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APPARATUS FOR THE ASPIRATION OF LINT AND THREAD WASTE IN TEXTILE MACHINES

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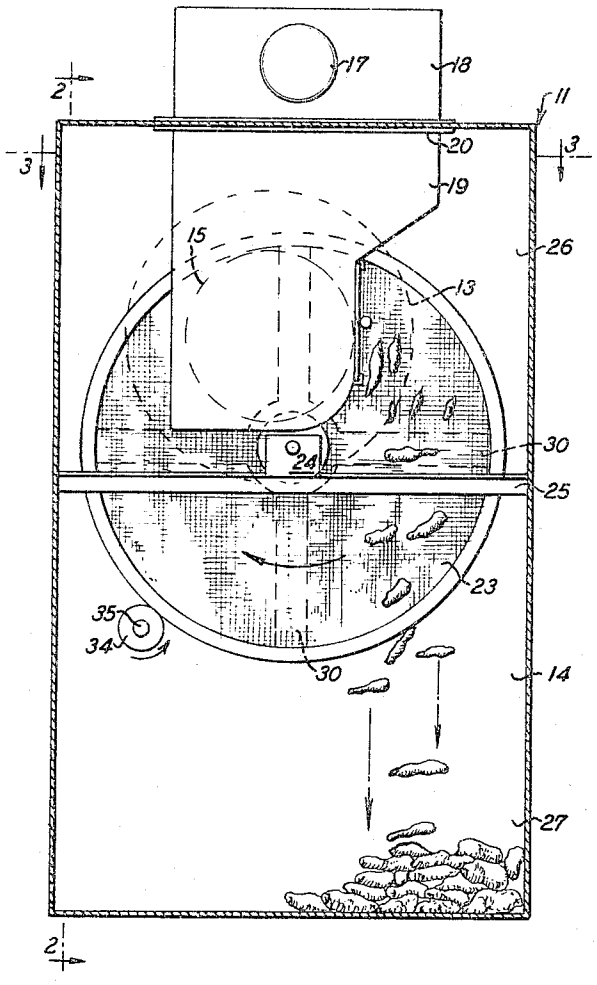

Fig. 1

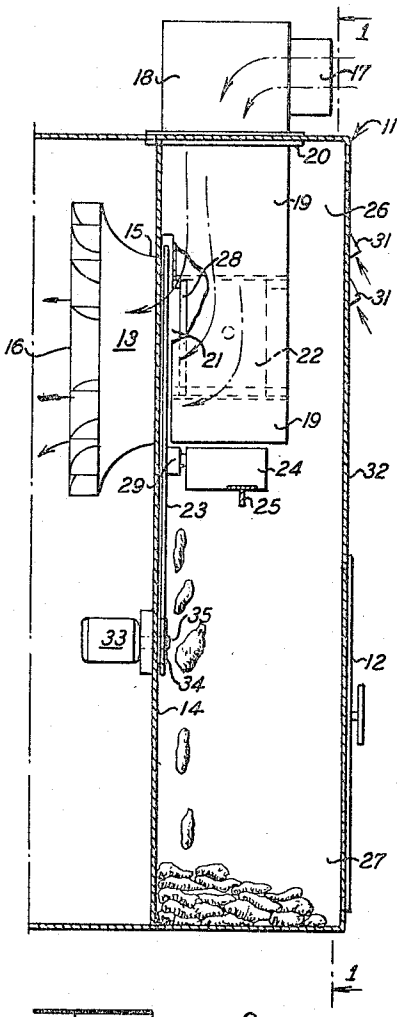

Fig. 2

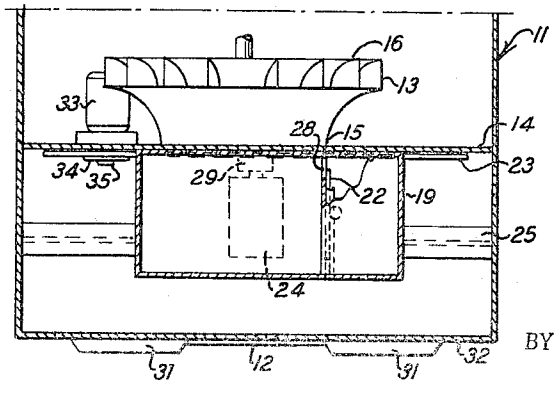

Fig. 3

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APPARATUS FOR THE ASPIRATION OF LINT AND THREAD WASTE IN TEXTILE MACHINES

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This invention relates in general to vacuum cleaning apparatus for the collection of lint or thread waste produced in the working of fibrous textile materials, and more particularly to a vacuum cleaning apparatus which is provided with a self-cleaning filter.

In the prior art, vacuum cleaning apparatus have been used in connection with various types of textile machinery to remove accumulated lint and fibrous fragments produced by the cutting and clipping of threads. Generally, in such apparatus, the fibrous material was aspirated into a suction airstream and removed therefrom by filtering means, with the filtered airstream being either fed back into the room or disposed otherwise.

To obtain continuous, uniformly strong vacuum cleaning performance, it is necessary to maintain a clean filter surface, otherwise, the accumulation of fibres on the filter would quickly reduce the flow of air therethrough, and result in a substantial loss of suction efficiency.

The problem of maintaining a clean filter has proven to be a great nuisance, especially in vacuum cleaning apparatus used with spinning-mill machinery, where relatively large amounts of lint are produced by reason of their high speeds of operation, necessitating more frequent cleaning of the filter.

In vacuum cleaning apparatus of the prior art, vaccum ducts have been emptied against transport screens which act as filters to collect the fibres entrained in the suction airstream, and similarly, against revolving screen drum filters from which the fibres are continuous removed by means of a roll, for example, which, among other things, winds up the collected fibres.

It has also been proposed to equip vacuum cleaning apparatus with reversible shut-off means for the air line, provided at the end of the vacuum duct, which can be reversed at arbitrarily selected time intervals so that the thread waste is alternately collected on a fixedly disposed filter, and ejected, without perceptible interruption of the vacuum cleaning.

Insofar as they provide for a continuous cleaning of the filter, such systems are relatively complicated, and on account of their numerous auxiliary units, require substantial amounts of space, which may not always be conveniently available, as when these vacuum cleaning systems are to be installed on the frames of ring-spinning machines.

On the other hand, non-continuous filter cleaning always requires an interruption, or at least a temporary reduction, of the suction power.

The vacuum cleaning apparatus of the instant invention basically provides for the removal of fibrous material entrained in a fluid stream, such as, for example, the waste fibres from textile machines ingested into a vacuum cleaner suction airstream. As will be described in further detail hereinafter, the apparatus of the invention uses a filtering disc, such as a screen, which is rotated about its central normal axis for the collection of the fibrous material. The filtering disc extends transversely into, and completely across the fluid stream, and is eccentrically positioned with respect to the area bounded by its intersection with said fluid stream. To utilize gravitational forces for the removal of fibrous material captured on the upstream side of the filtering disc, said filtering disc is

disposed preferably vertically, but any other suitable inclination may be used, depending upon the orientation of the fluid stream. The filtering disc should be of such dimensions as to not only cover the fluid stream from the eccentric position of its central axis, but also to have a substantial portion of its area outside said fluid stream so that when the filtering disc is rotated about its normal central axis, the fibrous material held against its upstream side by the action of the fluid stream will be removed from the stream and discharged from the filtering disc by gravitational forces, thus continuously providing a clean filtering area across the fluid stream.

While the vacuum cleaning apparatus of the invention is primarily intended for use with textile machinery and their waste fibres entrained in air streams, it may be readily adapted, with the substitution of suitable components, for other uses, for example, removing sea-weed from water inlets.

In the form of the invention hereinafter described, in addition to the rotating filtering disc, there is provided a blower for creating a suction airstream to aspirate the fibrous materials, an enclosed duct for guiding said air stream through the filtering disc, and a filter box for collecting the fibrous material collected by said filtering disc.

It is therefore, an object of the invention to provide a vacuum cleaning apparatus, suitable for use with textile machinery, which provides for continuous filter cleaning without requiring any interruption or reduction of the suction power.

Another object of the invention is to provide a relatively compact vacuum cleaning apparatus of the aforesaid continuous filter cleaning type.

Other objects and advantages of the invention will be apparent from the detailed description following hereinafter, and the accompanying drawings wherein:

FIG. 1 is a front elevation view, of the apparatus of the invention, taken with the front wall of the filter box removed.

FIG. 2 is a side elevation view, partly in section, of the apparatus of FIG. 1.

FIG. 3 is a plan view, partly in section, of the apparatus of FIG. 1.

Referring now to FIG. 2, a filter box **11** is provided for the collection of the fibrous materials, said filter box **11** having a door **12** for the removal of said collected fibrous materials. A blower **13**, is mounted in a conventional manner to the filter box **11** on its back wall **14**, said blower **13** having a suction inlet **15** communicating with the interior of said filter box **11**, and a discharge outlet **16** which exhausts outside said filter box **11**. The blower **13** creates a suction air stream for aspirating the fibrous material, said air stream entering through a duct connection **17** and a plenum **18** mounted on the filter box **11**. To provide better guidance for the suction air stream, an enclosed duct **19** is provided for separating the suction air from the rest of the space within the filter box **11**. The duct **19** is disposed within the filter box **11** and has an inlet **20** which communicates with the plenum **18** to receive the aspirated air flow, and an opening **21** disposed in coextensive spaced relation with, and facing the suction inlet **15** of the blower **13**. On the side of the duct **19**, there is installed a sliding and adjustable shutter **22**.

A filtering disc **23**, disposed within the filter box **11** extends into the opening **21** and completely covers the suction inlet **15** of the blower **13**. The filtering disc **23** is supported at its central normal axis by a bearing assembly **24**, so as to be rotatable about said axis. The bearing assembly **24** and filtering disc **23** are so disposed as to position the axis of said filtering disc **23** eccentrically with respect to the suction inlet **15**. A cross member **25** secured to the filter box **11** in a conventional manner fixedly supports the bearing assembly **24** and the filtering disc **23**.

Although the filtering disc **23** and suction inlet **15** heretofore described are circular, as shown in FIG. 1, it is understood that other suitable shapes can be used. However, the filtering disc **23** must be of such shape and dimensions as to completely cover the suction inlet **15** at all of its rotation positions, and must be of such size that the portion of its area which covers the suction inlet **15** can be rotated out through the opening **21**, so as to discharge the collected fibrous material. Accordingly, it is recommended that the diameter of the filtering disc **23** be at least twice the diameter of the suction inlet **15**.

As shown by FIGS. 2 and 3, the filtering disc **23** is disposed vertically, so that the collected fibres can be removed therefrom by gravitational forces. While the filtering disc can be disposed at other suitable inclinations, depending on the orientation of the impinging suction air stream, it is essential that the inclination of said filtering disc **23** be such as to permit removal of collected fibres therefrom by gravitational forces when the fibre bearing portion of the disc is rotated out of the suction air stream.

For purposes to become apparent hereinafter, the cross-member **25** may be regarded as dividing the filter box **11** into two portions, an upper portion **26** and a lower portion **27**.

In the operation of the vacuum cleaning apparatus in accordance with the invention, the aspirated fibrous material is ingested into the suction air stream through the duct connection **17** and passes through the plenum **18** and the duct **19** and is held against the filtering disc **23** by the action of the air stream. If the filtering disc **23** were to remain stationary, its upstream surface would be quickly covered with fibrous material and a reduction of the suction power would result, and exist until the filtering disc **23** was cleaned. By slowly rotating the filtering disc **23**, the fibres pressed against it are carried sideways away from the suction inlet **15**. Due to the suction air flow, however, the fibres tend to migrate to the central portion of the inlet **15** where the air velocity is the greatest. This tendency is favored above all by the air being aspirated not just perpendicularly to the filtering surface, but also funnel-wise from the sides as well, by reason of the spaced relation of the opening **21** in the duct **19** where the filtering disc **23** passes through. Consequently, transverse forces work upon the fibres on the filtering disc **23** surface, so that they form pellets, or clumps of fibres on a filtering surface which is moving in relation to a suction nozzle, said pellets or clumps tending just to stay in front of the suction opening. Due to the continuous rolling movement, more fibres constantly gather together, until the transverse forces of the air stream are no longer sufficient to roll the fibre clumps, which have grown heavier, any further on the filtering surface and keep them in front of the suction inlet **15**, so that said clumps are now carried on the rotating filtering disc **23** out of the range of action of the suction.

In the case of the vertically disposed filtering disc **23** shown in the drawings, the clumps fall of their own weight, when the suction action ceases, down from the filtering disc **23** and into the lower portion **27** of the filter box **11**. Thus, the filtering disc **23** is constantly cleaned automatically, and the rotary movement thereof continuously brings a clean filtering surface in front of the suction inlet **15**.

The arrangement shown in the drawings wherein the filtering disc **23** is vertically disposed provides a simple and expedient way of achieving automatic filter cleaning. However, any other filtering disc **23** position is permissible, provided that it permits the action of gravity to drop the fibre clumps without requiring a special wiping device (not shown) which would constitute an unnecessary complication.

Although the apparatus of the invention could operate with free aspirated air flow and without the duct **19** to guide the air flow through the filtering disc **23**, the inclusion of said duct **19** with its shutter **22** on the upstream side of the filtering disc **23**, provides for better flow and separation of the suction air stream from the fibre waste collected in the lower portion **27** of the filter box **11**. By the shutter **22** an aperture **28** is formed, through which the fibre clumps can be removed from the area of the suction inlet **15**, and an additional air stream can be produced which is necessary to create the transverse air flow forces to form said fibre clumps. The shutter **22** may be either fixed, or adjustable, as desired, in order to adapt the aperture **28** width to the requirements of a particular application of the invention.

As shown in FIG. 1, the particular filtering disc **23** selected for illustrating the invention is of the screen type, having a central hub **29**, and a plurality of radial spokes **30**. The dropping of the fibre clumps is additionally aided by the fact that the spokes **30**, shut off the suction air currents momentarily at the margin of the suction inlet **15** as they pass over said inlet **15**, at a point which has already passed practically beyond the shutter **22**.

Openings **31** are furthermore provided in the front wall **32** of the filter box **11** for the aspiration of additional air in such a manner that the air current passes only through the upper portion **26** of the interior of the filter box, **11** while the lower portion **27** thereof is maintained relatively draft-free for depositing the fibre wastes. Thus, it is possible on occasions to remove the collected wastes from the filter box **11** through the door **12**, without any disturbance or interruption of the aspirating or filter-cleaning process, and without said wastes being stirred upward, as, for example, by air currents resulting from opening the door **12**.

Any suitable conventional means can be used for rotating the filtering disc **23**. For example, the filtering disc **23** can be rotated by means of a motor **33** mounted to the wall **14** of the filter box **11**. A friction wheel **34** mounted upon the shaft **35** of the motor **33** and disposed thereupon within the filter box **11** so as to be in frictional engaging contact with the edge of said filtering disc **23** imparts the rotary motion of said motor **33** to the filtering disc **23**.

It is to be understood, however, that the filtering disc **23** can be inserted at any other point in the duct **19** that is suitable for filtering, and the particular location described and shown by the drawings herein is purely by way of example, and not as a limitation.

What is claimed is:

1. A vacuum cleaning apparatus for the aspiration and collection of fibrous materials, which comprises:

(a) A filter box for the collection of fibrous material, said filter box having a door for the removal of said collected fibrous material;

(b) A blower for creating a suction air flow, said blower being mounted to the filter box and having a suction inlet which communicates with the interior of said filter box and a discharge outlet which exhausts outside said filter box;

(c) A filtering disc disposed within the filter box and completely covering the suction inlet of said blower, said filtering disc being supported within the filter box so as to be rotatable about its central normal axis, said central axis being disposed eccentrically with respect to the suction inlet of the blower, and said filtering disc being greater in area than the suction inlet of the blower, and said filtering disc being also disposed so that gravitational forces tend to remove fibrous material captured by its downstream side;

(d) An enclosed duct disposed within the filter box, said duct having an inlet passage which communicates with the exterior of said filter box to receive fibrous materials aspirated by the suction air flow created by the blower, and an opening which faces, and is disposed in coextensive spaced apart relation to the blower suction inlet as covered by the filtering disc to define a clearance passage accommodating the rotation therethrough of said filtering disc across the

blower suction inlet, and for aspirating additional air from within said filter box to flow along the upstream side of the filtering disc transversely to the primary flow of air therethrough induced by the blower, acting upon fibrous materials captured thereupon to aggregate such fibrous materials into clumps thereof to aid in their removal by gravity; and,

(e) Means for rotating said filtering disc about its axis whereby the fibrous material aspirated through the enclosed duct and aggregated into clumps held against the upstream side of the filtering disc by the suction air flow is removed from said air flow, discharged from the filtering disc by gravity, and is collected in the filter box thereby continuously providing a clean filtering area across the blower suction inlet.

2. The vacuum cleaning apparatus of claim 1 wherein the filter box has an upper and a lower portion, with the lower portion being for the collection of the fibrous material, and the enclosed duct is disposed within the upper portion of said filter box, and the blower suction inlet is disposed so that the portion of the filtering disc which covers it lies within the upper portion of said filter box, and the remaining portion of said filtering disc extends partially into the lower portion of said filter box, so as to minimize the air circulation within said lower portion of the filter box.

3. The vacuum cleaning apparatus of claim 1 wherein the blower suction inlet and the filtering disc are both circular, and the diameter of the filtering disc is at least twice the diameter of the blower suction inlet.

4. The vacuum cleaning apparatus according to claim 1 including an adjustable shutter operatively connected to said enclosed duct to selectively vary the effective clearance passage area between the upstream side of the filtering disc and the opening of said duct defining said clearance passage to correspondingly regulate the transverse air flow aspirated therethrough.

5. The vacuum cleaning apparatus according to claim 4 wherein at least one opening is provided in the upper portion of the filter box to aid in the aspiration of the air flow regulated by said shutter.

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