

March 31, 1959

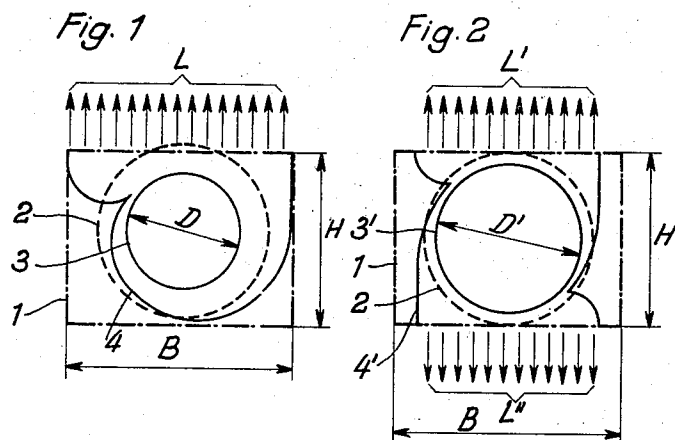
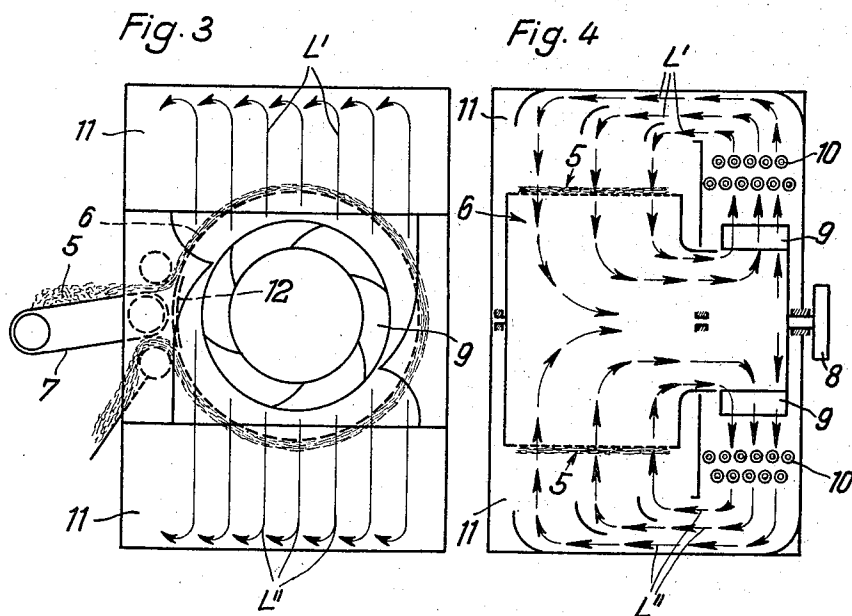
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DRIER OF THE SIEVE-DRUM TYPE

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DRIER OF THE SIEVE-DRUM TYPE

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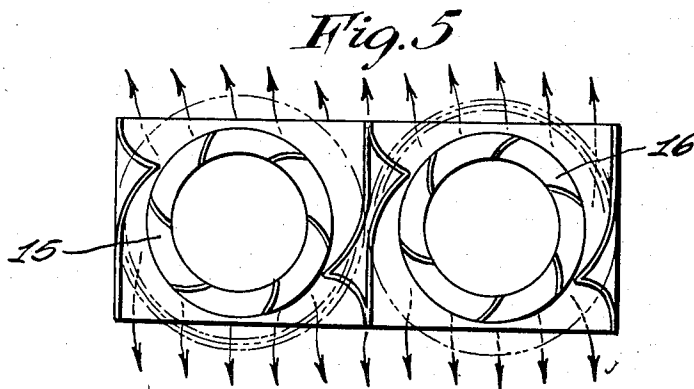
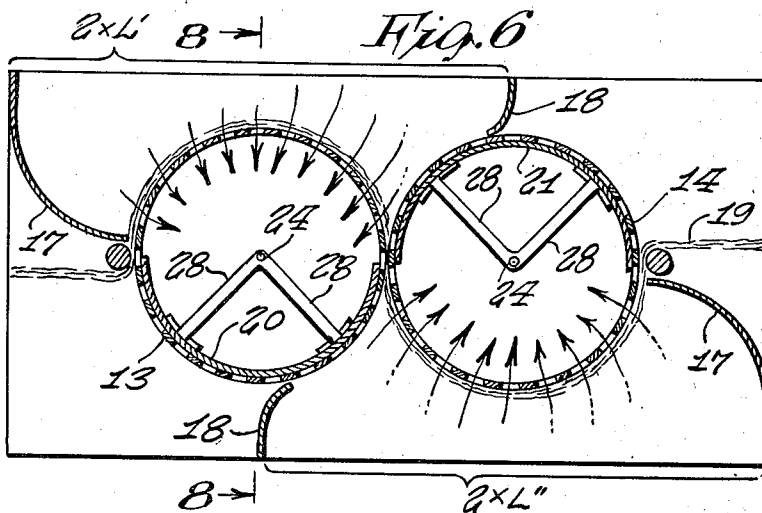
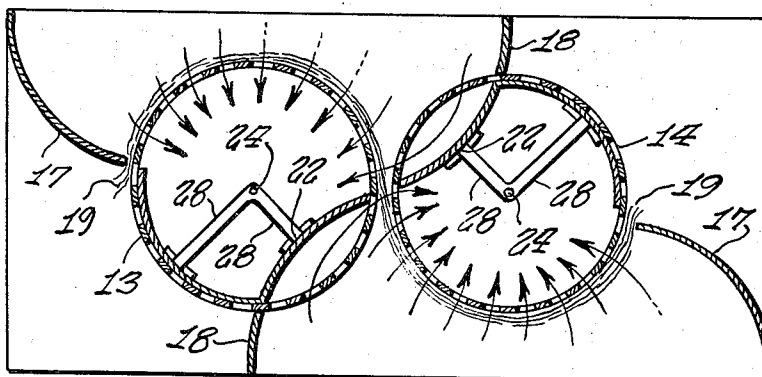


Fig. 7

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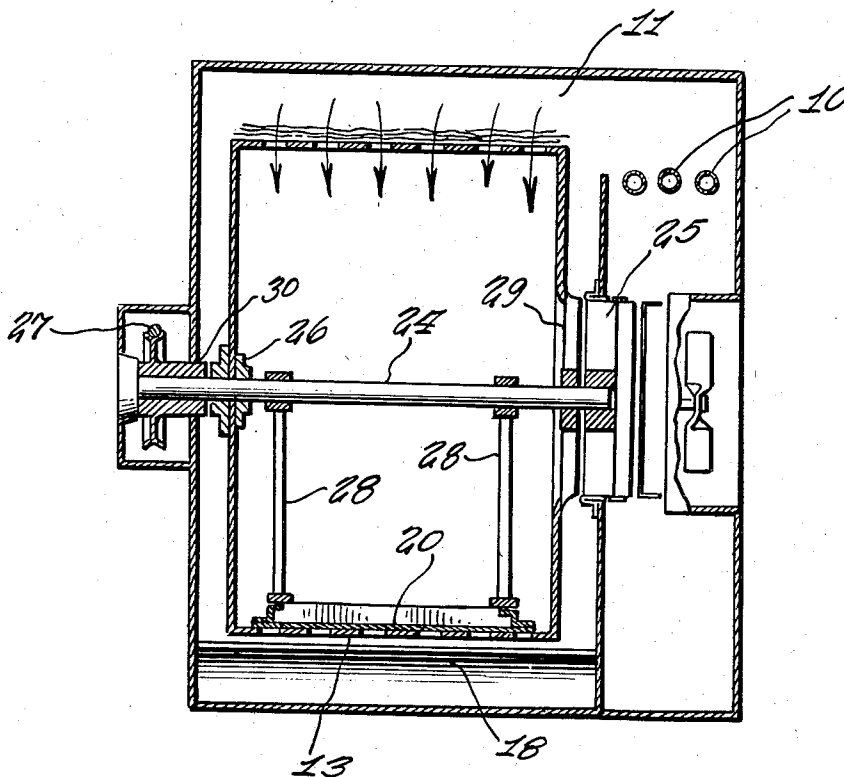
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Fig. 8



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DRIER OF THE SIEVE-DRUM TYPE

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2 Claims. (Cl. 34—114)

The present invention relates to drying apparatus of the sieve drum type with radially directed air supply and with blowers arranged axially with respect to the drums. The present invention relates to a drier of this type which is of improved design and requires comparatively little space.

In the known driers of the sieve-drum type, the goods to be dried, such as fiber material, are supplied by means of suitable feeding devices to the outer surface of the drum, where they are retained by means of a partial vacuum generated in the interior of the drum. Depending on the type of drier, one or several drums are arranged in a drying chamber. Air is sucked out of the drums by aspirators and is blown over radiators arranged in the drying chamber back into the interior of the drum. On its way, it passes through the goods to be dried and eliminates the water therefrom.

Heavy fibers, for instance cellulose flakes with high moisture content, require a large amount of air for drying; in order to maintain the fibers on the outer surface of the sieve-drum, it is necessary to reduce the pressure inside quite considerably. For fulfilling these requirements in an economically satisfactory way, a blower having a large rotor has to be used. This, in turn, is only possible with a large casing for the blower of a unilateral screw-blasting machine, which is the only one used up to now. The large space needed for the housing interferes with the arrangement of the drying chamber associated with the drum. This is particularly disadvantageous, when several drums are arranged in succession in a drier, because the drums cannot then be arranged for best transmission of goods from one drum to the other in view of the large size of the blower. In order to permit a satisfactory transmission of the fiber material from one drum to the next drum, only blowers with comparatively small rotors can be used. These, however, will not supply sufficiently effective air circulation.

It is the object of the present invention to provide an improved drier which overcomes the above-mentioned inconveniences, which is of high drying capacity, and yet requires only a limited space.

This is achieved in accordance with the present invention by using a blower in a casing having two outlet openings diametrically opposed with respect to each other; with a given space for mounting, a much larger rotor can then be used than is feasible with a blower in a casing with a single outlet opening. By the use of a blower in a casing having double air outlet, large quantities of air can be circulated while the pressure is considerably reduced in the suction space of the blower. It would be impossible to arrive at similar results with a screw blower having a single air outlet, with a casing of a given space and a rotor of the same r.p.m.

In a blower having two outlet openings, the air sucked from the interior of the drum is divided into two halves, one half being admitted to the upper half of the sieve-drum within the drying chamber, whereas the other half of air is admitted to the lower half of the sieve drum.

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Apart from the larger rotor which can be used in this arrangement, the above-mentioned division of air results in a simple feed-in to the drying chamber, the air being in this way admitted to the drum radially from all directions without the provision of special pipelines or nozzles, aspiration occurring directly by the shortest route. This arrangement permits the advantageous and practical use of a small single-drum drier of high capacity.

A very desirable embodiment according to the invention consists of a drier with several sieve-drums arranged in series. The several drums may be mounted in close proximity, leaving only a space therebetween which corresponds to the thickness of the layer of the goods to be dried; due to this arrangement, the total length of the drier is considerably shortened, and all drums can be arranged at the same level. This arrangement is particularly advantageous when a drier with several drums is so designed that each two adjacent drums with their blowers are combined to a unit.

In driers with sieve-drums arranged in series, the goods travel, as is known, from one side of one drum to the opposite side of the adjacent drum. According to the invention, the currents of air leaving the two blowers are so combined that the currents escaping from the top of both blowers are admitted to one drum from above, whereas the two currents escaping toward the bottom are combined and admitted to the adjacent drum from below. In this way, the capacity of the drier is considerably increased since each drum is fed with an amount of air which corresponds to the suction-output of the blower.

The device according to the invention will now be described with reference to the accompanying drawings but it should be understood that these are given by way of illustration and not of limitation and that many changes in the details can be made without departing from the spirit of the invention.

In the accompanying drawings:

Fig. 1 illustrates diagrammatically a screw blower having a single blower outlet;

Fig. 2 a screw blower with double outlet;

Figs. 3 and 4 show diagrammatically, partly in section, a single-drum drier in front and side views, respectively;

Fig. 5 is a front view of a screw-blower unit combining two blowers.

Fig. 6 is a frontal view of a unit combining two sieve-drums.

Fig. 7 a similar view of another embodiment, and

Fig. 8 is a cross section through the sieve drum drier showing the following:

The stationary axle 24 rests, on one side, in the rotating drum and, on the other, is wedged in a stationary, so-called nozzle-star. On the stationary axle 24, the sheet cover fasteners are situated which can pivot. After adjustment, the arms are tightened by means of bolts on axle 24. The drum itself is driven by way of clutch 26 with a transmission, in the particular case as seen in the drawing, by means of a worm gear. The drum has no bearing on the side of the drive, but is fastened by means of clutch 26, whereby the transmission bearings simultaneously act as bearings for the drum. The transmission drives the drum by way of the shaft driven by that transmission and by way of clutch 26. On the fan side, the drum is supported on the stationary axle above the so-called drum star 29. The nozzle star 25 as well as the drum star 29 are three-armed stars which allow support in the center, whereby no resistance is offered to the exhausting air.

Figs. 1 and 2 show for comparison two screw-blower devices, the one illustrated in Fig. 1 having a screw blower with single outlet, where as the one shown in Fig. 2 shows a similar device with two outlets.

Shown in dash-and-dot line is a square space 1 of the

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width B and height H which is the space available for housing the blowing device. Both squares have the same size. In each space a sieve drum 2 of equal diameter is shown in broken lines.

In Fig. 1 a rotor 3 is illustrated, which is arranged ahead in axial direction of the screw blower designated by 4. The effluent air is illustrated by arrows L. The available space 1 is completely filled by the casing of the screw blower 4. The largest diameter of the rotor 3 is indicated by D.

In Fig. 2, the same space 1 is shown to house a screw blower having two blower outlets, one directed toward the top and the other directed toward the bottom. A rotor 3' is shown with a diameter D' and an associated screw blower 4'. On top, as well as at the bottom, half of the aspirated air is shown to escape, as indicated by arrows L' and L''.

As the comparison between Figs. 1 and 2 demonstrates, with a larger rotor diameter D' the required space for the screw casing is even smaller than with a blower having a smaller rotor diameter D, but a screw casing with a single outlet. It will furthermore be understood that with the same number of revolutions per minute, the air delivered by the blower according to Fig. 2, which amounts to L'+L'' is larger than the amount of air L delivered by the single outlet screw blower of Fig. 1.

Figs. 3 and 4 show a drier with a single sieve drum. The material to be dried, which is designated by 5, is supplied to a drum 6 by means of a suitable feeding device, e.g. an endless conveyor 7. The material is retained on the drum by reduced pressure. Air, designated by arrows L' and L'', is sucked from the drum interior by a vacuum generated by a blower 9, driven in conventional manner by means of a pulley 8; however, an electromotor could likewise be used as a drive means. Surrounding the blower 9 are heaters 10, over which the air passes upward and downward, respectively, on its way to a drying chamber 11. Returning from there to the interior of the drum 6, the heated air will penetrate the material to be dried and will withdraw moisture therefrom. The material to be dried travels through the drying chamber with the drums for almost 360° and separates therefrom near the spot where it was fed to the same. An inner shutter disk 12 serves for directing the current of air at the feeding and discharge spots, so that the goods will be properly taken in and released, respectively.

When a drier is so designed that several drums are arranged in succession, the goods are conveyed by slow rotation of the drums which are provided with shutter disks similar to plate 12 shown in Fig. 3, and which direct the transmission from one drum to the next one until the goods leave the apparatus. Each drum is provided with a blower, which is arranged axially ahead thereof. The blowers depend in size on the axial distance of two adjacent drums. The screw casing, however, requires a lot of space, and, consequently, only permits the mounting of comparatively small rotors with low blowing efficiency.

According to the invention, it has become possible to provide, also in multiple drum driers, the single drums within effective blowers, in spite of the limited space for housing the latter. An embodiment of the contemplated design is diagrammatically shown in Figs. 5 to 7.

Of the drums, which are arranged at the same level, each two adjacent drums, e.g. designated by 13 and 14, are so combined to a unit that the associated blowers

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15 and 16 (Fig. 5) deliver the sucked-off air in two opposite directions: one-half L' to pass the upper drum space and to be delivered to drum 13, and the other half L'' to pass the lower drum space and be delivered to drum 14. Similar to the arrangement shown in Fig. 4, the air is passed over radiators. By means of guide members 17, 18, appropriately arranged within the drying chamber, the air is evenly distributed with respect to the goods 19 to be dried, and after passing the same is sucked off again by the blowers from the interior of the drum. Shutter disks 20 and 21 at the inside of the drum are provided for directing the goods to be dried in an orderly manner from one drum to the other. By shaping the disks, as shown in Fig. 7 at 22 and 23, with end members, e.g., by giving them the shape of two arcs merging at the point of transition from one drum to the other, the current of air is properly directed, so that, at this point too, it will be supplied to the drum interior in a radial direction.

What we claim is:

1. In a drier of the sieve-drum type for drying heavy loose fibers having a high moisture content, a plurality of perforated drums, each having an open end, including a first and a second drum arranged in series and in close proximity to each other, means for feeding material to be dried to said first drum for sequential passage over said plurality of drums, a casing defining a drying chamber surrounding said drums, a transverse wall perpendicular to the axes of said drums extending across said casing and defining an air passage duct in cooperation with one wall of said casing and having a plurality of upper and lower air outlet openings formed therein, one of said plurality of openings being above said drums and the other being at the bottom of said drums in said casing, a plurality of centrifugal blowers mounted in said casing, each blower having a suction side in communication with the open end of one of said drums and a discharge side in communication with said air passage duct, heating means mounted in said casing, associated with each of said blowers, deflecting means for said first drum, comprising an internal seal plate mounted upon said casing and cooperating with the lower portion of said first drum to prevent the passage of air through said lower portion, second deflecting means likewise comprising internal seal plates in said second drum, mounted upon said casing, a plurality of upper baffles mounted in said casing and extending thereacross parallel and contiguous to the upper portion of said drums to direct air from said upper openings through the perforations in said upper portion, a plurality of lower baffles mounted in said casing and extending thereacross parallel and contiguous to the lower portion of said drums, to direct air from said lower openings through the perforation in said lower portion.

2. A drier according to claim 1, wherein each of said seal plates comprises arc-shaped plates which have concave end portions converging radially to the point of proximity of one drum to the adjacent drum.

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