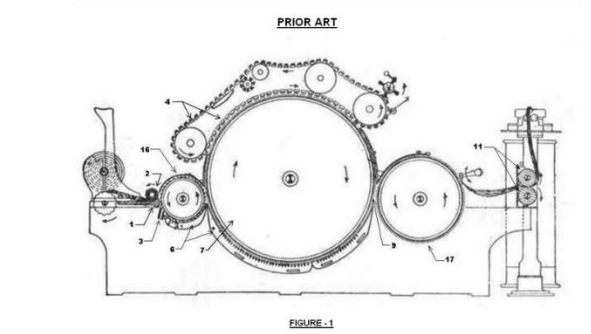

FIGURE - 1

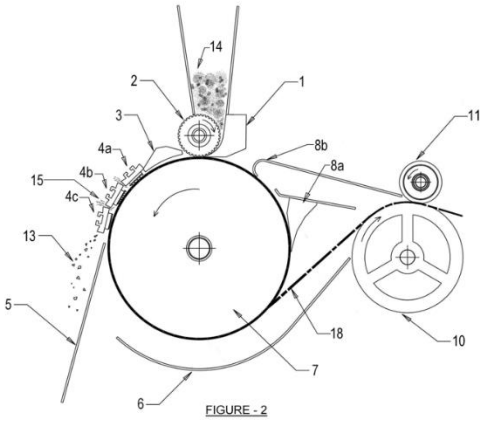

FIGURE - 2

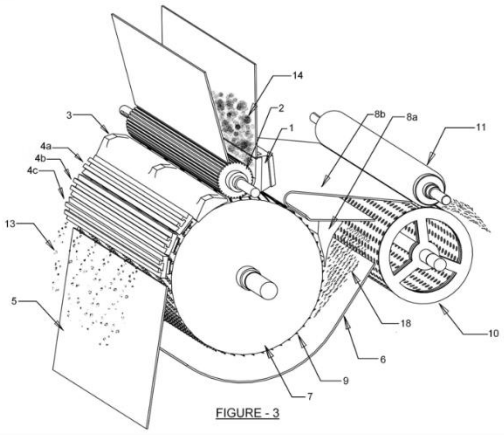

FIGURE - 3

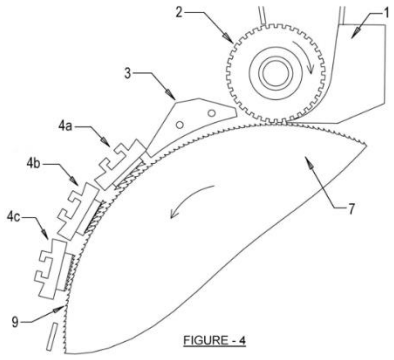

FIGURE - 4

Claims

1. An apparatus for carding staple fibres, comprising:
    a. a feeding arrangement with a feed table and a feed roller for feeding tufts of staple fibers;
    b. a rotating carding cylinder having carding pins on its surface,

c. one or more carding flats co-operating with the said carding cylinder for opening of tufts into individual fibres;
d. a zone downstream of the said carding flats where the air stream entrained by rotation of the said carding cylinder is unconstrained;
e. an air guiding element to enclose the unconstrained air stream and direct it towards a preferred exit;
f. at least one air deflecting element to deflect the generated air stream away from the said carding cylinder towards the said preferred exit; and
g. a perforated roller at the preferred exit for doffing fibres entrained in the said air current.

2. The apparatus as claimed in claim 1, wherein the diameter of the said carding cylinder is in the range of 200mm to 300mm and the rotational speed is between 1200 to 1500 revolutions per minute.

3. The apparatus as claimed in claim 1, wherein the said feeding arrangement feeds said tufts directly to the said carding cylinder.

4. The apparatus as claimed in claim 1, wherein the staple fiber is preferably cotton with density of tufts less than 0.4g/cc.

5. The apparatus as claimed in claim 1, wherein the said feed table is positioned before the said feed-roller with respect to the direction of approach of the said carding pins.

6. The apparatus as claimed in claim 5, wherein the said feed roller is pinned, knurled or has straight or helical flutes.

7. The apparatus as claimed in claim 1, wherein first of at least one of the said air deflecting elements comprising a surface with a blade edge is positioned relative to the said rotating carding cylinder such that the said blade edge is located in proximity to the pinned surface of the said carding cylinder.

8. The apparatus as claimed in claim 7, wherein the said surface with a blade edge deflects the air current carrying substantial part of carded fibers away from the said carding cylinder.

9. The apparatus as claimed in claim 8, wherein a second air deflecting element is positioned after the said first air deflecting element to doff substantial part of remaining fibers, thereby reducing recirculation of un-doffed fibers.

10. The apparatus as claimed in claim 8, wherein a plurality of secondary air deflecting elements are positioned successively after the said first air deflecting element to further reduce re-circulation of fibers.

11. The apparatus as claimed in claim 1, wherein the leading surface of the said carding pins is inclined towards the direction of movement of the said carding cylinder.

12. The apparatus as claimed in claim 1, wherein the preferable number of carding flats is atleast 2 to but not greater than 4.

13. The apparatus as claimed in claim 12, wherein adjacent carding flats have a gap preferably between 1 mm to 3 mm circumferentially long for radially expelling short fibres.

14. The apparatus as claimed in claim 12, wherein successive flats of the said carding flats have progressively increasing pin densities.

15. The apparatus as claimed in claim 12, wherein successive flats of the said carding flats are set progressively closer to the pinned surface of the said carding cylinder.

16. The apparatus as claimed in claim 1, wherein the said one or more carding flats have pin profile and pin-densities which do not allow the accumulation of fibres and trash.

17. The apparatus as claimed in claim 1 further comprises a surface with knife-edge, positioned immediately after the said feeding arrangement.

18. The apparatus as claimed in claim 1, further comprising a trash separation plate positioned in the un-constrained airstream downstream of the said carding flats, such that the leading edge of the said trash separation plate is positioned between the radially farther zone of the airstream around the said carding cylinder where trash particles are entrained, and the radially proximate zone of the airstream around the said carding cylinder, where long fibers are entrained.

19. A method for carding staple fibers comprising:
    a. enhancing the radial forces acting on materials entrained in air-current around a rotating carding cylinder of reduced diameter

and increasing the rotational speed of the said carding cylinder to maintain the preferred surface speed;

b. feeding of loose tufts of staple fibres through a feeding arrangement of feed roller and feed table to the said rotating carding cylinder;
c. removing of coarse particles by placing a surface with its leading knife-edge close to the pinned surface of the said carding cylinder;
d. expelling short fibres radially by radial force generated in the said air current;
e. separating fine trash from carded fibers by allowing entrained trash particles to move radially away in an air-stream that is free to expand in the radial direction;
f. directing the air-current carrying fine trash away from the said cylinder using a trash separation plate;
g. enclosing the residual air-current carrying entrained long fibers and directing it towards a perforated roller by means of an air-guiding element;
h. allowing long fibres to stay close to the carding cylinder by the retaining action of pins whose leading surfaces are inclined towards the direction of rotation;
i. forcing the said long fibres to deflect from the carding cylinder onto a perforated roller by deflecting the air current away from the carding cylinder using at least one air deflection element proximate to the pinned surface of the said cylinder;
j. permitting the said air current to escape through the perforations in the roller while retaining the fibres on the perforated surface; and
k. rotating the perforated roller to deliver carded web.

20. The method as claimed in claim 19, wherein the staple fiber being fed is cotton with density of tufts less than 0.4g/cc.

21. The method as claimed in claim 19, wherein strong radial forces are generated by rotating carding cylinder with diameter in the range of 200mm to 300mm at the rotational speeds lying between 1200 to 1500 revolutions per minute.

22. The method as claimed in claim 19, wherein damage due to the impact of pins of the said carding cylinder on the fibers gripped in the said feeding arrangement is reduced by positioning the said feed-table before the said feed-roller, with respect to the direction of approach of pins of the said carding cylinder.

23. The method as claimed in claim 19, wherein intended movement of the fibers and trash in the entrained air is selectively enhanced by the application of suction.

24. The method as claimed in claim 19, wherein intended movement of the fibers and trash in the entrained air is selectively enhanced by the application of blowing air.

25. The method as claimed in claim 19, wherein uniformity of the web is enhanced by the successive deposition of multiple layers of fibers on the surface of the perforated roller, by rotating the said perforated roller at slow peripheral speed in relation to that of the said carding cylinder.

26. The method as claimed in claim 19, wherein uniformity of the web is enhanced by successive deposition of successive layers of fibers on the surface of the perforated roller, preferentially in areas with lesser densities of deposition, on account of reduced flow resistance leading to stronger air-currents directing fibers towards those regions.

27. The method as claimed in claim 19, wherein uniformity of the web is enhanced by setting the at least one air-deflecting element at a farther setting from the said carding cylinder, so that a greater number of fibers re-circulate, building up a reserve-stock of re-circulating fibers that smoothen momentary variations in rate of feed of fibers.

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