May 19, 1964 C. NEUBAUER 3,133,318

FIBRE OPENING AND CLEANING MACHINE

Filed Oct. 25, 1961 3 Sheets-Sheet 1

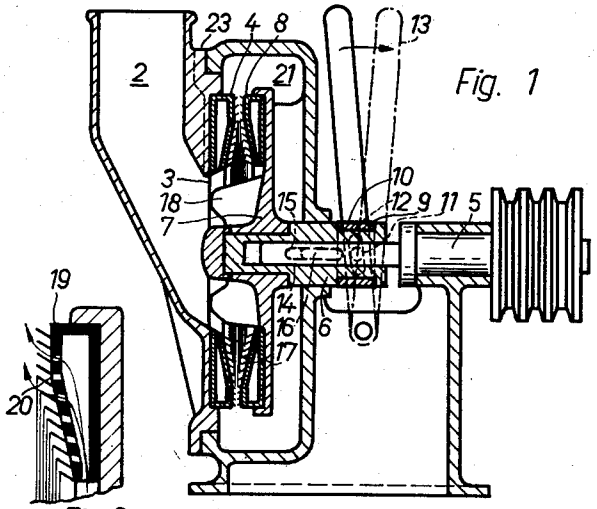


Fig. 1

Fig. 3

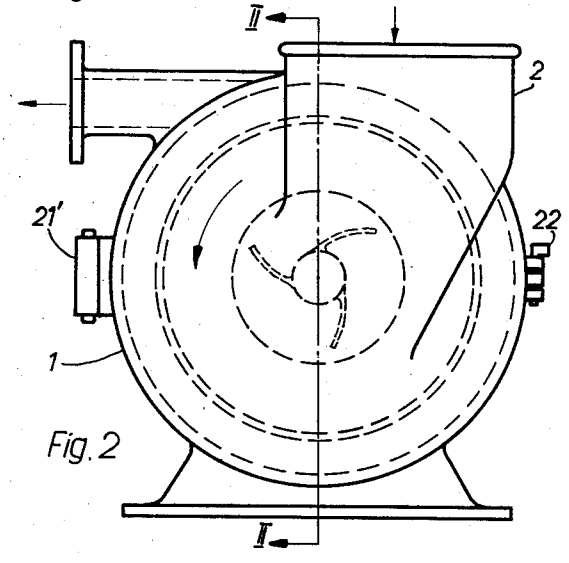


Fig. 2

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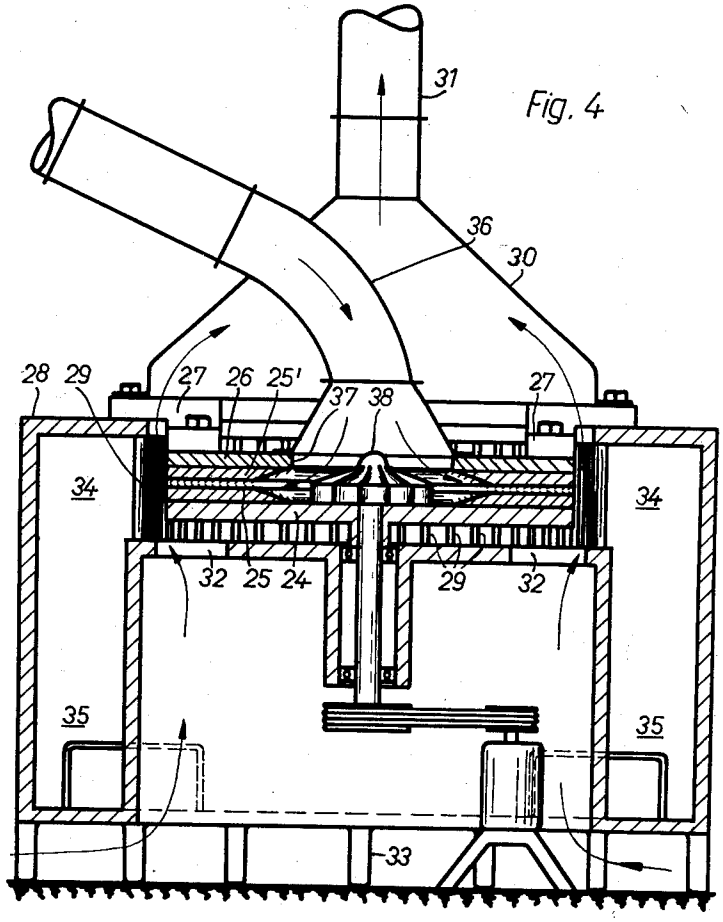


Fig. 4

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FIBRE OPENING AND CLEANING MACHINE

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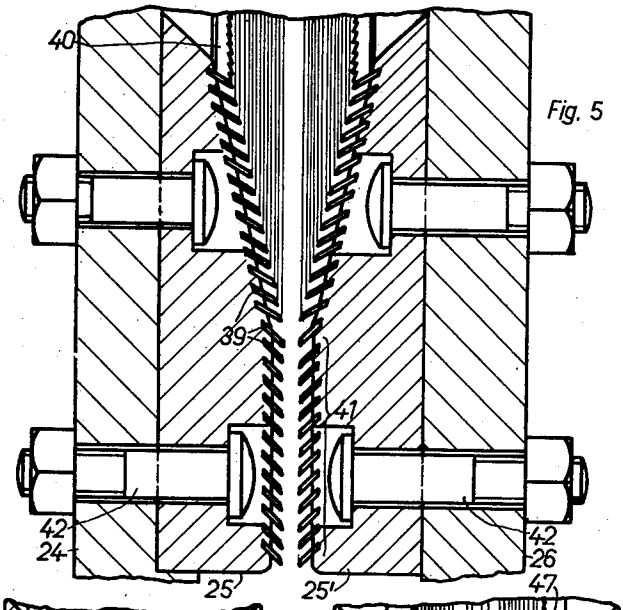


Fig. 5

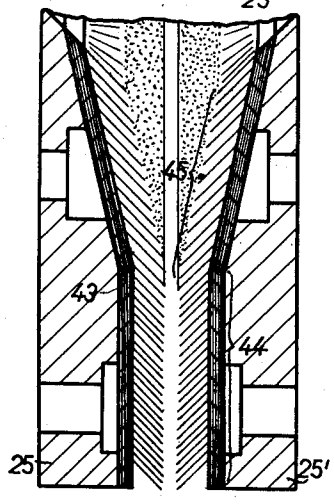


Fig. 6

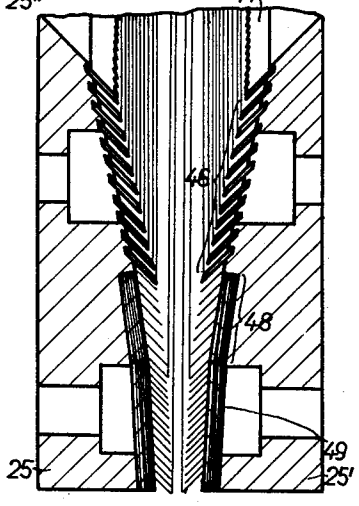


Fig. 7

United States Patent Office 3,133,318 Patented May 19, 1964

3,133,318

FIBRE OPENING AND CLEANING MACHINE

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8 Claims. (Cl. 19—80)

The present invention relates to a fibre opening and cleaning machine which is used for opening staple fibre material as far as possible to obtain individual fibres, and to free such material from particles of dust.

Known fibre opening machines have cylindrical members which are covered with saw-toothed or card wire clothing and either co-operate with one another or act in conjunction with nip points, for example with a pedal plate feed system, whereby the material to be processed is supplied. With these arrangements, the zones in which opening work is performed are always limited to small, basically linear regions of contact between two or more cylinders or to the nip point co-operating with the cylinder. Therefore, those portions of the clothing which are actually operating at any given instant amount to only a small fraction of the total available clothing-covered surface, which is for the greater part inactive, so that the outlay required in clothing-lined surface per unit of quantity of the fibrous material to be treated is very considerable, quite apart from the fact that an entire series of cylinders and nip points are required for obtaining a sufficiently large total working surface to obtain a satisfactory degree of opening.

Machines for unravelling waste fabrics such as rags and the like are already known which comprise one stationary and one rotating disc both of which are fitted with widely spaced, thick, individual conical points which engage in one another. The waste material to be processed is fed-in centrally, unravelled between the points, i.e. distintegrated, and is hurled away tangentially towards the outside. However, owing to the clothing arrangement described, this unravelling machine is not only incapable of distintegrating tufts of fibres without damaging the fibres, but is also incapable of opening the tufts to approximately the state of individual fibres since it is designed for unravelling work and not for carding work.

Furthermore, the known unravelling machines do not have any cleaning zones since disintegrated or unravelled rags and the like are not yet opened to a sufficient degree for cleaning.

An object of the present invention is to provide a fibre opening machine which is of extremely simple construction and which avoids the disadvantages referred to hereinbefore. Accordingly, the machine provided by the invention comprises a housing with a central fibre feed aperture, a first annular card clothing within the housing, a rotor and a second annular card clothing carried by the rotor and situated opposite the first clothing, both the said clothings having fibre-opening elements which, as viewed in the radial direction, closely approach one another but do not engage each other. In order to bring about an outwardly flowing current of air means may be provided to produce a pressure drop between the interior and the periphery of the clothings.

There can be arranged near the fibre discharge region of the clothings, grid bars which extend transversely to the direction of fibre outflow and through which an axial current of air is conducted.

With the present invention, fibre opening is effected in a simple manner owing to the fact that the material to be opened, assisted by the flow produced by the pressure drop, follows a path of travel between the fibre-opening clothings which approach one another and consist of saw-tooth and/or card wire.

The machine has very considerable advantages over the machines which have hitherto been conventionally used for fibre opening. Thus, it makes it possible for the fibrous material which is to be opened to be processed in an uninterrupted sequence on its way from the centre to the outer edge of the fibre-opening clothings, and, where appropriate, to pass through a plurality of clothing regions graduated from coarse clothing elements to fine clothing elements, so that fine opening is reliably obtained although the construction of the machine is kept simple. Furthermore, owing to the full utilisation of the available clothings, the machine permits of a very considerable quantity output whilst being only of moderate dimensions and employing a high rotational speed. The assembly of the machine can be made extremely simple and the interior of the machine be made readily accessible by fixing the first annular fibre-opening clothing in a forward part of the housing which is arranged to be swung open like a door. A current of air can be produced by blades on the rotor. The passage through which material can travel through the machine can be constricted or opened by adjusting the setting of the fibre-opening clothings thus permitting suitable processing of fine and coarse fibrous material. The finely opened fibre aglomerations impinge against the peripherally arranged grid bars owing to their high outflow speed, and will be separated from impurities at these bars and carried away by the axial air current.

The novel features which are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, and additional objects and advantages thereof will best be understood from the following description of an embodiment thereof when read in connection with the accompanying drawing wherein:

FIG. 1 is a vertical sectional view of a fibre-opening machine along the line II—II of FIG. 2,

FIG. 2 is an end view of the machine.

FIG. 3 is a sectional view of a portion of the stationary annular clothing forming part of the machine shown in FIGURES 1 and 2,

FIG. 4 is a vertical sectional view of a cleaning machine which may be used in combination and series relation with the machine shown in FIGURES 1 to 3,

FIGS. 5, 6 and 7 are axial sectional views on a larger scale of portions of three modifications of opposed clothing rings for use in the machine illustrated in FIG. 4.

The machine illustrated in FIGURES 1 and 2 has a two-part housing **1** which comprises an inlet **2** which leads into a central aperture **3** of a ring **4** fixed to the housing **1**. Mounted at the end of a shaft **5** rotatable in two bearings in the housing **1**, is a sleeve **6** and a rotor **7** which carries a ring **8**. The sleeve **6** has an annular groove **9** in which is a stationary guide ring **10** comprising a lateral stud **11** which engages in a slot **12** in a pivotally supported lever **13**. The sleeve **6** has a bore **14** with a keyway **15** and can be displaced along a key **16** mounted on the shaft **5** so that the position of the ring **8** and of the rotor **7** can be axially adjusted to or from the stationary ring **4**. In this way, the free area of the passage between the two rings **4** and **8** can be narrowed or widened to suit the kind of textile material being processed. The opposed surfaces of the stationary rings **4** and **8** are covered with fibre-opening clothing **17**, for example saw-toothed wire, sector wire or card wire clothing. These clothings are fixed and arranged in the manner conventionally employed with textile spinning machines. The clothings **17** on the rings **4** and **8** may gradually approach each other in the outward direction and relatively coarse wires may be used close to the center of the rings and relatively

fine wires maybe used in the outer parts of the rings. The thickness, height, pitch and spacings of the wires may gradually change from the inside to the outside of the rings, in order to take into account the progressive opening of the fibres on their way from the inside towards the outside. The teeth of clothings are not arranged in the axial direction from their fixing base, but are inclined outwardly i.e. in the direction of flow of the material, more particularly in order to prevent the fibres from becoming deposited in the clothing. The rotor **7** carries blades **18** which produce a radial air flow between the clothings in the outward direction. The prevention of fibre deposits in the clothing is also promoted by rings **19** (FIG. 3) having holes **20** through which air can pass. The housing **1** has, outside the rotor **7**, an annular duct **21** to which an outlet pipe is tangentially connected. A hinge **21'** and a fastener **22** connect the part **23** of the housing which carries the stationary ring **8** and is swingable about the hinge **21'**.

FIG. 4 shows a cleaner which may be used in combination with and in series relation to the opener shown in FIGURES 1 and 2. Numeral **24** designates a motor-driven rotor provided with a ring **25** which is covered with a saw-toothed or flexible card wire clothing and which is situated opposite a stationary section ring **26** with a small clearance amounting to about 3 mm., the said stationary ring being provided with a similar clothing **25'**. The stationary ring **26** is fixed to the machine frame **28** by means of a plurality of supports **27** distributed symmetrically about the periphery. Outside the rotor **24** a relatively large number of vertical grid bars **29** are distributed uniformly about the periphery of the rings. Bolted on the frame **28** is a hood **20** which is connected by means of a suction pipe **31** to a vacuum source (not shown). In the vicinity of the grid bars **29**, the frame **28** has apertures **32** and, in the vicinity of the bottom, passages formed by feet **33** for permitting air to be sucked in from the room. A chamber **34** immediately outside the grid bars opens into an annular waste-collecting shaft **35**. A material feed pipe **36** leads through the hood **30** to a central aperture **37** of the stationary ring **26**, arranged concentrically to which is a fan wheel **38** mounted on the rotor **24**.

The detailed structure of the rings **25** and **26** carrying the clothing is shown on a larger scale in FIG. 5. Obliquely formed grooves **39**, which can be circular or spiral in formation, receive the base portions of a saw-toothed wire **40** of a coarser quality than the wire provided in the plane parallel portion **41**. The covered rings **25** and **25'** are fixed by means of bolts **42** to the rotor **24** and the stationary ring **25**, respectively.

In the variant shown in FIG. 6, the rings **25** and **25'** are covered with flexible card wire clothing **43**, the wire elements being finer in a zone **44** situated at right angles to the axis of rotation than in a conical zone **45**, in order to allow for the progressive opening of the fibres.

In the modfication shown in FIG. 7, a first conical portion **46** is provided with saw-toothed wire **47** whereas in an adjoining, less markedly conical portion **48** there is arranged a flexible card wire clothing which is followed by a similar but finer clothing **49** which covers the remaining distance to the periphery and which is supported on a very slightly conical annular surface.

The method of operation of the variant shown in FIG. **4** is as follows:

The cotton tufts which are to be opened and cleaned travel through the pipe **36** into the circle of action of the fan wheel **38** which produces a radial air current in the outward direction between the clothings **25** and **25'** and thereby conveys the fibre tufts outwardly through the narrow gap between the two clothings. As they pass through, they are opened to a very considerable extent by the carding work of the clothings which are displaced relatively to one another. After leaving the gap, the fibre agglomerations impinge owing to their inertia against

the grid bars **29** which are arranged at right angles to the direction of flow, where the dirt is separated as a result of the impact and passes into the chamber **34** and then into the waste-collecting shaft **35**. The fibres themselves are engaged and carried away by the upwardly flowing air current after impinging against the grid bars **29**.

What is claimed is:

1. A fibre-opening and cleaning machine comprising a housing with a central fibre feed aperture, a first annular card clothing arranged within the housing, a rotor arranged in the housing, a second annular card clothing carried by the rotor and situated opposite the first clothing, the two clothings having fibre-opening elements which, as viewed in the radial outward direction, gradually approach and become nearer to one another, but without any overlapping and inter-engagement.

2. A machine according to claim 1 wherein the opposite outermost portions of said fibre-opening card clothings as viewed in the radial outward direction are parallel to each other with a small clearance therebetween.

3. A textile fibre opening and cleaning machine comprising a housing with a feed aperture, a first annular card clothing fixed within said housing and having fibre-opening elements, a rotor rotatable within said housing, a second annular card clothing fixed to and rotatable with said rotor and having fibre-opening elements which extend from said second clothing towards and close to said elements of said first clothing without engagement therewith, and means placed in the center of said rotor for producing a pressure drop between said first and second clothings thereby to produce an outwardly flowing current of air.

4. A fibre opening and cleaning machine comprising a housing with a central feed aperture, a first annular card clothing fixed inside said housing and provided with fibre-opening elements inclined in the radial outward direction of flow of fibrous material through the machine, a rotor movable within said housing, a second annular card clothing fixed to said rotor and provided with fibre-opening elements inclined in said direction of flow, said elements of said second card clothing extending close to those of said first annular clothing without engaging therewith, and means placed in the center of said rotor for creating a pressure drop between said first and second clothings thereby to produce a radial flow of air between said clothings.

5. A machine for opening and cleaning textile fibres comprising:

a housing with a central feed aperture,

a first annular card clothing with fibre-opening elements fixed within said housing,

a rotatable second card clothing with fibre-opening elements arranged inside said housing with its said elements extending close to said elements of said first clothing without engaging therewith, and

grid bars affording passage of an axial air current and located near the periphery of said clothings and placed transversely of the direction of outflow of the fibres from said clothings.

6. A machine for opening and cleaning textile fibres comprising:

a housing having a central feed aperture,

a first annular card clothing having fibre-opening elements and including support means fixed within said housing,

a rotor within said housing coaxial with said first annular card clothing, and

a second annular card clothing having fibre-opening elements and including support means fixed to said rotor,

said fibre-opening elements of said first card clothing being opposite said fibre-opening elements of said second card clothing and being spaced therefrom,

said support means being provided with air passage means for passing an air current in a radial outward

direction and including perforations affording outlet of the air current from said passage means in a direction parallel to the rotation axis of said rotor and into the space between said fibre-opening elements.

7. A fibre opening and cleaning machine comprising a housing with a central feed aperture, a first annular card clothing fixed inside said housing and provided with fibre-opening elements inclined in the radial outward direction of flow of fibrous material through the machine, a rotor movable within said housing, a second annular card clothing fixed to said rotor and provided with fibre-opening elements inclined in said direction of flow, said elements of said second card clothing extending close to those of said first annular clothing without engaging therewith, and fan means placed in the center of said rotor for creating a pressure drop between said first and second clothings thereby to produce a radial flow of air between said clothings.

8. A machine as claimed in claim 4 in which said elements of said clothings are arranged in groups of elements of equal fineness, the elements becoming increasingly finer with increasing distance of the groups from the center of the machine.

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